JOB QUALITY IN 2015 AND THE CHANGE IN JOB QUALITY BETWEEN 2001 AND 2015

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ASU W. P. CAREY SCHOOL of BUSINESS
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SUMMARY

Job quality in a state, county, or metropolitan area is computed as the average of the total industrial job mix and the total occupational job mix. The total job mix is the sum of the job mix values over all industries or occupations. The job mix value by industry or occupation is calculated as the difference between the subnational area and the nation in the share of employment by industry or occupation multiplied by the ratio of national average earnings per worker by industry or occupation to the overall national average earnings per worker. In order to isolate the effect of geographic differences in the employment structure, average earnings per worker is measured by national earnings data. Since local earnings are not used, geographic differences in living costs and other factors that affect local earnings levels do not distort the analysis of job quality.

Industrial job mix values by sector are calculated as the sum of the job mix values over all industries in a sector. Similarly, occupational job mix values by occupational group are computed as the sum of the job mix values over all occupations in a group. Alternatively, industrial job mix values can be calculated for clusters, which represent an alternative combination of industries than specified in the North American Industry Classification System. Traded clusters — those that sell their products to customers outside the local area — are of particular significance to a regional economy.

Job Quality by State in 2015

Job quality in 2015 was highest along the Atlantic Coast from Massachusetts south to Virginia, with job quality boosting average earnings per worker by at least 3 percent in six states and the District of Columbia. The western states of Washington, Colorado, and Utah also were among the top 10. Arizona ranked sixth among 10 western states (behind Texas and California as well) and 21st among the 50 states and the District of Columbia at -0.05. (That is, job quality lowered overall average earnings per worker by 0.05 percent relative to the national average.) Job quality was lowest in Nevada and Hawaii, two states with large numbers of tourists.

Across the states, the total industrial mix and the total occupational mix were highly correlated. Arizona's total industrial mix was -0.70, ranking 29th nationally and sixth among 10 western states — behind Washington, Utah, Colorado, Texas, and New Mexico. The traded clusters portion of the industrial mix was -0.34 in Arizona, 21st nationally and sixth in the West (higher than New Mexico, Oregon, Idaho, and Nevada). In the nontraded clusters portion, the value was -0.38 in Arizona, ranking 41st nationally and eighth in the West (higher than Nevada and California). The total occupational mix in Arizona was 0.60, ranking 21st nationally and fifth in the West, behind Colorado, Washington, Utah, and California. Thus, Arizona's job quality in 2015 was nearly equal to the national average, the result of a slightly above average occupational mix and a slightly below average industrial mix.

Two sectors were particularly responsible for Arizona's total industrial mix being below the national average. The real estate and rental and leasing sector had the largest negative effect, caused by the disproportionately large size of various below-average-paying industries related to real estate. The professional, scientific, and technical services sector — mostly consisting of above-average-paying industries in which Arizona's sectoral share was below average — also

had a large negative impact, with negative industrial mix values in eight of nine industry groups, especially research and development.

In contrast, the finance and insurance sector and the health care and social assistance sector had strong positive effects on Arizona's industrial mix. The manufacturing sector also had a positive impact, due to the disproportionately large size of two of its high-paying industries — semiconductor and related devices and guided missiles and space vehicle — which had the two largest positive impacts of any industry on the total industrial mix. Except for these two industries, however, the net effect of manufacturing was negative.

The traded clusters that include these two high-tech manufacturing industries — aerospace vehicles and defense and information technology and analytical instruments — had positive effects on the traded cluster job mix value, along with the financial services cluster. However, the business services cluster had a large negative impact on the traded cluster value.

None of the occupational groups had particularly large effects on the total occupational mix in Arizona in 2015. The production, transportation and material moving, and computer and mathematical groups had positive effects, while the sales and related group had a negative effect.

Job Quality by Metropolitan Area in 2015

Job quality was calculated for the 34 most-populous metropolitan areas nationally, 15 of which (including Phoenix) are located in the 10 western states. Each metro had a 2015 population of at least 2 million. In addition, job quality was computed for 16 western metro areas with a population between 500,000 and 1.2 million (including Tucson; no western metro had a population between 1.2 and 2 million).

Job quality in 2015 was related to metro size, with the median of the total industrial mix and the total occupational mix in the 34 largest metros well above the national average. Job quality in 2015 in San Jose, Washington D.C., Boston, Seattle, San Francisco, Denver, and Austin each boosted overall earnings per worker by at least 6 percent relative to the national average. However, job quality in a few populous metros — Las Vegas, Riverside, Orlando, and Miami — was substantially below average.

At 1.31, job quality in the Phoenix area in 2015 ranked 10th among 15 large western metros and 24th among 34 large metros nationwide. The Phoenix area's total industrial mix was 0.54 (10th among the large western metros and 26th among all large metros) and its total occupational mix was 2.07 (10th among the large western metros and 21st among all large metros). In the traded cluster portion of the industrial mix, the Phoenix metro had a value of 1.01, 10th among large western metros and 26th among large metros nationwide. In the nontraded cluster portion of the industrial mix, the Phoenix metro had a value of -0.48, eighth among large western metros and 22nd among large metros nationwide. Thus, while job quality in Metro Phoenix was above the national average, it was below the norm of populous metro areas.

The disproportionately large size of three high-paying traded clusters — financial services (with a job mix value of 1.24), information technology and analytical instruments (0.84), and aerospace vehicles and defense (0.50) — as well as the disproportionately small size of the low-

paying farming and ranching cluster (0.46) were positive factors on the total industrial mix in the Phoenix metro area. The semiconductor and related device manufacturing industry was of particular significance at 1.19. However, these positives were partially offset by negative effects from a number of traded clusters, including the federal government, oil and gas production and transportation, and education and knowledge creation.

Even in the 16 mid-sized western metros, median job quality was considerably below the national average. Job quality exceeded 6 in Salt Lake City and was above the U.S. average in Albuquerque, Ogden, and Provo, but was more than 6 below average in seven of the metros. The Tucson metro's job quality (-1.14) ranked seventh among the 16 metros. Its total industrial mix was -1.70 (fifth among the mid-sized western metros) and its total occupational mix was -0.57 (seventh among the mid-sized western metros). In the traded cluster portion of the industrial mix, the Tucson metro had a value of -0.58, fifth among mid-sized western metros. In the nontraded cluster portion of the industrial mix, the Tucson metro had a value of -1.13, 11th among mid-sized western metros. Thus, while job quality in Metro Tucson was below the national average, it was in the middle of the mid-sized western metro areas.

The Tucson metro area's total industrial mix in 2015 was heavily impacted by the large size of the high-paying traded cluster of aerospace vehicles and defense (3.49). The above-average-paying federal government cluster also had a large favorable influence (1.07), while the small size of the farming and ranching cluster (0.46) also contributed. The guided missile and space vehicle manufacturing industry was of huge importance (3.64). Despite these favorable impacts, the overall traded cluster value was negative in the Tucson area. Three above-average-paying traded clusters of disproportionately small size were particularly responsible: business services (-2.09), financial services (-0.92), and distribution and electronic commerce (-0.74).

Change Over Time in National Job Quality

Nationally, the change in job quality is computed as the average of the change in the total industrial job mix and the change in the total occupational job mix. The change in the job mix by industry or occupation is calculated as the change over time in the share of total employment by industry or occupation multiplied by the ratio of average earnings per worker by industry or occupation to overall average earnings. The change in the total job mix is the sum of the changes in the job mix values by industry or occupation.

Job quality declined nationally between 2001 and 2015 by 1.68. That is, the deterioration in job quality had the effect of lowering overall average earnings per worker by 1.68 percent. Most of the decline occurred between 2001 and 2006. The total industrial job mix dropped 3.39 between 2001 and 2015, with significant losses between 2001 and 2006. Following an improvement in the total industrial mix in 2008, losses occurred in each year from 2009 through 2015. In contrast, the total occupational mix dropped less significantly between 2001 and 2006, rose from 2007 through 2009, and has fluctuated since then, with a change between 2001 and 2015 of 0.03.

The largest negative effect on the 2001-to-2015 change in the total industrial mix nationally came from declines in the employment share in the above-average-paying manufacturing sector. The employment share decreased in all 21 manufacturing subsectors. The largest drop was in

computer and electronic products, a very high-paying subsector. Thus, this subsector had a large negative effect on the change in industrial mix.

The next-largest negative impacts on the change in industrial mix came from the accommodation and food services sector — due to increases in employment share in low-paying restaurant industries — and from the health care and social assistance sector, due to increases in employment share in the low-paying services for the elderly and persons with disabilities industry and the home health care industry.

Between 2001 and 2015, the industrial mix declined for both traded clusters (-1.04) and nontraded clusters (-2.35). The information technology and analytical instruments cluster had the largest negative effect among the traded clusters, followed by the communications equipment and services cluster.

Increases between 2001 and 2015 in the occupational mix values of the production occupational group and the business and financial occupational group were offset by decreases in the personal care and services occupational group and the food preparation and serving occupational group. The personal financial advisors occupation had the greatest positive effect while the personal care aides occupation had the largest negative effect.

Change Over Time in Job Quality by State

The change in job quality and in the job mixes in a subnational area are computed simply as the difference in the values in two years. To be consistent with the 2015 figures, the change over time also is expressed relative to the national average. The total change in a subnational area therefore is the sum of the national change and the subnational change relative to the national average.

Between 2001 and 2015, the change in job quality tended to be highest in noncoastal states, particularly in the Great Plains. Some of the states along the Atlantic Coast that had the highest job quality in 2015 experienced among the largest losses between 2001 and 2015. Arizona ranked eighth among 10 western states (ahead of Idaho and California) and 39th among the 50 states and the District of Columbia with a 2001-to-2015 change in job quality of -0.24. Job quality in Arizona declined between 2001 and 2006, but gains in 2008 and 2009 offset the earlier losses. Between 2009 and 2015, the annual change fluctuated but on net was negative, with decreases in 2014 and 2015.

Across the states, the changes between 2001 and 2015 in the total industrial mix and the total occupational mix were highly correlated. The total industrial job mix in Arizona dropped only 0.37 between 2001 and 2015, but Arizona ranked 40th nationally and eighth among 10 western states, ahead of Idaho and California. Declines in Arizona's total industrial mix occurred between 2001 and 2005. Following an improvement in the total industrial mix between 2008 and 2010, the change fluctuated by year but was negative on net from 2011 through 2015. The total occupational mix slipped 0.10 between 2001 and 2015, ranking 35th nationally and seventh in the West, ahead of New Mexico, Idaho, and California. The total occupational mix dipped from 2005 through 2007, rose from 2008 through 2010, and dropped from 2011 through 2015. Thus,

while job quality fell only a little in Arizona relative to the national average between 2001 and 2015, this performance placed the state among the bottom 15.

The 2001-to-2015 change in the traded clusters portion of the industrial mix was -1.17 in Arizona, 43rd nationally and eighth in the West (higher than Idaho and California). In the nontraded clusters portion, the change in value was 0.79 in Arizona, ranking 23rd nationally and sixth in the West (higher than Idaho, Texas, Nevada, and California).

The manufacturing sector was particularly responsible for Arizona's decline in the total industrial mix between 2001 and 2015, though most of the drop occurred in 2001-to-2007 period. Four high-technology manufacturing industries were among the 10 with the largest decline in industrial mix value, but the decrease in the semiconductor and related devices industry was far larger than in the other industries. The real estate and rental and leasing sector also contributed to the decline in the total industrial mix. In contrast, the finance and insurance sector and the health care and social assistance sector positively affected the change in industrial mix, each due to small gains in several industries.

Two high-tech traded clusters — aerospace products and defense (-0.40) and information technology and analytical instruments (-1.26) — were responsible for the decrease in the traded cluster value in Arizona between 2001 and 2015. In contrast, the financial services cluster had a positive impact on the change in the traded cluster value.

None of the occupational groups had much effect on the change in the total occupational mix in Arizona between 2001 and 2015. The health practitioners group had a positive effect that was offset by the architecture and engineering group.

Change Over Time in Job Quality by Metropolitan Area

Unlike the 2015 job quality level, the change in job quality between 2001 and 2015 was not related to metro size. Among the nation's 34 most-populous metro areas, the change in job quality between 2001 and 2015 was greatest in Seattle, Kansas City, and Pittsburgh, each with a gain of more than 1. In contrast, job quality fell by more than 1 in 13 of the populous metros, with the greatest declines in Austin, New York, Boston, and Philadelphia.

At -0.81, the 2001-to-2015 change in job quality in the Phoenix area ranked ninth among 15 large western metros and 21st among 34 large metros nationwide. Its change in the total industrial mix was -1.31 (ninth among the large western metros and 20th among all large metros) and its change in the total occupational mix was -0.31 (eighth among the large western metros and 18th among all large metros). In the traded cluster portion of the industrial mix, the Phoenix metro had a change in value of -1.62, 11th among large western metros and 26th among large metros nationwide. In the nontraded cluster portion of the industrial mix, the Phoenix metro had an increase in value of 0.29, tied for fourth among large western metros and 10th among large metros nationwide. Thus, job quality in Metro Phoenix fell relative to the U.S. average between 2001 and 2015, a performance below the norm of the highly populous metro areas. The decrease in the traded cluster job mix was of particular significance.

The information technology and analytical instruments traded cluster had a large negative effect (-1.53) on the change in the total industrial mix in the Phoenix metro area, entirely in the semiconductor and related devices manufacturing industry. The next-largest traded cluster negative effect (-0.45) came from electric power generation and transmission. The largest positive effect came from the financial services traded cluster (0.41).

Among the 16 mid-sized western metros, the 2001-to-2015 change in job quality in the Tucson metro area of -0.81 ranked tied for 10th. The Tucson area's change in the total industrial mix was -0.98 (11th among the mid-sized western metros) and its change in the total occupational mix was -0.64 (seventh among the mid-sized western metros). In the traded cluster portion of the industrial mix, the Tucson metro had a change in value of -2.52, 11th among mid-sized western metros. In the nontraded cluster portion of the industrial mix, the Tucson metro had a change in value of 1.53, fifth among mid-sized western metros. Thus, Metro Tucson's job quality fell by an amount equal to Metro Phoenix between 2001 and 2015, a performance below the norm of mid-sized western metros. The decrease in the traded cluster industrial mix was even larger than in Metro Phoenix.

Two high-tech clusters — information technology and analytical instruments (-1.91) and aerospace vehicles and defense (-1.28) — accounted for the decrease in the Tucson metro area's traded cluster industrial mix between 2001 and 2015. The electronic computer manufacturing (-1.20), software publishers (-0.40), guided missiles and space vehicles manufacturing (-0.80), and aircraft manufacturing (-0.58) industries were responsible for the decreases in these two clusters. The largest positive effect came from the federal government cluster (0.64).

INTRODUCTION

For subnational regions — such as states, counties, and metropolitan areas — the total industrial "job mix" (or simply, industrial mix) in any year can be calculated using employment and earnings data by industry. The total industrial mix is expressed as a level relative to the national average, based on the difference between the nation and the subnational region in each industry's share of total employment, considering average earnings in each industry, as measured by national data. The national level of the job mix cannot be specified.

Using employment and earnings data by occupation, the total occupational job mix in any year can be similarly calculated. "Job quality" is calculated as the average of the total industrial job mix and the total occupational job mix.[1]

The change over time in the total industrial job mix, the total occupational job mix, and job quality can be calculated for subnational regions, again expressed relative to the national average. The change in each of these measures also can be calculated for the nation.

The industries are defined in the North American Industry Classification System (NAICS). The NAICS consists of two-digit sectors, three-digit subsectors, four-digit industry groups, and five- and six-digit industries. The occupations are defined by the Standard Occupational Classification (SOC). The SOC usually is analyzed either by two-digit occupational groups or by occupations.

The methodology and datasets used to calculate the job mixes and job quality that are presented in this report are discussed in the remainder of this section.

Methodology

Subnational Job Mix (Level in a Given Year)

The job mix (either industrial mix or occupational mix) value in a subnational region for a specific industry or occupation is calculated from Formula 1:

> **Formula 1: (the difference between the subnational area and the nation in the share of employment by industry or by occupation) * (the ratio of the national average earnings per worker by industry or by occupation to the overall national average earnings per worker – 1) * 100.**

The total job mix is the sum of the job mix values over all industries or occupations.

To isolate the effect of geographic differences in the employment structure, average earnings per worker is measured by national earnings data. Since local earnings are not used, geographic differences in living costs and other factors that affect local earnings levels do not distort the analysis.

For an industry or occupation, Formula 1 results in a positive value if the industry or occupation has higher-than-average earnings and a larger share of employment in the region than the

[1] Ideally, a cross-tabulation of employment by industry and occupation would be used to calculate job quality, but such data are not available for subnational regions.

national average, or if the industry or occupation has lower-than-average earnings and a smaller share of employment in the region than the national average.

Summed over all industries or occupations, the total job mix value would be zero if a region's employment shares by industry or by occupation were exactly equal to the national average. A negative total job mix indicates that a disproportionately large share of the region's employment is in industries or occupations that nationally pay below-average earnings. The multiplication by 100 in Formula 1 converts the results to percentages. For example, a total job mix value of -0.50 indicates that the employment mix has a downward effect of 0.5 percent on the region's overall average earnings per worker relative to the national average.

Industrial job mix values from Formula 1 can be aggregated into industry groups, subsectors, or sectors in addition to the total job mix. Intermediate job mixes also can be aggregated from the occupational values.

Change in the National Job Mix Over Time

The change in the industrial or occupational job mix value for the nation is calculated from Formula 2:

> **Formula 2: (change over time in the industrial or occupational share of national employment) * (the ratio of national average earnings per worker by industry or by occupation to overall national average earnings per worker – 1) * 100.**

The total change in the job mix is calculated by summing over all industries or occupations.

The mid-point of the change in the total job mix for the nation is a value of zero — that is, industrial or occupational employment changes that are exactly proportionate to the existing employment shares. A negative value for the total job mix indicates a deterioration in the job mix: disproportionately fast growth in industries or occupations with below-average earnings per worker or disproportionately slow growth in industries or occupations with above-average earnings per worker. The multiplication by 100 in Formula 2 again converts the results to percentages. For example, a change in the total job mix value of 2.50 indicates that an improvement in the job mix had an upward effect of 2.5 percent on overall average earnings per worker.

The earnings data used in Formula 2 can be for either the first or last year of the time period being analyzed. The selection of the year may result in a noticeable difference in the value of the change in the job mix. Since earnings by occupation are available only for the most recent year from the data source used for this report, all of the analyses in this paper are based on earnings per worker in 2015, except for the alternative calculations presented in the next section ("Alternative Measures of Job Quality") for the total industrial job mix in Arizona and the nation.

Change in the Subnational Job Mix

The change in job quality and in the job mixes in a subnational area simply is the difference in the values in different years. The changes are expressed relative to the national average. The total

change in a subnational area therefore is the sum of the national change and the subnational change relative to the national average.

Ideally, the annual change in the total job mix for the nation and in regions would be calculated, allowing for the earnings data to be updated each year, rather than held constant. In this option, the change in the total job mix over a longer period of time would consist of an aggregation of the annual changes. This option was not pursued because of the large amount of data processing required and the difficulty in presenting the voluminous results for the large number of geographic areas examined in this report: the 50 states and the District of Columbia, Arizona's 15 counties, and 50 metropolitan areas. Instead, the analysis for these geographic areas was limited to 2001 (the first year available from the data source), 2007 (the end of the prior economic expansion), and 2015 (the latest actual data). Thus, the change in the job mix was calculated for the 2001-to-2007, 2007-to-2015, and 2001-to-2015 periods, with an emphasis on the 14-year period.

Data

All of the data used to calculate the job mixes and job quality were obtained from Emsi (www.economicmodeling.com), which is a private-sector company providing selected economic and related data for the nation, states, counties, and metropolitan areas. Emsi updates the data quarterly; the data used in this report come from Emsi's fourth quarter 2016 data release. While Emsi projects data for the current year and subsequent years, the latest data used in this report are for the 2015 calendar year.

Emsi uses a variety of sources, predominantly federal government agencies, to develop its data, which are available only to subscribers. The advantage of using the Emsi data is that Emsi imputes values for the large volume of data that are withheld by the federal government. Due to federal disclosure laws intended to prevent the disclosure of information regarding specific businesses and households, a substantial amount of data are withheld in less-populous areas. Data for a number of industries and occupations are not disclosed even for states.[2]

Among the data available from Emsi is employment and earnings by industry and employment and earnings by occupation. By industry, employment and earnings estimates are available annually since 2001 for 1,001 industries. By occupation, the employment estimates are available annually since 2001 for 876 occupations, but the earnings estimates are limited to the most recent year.

Employment and earnings are reported by Emsi for each of four categories; totals are available for any combination of two or more categories. The first category corresponds to the Quarterly Census of Employment and Wages (QCEW), produced by the U.S. Department of Labor's Bureau of Labor Statistics (BLS). The QCEW covers wage and salary employees who are covered by the unemployment insurance program. Nationally in 2015, the number of workers

[2] Emsi does not provide an estimate of employment or earnings for industries or occupations with between 1 and 10 employees, though it does indicate that employment is within this range. In order to calculate the job mix, values for the missing employment data were calculated as the total industrial or occupational employment not reported by industry or occupation divided by the number of industries or occupations with unreported data in each geographic area.

counted by the QCEW was 139.5 million. The QCEW provides data by industry. The counterpart for the occupational data is the Occupational Employment Statistics (OES) provided annually by the BLS. Though the employment totals from these sources differ, Emsi forces the industrial and occupational totals to be identical.

The second category of data from Emsi is wage and salary workers who are not covered by unemployment insurance (shown as "Non-QCEW" in Table 1); the total was estimated by Emsi to be 6.4 million nationally in 2015. Those in the military and those working for railroads are in this category, as are some employees of the federal government, religious organizations, etc. The third category of self-employed includes those individuals whose self-employment constitutes a high proportion of their earnings and working hours. Nationally in 2015, the number of self-employed was estimated by Emsi to be 10.1 million. The fourth category includes those individuals with earnings from self-employment, but whose self-employment does not make up the majority of their earnings or time spent at work (shown as "Extended Proprietors" in Table 1). This category included 32.5 million individuals nationally in 2015, according to Emsi.

The sum of the four categories — 188.5 million — is close to the total employment figure reported by the U.S. Department of Commerce's Bureau of Economic Analysis (BEA). For this analysis of job quality, the four categories were combined. Alternatively, the fourth category of those self-employed part time might be excluded since these individuals are either primarily retired or primarily work at a wage and salary job. The total job mix results based on each combination of categories is included in the next section.

Conceptually, the more detailed the data, the more robust the results will be. Thus, the most detailed industries and occupations were used for this analysis of job quality. Results can vary depending on the amount of categorical detail used (for example, 6-digit industries versus 2-digit sectors), as seen in the next section.

Clusters

An alternative combination of industries than those specified in the NAICS also is analyzed in this report. Clusters were discussed in the July 2016 Office of the University Economist report "The Economic Base of Arizona, Metropolitan Phoenix, Metropolitan Tucson, and the Balance of the State: Updated With 2014 Data" (https://wpcarey.asu.edu/sites/default/files/basestudy07-16.pdf). The concept of traded versus nontraded economic activities also is discussed in that report.

Briefly, a cluster is a geographic concentration of related companies, organizations, and institutions in a particular field. Goods and services sold to customers (individuals or businesses) who are not residents of a region are referred to as "traded" economic activities. The sale of goods and services to customers from outside the region imports money into the regional economy that would otherwise not be present. Importing money into a regional economy is a necessity since "leakages" of money from the regional economy inevitably occur.

In contrast to traded activities, nontraded economic activities are location specific since they sell their goods and services to regional customers (which consist of local companies as well as individuals). Local economic activities do not display geographic concentrations across the

country. Instead, their presence largely is proportional to a region's size, as defined by purchasing power.

The Institute for Strategy and Competitiveness at the Harvard Business School, directed by Professor Michael Porter, has defined 51 traded clusters and 16 nontraded clusters. These definitions exclude the public sector and a large portion of the agriculture sector. Thus, for this report on job quality, three additional clusters have been defined: the traded cluster of farming and ranching (crop and animal production), the traded cluster of the federal government, and the nontraded cluster of state and local governments. The clusters are summarized in the Appendix.

Most of the traded clusters are too small to have much of an effect on the total industrial job mix. For example, the difference in the industrial mix value between the state with the highest value and the state with the lowest value was less than 0.5 in 26 traded clusters. The traded clusters with the largest impacts on the total industrial mix include the federal government; business services; financial services; information technology and analytical instruments; oil and gas production and transportation; farming and ranching; education and knowledge creation; aerospace vehicles and defense; hospitality and tourism; distribution and electronic commerce; marketing, design, and publishing; and insurance services.

Since most of the nontraded clusters are of considerable size, there is a moderate difference in the industrial mix value between the state with the highest value and the state with the lowest value in about one-half of the nontraded clusters, even though by definition the nontraded clusters exhibit limited geographic variation in concentration.

ALTERNATIVE MEASURES OF JOB QUALITY

In the following sections of this paper, the job mixes and job quality are calculated using the broadest measure of employment — the sum of the four Emsi categories — and the most detailed industrial and occupational data for 2001, 2007, and 2015. In this section, alternative calculations of job quality are presented for Arizona and the nation.

The total job mixes and job quality in Arizona (relative to the nation) using various Emsi categories of employment are presented in the top portion of Table 1 for 2015. While the estimates vary somewhat with the definition of employment, the differences are small. The differences are larger depending on the amount of industrial and occupational detail that is used, as seen in the bottom portion of the table. Most of the traditional sources of data are limited to 2- and 3-digit detail; the results at these levels are different from those using the most-detailed data. The 6-digit level is conceptually the most accurate, though the number of imputed values is largest at this detailed level.

Annual estimates of the total industrial job mix and the total occupational job mix are shown in the top portion of Table 2 for Arizona. The annual change in each job mix is shown in the bottom portion of the table for Arizona and the nation. The total industrial job mix in Arizona varied over the 2001-through-2015 period. As calculated with the earnings data from each year, the total industrial job mix declined in each year of the expansion (2002 through 2007). It then improved in each year of the recession and early expansion (2008 through 2013), but declined in 2014 and 2015. The annual changes are somewhat different calculated using 2015 earnings for each year, but the general temporal pattern is the same.

The total occupational job mix did not vary as much over the 2001-through-2015 period as the total industrial job mix. Annual changes generally were small, but like the total industrial job

TABLE 1
ALTERNATIVE MEASURES OF JOB QUALITY, 2015, ARIZONA

	Total Industrial Mix	Total Occupa-tional Mix	Job Quality*
Using Various Definitions of Employment:			
QCEW	-1.11	0.59	-0.26
QCEW + Non-QCEW	-0.71	0.54	-0.09
QCEW + Non-QCEW + Self-Employed	-0.79	0.45	-0.17
QCEW + Non-QCEW + Self-Employed + Extended Proprietors	-0.70	0.60	-0.05
Using Various Amounts of Industrial and Occupational Detail:			
2 Digit	-2.39	0.06	-1.17
3 Digit	-1.55	0.55	-0.50
4 Digit	-1.07	0.67	-0.20
5 Digit	-1.14	na	
6 Digit	-0.70	0.60	-0.05

* Job quality is the average of the total industrial mix and the total occupational mix.
na: not available.

Source: Calculated from data provided by Emsi.

mix, the total occupational job mix was lowest just before the start of the recession and improved during the recession. Differences between using median earnings or mean earnings in the calculation are slight.

Nationally, the total industrial job mix dropped in every year except 2007 and 2008, with substantial declines from 2002 through 2004. The total occupational job mix in 2015 was nearly equal to the value in 2001, as declines in the job mix from 2002 through 2005 were reversed by gains from 2007 through 2009.

TABLE 2
ALTERNATIVE MEASURES OF THE TOTAL JOB MIX BY YEAR

	Arizona				United States			
	Total Industrial Mix*		Total Occupational Mix**		Total Industrial Mix*		Total Occupational Mix**	
	Yearly	2015	Median	Average	Yearly	2015	Median	Average
2001	-0.79	-0.36	0.68	0.70				
2002	-0.93	-0.65	0.62	0.64				
2003	-1.09	-0.83	0.65	0.67				
2004	-1.15	-0.90	0.70	0.71				
2005	-1.61	-1.31	0.54	0.55				
2006	-1.70	-1.33	0.50	0.51				
2007	-1.98	-1.28	0.46	0.47				
2008	-1.76	-0.99	0.61	0.61				
2009	-1.31	-0.54	0.85	0.85				
2010	-1.22	-0.52	1.00	1.00				
2011	-1.19	-0.67	0.76	0.75				
2012	-0.93	-0.51	0.77	0.75				
2013	-0.51	-0.38	0.74	0.72				
2014	-0.76	-0.64	0.73	0.72				
2015	-0.81	-0.81	0.60	0.60				
Annual Change								
2002	-0.14	-0.29	-0.06	-0.06	-0.71	-0.79	-0.29	-0.29
2003	-0.16	-0.18	0.03	0.03	-0.82	-0.86	-0.16	-0.17
2004	-0.06	-0.07	0.05	0.04	-0.47	-0.50	-0.07	-0.08
2005	-0.46	-0.41	-0.16	-0.16	-0.29	-0.31	-0.04	-0.05
2006	-0.09	-0.02	-0.04	-0.04	-0.21	-0.19	0.02	0.02
2007	-0.28	0.05	-0.04	-0.04	0.04	-0.00	0.24	0.24
2008	0.22	0.29	0.15	0.14	0.62	0.52	0.38	0.38
2009	0.45	0.45	0.24	0.24	-0.05	-0.06	0.25	0.23
2010	0.09	0.02	0.15	0.15	-0.30	-0.30	-0.16	-0.18
2011	0.03	-0.15	-0.24	-0.25	-0.24	-0.21	-0.06	-0.05
2012	0.26	0.16	0.01	0.00	-0.03	-0.04	-0.04	-0.03
2013	0.42	0.13	-0.03	-0.03	-0.14	-0.16	0.08	0.08
2014	-0.25	-0.26	-0.01	0.00	-0.30	-0.30	-0.06	-0.05
2015	-0.05	-0.17	-0.13	-0.12	-0.13	-0.13	-0.01	-0.01

* The “Yearly” columns use the earnings data for the year shown at the left; the “2015” column uses the 2015 earnings data for each year.
** Earnings in 2015 are used in all years; two versions are available: the median and the mean.

Source: Calculated from data provided by Emsi.

CHANGE IN NATIONAL JOB QUALITY

Job quality declined nationally between 2001 and 2015. The total industrial job mix dropped -2.63 between 2001 and 2007 and a further -0.76 between 2007 and 2015. The total decline between 2001 and 2015 was -3.39. The total occupational job mix hardly changed, as a decrease of -0.33 between 2001 and 2007 was offset by a gain of 0.36 between 2007 and 2015. Job quality, calculated as the average of the total industrial and total occupational job mixes, dropped -1.48 between 2001 and 2007 and an additional -0.20 between 2007 and 2015 for a total decline of -1.68 between 2001 and 2015.

Industrial Job Mix

More than one-third of the decrease in the total industrial job mix between 2001 and 2015 resulted from declines in the employment share in the generally high-paying manufacturing sector (see Table 3). Just one of the 21 subsectors — computer and electronic products — accounted for more than half of the manufacturing decline. Two of the industries in this subsector — electronic computers and semiconductor and related devices — were among the 10 industries posting the largest negative contribution to the total industrial job mix (see Table 4). Other manufacturing subsectors causing a drop in the industrial job mix were transportation equipment, chemicals, machinery, and paper.

The sector with the next-largest negative effect on the total industrial job mix was accommodation and food services, a low-paying sector that experienced disproportionate gains in employment. All of the negative effect came from the food services subsector, with two restaurant industries responsible for the second- and third-largest negative impacts on the total industrial job mix.

The healthcare and social assistance sector also had a negative effect on the total industrial job mix, primarily coming from the social assistance subsector. The services for the elderly and persons with disabilities industry had the largest negative impact of any industry, due to a rising employment sectoral share in this low-paying industry. The home health care services industry also was among the bottom 10.

The real estate and rental and leasing sector had the next-largest negative effect on the total industrial job mix, coming from the real estate subsector. The negative effect was nearly as great in the administrative support and waste management sector. Most of the negative effect in this sector resulted from disproportionate employment gains in the low-paying services to buildings and dwellings industry group, which includes the janitorial services industry, which was among the bottom 10.

Some sectors had a positive effect on the total industrial job mix. The largest positive impact came from retail trade, a low-paying sector that experienced disproportionately slow job growth. All but one of its subsectors had a positive effect. The professional, scientific, and technical services sector also had a positive impact, primarily due to strong employment gains in its high-paying computer systems design services and management, scientific, and technical consulting services industry groups. The management of companies sector also had a positive effect.

TABLE 3
CHANGE IN JOB MIX VALUES BY SECTOR AND OCCUPATIONAL GROUP, UNITED STATES

Sector	2001-07	2007-15	2001-15
Retail Trade	0.14	0.16	0.30
Professional, Scientific, and Technical Services	0.06	0.21	0.27
Management of Companies	-0.01	0.22	0.21
Agriculture, Forestry, Fishing and Hunting	0.14	0.03	0.16
Mining, Quarrying, and Oil and Gas Extraction	0.04	0.12	0.16
Construction	-0.09	0.10	0.01
Unclassified	-0.00	0.00	-0.00
Wholesale Trade	-0.02	-0.08	-0.10
Utilities	-0.07	-0.03	-0.10
Information	-0.24	0.13	-0.11
Arts, Entertainment and Recreation	-0.08	-0.06	-0.14
Other Services	-0.11	-0.04	-0.15
Transportation and Warehousing	-0.12	-0.09	-0.21
Finance and Insurance	-0.14	-0.10	-0.23
Educational Services	-0.11	-0.15	-0.26
Public Administration	-0.15	-0.14	-0.29
Administrative Support and Waste Management	-0.20	-0.13	-0.33
Real Estate and Rental and Leasing	-0.47	0.12	-0.36
Health Care and Social Assistance	-0.15	-0.30	-0.44
Accommodation and Food Services	-0.20	-0.35	-0.55
Manufacturing	-0.85	-0.36	-1.22
TOTAL INDUSTRIAL JOB MIX	-2.63	-0.76	-3.39
Occupational Group			
Production	0.26	0.15	0.41
Business and Financial	0.10	0.23	0.34
Healthcare Practitioners and Technical	0.16	0.11	0.26
Management	-0.08	0.26	0.18
Office and Administrative Support	0.07	0.08	0.15
Sales and Related	-0.03	0.16	0.14
Education, Training and Library	0.01	0.03	0.04
Life, Physical, and Social Sciences	0.02	0.01	0.03
Military	0.02	0.01	0.03
Legal	0.02	-0.00	0.01
Transportation and Material Moving	0.02	-0.02	-0.00
Farming, Fishing and Forestry	0.02	-0.02	-0.00
Community and Social Services	-0.00	-0.01	-0.01
Construction and Extraction	-0.05	0.05	-0.01
Installation, Maintenance and Repair	-0.02	0.01	-0.01
Unclassified	-0.01	-0.01	-0.02
Computer and Mathematical	-0.14	0.12	-0.02
Protective Services	-0.01	-0.02	-0.03
Arts, Design, Entertainment, Sports and Media	-0.03	-0.03	-0.05
Building and Grounds Cleaning and Maintenance	-0.11	-0.08	-0.19
Healthcare Support	-0.08	-0.12	-0.20
Architecture and Engineering	-0.14	-0.06	-0.20
Food Preparation and Serving	-0.12	-0.24	-0.36
Personal Care and Services	-0.20	-0.25	-0.45
TOTAL OCCUPATIONAL JOB MIX	-0.33	0.36	0.02

Note: The job mix values are the sum of the values by industry within each sector or by occupation within each occupational group.

Source: Calculated from data provided by Emsi.

TABLE 4
CHANGE IN INDUSTRIAL JOB MIX VALUES BY INDUSTRY, 2001 THROUGH 2015, UNITED STATES

	Change in Job Mix Value	Change in Share*	Average Earnings**
Greatest Increases			
Corporate, Subsidiary, and Regional Managing Offices	0.24	0.19	2.23
Portfolio Management	0.19	0.37	1.52
Internet Publishing and Broadcasting and Web Search Portals	0.19	0.08	3.28
Wholesale Trade Agents and Brokers	0.16	0.17	1.93
Computer Systems Design Services	0.16	0.16	1.98
Offices of Physicians (except Mental Health Specialists)	0.16	0.18	1.89
Department Stores (except Discount Department Stores)	0.12	-0.26	0.53
Other Financial Vehicles	0.12	0.08	2.53
Crop Production	0.11	-0.24	0.55
Crude Petroleum and Natural Gas Extraction	0.11	0.30	1.37
Largest Decreases			
Other Activities Related to Real Estate	-0.12	0.21	0.43
Electronic Computer Manufacturing	-0.12	-0.04	3.95
Warehouse Clubs and Supercenters	-0.13	0.31	0.56
Semiconductor and Related Device Manufacturing	-0.15	-0.08	2.88
Wired Telecommunications Carriers	-0.16	-0.25	1.62
Janitorial Services	-0.18	0.27	0.33
Home Health Care Services	-0.20	0.45	0.55
Limited-Service Restaurants	-0.21	0.31	0.32
Full-Service Restaurants	-0.24	0.41	0.42
Services for the Elderly and Persons with Disabilities	-0.42	0.67	0.38

* Of employment, expressed as a percent.
** Average earnings per worker, expressed as a ratio to the overall average in 2015.

Source: Calculated from data provided by Emsi.

As seen in Table 4, eight of the 10 industries providing the greatest positive boost to the total industrial job mix were high-paying industries that experienced a gain in the share of overall employment. In contrast, seven of the 10 industries having the largest negative effect were low-paying industries that experienced disproportionately strong employment gains.

Clusters

Between 2001 and 2015, the change in the national industrial mix was -1.04 for the aggregate of traded clusters and -2.35 for the aggregate of nontraded clusters. Thirty-five of the 53 traded clusters had a negative effect on the total industrial mix, though the magnitude of the negative effect was small in most of these clusters. However, the information technology and analytical instruments cluster had a larger negative effect (see Table 5). The business services cluster had the only sizable positive effect on the total job mix.

The decline in the traded clusters job mix occurred between 2001 and 2007; a slight improvement occurred between 2007 and 2015. A number of clusters contributed to the better performance in the 2007-to-2015 period relative to the earlier period. In particular, nearly all of

TABLE 5
CHANGE IN INDUSTRIAL JOB MIX VALUES BY CLUSTER, 2001 THROUGH 2015, UNITED STATES

	Change in Job Mix Value	Change in Share*	Average Earnings**
Traded Clusters			
Greatest Increases			
Business Services	0.44	0.58	1.54
Farming and Ranching	0.17	-0.39	0.55
Marketing, Design, and Publishing	0.15	0.11	1.37
Oil and Gas Production and Transportation	0.15	0.40	1.58
Apparel	0.04	-0.15	0.70
Largest Decreases			
Electric Power Generation and Transmission	-0.13	-0.09	2.72
Distribution and Electronic Commerce	-0.14	0.06	1.38
Insurance Services	-0.15	-0.14	1.70
Communications Equipment and Services	-0.22	-0.22	1.84
Information Technology and Analytical Instruments	-0.45	-0.38	2.45
Nontraded Clusters			
Greatest Increases			
Food and Beverage Processing and Distribution	0.10	-0.20	0.54
Entertainment and Media	0.07	-0.41	0.79
Clothing and General Merchandise Retail	0.03	-0.05	0.47
Largest Decreases			
Real Estate and Construction	-0.36	0.17	0.82
Community and Civic Organizations	-0.38	0.63	0.51
Hospitality Establishments	-0.63	0.98	0.37

* Of employment, expressed as a percent.
** Average earnings per worker, expressed as a ratio to the overall average in 2015.

Source: Calculated from data provided by Emsi.

the 2001-to-2015 gain in business services occurred between 2007 and 2015 and nearly all of the decline in information technology and analytical instruments occurred between 2001 and 2007.

The nontraded clusters job mix decreased in both periods, though by more between 2001 and 2007 than in the later period. Twelve of the 17 nontraded clusters had a negative effect on the total industrial mix between 2001 and 2015, with the largest coming from local hospitality establishments, including local recreational facilities and instruction. None of the nontraded clusters had much of a positive impact on the total job mix.

Since clusters consist of a number of industries, it is not necessarily the case that a gain in the employment share of a cluster with above-average earnings equates to that cluster's contributing to an increase in the job mix. This is seen in Table 5 in the distribution and electronic commerce cluster as well as in some of the nontraded clusters.

Occupational Job Mix

While the total occupational job mix value hardly changed nationally between 2001 and 2015, several of the occupational groups had moderate positive or negative effects (see Table 3). The largest positive came from the production group; most of its occupations contributed positively. The team assemblers occupation was among the 10 occupations having the greatest positive contribution (see Table 6), due to a declining employment share in this low-paying occupation.

The positive contribution to the change in the total occupational job mix from the high-paying business and financial occupational group primarily occurred among its financial occupations, with the personal financial advisors occupation posting the largest positive contribution of any occupation. The management analysts occupation also was among the top 10.

The high-paying healthcare practitioners and technical group had the next largest positive contribution to the change in the total occupational job mix, almost entirely occurring in its practitioners occupations. Registered nurses ranked among the top 10 occupations.

Two occupational groups had a sizable negative effect on the change in the total occupational job mix, each a result of a rising share of employment in low-paying occupations. In the personal care and services group, the personal care aides occupation had the largest negative effect of any occupation; the hairdressers, hairstylists, and cosmetologists occupation also had one of the largest negative impacts.

In the food preparation and serving occupational group, the combined food preparation and serving, including fast food occupation had the second-largest negative effect of any occupation; the waiters and waitresses occupation also had one of the largest negative impacts.

As seen in Table 6, five of the 10 occupations providing the greatest positive boost to the occupational job mix were high-paying occupations that experienced a gain in the share of overall employment. In contrast, nine of the 10 occupations having the largest negative effect were low-paying occupations that experienced disproportionately strong employment gains.

Annual Change in Job Mix

The annual changes discussed in this subsection were calculated using the 2015 earnings figures. As seen in Chart 1, a cyclical pattern in the change in the total industrial and total occupational job mixes occurred over the 2002 through 2015 period nationally. In most years, job quality fell, especially the industrial job mix. However, in the 2007-through-2009 period, particularly during the recession year of 2008, gains were registered. Since then, declines have generally been the norm, but the magnitude of the losses is not as great as in the early 2000s.

TABLE 6
CHANGE IN OCCUPATIONAL JOB MIX VALUES BY OCCUPATION, 2001 THROUGH 2015, UNITED STATES

	Change in Job Mix Value	Change in Share*	Average Earnings**
Greatest Increases			
Personal Financial Advisors	0.35	0.45	1.76
Farmers, Ranchers, and Other Agricultural Managers	0.16	-0.38	0.57
Chief Executives	0.12	0.09	2.41
Retail Salespersons	0.10	-0.25	0.59
Registered Nurses	0.08	0.15	1.55
Cashiers	0.08	-0.15	0.48
Management Analysts	0.07	0.11	1.67
Team Assemblers	0.07	-0.23	0.70
Postsecondary Teachers	0.07	0.10	1.66
Childcare Workers	0.06	-0.11	0.40
Largest Decreases			
Maids and Housekeeping Cleaners	-0.05	0.10	0.48
Janitors & Cleaners, Except Maids & Housekeeping Cleaners	-0.06	0.13	0.58
Landscaping and Groundskeeping Workers	-0.07	0.15	0.56
Waiters and Waitresses	-0.07	0.14	0.52
General and Operations Managers	-0.09	-0.06	2.50
Hairdressers, Hairstylists, and Cosmetologists	-0.09	0.19	0.54
Real Estate Sales Agents	-0.11	0.54	0.80
Home Health Aides	-0.12	0.25	0.50
Combined Food Preparation & Serving, Including Fast Food	-0.13	0.24	0.45
Personal Care Aides	-0.26	0.50	0.48

* Of employment, expressed as a percent.
** Average earnings per worker, expressed as a ratio to the overall average in 2015.

Source: Calculated from data provided by Emsi.

CHART 1
TOTAL JOB MIXES, ANNUAL CHANGE, UNITED STATES

Source: Calculated from data provided by Emsi.

ARIZONA'S JOB QUALITY

Job Quality in 2015

Arizona's total industrial job mix value (relative to the national average) was -0.70 but its total occupational mix value was 0.60, putting its job quality at -0.05 in 2015 — barely below the national average. Nine of 20 sectors had a positive effect on the total industrial job mix while 13 of 23 occupational groups had a positive effect on the total occupational job mix (see Table 7).

Industrial Mix

The finance and insurance sector had the greatest positive effect on the total industrial job mix in Arizona in 2015, mostly from the credit intermediation and related activities subsector. Its financial transactions processing, reserve, and clearinghouse industry ranked among the top 10 industries on positive impact (see Table 8). The funds, trusts, and other financial vehicles subsector also had a positive contribution, with its open-end investment funds industry ranking among the top 10. The securities brokerage industry also was among the top 10. Each of these

TABLE 7
JOB MIX VALUES BY SECTOR AND OCCUPATIONAL GROUP, 2015, ARIZONA

Sector		Occupational Group	
Finance and Insurance	0.74	Production	0.39
Health Care and Social Assistance	0.69	Transportation and Material Moving	0.32
Manufacturing	0.41	Computer and Mathematical	0.31
Other Services	0.30	Management	0.23
Agriculture, Forestry, Fishing, Hunting	0.23	Healthcare Support	0.13
Transportation and Warehousing	0.13	Protective Services	0.12
Arts, Entertainment and Recreation	0.11	Construction and Extraction	0.07
Educational Services	0.02	Community and Social Services	0.05
Unclassified	0.02	Building & Grounds Cleaning & Maint	0.05
Utilities	-0.01	Business and Financial	0.03
Mining, Quarrying, Oil & Gas Extraction	-0.06	Military	0.02
Construction	-0.09	Personal Care and Services	0.02
Wholesale Trade	-0.09	Architecture and Engineering	0.01
Public Administration	-0.10	Installation, Maintenance, and Repair	-0.01
Retail Trade	-0.23	Unclassified	-0.02
Accommodation and Food Services	-0.24	Farming, Fishing, and Forestry	-0.02
Administrative Support and Waste Mgt	-0.26	Education, Training, and Library	-0.03
Management of Companies	-0.28	Arts, Design, Entertain, Sports & Media	-0.06
Information	-0.30	Legal	-0.08
Professional, Scientific, Technical Servs	-0.77	Life, Physical, and Social Sciences	-0.09
Real Estate, Rental and Leasing	-0.92	Food Preparation and Serving	-0.16
		Office and Administrative Support	-0.16
		Healthcare Practitioners and Technical	-0.22
		Sales and Related	-0.32
TOTAL INDUSTRIAL JOB MIX	-0.70	TOTAL OCCUPATIONAL JOB MIX	0.60

Note: The job mix values are expressed relative to the national average and are the sum of the values by industry within each sector or by occupation within each occupational group.

Source: Calculated from data provided by Emsi.

TABLE 8
INDUSTRIAL JOB MIX VALUES BY INDUSTRY, 2015, ARIZONA

	Job Mix Value*	Share**	Average Earnings***
Greatest Positive Effects			
Semiconductor and Related Device Manufacturing	0.83	0.44	2.88
Guided Missile and Space Vehicle Manufacturing	0.51	0.27	2.87
Open-End Investment Funds	0.24	0.06	5.33
Religious Organizations	0.20	-0.32	0.39
Services for the Elderly and Persons with Disabilities	0.20	-0.31	0.38
Financial Transactions Processing & Clearinghouse	0.19	0.29	1.67
Crop Production	0.19	-0.41	0.55
Local Government Other Than Education and Hospitals	0.18	0.53	1.34
Copper Ore and Nickel Ore Mining	0.17	0.29	1.56
Securities Brokerage	0.16	0.08	3.11
Largest negative Effects			
Offices of Lawyers	-0.13	-0.17	1.76
Software Publishers	-0.13	-0.17	2.84
Professional Employer Organizations	-0.13	1.14	0.89
Electronic Computer Manufacturing	-0.15	-0.05	3.95
Hotels and Motels	-0.15	0.38	0.60
Telemarketing Bureaus and Other Contact Centers	-0.17	0.55	0.70
Research & Development in Sciences	-0.17	-0.12	2.39
Other Activities Related to Real Estate	-0.25	0.44	0.43
Corporate, Subsidiary, and Regional Managing Offices	-0.28	-0.23	2.23
Offices of Real Estate Agents and Brokers	-0.53	0.98	0.46

* The job mix values are expressed relative to the national average.
** The difference in the employment share between Arizona and the nation, expressed as a percent.
*** National average earnings per worker expressed as a ratio to the overall average.

Source: Calculated from data provided by Emsi.

industries are high-paying with an employment share in Arizona greater than the national average.

The healthcare and social assistance sector had the second-largest positive contribution to Arizona's total industrial job mix. Its high-paying ambulatory health care services subsector had an above-average employment share while its low-paying social assistance subsector had a below-average employment share. The services for the elderly and persons with disabilities industry ranked among the top 10 on its contribution to the total industrial job mix, due to its below-average size and below-average earnings.

The manufacturing sector ranked third on positive contribution to the state's total industrial job mix. Two high-technology subsectors with above-average employment shares — computer and electronic products and transportation equipment — had significant positive contributions, but most of the other manufacturing subsectors had a negative effect on the total industrial job mix, particularly chemicals. Two manufacturing industries — semiconductor and related devices and guided missiles and space vehicles — had the two largest positive contributions of any industry,

but the electronic computers industry had among the 10 largest negative effects on the total industrial job mix, due to its below-average share and very high earnings.

The largest negative effect on the total industrial job mix came from the real estate and rental and leasing sector, almost entirely from the real estate subsector. The offices of real estate agents and brokers industry had the largest negative effect of any industry, with an employment share above the national average and low earnings. The other activities related to real estate industry had the third-largest negative effect.

The professional, scientific, and technical services sector also put significant downward pressure on the state's total industrial job mix. Eight of its nine industry groups had a negative effect, with the largest from scientific research and development services; the research and development in physical, engineering and life sciences industry was among the bottom 10. Other industry groups having a negative effect include legal services (the offices of lawyers industry was in the bottom 10) and computer systems design and related services.

As seen in Table 8, seven of the 10 industries providing the greatest positive boost to the total industrial job mix were high-paying industries with an employment share greater than the national average. Five of the 10 industries having the largest negative effect were high-paying industries with an employment share less than the national average.

Clusters. In 2015, the industrial job mix in Arizona was -0.34 for the aggregate of traded clusters and -0.38 for the aggregate of nontraded clusters. Thirty-four of the 53 traded clusters had a negative effect on the total industrial mix, though the magnitude of the negative effect was small in most of these clusters. However, the business services cluster had a large negative effect (see Table 9). Two high-technology clusters — information technology and analytical instruments and aerospace vehicles and defense — and the financial services cluster had sizable positive effects on the total industrial job mix.

Twelve of the 17 nontraded clusters had a negative effect on the total industrial mix, with the largest coming from local real estate, construction and development. Two of the nontraded clusters had a moderate positive impact on the total industrial job mix: community and civic organizations and local health services.

Occupational Mix

None of the occupational groups had as large an impact (positive or negative) on Arizona's total occupational job mix as several of the sectors had on the total industrial job mix (see Table 7). The largest positive effect came from the production group, spread across many of its occupations. Its team assemblers occupation ranked in the top 10, due to its below-average earnings and a below-average share in Arizona (see Table 10). The transportation and material moving group had nearly as large a positive effect, mostly in the transportation workers (high-paying with an above-average share in Arizona) and material moving workers occupations (low-paying with a below-average share in Arizona).

TABLE 9
INDUSTRIAL JOB MIX VALUES BY CLUSTER, 2015, ARIZONA

	Job Mix Value*	Share**	Average Earnings***
Traded Clusters			
Greatest Positive Effects			
Aerospace Vehicles and Defense	0.81	0.55	2.18
Financial Services	0.58	0.71	1.69
Info Tech and Analytical Instruments	0.48	0.24	2.45
Farming and Ranching	0.23	-0.50	0.55
Metal Mining	0.17	0.29	1.50
Largest Negative Effects			
Automotive	-0.16	-0.39	1.35
Marketing, Design, and Publishing	-0.16	-0.19	1.37
Education and Knowledge Creation	-0.28	-0.41	1.18
Oil & Gas Production and Transportation	-0.36	-0.54	1.58
Business Services	-0.73	1.37	1.54
Nontraded Clusters			
Greatest Positive Effects			
Community and Civic Organizations	0.44	-0.77	0.51
Health Services	0.40	0.06	1.12
Local Financial Services	0.16	0.40	1.26
Largest Negative Effects			
Hospitality Establishments	-0.16	0.25	0.37
State and Local Governments	-0.21	-0.15	1.26
Real Estate and Construction	-0.82	1.63	0.82

* The job mix values are expressed relative to the national average.
** The difference in the employment share between Arizona and the nation, expressed as a percent.
*** National average earnings per worker, expressed as a ratio to the overall average.

Source: Calculated from data provided by Emsi.

The high-paying computer and mathematical group also had a positive effect on the total occupational job mix, largely among the computer occupations. Two of these occupations — computer systems analysts and software developers of systems software — ranked in the top 10.

The largest negative effect on the total occupational job mix came from the sales and related occupational group. Arizona had an above-average share of two of its low-paying occupations; real estate sales agents and telemarketers each ranked among the bottom 10.

As seen in Table 10, five of the 10 occupations providing the greatest positive boost to the total occupational job mix were high-paying occupations with an employment share greater than the national average. Five of the 10 occupations having the largest negative effect were high-paying occupations with an employment share less than the national average.

TABLE 10
OCCUPATIONAL JOB MIX VALUES BY OCCUPATION, 2015, ARIZONA

	Job Mix Value*	Share**	Average Earnings***
Greatest Positive Effects			
Farmers, Ranchers, and Other Agricultural Managers	0.17	-0.40	0.57
Nursing Assistants	0.15	-0.38	0.59
Sales Managers	0.13	0.09	2.51
Computer Systems Analysts	0.13	0.14	1.88
Childcare Workers	0.11	-0.18	0.40
Team Assemblers	0.10	-0.33	0.70
Detectives and Criminal Investigators	0.10	0.13	1.77
Software Developers, Systems Software	0.10	0.07	2.32
Food Preparation Workers	0.09	-0.19	0.49
Loan Officers	0.09	0.14	1.65
Largest Negative Effects			
Surgeons	-0.07	-0.02	4.91
General and Operations Managers	-0.07	-0.05	2.50
Telemarketers	-0.08	0.20	0.61
Lawyers	-0.09	-0.06	2.55
Business Operations Specialists, All Other	-0.10	-0.17	1.61
Waiters and Waitresses	-0.10	0.22	0.52
Physicians and Surgeons, All Other	-0.15	-0.05	4.07
Personal Care Aides	-0.15	0.29	0.48
Real Estate Sales Agents	-0.17	0.83	0.80
Customer Service Representatives	-0.23	0.96	-0.76

* The job mix values are expressed relative to the national average.
** The difference in the employment share between Arizona and the nation, expressed as a percent.
*** National average earnings per worker, expressed as a ratio to the overall average.

Source: Calculated from data provided by Emsi.

Change in Job Quality

Job quality in Arizona declined relative to the national average between 2001 and 2015, but not by a substantial degree, as seen in Table 11. However, since the nation's job quality declined moderately, Arizona's job quality also dropped moderately. The decline in job quality was largely due to a decrease in the total industrial mix; little change was experienced in the total occupational mix.

Industrial Job Mix

The decrease in the industrial mix value for the manufacturing sector was greater than the total decline in Arizona between 2001 and 2015 (see Table 12). The negative effect from the manufacturing sector resulted from just two of its 21 subsectors — transportation equipment and especially computer and electronic products. These high-paying subsectors experienced declines in their shares of total employment. Four industries in these subsectors were among the 10 industries having the largest negative effect on the change in the overall industrial job mix (see Table 13). The decline caused by the semiconductor and related devices industry was far greater than from the other industries.

TABLE 11
CHANGE IN JOB QUALITY

	Total Industrial Job Mix	Total Occupational Job Mix	Job Quality*
Arizona Relative to the Nation			
2001-07	-0.89	-0.23	-0.56
2007-15	0.52	0.13	0.32
2001-15	-0.37	-0.10	-0.24
United States			
2001-07	-2.63	-0.33	-1.48
2007-15	-0.76	0.36	-0.20
2001-15	-3.39	0.03	-1.68
Arizona Total			
2001-07	-3.52	-0.56	-2.04
2007-15	-0.24	0.49	0.12
2001-15	-3.76	-0.07	-1.92

* Job quality is the average of the total industrial mix and the total occupational mix.

Source: Calculated from data provided by Emsi.

None of the other sectors had a particularly large negative effect on the total industrial job mix; the real estate and rental and leasing sector and the wholesale trade sector had the largest negative effects. The wholesaling of other electronic parts and equipment industry ranked among the bottom 10.

The finance and insurance sector had a substantial positive effect on the total industrial job mix, with most of its subsectors contributing. Three of its industries — all high-paying with an increase in employment share greater than the U.S. average — ranked among the 10 with the greatest positive effect, including the top-ranked open-end investment funds industry. The health care and social assistance sector also had a positive impact, with the employment share rising in many of its high-paying industries, such as hospitals and offices of physicians, but falling in low-paying industries, including services for the elderly and persons with disabilities.

As seen in Table 13, six of the 10 industries providing the greatest contribution to the change in the total industrial mix were high-paying industries that experienced a gain in the share of overall employment relative to the nation. In contrast, seven of the 10 industries having the largest negative effect were high-paying industries that experienced disproportionately weak employment changes.

Clusters. The change between 2001 and 2015 in the industrial job mix in Arizona was -1.17 for the aggregate of traded clusters and 0.79 for the aggregate of nontraded clusters. Only 21 of the 53 traded clusters had a negative effect on the change in the industrial mix, but the decline caused by the information technology and analytical instruments cluster was quite large; the aerospace vehicles and defense cluster had a moderate negative effect (see Table 14). The financial services cluster had a moderate positive effect. Ten of the 17 nontraded clusters had a

TABLE 12
CHANGE IN JOB MIX VALUES BY SECTOR AND OCCUPATIONAL GROUP, ARIZONA

Sector	2001-07	2007-15	2001-15
Finance and Insurance	0.16	0.61	0.77
Health Care and Social Assistance	0.15	0.20	0.35
Accommodation and Food Services	0.28	-0.02	0.26
Administrative Support and Waste Management	0.17	0.08	0.25
Management of Companies	0.13	-0.02	0.11
Construction	-0.11	0.13	0.02
Unclassified	-0.00	0.02	0.02
Arts, Entertainment and Recreation	-0.01	0.02	0.01
Educational Services	-0.00	-0.02	-0.02
Other Services	0.14	-0.18	-0.04
Mining, Quarrying, and Oil and Gas Extraction	-0.03	-0.01	-0.04
Transportation and Warehousing	0.01	-0.06	-0.05
Professional, Scientific, and Technical Services	0.13	-0.20	-0.07
Public Administration	-0.19	0.12	-0.07
Information	-0.17	0.06	-0.11
Agriculture, Forestry, Fishing and Hunting	-0.08	-0.04	-0.12
Utilities	-0.03	-0.10	-0.12
Retail Trade	-0.15	0.00	-0.15
Wholesale Trade	-0.05	-0.13	-0.18
Real Estate and Rental and Leasing	-0.31	0.08	-0.23
Manufacturing	-0.92	-0.04	-0.95
TOTAL CHANGE IN INDUSTRIAL MIX	-0.89	0.52	-0.37
Occupational Group			
Healthcare Practitioners and Technical	0.00	0.24	0.25
Food Preparation and Serving	0.16	-0.04	0.12
Construction and Extraction	-0.03	0.14	0.12
Farming, Fishing and Forestry	0.07	0.05	0.11
Computer and Mathematical	-0.06	0.14	0.08
Building and Grounds Cleaning and Maintenance	0.04	0.00	0.05
Education, Training and Library	0.01	0.04	0.05
Transportation and Material Moving	0.02	0.01	0.02
Legal	-0.02	0.03	0.02
Installation, Maintenance and Repair	0.00	0.02	0.02
Community and Social Services	0.00	0.01	0.01
Arts, Design, Entertainment, Sports and Media	0.02	-0.01	0.01
Protective Services	0.01	0.00	0.01
Military	0.01	-0.01	0.01
Unclassified	-0.00	-0.01	-0.01
Office and Administrative Support	0.00	-0.02	-0.02
Healthcare Support	0.02	-0.04	-0.02
Life, Physical, and Social Sciences	-0.03	-0.01	-0.03
Business and Financial	-0.04	-0.03	-0.07
Personal Care and Services	0.07	-0.16	-0.09
Sales and Related	-0.15	0.03	-0.13
Production	-0.09	-0.06	-0.15
Management	-0.10	-0.10	-0.20
Architecture and Engineering	-0.14	-0.12	-0.25
TOTAL CHANGE IN OCCUPATIONAL MIX	-0.23	0.13	-0.10

Note: The job mix values are expressed relative to the national average and are the sum of the values by industry within each sector or by occupation within each occupational group.

Source: Calculated from data provided by Emsi.

TABLE 13
CHANGE IN INDUSTRIAL JOB MIX VALUES BY INDUSTRY, 2001 THROUGH 2015, ARIZONA

	Change in Job Mix Value*	Change in Share**	Average Earnings***
Greatest Increases			
Open-End Investment Funds	0.40	0.10	5.33
Temporary Help Services	0.26	-0.76	0.65
Commercial Banking	0.22	0.39	1.57
Electric Power Distribution	0.19	0.14	2.33
General Medical and Surgical Hospitals	0.14	0.41	1.34
Discount Department Stores	0.14	-0.23	0.42
Services for the Elderly and Persons with Disabilities	0.14	-0.22	0.38
Investment Banking and Securities Dealing	0.13	0.05	4.14
Full-Service Restaurants	0.13	-0.22	0.42
Offices of Physicians (except Mental Health Specialists)	0.12	0.13	1.89
Largest Decreases			
Aircraft Manufacturing	-0.11	-0.08	2.29
Telemarketing Bureaus and Other Contact Centers	-0.11	0.35	0.70
Electronic Computer Manufacturing	-0.12	-0.04	3.95
Credit Card Issuing	-0.13	-0.09	2.40
Other Electronic Parts and Equipment Merchant Wholesalers	-0.15	-0.16	1.95
Animal Production and Aquaculture	-0.19	0.40	0.55
Guided Missile and Space Vehicle Manufacturing	-0.19	-0.10	2.87
Warehouse Clubs and Supercenters	-0.19	0.44	0.56
Nuclear Electric Power Generation	-0.43	-0.20	3.11
Semiconductor and Related Device Manufacturing	-1.06	-0.57	2.88

* The job mix values are expressed relative to the national average.
** The difference in the employment share between Arizona and the nation, expressed as a percent.
*** National average earnings per worker expressed as a ratio to the overall average in 2015.

Source: Calculated from data provided by Emsi.

positive effect on the change in the total industrial mix, but none of the nontraded clusters had a substantial effect.

Occupational Job Mix

Consistent with the small change in the total occupational job mix between 2001 and 2015, none of the occupational groups had a substantial positive or negative effect (see Table 11). The largest positive impact came from the health practitioners and technical group; three of its occupations in the health diagnosing and treating practitioners category ranked among the top 10 (see Table 15).

The occupational groups with the largest negative effect on the change in the total occupational job mix were the generally high-paying management and architecture and engineering groups. Two occupations in the management group ranked among the top 10, but three ranked among the bottom 10, including the low-paying farmers, ranchers, and other agricultural managers

TABLE 14
CHANGE IN INDUSTRIAL JOB MIX VALUES BY CLUSTER, 2001 THROUGH 2015, ARIZONA

	Change in Job Mix Value*	Change in Share**	Average Earnings***
Traded Clusters			
Greatest Increases			
Financial Services	0.39	-0.13	1.69
Communications Equipment and Services	0.15	0.15	1.84
Insurance Services	0.15	0.22	1.70
Agricultural Inputs and Services	0.09	-0.21	0.61
Biopharmaceuticals	0.08	0.04	2.76
Largest Decreases			
Distribution and Electronic Commerce	-0.17	-0.14	1.38
Farming and Ranching	-0.20	0.44	0.55
Electric Power Generate & Transmit	-0.31	-0.12	2.72
Aerospace Vehicles and Defense	-0.40	-0.32	2.18
Info Tech and Analytical Instruments	-1.26	-0.68	2.45
Nontraded Clusters			
Greatest Increases			
Commercial Services	0.33	-0.71	0.83
Local Financial Services	0.24	0.30	1.26
Health Services	0.19	1.13	1.12
Largest Decreases			
Logistical Services	-0.07	0.25	0.76
State and Local Governments	-0.11	-0.61	1.26
Clothing and General Merchandise Retail	-0.13	0.31	0.47

* The job mix values are expressed relative to the national average.
** The difference in the employment share between Arizona and the nation, expressed as a percent.
*** National average earnings per worker expressed as a ratio to the overall average in 2015.

Source: Calculated from data provided by Emsi.

occupation that had a disproportionate gain in employment share in Arizona. Two occupations in the architecture and engineering group were among the 10 with the largest negative impacts.

As seen in Table 15, six of the 10 occupations providing the greatest positive boost to the total occupational job mix were high-paying occupations that experienced a gain in the share of overall employment. In contrast, four of the 10 occupations having the largest negative effect were high-paying occupations that experienced disproportionately weak employment gains.

Annual Job Mix

The annual changes and levels discussed in this subsection were calculated using the 2015 earnings figures. The annual job quality, total industrial mix, and total occupational mix in Arizona is displayed in Chart 2. None of the measures displays a trend. The occupational job mix did not vary much between 2001 and 2015, holding between values of 0.5 and 1.0. More fluctuation occurred in the industrial job mix, with declines in the early 2000s being largely

TABLE 15
CHANGE IN OCCUPATIONAL JOB MIX VALUES BY OCCUPATION, 2001 THROUGH 2015, ARIZONA

	Change in Job Mix Value*	Change in Share**	Average Earnings***
Greatest Increases			
Farmworkers and Laborers, Crop, Nursery, and Greenhouse	0.11	-0.22	0.51
Registered Nurses	0.09	0.17	1.55
Construction Laborers	0.08	-0.25	0.70
Waiters and Waitresses	0.05	-0.10	0.52
Family and General Practitioners	0.05	0.01	3.91
Pharmacists	0.04	0.02	2.61
Medical and Health Services Managers	0.04	0.04	2.23
Computer Systems Analysts	0.04	0.04	1.88
Financial Managers	0.04	0.03	2.42
Laborers and Freight, Stock, and Material Movers, Hand	0.04	-0.10	0.62
Largest Decreases			
Nuclear Engineers	-0.04	-0.03	2.16
Sewing Machine Operators	-0.04	0.09	0.59
Electronics Engineers, Except Computer	-0.04	-0.04	2.21
Real Estate Sales Agents	-0.04	0.19	0.80
Retail Salespersons	-0.04	0.10	0.59
Architectural and Engineering Managers	-0.05	-0.02	2.98
General and Operations Managers	-0.05	-0.04	2.50
Customer Service Representatives	-0.07	0.31	0.76
Personal Care Aides	-0.11	0.21	0.48
Farmers, Ranchers, and Other Agricultural Managers	-0.22	0.52	0.59

* The job mix values are expressed relative to the national average.
** The difference in the employment share between Arizona and the nation, expressed as a percent.
*** National average earnings per worker expressed as a ratio to the overall average in 2015.

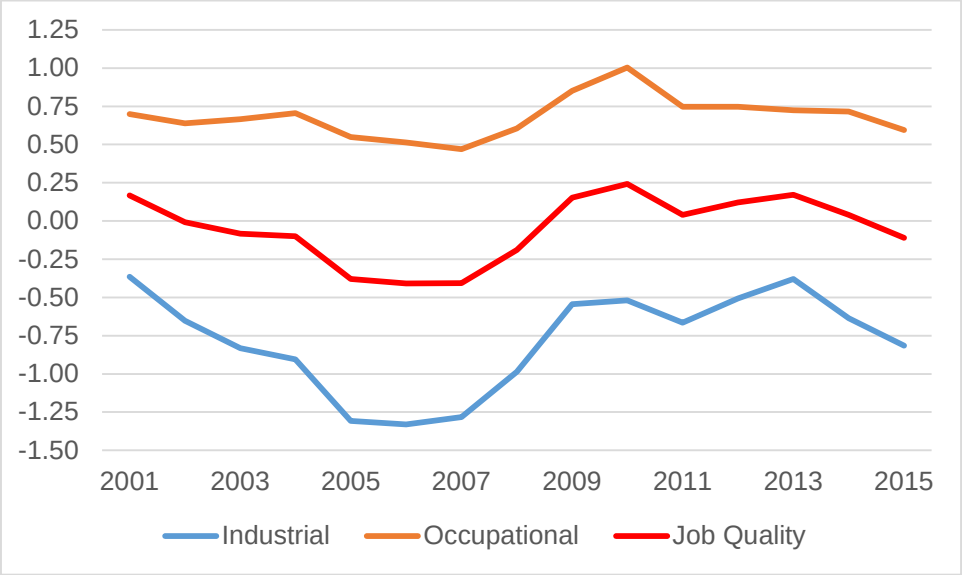
Source: Calculated from data provided by Emsi.

offset by gains during the recession. Job quality slipped through 2005, increased between 2007 and 2010, and fluctuated — but on net dropped — since 2010.

The annual change in the total job mixes in Arizona is shown in Chart 3. The top graph shows the change relative to the national average. As with the national changes (see Chart 1), the strongest gains occurred during the recession.[3] Unlike the nation, there is more of an erratic annual pattern in the Arizona data. The bottom graph of Chart 3 presents the total change in Arizona: the sum of the national change and the Arizona change relative to the national average.

[3] The changes in the Arizona job mixes are expressed relative to the changes in the national job mix. Thus, the annual pattern seen in the national data — strongest gains from 2007 through 2009 and the largest losses in the early 2000s — is more exaggerated in the Arizona data.

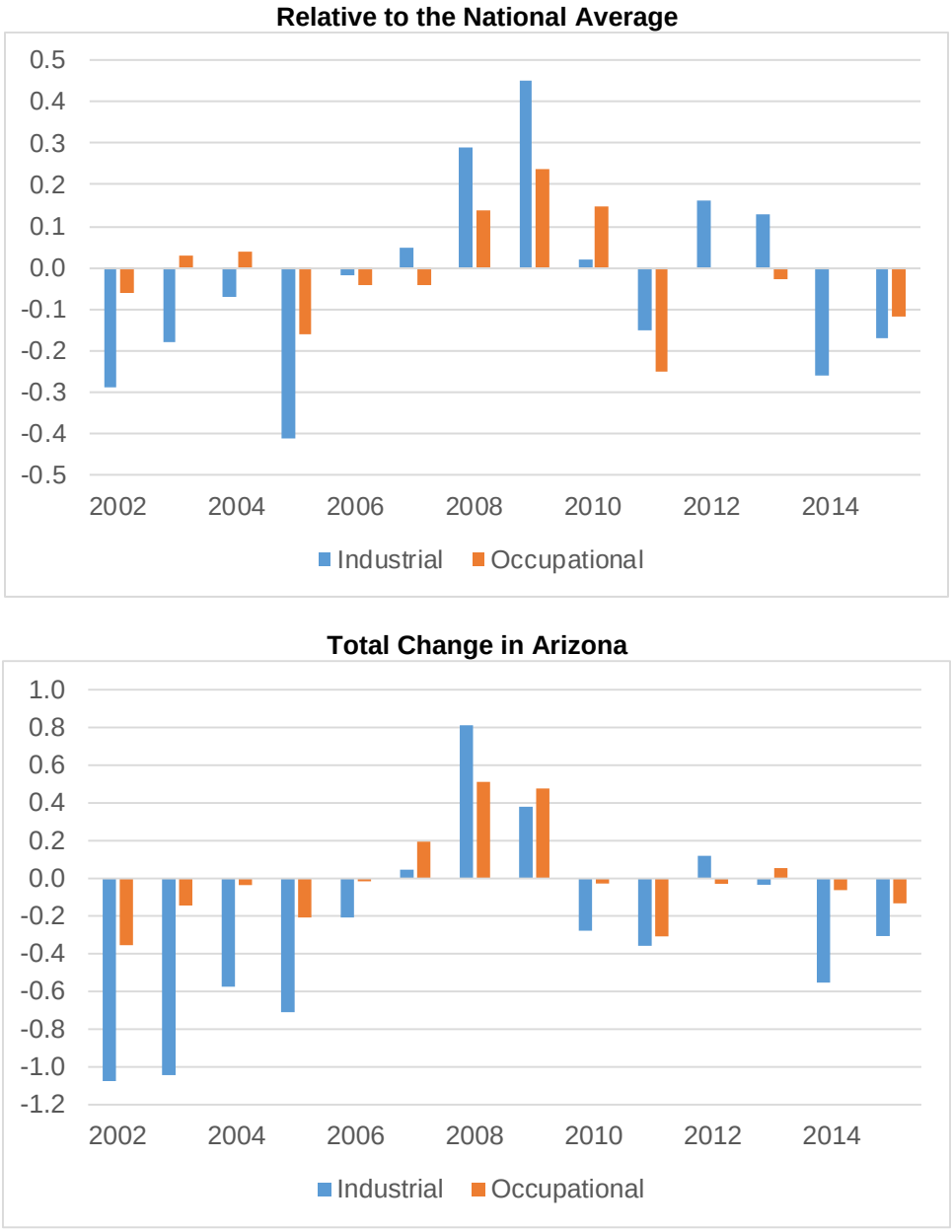
CHART 2
JOB QUALITY AND TOTAL JOB MIXES, 2001 THROUGH 2015, ARIZONA



Note: The total job mix is expressed relative to the national average.

Source: Calculated from data provided by Emsi.

CHART 3
TOTAL JOB MIXES, ANNUAL CHANGE, ARIZONA



Note: The change in the total job mix is expressed relative to the national average.

Source: Calculated from data provided by Emsi.

JOB QUALITY WITHIN ARIZONA

Job Quality in 2015

Job quality in 2015 varied widely across Arizona's counties. Job quality in the Sun Corridor — Maricopa, Pima, and Pinal counties — was a little higher than the national average, though job quality was positive only in Maricopa County. In contrast, job quality in the aggregate of the other 12 less-populous counties was considerably below average, as seen in Table 16. However, job quality ranged widely among the 12 less-populous counties.

Only three Arizona counties had higher job quality than the national average in 2015; three had a positive total industrial mix and three had a positive total occupational mix. Job quality in Greenlee County was the highest in the state, with an extremely high total industrial mix and an

TABLE 16
JOB QUALITY, 2015, ARIZONA COUNTIES AND SUBREGIONS

				Industrial Job Mix	
	Total Industrial Job Mix*	Total Occupational Job Mix*	Job Quality**	Traded Clusters*	Nontraded Clusters*
Greenlee	31.52	1.22	16.37	22.16	9.37
Maricopa	0.79	2.24	1.52	1.30	-0.51
Cochise	-0.14	0.38	0.12	0.14	-0.27
Pima	-1.70	-0.57	-1.14	-0.58	-1.13
Apache	2.26	-6.57	-2.16	-8.23	10.49
Gila	-2.46	-4.56	-3.51	-3.59	1.13
Graham	-3.30	-4.42	-3.86	-5.47	2.16
Pinal	-6.38	-2.64	-4.51	-6.80	0.42
Coconino	-7.37	-3.58	-5.48	-7.87	0.50
Navajo	-5.04	-7.74	-6.39	-7.43	2.39
Santa Cruz	-4.68	-8.41	-6.55	-1.51	-3.16
La Paz	-5.10	-9.75	-7.43	-9.42	4.32
Yavapai	-12.68	-5.34	-9.01	-8.31	-4.37
Mohave	-12.39	-7.49	-9.94	-9.90	-2.50
Yuma	-9.79	-10.89	-10.34	-13.09	3.31
Sun Corridor^	0.17	1.63	0.90	0.75	-0.59
Metro Phoenix	0.54	2.07	1.31	1.02	-0.48
Metro Tucson	-1.70	-0.57	-1.14	-0.58	-1.13
Balance of State^	-6.96	-5.95	-6.46	-7.43	0.47

Note: The sum of the traded clusters and nontraded clusters does not equal the industrial mix value due to unclassified activities included in the total.

* Expressed as a percentage difference from the national average.
** Job quality is calculated as the average of the industrial mix and the occupational mix, expressed as a percentage difference from the national average.
^ The Sun Corridor consists of Metro Phoenix (Maricopa and Pinal counties) and Metro Tucson (Pima County). The balance of the state is the other 12 counties.

Source: Calculated from data provided by Emsi.

above-average total occupational mix. Greenlee County's economy is dominated by the above-average-paying copper mining industry. Maricopa County had the next-highest job quality, the result of the state's highest total occupational mix and a slightly above-average total industrial mix. Cochise County was the only other county with above-average job quality, the result of a slightly above-average total occupational mix and a marginally negative total industrial mix. Apache County's total industrial mix was positive in 2015, but its total occupational mix was highly negative.

In Pima County, the second-most populous county, job quality was only a little below the U.S. average, with both the industrial and occupational mixes being somewhat below average. The other 10 Arizona counties had a job quality value of less than -3.5, with both the total industrial mix and the total occupational mix being substantially below average.

Industrial Mix

In most of the counties, extreme industrial mix values were present in a few industries in 2015. For example, in Greenlee County, the industrial mix value in the copper mining industry was 32.72, greater than the total job mix of 31.52. For a few industries, the value was substantial in multiple counties. In particular, the value for the federal government exceeded 1 in nine counties and the value for corporate, subsidiary, and regional managing offices was less than -1 in 12 counties.

In Maricopa County, the value for the semiconductor and related device manufacturing industry was 1.24, greater than the total industrial mix of 0.79. In Pima County, the value was 3.64 for the guided missile and space vehicle manufacturing industry and 1.16 for the federal government. Yet the total industrial mix in Pima County was -1.70. Thus, apart from these two industries, Pima County's industrial mix value was in line with that of the less-populous counties. The industrial mix in the balance of the state was boosted by the federal government (2.77) and local governments (1.35). Despite the positive contributions of these industries, the total industrial mix value of the 12 less-populous counties combined was very low at -6.96, with figures of less than -10 in Mohave and Yavapai counties.

Clusters. Considerable variation was present across the counties in the industrial mix value for the aggregate of the traded clusters (see Table 16). The 2015 value was by far the highest in Greenlee County at 22.16. The only other counties with a positive value were Maricopa (1.30) and Cochise (0.14). The values were not strongly negative in Pima or Santa Cruz counties, but in each of the other counties the value was less than -3.5. Several of the counties had very large negative values, including Yuma (-13.09), Mohave (-9.90), La Paz (-9.42), Yavapai (-8.31), and Apache (-8.23). The value for the Sun Corridor was 0.75, consisting of Maricopa County at 1.30, Pima County at -0.58, and Pinal County at -6.80. The value for the other 12 counties combined was -7.43.

In most of the traded clusters, not much difference in the 2015 industrial mix value was present across the counties. The large variation in the overall traded cluster job mix largely resulted from 11 clusters. In the following list, the value after the cluster name is the national average earnings in the cluster expressed as a ratio to the overall average:

- Metal Mining (1.50). Most of the counties had a value near zero, but seven counties had a positive value, including 33.5 in Greenlee County, 3.7 in Graham County, 2.7 in Gila County, and 1.4 in La Paz County.
- Federal Government (1.49). The value was positive in 12 counties, as high as 8.0 in Apache and Cochise counties. Santa Cruz, La Paz, Navajo, Yuma, Graham, and Coconino counties had values greater than 2 and Pima County had a value of just more than 1. Maricopa was among the three counties with a negative value.
- Farming and Ranching (0.55). Five counties in which agriculture's share of the total economy is small had positive values, with the largest values in Maricopa and Pima counties. In contrast, five counties had a value of -1 or less: Apache, Graham, La Paz, Navajo, and Yuma.
- Agricultural Inputs and Services (0.61). Most counties had a value ranging from slightly positive to slightly negative. La Paz (-0.4) and Yuma counties (-4.9) had a larger negative value.
- Aerospace Vehicles and Defense (2.18). Most of the counties had a moderate negative value. However, the value was 3.5 in Pima County, 0.5 in Maricopa County, and 0.4 in Pinal County.
- Business Services (1.54). Every county had a value lower than -1 except Maricopa, whose value was near zero.
- Upstream Metal Manufacturing (1.38). Most counties had a barely negative value, but the figure was 3.2 in Gila County.
- Medical Devices (1.88). Most counties had a slightly negative value, but the figure was 2.8 in Coconino County.
- Financial Services (1.69). The value in Maricopa County was 1.3 while every other county had a negative value, often less than -1.
- Hospitality and Tourism (0.68). The value was slightly positive in Greenlee, Pinal, and Yuma counties, indicating a below-average share of tourism. In the other counties, the value ranged from slightly negative to values of -1 or less in Mohave, La Paz, and Coconino counties.
- Communications Equipment and Services (1.84). The value in Navajo County was 2.4 while every other county had a slightly negative value.

Across the counties, the industrial mix value for the aggregate of the nontraded clusters in 2015 (see Table 16) was only slightly correlated (0.31) to the aggregate value of the traded clusters. The nontraded cluster value was positive in nine counties and ranged from 10.49 in Apache County to -4.37 in Yavapai County. The value was negative in Maricopa and Pima counties, putting the value in the Sun Corridor (-0.48) lower than in the balance of the state (0.47).

In Table 17, the clusters having the greatest and lowest industrial mix values are presented for the state's subregions. Considerable variation existed across the subregions in those clusters making significant contributions, positive or negative, to the industrial mix.

Occupational Mix

Compared to industries, extreme job mix values in 2015 were much less common by occupation. In only two cases was the occupational job mix value greater than 1: mining and geological engineers in Greenlee County and detectives and criminal investigators in Cochise County.

TABLE 17
INDUSTRIAL JOB MIX VALUES BY CLUSTER, 2015, ARIZONA SUBREGIONS

	Sun Corridor	Metro Phoenix	Metro Tucson	Balance of State
Traded Clusters				
Greatest Positive Effects				
Aerospace Vehicles and Defense	**1.00**	**0.50**	**3.49**	-0.28
Financial Services	**0.88**	**1.24**	-0.92	-1.19
Information Technology and Analytical Instruments	**0.71**	**0.84**	0.09	-0.84
Farming and Ranching	**0.47**	**0.46**	**0.52**	-1.21
Transportation and Logistics	**0.13**	0.18	-0.12	-0.02
Hospitality and Tourism	0.13	**0.20**	-0.25	-0.82
Federal Government	-0.32	-0.60	**1.07**	**2.63**
Metal Mining	0.08	0.05	**0.24**	**0.68**
Electric Power Generation and Transmission	-0.11	-0.16	**0.14**	0.02
Medical Devices	-0.03	-0.04	0.01	**0.36**
Communications Equipment and Services	0.01	0.03	-0.08	**0.09**
Performing Arts	0.03	0.06	-0.10	**0.08**
Largest Negative Effects				
Business Services	**-0.47**	-0.14	**-2.09**	**-2.65**
Oil and Gas Production and Transportation	**-0.38**	**-0.40**	**-0.28**	-0.25
Federal Government	**-0.32**	**-0.60**	1.07	2.63
Education and Knowledge Creation	**-0.26**	**-0.33**	0.13	-0.42
Automotive	**-0.16**	**-0.15**	-0.17	-0.14
Electric Power Generation and Transmission	-0.11	**-0.16**	0.14	0.02
Financial Services	0.88	1.24	**-0.92**	**-1.19**
Distribution and Electronic Commerce	-0.02	0.13	**-0.74**	**-0.97**
Marketing, Design, and Publishing	-0.13	-0.10	**-0.30**	-0.35
Farming and Ranching	0.47	0.46	0.52	**-1.21**
Information Technology and Analytical Instruments	0.71	0.84	0.09	**-0.84**
Nontraded Clusters				
Greatest Positive Effects				
Local Health Services	**0.44**	**0.52**	0.06	0.23
Local Community and Civic Organizations	**0.41**	**0.44**	**0.24**	**0.56**
Local Financial Services	**0.21**	**0.28**	-0.16	-0.24
Local Commercial Services	-0.14	-0.19	**0.14**	**0.40**
State and Local Governments	-0.42	-0.53	**0.14**	**1.10**
Largest Negative Effects				
Local Real Estate, Construction, and Development	**-0.88**	**-0.90**	**-0.79**	**-0.56**
State and Local Governments	**-0.42**	**-0.53**	0.14	1.10
Local Hospitality Establishments	**-0.17**	-0.17	-0.15	-0.23
Local Commercial Services	-0.14	**-0.19**	0.14	0.40
Local Financial Services	0.21	0.28	**-0.16**	**-0.24**
Local Personal Services (Non-Medical)	0.15	0.21	**-0.15**	0.13
Local Motor Vehicle Products and Services	0.01	0.02	-0.01	**-0.31**

Note: The job mix values are expressed relative to the national average. The values in bold are among the top or bottom five clusters for the traded clusters and among the top or bottom three clusters for the nontraded clusters.

Source: Calculated from data provided by Emsi.

Several other counties had relatively high values in the latter occupation. There were more cases of an occupational job mix value less than -1, with a few of the values quite negative: farmers, ranchers, and other agricultural managers in Apache (-7.0) and Navajo (-3.4) counties; farmworkers and laborers in Yuma (-6.1) and La Paz (-1.0) counties; cashiers in La Paz County (-2.3); and military occupations in Cochise County (-1.2).

Those counties with significant agricultural activities had a negative total occupational mix. Several other counties also had a relatively large negative total occupational mix, even though no particular occupation had a very sizable negative effect. The total occupational mix value was less than -2.5 in 11 counties (see Table 16).

Change in Job Quality

The change in job quality between 2001 and 2015 followed a different geographic pattern within Arizona than the 2015 level, as declines occurred in the Sun Corridor while advances were registered in the balance of the state. Between 2001 and 2007, job quality dropped in the Sun Corridor while rising in the balance of the state. Between 2007 and 2015, a slight gain in job quality in the Sun Corridor was less than the small increase in the balance of the state. Thus, the differential in job quality between the populous urban areas and the rest of the state was even greater in 2001 than in 2015.

In the Sun Corridor, the total industrial job mix and the total occupational job mix each declined between 2001 and 2015, as decreases during the 2001-through-2007 period were followed by small gains between 2007 and 2015 (see Table 18). The changes in Maricopa County were similar to those of the entire Sun Corridor, but the patterns in Pima and Pinal counties were considerably different. Pinal County experienced large increases in both the total industrial mix and the total occupational mix between 2001 and 2007, but between 2007 and 2015, the total industrial mix dropped and the total occupational mix was unchanged. In Pima County, the total job mix hardly changed between 2001 and 2007 but declined between 2007 and 2015.

Ten counties experienced an increase in job quality between 2001 and 2015, with substantial gains in some counties. Only Apache County experienced a large decline. In the majority of the counties, the performance on job quality was better between 2001 and 2007 than between 2007 and 2015, but Maricopa and Pima counties were among the exceptions to this generalization.

In each of the counties with an increase in job quality between 2001 and 2015, the improvement in the total industrial mix was greater than the gain in the total occupational mix. In the other counties, declines in the total occupational mix played a large role in the decrease in job quality.

Industrial Mix

In most of the counties, extreme changes in industrial mix values between 2001 and 2015 were present in a few industries. The change in value was greater than 2 in copper ore mining in Graham and Greenlee counties, but Greenlee County had changes of less than -2 in the associated industrial building construction industry and in the offices of physicians industry. The change in value exceeded 2 in La Paz County in the farm labor contractors and federal government industries. Apache and Navajo counties had large negative changes in animal production; Apache also had large negatives in federal government and local government.

TABLE 18
CHANGE IN JOB QUALITY, ARIZONA COUNTIES AND SUBREGIONS

	Total Industrial Job Mix*			Total Occupational Job Mix*			Job Quality**		
	2001-07	2007-15	2001-15	2001-07	2007-15	2001-15	2001-07	2007-15	2001-15
Apache	-7.13	-2.02	-9.15	-6.27	-1.61	-7.88	-6.70	-1.82	-8.52
Cochise	4.03	1.16	5.19	2.47	0.55	3.02	3.25	0.86	4.11
Coconino	-0.74	2.89	2.15	-0.88	0.45	-0.43	-0.81	1.67	0.86
Gila	0.38	3.58	3.96	0.04	0.86	0.90	0.21	2.22	2.43
Graham	5.32	6.07	11.39	0.84	3.55	4.39	3.08	4.81	7.89
Greenlee	8.75	-1.75	7.00	3.27	-3.14	0.13	6.01	-2.45	3.57
La Paz	5.85	4.24	10.09	1.49	0.71	2.20	3.67	2.48	6.15
Maricopa	-1.97	0.62	-1.35	-0.66	0.32	-0.34	-1.32	0.47	-0.85
Mohave	1.38	1.27	2.65	0.65	-0.17	0.48	1.02	0.55	1.57
Navajo	-0.47	-0.39	-0.86	-1.24	-1.47	-2.71	-0.86	-0.93	-1.79
Pima	-0.14	-0.84	-0.98	0.36	-1.00	-0.64	0.11	-0.92	-0.81
Pinal	4.87	-1.43	3.44	2.91	0.04	2.95	3.89	-0.69	3.20
Santa Cruz	0.93	0.61	1.54	-1.17	-0.63	-1.80	-0.12	-0.01	-0.13
Yavapai	2.43	0.37	2.80	0.82	-0.68	0.14	1.63	-0.15	1.47
Yuma	6.62	0.11	6.73	3.83	0.08	3.91	5.23	0.10	5.32
Sun Corridor^	-1.53	0.32	-1.21	-0.42	0.09	-0.33	-0.98	0.21	-0.77
Metro Phoenix	-1.84	0.53	-1.31	-0.61	0.29	-0.32	-1.23	0.41	-0.82
Metro Tucson	-0.14	-0.84	-0.98	0.36	-1.00	-0.64	0.11	-0.92	-0.81
Balance of State^	1.80	1.10	2.90	0.57	-0.19	0.38	1.19	0.46	1.64

* Expressed as a percentage difference from the national average.
** Job quality is calculated as the average of the industrial mix and the occupational mix, expressed as a percentage difference from the national average.
^ The Sun Corridor consists of Metro Phoenix (Maricopa and Pinal counties) and Metro Tucson (Pima County). The balance of the state is the other 12 counties.

Source: Calculated from data provided by Emsi.

In Maricopa County, the only significant change in the industrial mix value between 2001 and 2015 was a decline of -1.6 in the semiconductor and related device manufacturing industry. In Pima County, the largest change was -1.2 in electronic computer manufacturing. Two aerospace industries combined had a change of -1.4.

Clusters. Considerable variation was present across the counties in the change in the industrial mix value between 2001 and 2015 for the aggregate of the traded clusters. The change exceeded 3 in six counties, led by La Paz at 6.92. In contrast, four counties had a change of less than -1.6, including Maricopa and Pima (see Table 19). The change for the Sun Corridor was -1.76, while the change for the other 12 counties combined was 1.00.

In most of the traded clusters, not much difference was present across the counties in the 2001-to-2015 change in industrial mix value. The large variation in the change in the overall traded cluster job mix largely resulted from eight clusters. In the following list, the value after the

TABLE 19
CHANGE IN INDUSTRIAL JOB MIX, 2001 THROUGH 2015,
ARIZONA COUNTIES AND SUBREGIONS

	Total	Traded Clusters	Nontraded Clusters
Graham	11.38	5.87	5.51
La Paz	10.08	6.92	3.16
Greenlee	6.99	4.92	2.08
Yuma	6.72	4.42	2.30
Cochise	5.19	3.18	2.01
Gila	3.96	1.37	2.59
Pinal	3.44	3.49	-0.05
Yavapai	2.81	1.80	1.01
Mohave	2.65	0.02	2.63
Coconino	2.14	-0.06	2.21
Santa Cruz	1.56	0.64	0.92
Navajo	-0.85	-2.87	2.03
Pima	-0.99	-2.52	1.53
Maricopa	-1.36	-1.65	0.29
Apache	-9.16	-7.28	-1.87
Sun Corridor^	-1.23	-1.76	0.53
Metro Phoenix	-1.32	-1.62	0.29
Metro Tucson	-0.99	-2.52	1.53
Balance of State^	2.90	1.00	1.90

Note: The change in the industrial mix is expressed as a percentage difference from the national average.

Note: The sum of the traded clusters and nontraded clusters does not equal the industrial mix value due to unclassified activities included in the total.

^ The Sun Corridor consists of Metro Phoenix (Maricopa and Pinal counties) and Metro Tucson (Pima County). The balance of the state is the other 12 counties.

Source: Calculated from data provided by Emsi.

cluster name is the national average earnings in the cluster expressed as a ratio to the overall average:

- Farming and Ranching (0.55). Five counties in which agriculture's share of the total economy is small had changes in value near zero, but the change ranged widely in the other counties, from 0.8 in Graham and Pinal counties to -4.0 in Navajo County and -7.7 in Apache County.
- Metal Mining (1.50). Most of the counties had a change in value near zero, but four counties had a change of at least 0.9: 5.2 in Greenlee County, 3.6 in Graham County, 1.1 in La Paz County, and 0.9 in Gila County. In contrast, the change was -0.7 in Pinal County.
- Federal Government (1.49). The change in value ranged widely from 2.4 in La Paz County, 1.6 in Santa Cruz County, and 1.5 in Cochise County to -1.4 in Coconino County and -3.1 in Apache County.
- Construction Products and Services (1.43). The change in value was near zero in most counties, but negative in a few counties, including Greenlee (-2.8).
- Agricultural Inputs and Services (0.61). Most counties had a change in value near zero, but the change was 2.9 in La Paz and 2.0 in Yuma.
- Information Technology and Analytical Instruments (2.45). Most of the counties had a moderate positive change in value, but the changes in the two-largest counties were -1.9 in Pima and -1.6 in Maricopa.
- Electric Power Generation and Transmission (2.72). Most counties had a change in value near zero, but it was 1.6 in Apache County, -0.5 in Maricopa County, and -0.8 in Cochise County.
- Aerospace Vehicles and Defense (2.18). Most of the counties had a change in value ranging from slightly positive to slightly negative. However, the change was 0.9 in Pinal County and -1.3 in Pima County.

Across the counties, the 2001-to-2015 change in industrial mix value for the aggregate of the nontraded clusters (see Table 19) was moderately correlated (0.66) to the aggregate change of the traded clusters. The overall change in value in the nontraded clusters ranged from 5.51 in Graham County to -1.87 in Apache County; the change was positive in 13 counties. The change was lower in the Sun Corridor (0.53) than in the balance of the state (1.90).

In Table 20, the clusters having the greatest and least change in industrial mix values between 2001 and 2015 are presented for the state's subregions. Considerable variation existed across the subregions in those clusters contributing the greatest change, positive or negative, to the industrial mix.

Occupational Mix

In only two cases was the change in the occupational job mix value between 2001 and 2015 greater than 1, both in the farmworkers and laborers occupation: 2.4 in Yuma County and 1.7 in La Paz County. The change in the occupational job mix value was less than -1 in three cases, all in the farmers, ranchers, and other agricultural managers occupation: -6.6 in Apache County, -3.4 in Navajo County, and -1.1 in Coconino County.

TABLE 20
CHANGE IN INDUSTRIAL JOB MIX VALUES BY CLUSTER, 2001 THROUGH 2015, ARIZONA SUBREGIONS

	Sun Corridor	Metro Phoenix	Metro Tucson	Balance of State
Traded Clusters				
Greatest Increases				
Financial Services	**0.37**	**0.41**	0.02	**0.43**
Insurance Services	**0.14**	**0.10**	**0.27**	0.13
Communications Equipment and Services	**0.12**	**0.12**	**0.15**	**0.31**
Federal Government	**0.11**	0.02	**0.64**	-0.19
Hospitality and Tourism	**0.10**	**0.09**	**0.12**	-0.08
Biopharmaceuticals	0.09	**0.10**	0.05	0.04
Education and Knowledge Creation	0.04	0.03	**0.13**	-0.03
Information Technology and Analytical Instruments	-1.59	-1.53	-1.91	**0.44**
Agricultural Inputs and Services	0.03	0.04	0.02	**0.36**
Medical Devices	0.05	0.07	-0.03	**0.27**
Largest Decreases				
Information Technology and Analytical Instruments	**-1.59**	**-1.53**	**-1.91**	0.44
Aerospace Vehicles and Defense	**-0.48**	**-0.25**	**-1.28**	0.02
Electric Power Generation and Transmission	**-0.39**	**-0.45**	-0.06	0.14
Distribution and Electronic Commerce	**-0.29**	**-0.40**	0.11	0.06
Business Services	**-0.10**	0.01	**-0.74**	**-0.28**
Construction Products and Services	-0.08	**-0.08**	-0.07	**-0.10**
Farming and Ranching	-0.09	-0.08	**-0.16**	**-0.88**
Transportation and Logistics	-0.08	-0.07	**-0.16**	0.10
Federal Government	0.11	0.02	0.64	**-0.19**
Marketing, Design, and Publishing	-0.03	-0.01	-0.11	**-0.15**
Nontraded Clusters				
Greatest Increases				
Local Commercial Services	**0.36**	**0.38**	0.29	**0.24**
Local Financial Services	**0.26**	**0.30**	0.05	-0.01
Local Health Services	**0.22**	**0.32**	-0.29	0.10
State and Local Governments	-0.18	-0.31	**0.49**	**0.24**
Local Real Estate, Construction, and Development	-0.11	-0.21	**0.34**	0.14
Local Hospitality Establishments	0.10	0.05	**0.34**	**0.43**
Largest Decreases				
State and Local Governments	**-0.18**	**-0.31**	0.49	0.24
Local Retailing of Clothing & General Merchandise	**-0.15**	**-0.17**	**-0.09**	**-0.02**
Local Real Estate, Construction, and Development	**-0.11**	**-0.21**	0.34	0.14
Local Health Services	0.22	0.32	**-0.29**	0.10
Local Entertainment and Media	-0.04	-0.02	**-0.15**	**-0.05**
Local Logistical Services	-0.07	**-0.08**	0.01	**-0.08**

Note: The values in bold are among the top or bottom five clusters for the traded clusters and among the top or bottom three clusters for the nontraded clusters.

Source: Calculated from data provided by Emsi.

JOB QUALITY BY STATE

Job Quality in 2015

In 2015, job quality by state ranged from 6.78 percent above the national average in Massachusetts to 8.10 percent below average in Nevada. The figure in the District of Columbia was much higher at 28.69. As seen in Table 21, job quality was higher than the national average in only 19 of the 51 "states." Arizona ranked 21st. Seven states along the Atlantic Coast from Massachusetts to Virginia had the best job quality; the western states of Colorado, Utah, and Washington completed the top 10. Job quality also was at least 1 percent above average in New York, Illinois, Minnesota, and Alaska. States with the lowest job quality were more dispersed. The bottom 10 included the high-tourism states of Hawaii and Nevada, four southern states (Florida, Mississippi, South Carolina, and Tennessee), Idaho and Montana, and Maine and South Dakota.

Among 10 western states, Arizona ranked sixth on job quality. Washington, Colorado, and Utah were well above the national average and Texas and California were a little above average. Job quality was further below average than in Arizona in New Mexico, Oregon, Idaho, and Nevada, with the latter two states considerably below average.

In most states, the rankings on the total industrial mix and the total occupational mix were similar in 2015; the correlation in the two total job mixes was 0.91 across the states. Among the exceptions were the mining-intensive states of North Dakota and West Virginia, which had a higher total industrial mix than total occupational mix. In California, Maine, and Utah, the total occupational mix was considerably higher than the total industrial mix.

The total industrial mix was highest in the District of Columbia at 29.21, followed by Delaware at 5.30 and Massachusetts at 4.80. In contrast, the total industrial mix was -9.05 in Nevada, -7.67 in Hawaii, and -6.28 in Montana. In 23 states, the total industrial mix was higher than the national average. Arizona ranked 29th nationally and sixth among 10 western states at -0.70. Washington, Utah, and Colorado had the strongest total industrial mixes in the West, while Idaho ranked ninth and Nevada was last.

The total occupational mix was highest in the District of Columbia at 28.17, followed by Massachusetts at 8.76 and Connecticut at 5.77. The weakest total occupational mixes were in Nevada (-7.14), South Dakota (-6.72), and Mississippi (-5.82). The total occupational mix exceeded the U.S. average in 20 states. Arizona ranked 17th nationally and fifth among 10 western states at 0.60. Colorado, Washington, and Utah had the best total occupational mixes in the West, while Idaho ranked ninth and Nevada was last.

Clusters

The division of the total industrial mix into traded clusters and nontraded clusters also is shown in Table 21. The correlation of the traded and nontraded values by state was relatively low in 2015 at 0.33. The traded cluster value was very highly correlated to the total industrial mix (0.96), while the nontraded cluster correlation to the total industrial mix was lower at 0.59.

TABLE 21
JOB QUALITY, 2015, STATES

					Industrial Job Mix	
		Total Industrial Job Mix*	Total Occupation-al Job Mix*	Job Quality**	Traded Clusters*	Nontraded Clusters*
1.	District Columbia	29.21	28.17	28.69	22.65	6.53
2.	Massachusetts	4.80	8.76	6.78	4.59	0.22
3.	Connecticut	3.12	5.77	4.45	3.26	-0.13
4.	Delaware	5.30	2.25	3.78	4.16	1.15
5.	Maryland	2.44	5.02	3.73	3.22	-0.77
6.	New Jersey	2.87	3.23	3.05	2.02	0.83
7.	Virginia	3.52	2.50	3.01	3.31	0.20
8.	Washington	3.53	2.16	2.84	2.54	1.00
9.	Colorado	1.97	3.68	2.82	1.76	0.21
10.	Utah	3.04	1.79	2.42	1.82	1.24
11.	New York	1.81	2.79	2.30	0.91	0.88
12.	Illinois	1.71	1.98	1.85	1.39	0.32
13.	Minnesota	2.07	0.73	1.40	0.78	1.30
14.	Alaska	1.97	0.11	1.04	-3.58	5.55
15.	Oklahoma	1.02	0.16	0.59	-1.60	2.63
16.	Rhode Island	-0.34	1.51	0.59	0.07	-0.40
17.	Texas	1.54	-0.37	0.58	1.62	-0.07
18.	New Hampshire	-0.08	0.65	0.29	0.45	-0.52
19.	California	-0.83	1.30	0.24	0.74	-1.59
20.	Ohio	0.69	-0.78	-0.04	0.42	0.28
21.	Arizona	-0.70	0.60	-0.05	-0.34	-0.38
22.	Michigan	-0.23	0.08	-0.07	-0.42	0.19
23.	Kansas	1.10	-1.54	-0.22	-0.55	1.66
24.	Georgia	-0.44	-0.18	-0.31	-0.32	-0.13
25.	Pennsylvania	0.24	-0.95	-0.35	0.01	0.24
26.	Wyoming	1.05	-2.11	-0.53	-2.37	3.43
27.	New Mexico	0.07	-1.44	-0.69	-1.86	1.94
28.	West Virginia	1.62	-3.24	-0.81	-1.27	2.90
29.	Oregon	-2.05	-1.09	-1.57	-1.87	-0.17
30.	Missouri	-0.84	-2.37	-1.60	-1.12	0.28
31.	Louisiana	-0.31	-3.04	-1.67	-0.84	0.53
32.	North Dakota	1.11	-4.89	-1.89	-2.98	4.10
33.	North Carolina	-1.29	-2.55	-1.92	-1.22	-0.06
34.	Wisconsin	-0.75	-3.52	-2.13	-1.51	0.76
35.	Alabama	-0.78	-3.80	-2.29	-1.50	0.73
36.	Nebraska	-1.53	-3.42	-2.47	-2.88	1.37
37.	Indiana	-1.37	-3.91	-2.64	-1.50	0.14
38.	Kentucky	-2.21	-4.48	-3.34	-3.34	1.13
39.	Arkansas	-2.85	-4.20	-3.52	-3.80	0.96
40.	Iowa	-2.46	-4.62	-3.54	-3.68	1.23

(continued)

TABLE 21 (continued)
JOB QUALITY, 2015, STATES

		Total Industrial Job Mix*	Total Occupation-al Job Mix*	Job Quality**	Industrial Job Mix: Traded Clusters	Industrial Job Mix: Total Industrial Job Mix*
41.	Vermont	-4.79	-2.31	-3.55	-5.46	0.67
42.	Tennessee	-4.05	-3.56	-3.80	-3.17	-0.87
43.	Maine	-5.63	-2.20	-3.92	-5.24	-0.39
44.	South Carolina	-3.84	-4.19	-4.01	-2.87	-0.96
45.	Idaho	-4.99	-3.53	-4.26	-4.98	-0.01
46.	Florida	-5.87	-3.53	-4.70	-3.31	-2.55
47.	South Dakota	-3.37	-6.72	-5.05	-6.18	2.82
48.	Mississippi	-5.26	-5.82	-5.54	-5.95	0.70
49.	Montana	-6.28	-5.32	-5.80	-7.28	1.00
50.	Hawaii	-7.67	-4.52	-6.09	-6.72	-0.94
51.	Nevada	-9.05	-7.14	-8.10	-7.28	-1.76

Note: The sum of the traded clusters and nontraded clusters does not equal the industrial mix value due to unclassified activities included in the total.

* Expressed as a percentage difference from the national average.
** Total job quality is calculated as the average of the industrial mix and the occupational mix, expressed as a percentage difference from the national average.

Source: Calculated from data provided by Emsi.

The traded cluster value was highest in the District of Columbia at 22.65, followed by Massachusetts at 4.59 and Delaware at 4.16. The lowest values were -7.28 in Nevada and Montana and -6.72 in Hawaii. Only 19 states had a positive value. Arizona ranked 21st nationally and sixth among 10 western states at -0.34. Washington, Utah, and Colorado had the highest values in the West, while Idaho ranked ninth and Nevada was last.

The nontraded cluster value was highest in the District of Columbia at 6.53, followed by Alaska at 5.55 and North Dakota at 4.10. The lowest values were -2.55 in Florida, -1.76 in Nevada, and -1.59 in California. Thirty-four states had a positive value. Arizona ranked 41st nationally and eighth among 10 western states at -0.38. New Mexico, Utah, and Washington had the highest values in the West, while California ranked ninth and Nevada was last.

Most of the traded clusters are too small to have much of an effect on the industrial mix. The range of the extreme values across the states exceeded 1 in only 14 of the 53 traded clusters (see Table 22). Arizona ranked among the top 10 in three of these 14 clusters; it did not rank among the bottom 10 in any of them. Arizona ranked among the top or bottom five states in only a few of the traded clusters: fourth in aerospace vehicles and defense, fourth in metal mining, and 50th in water transportation.

Among the nontraded clusters, the range of the extreme values in the industrial mix value exceeded 1 in nine of 17 clusters, but was less than 3 in all clusters. Arizona ranked fifth in the

TABLE 22
INDUSTRIAL JOB MIX VALUES IN TRADED CLUSTERS, 2015, STATES

Clusters With the Widest Range of Values Across the States	Three Highest Values			Arizona Value	Arizona Rank*	Three Lowest Values		
Federal Government	DC 24.0	MD 3.7	VA 2.5	0.11	18	WI -0.7	IA -0.7	CT -0.8
Financial Services	DE 5.1	NY 2.7	CT 1.3	0.57	7	MS -1.3	NV -1.5	AK -1.6
Business Services	VA 2.9	DC 1.3	RI 1.3	-0.74	31	ID -1.7	NM -1.9	WY -2.3
Oil and Gas Production and Transportation	WY 3.4	OK 2.9	LA 2.4	-0.36	28	NH -0.5	MA -0.5	DC -0.5
Information Technology & Analytical Instruments	OR 2.5	WA 2.1	MA 1.8	0.48	10	WY -0.9	HI -0.9	AK -0.9
Education and Knowledge Creation	NM 2.5	MA 1.5	DE 1.4	-0.28	34	LA -0.4	WY -0.4	VT -0.6
Hospitality and Tourism	MI 0.3	OK 0.2	OH 0.2	-0.01	32	AK -0.9	HI -1.9	NV -2.7
Aerospace Vehicles and Defense	WA 2.4	KS 1.4	CT 0.8	0.80	4	SD -0.4	AK-0.4	DC -0.4
Farming and Ranching	DC 0.6	AK 0.5	MA 0.5	0.23	14	ID -1.3	ND -1.7	SD -1.9
Insurance Services	CT 1.4	IA 0.7	NE 0.5	-0.01	20	MT -0.4	WY -0.4	AK -0.5
Distribution and Electronic Commerce	NJ 0.5	GA 0.5	TX 0.5	-0.09	19	MS -0.7	AK -0.7	DC -0.9
Coal Mining	WV 1.2	WY 1.0	KY 0.3	-0.02	19	CT -0.0	DE -0.0	HI -0.0
Marketing, Design, and Publishing	DC 0.8	NY 0.8	CA 0.6	-0.16	19	NM -0.4	AK -0.4	MS -0.4
Automotive	MI 1.0	KY 0.8	IN 0.7	-0.16	35	AK -0.2	HI -0.2	DC -0.2

Note: The industrial mix values are expressed as a percentage difference from the national average.
* Rank among the 50 states and the District of Columbia; a rank of 1 indicates the highest industrial mix value.

Source: Calculated from data provided by Emsi.

local health services cluster and 50th in the local real estate, construction, and development cluster.

Change in Job Quality

The change in job quality over time by state is displayed in Table 23. Between 2001 and 2015, the change, in either direction, was less than 1 in 26 states. The change ranged from 4.2 in North Dakota to -2.5 in New Jersey. Other states with increases of more than 2.5 included Wyoming, Oklahoma, and Iowa; other states with a change of less than -2 included Massachusetts and Delaware. A gain was registered in 37 states. The Plains states and other noncoastal states generally recorded the greatest gains. States with the largest losses included the states along the Atlantic coast from Massachusetts to Delaware, Florida and Georgia, and some of the western states.

With a change of -0.24 between 2001 and 2015, Arizona ranked 39th nationally and eighth among the 10 western states on the change in job quality. Seven of the western states experienced a gain in job quality between 2001 and 2015, but Washington was the only one with a gain of more than 1. The change in Idaho and California was less than -1.

In 34 states, the performance on job quality was stronger between 2001 and 2007 than between 2007 and 2015. Across the states, the change in job quality between 2001 and 2007 was only moderately correlated (0.42) with the change between 2007 and 2015. Arizona ranked 45th nationally between 2001 and 2007 with a decline of -0.56 but ranked 19th between 2007 and 2015 with a gain of 0.33. Several of the western states were inconsistent on their ranks in the 2001-through-2007 and 2007-through-2015 periods. Nevada and New Mexico led the western states between 2001 and 2007, but had the worst performance between 2007 and 2015. Arizona ranked eighth in the West between 2001 and 2007 and also between 2001 and 2015, but was fifth between 2007 and 2015.

The change in the total industrial mix was strongly correlated to the change in the total occupational mix in each period: 0.86 from 2001 through 2007, 0.74 from 2007 through 2015, and 0.85 from 2001 through 2015. The change in the total industrial mix was more highly correlated to the change in job quality than the change in the total occupational mix in each period, with a correlation coefficient of at least 0.97.

The change in the total industrial mix between 2001 and 2015 was highest in North Dakota at 6.46, followed by Delaware at 5.30 and Massachusetts at 4.80. The largest declines were -3.88 in New Jersey, -3.53 in the District of Columbia, and -3.42 in Delaware. Thirty-six states had an improvement in the total industrial mix relative to the nation. Arizona ranked 40th nationally and eighth among 10 western states at -0.37. Washington, New Mexico, and Colorado had the strongest gains in the West, while California ranked ninth and Idaho was last.

The changes in the total occupational mix between 2001 and 2015 were not as large as the changes in the total industrial mix. The greatest increase was 2.30 in Oklahoma. North Dakota and Wyoming also had increases of more than 2. The largest decreases were -1.14 in New York and -1.03 in New Jersey. Thirty-two states had an improvement in the total occupational mix relative to the nation. Arizona ranked 35th nationally and seventh among 10 western states at -

0.10. Washington, Utah, and Colorado had the strongest gains in the West, while California had the only sizeable decline.

Clusters

The change in the industrial mix between 2001 and 2015 is divided into traded clusters and nontraded clusters in Table 24. The correlation of the traded and nontraded changes by state was low at 0.21. The traded cluster change was highly correlated (0.84) to the total industrial mix change, while the nontraded cluster correlation to the total industrial mix change was lower at 0.70.

The change in the traded cluster value was greatest in North Dakota at 3.96, followed by Rhode Island at 2.44, and Iowa at 2.39. The lowest changes were -3.34 in Delaware, -3.06 in Massachusetts, and -2.78 in New Jersey. Thirty states had an increase. Arizona ranked 43rd nationally and eighth among 10 western states at -1.17. Nevada, Washington, and New Mexico had the greatest gains in the West, while Utah ranked ninth and Idaho was last.

The change in the nontraded cluster value was greatest in Wyoming at 2.83, followed by Alaska at 2.77, and North Dakota at 2.51. The lowest values were -1.99 in the District of Columbia, -1.69 in Nevada, and -1.53 in Mississippi. Thirty-three states had an increase. Arizona ranked 23rd nationally and sixth among 10 western states at 0.79. Utah, Washington, and Colorado had the greatest gains in the West, while California ranked ninth and Nevada was last.

In most of the traded clusters, the change in the industrial mix value between 2001 and 2015 was small in most of the states. The range of the extreme changes across the states exceeded 1 in only 11 of the 53 traded clusters (see Table 25). Arizona ranked among the top 10 in three of these 11 clusters, but ranked among the bottom 10 in three of them.

On the change in the industrial mix value between 2001 and 2015, Arizona ranked among the top or bottom five states in about one in 10 of the traded clusters. It was in the top five states in agricultural inputs and services; insurance services; medical devices; metal mining; and trailers, motor homes, and appliances. Arizona ranked among the bottom five states in aerospace vehicles and defense; construction products and services; electric power generation and transmission; farming and ranching; information technology and analytical instruments; and music and sound recording.

Among the nontraded clusters, the range across the states of the extreme changes in the industrial mix value exceeded 1 in six of 17 clusters, but was less than 1.6 in all clusters. Arizona ranked first in the local commercial services cluster, second in the local financial services cluster, but 50th in the local logistical services cluster.

TABLE 23
CHANGE IN JOB QUALITY, STATES

	Total Industrial Job Mix *			Total Occupational Job Mix*			Job Quality**		
	2001-07	2007-15	2001-15	2001-07	2007-15	2001-15	2001-07	2007-15	2001-15
Alabama	1.01	0.02	1.03	0.24	-0.35	-0.11	0.63	-0.17	0.46
Alaska	1.16	1.17	2.33	-0.29	0.07	-0.22	0.44	0.62	1.06
Arizona	-0.89	0.52	-0.37	-0.23	0.13	-0.10	-0.56	0.33	-0.24
Arkansas	1.40	0.14	1.54	0.89	-0.05	0.84	1.15	0.04	1.19
California	-1.91	0.04	-1.87	-1.06	0.17	-0.89	-1.49	0.11	-1.38
Colorado	-0.24	0.95	0.71	-0.11	0.67	0.56	-0.18	0.81	0.64
Connecticut	-0.73	-1.33	-2.06	-0.27	-0.25	-0.52	-0.50	-0.79	-1.29
Delaware	-1.99	-1.43	-3.42	-0.67	0.01	-0.66	-1.33	-0.71	-2.04
District Columbia	-0.68	-2.85	-3.53	0.69	-0.98	-0.29	0.00	-1.92	-1.91
Florida	0.50	-0.77	-0.27	0.15	-0.72	-0.57	0.32	-0.75	-0.42
Georgia	-1.49	0.43	-1.06	-0.20	0.03	-0.17	-0.85	0.23	-0.62
Hawaii	1.12	-0.11	1.01	0.52	-0.54	-0.02	0.82	-0.33	0.50
Idaho	-1.54	-0.52	-2.06	0.00	-0.21	-0.21	-0.77	-0.37	-1.14
Illinois	-0.40	0.27	-0.13	-0.22	-0.05	-0.27	-0.31	0.11	-0.20
Indiana	1.46	0.14	1.60	0.55	-0.29	0.26	1.01	-0.08	0.93
Iowa	2.87	1.15	4.02	1.13	0.30	1.43	2.00	0.73	2.73
Kansas	1.16	0.73	1.89	0.49	0.74	1.23	0.83	0.74	1.56
Kentucky	1.74	0.34	2.08	0.78	-0.34	0.44	1.26	0.00	1.26
Louisiana	0.73	-1.38	-0.65	0.12	-0.49	-0.37	0.43	-0.94	-0.51
Maine	0.33	0.25	0.58	0.33	-0.16	0.17	0.33	0.04	0.38
Maryland	0.29	0.17	0.46	0.18	-0.12	0.06	0.24	0.02	0.26
Massachusetts	-2.18	-1.18	-3.36	-0.48	-0.26	-0.74	-1.33	-0.72	-2.05
Michigan	-0.49	0.41	-0.08	0.05	0.39	0.44	-0.22	0.40	0.18
Minnesota	0.47	0.60	1.07	0.10	0.20	0.30	0.29	0.40	0.69
Mississippi	1.52	-1.18	0.34	0.78	-0.61	0.17	1.15	-0.90	0.26
Missouri	0.96	0.52	1.48	0.32	-0.08	0.24	0.64	0.22	0.86
Montana	2.08	1.18	3.26	0.71	0.28	0.99	1.40	0.73	2.13
Nebraska	2.78	0.38	3.16	1.07	0.11	1.18	1.93	0.25	2.17
Nevada	0.78	-0.32	0.46	0.79	-0.51	0.28	0.79	-0.42	0.37
New Hampshire	-0.23	0.97	0.74	-0.09	0.37	0.28	-0.16	0.67	0.51
New Jersey	-1.53	-2.35	-3.88	-0.49	-0.54	-1.03	-1.01	-1.45	-2.46
New Mexico	2.43	-0.71	1.72	0.80	-0.96	-0.16	1.62	-0.84	0.78
New York	-0.40	-1.68	-2.08	-0.37	-0.77	-1.14	-0.39	-1.23	-1.61

(continued)

TABLE 23 (continued)
CHANGE IN JOB QUALITY, STATES

	Total Industrial Job Mix *			Total Occupational Job Mix*			Job Quality**		
	2001-07	2007-15	2001-15	2001-07	2007-15	2001-15	2001-07	2007-15	2001-15
North Carolina	0.80	0.60	1.40	0.70	0.18	0.88	0.75	0.39	1.14
North Dakota	3.50	2.96	6.46	1.36	0.65	2.01	2.43	1.81	4.24
Ohio	1.08	0.60	1.68	0.58	0.04	0.62	0.83	0.32	1.15
Oklahoma	2.14	2.03	4.17	0.99	1.31	2.30	1.57	1.67	3.24
Oregon	-0.13	0.75	0.62	-0.32	0.53	0.21	-0.23	0.64	0.42
Pennsylvania	0.74	-1.16	-0.42	0.07	-0.43	-0.36	0.41	-0.80	-0.39
Rhode Island	1.69	0.57	2.26	0.63	-0.36	0.27	1.16	0.11	1.27
South Carolina	0.42	0.51	0.93	0.44	-0.07	0.37	0.43	0.22	0.65
South Dakota	1.67	1.16	2.83	0.80	0.44	1.24	1.24	0.80	2.04
Tennessee	0.36	0.19	0.55	0.54	-0.27	0.27	0.45	-0.04	0.41
Texas	0.32	0.28	0.60	0.05	0.48	0.53	0.19	0.38	0.57
Utah	0.40	-0.16	0.24	0.17	0.72	0.89	0.29	0.28	0.57
Vermont	-0.01	0.85	0.84	0.32	-0.39	-0.07	0.16	0.23	0.39
Virginia	0.46	-0.15	0.31	0.70	-0.04	0.66	0.58	-0.10	0.49
Washington	0.39	2.13	2.52	0.16	0.98	1.14	0.28	1.56	1.83
West Virginia	1.61	1.00	2.61	0.27	0.14	0.41	0.94	0.57	1.51
Wisconsin	1.42	1.17	2.59	0.53	0.01	0.54	0.98	0.59	1.57
Wyoming	3.81	0.97	4.78	1.17	0.84	2.01	2.49	0.91	3.40

* Expressed as a percentage difference from the national average.
** Job quality is calculated as the average of the industrial mix and the occupational mix, expressed as a percentage difference from the national average.

Source: Calculated from data provided by Emsi.

TABLE 24
CHANGE IN INDUSTRIAL JOB MIX, 2001 THROUGH 2015, STATES

		Clusters				Clusters	
	Total	Traded	Non-traded		Total	Traded	Non-traded
Alabama	1.03	1.63	-0.59	Montana	3.26	1.27	1.99
Alaska	2.33	-0.44	2.77	Nebraska	3.16	1.61	1.55
Arizona	-0.37	-1.17	0.79	Nevada	0.46	2.14	-1.69
Arkansas	1.54	1.49	0.05	New Hampshire	0.74	-0.91	1.65
California	-1.87	-1.08	-0.80	New Jersey	-3.88	-2.78	-1.04
Colorado	0.71	-0.56	1.26	New Mexico	1.72	0.83	0.90
Connecticut	-2.06	-1.81	-0.25	New York	-2.08	-1.37	-0.71
Delaware	-3.42	-3.34	-0.08	North Carolina	1.40	1.54	-0.14
District Columbia	-3.53	-1.51	-1.99	North Dakota	6.46	3.96	2.51
Florida	-0.27	1.18	-1.45	Ohio	1.68	0.71	0.98
Georgia	-1.06	-0.14	-0.89	Oklahoma	4.17	2.13	2.03
Hawaii	1.01	0.36	0.64	Oregon	0.62	-0.22	0.84
Idaho	-2.06	-2.71	0.65	Pennsylvania	-0.42	-0.50	0.08
Illinois	-0.13	-0.19	0.06	Rhode Island	2.26	2.44	-0.15
Indiana	1.60	0.53	1.07	South Carolina	0.93	1.51	-0.57
Iowa	4.02	2.39	1.63	South Dakota	2.83	0.95	1.87
Kansas	1.89	1.10	0.78	Tennessee	0.55	0.60	-0.04
Kentucky	2.08	1.21	0.87	Texas	0.60	0.40	0.20
Louisiana	-0.65	0.46	-1.11	Utah	0.24	-1.40	1.64
Maine	0.58	-0.78	1.36	Vermont	0.84	-0.66	1.50
Maryland	0.46	0.45	0.03	Virginia	0.31	0.53	-0.22
Massachusetts	-3.36	-3.06	-0.30	Washington	2.52	1.12	1.39
Michigan	-0.08	-0.66	0.58	West Virginia	2.61	1.58	1.04
Minnesota	1.07	-0.57	1.64	Wisconsin	2.59	1.69	0.89
Mississippi	0.34	1.86	-1.53	Wyoming	4.78	1.95	2.83
Missouri	1.48	1.20	0.27				

Note: The change in the industrial mix is expressed as a percentage difference from the national average.

Note: The sum of the traded clusters and nontraded clusters does not equal the total industrial mix value due to unclassified activities included in the total.

Source: Calculated from data provided by Emsi.

TABLE 25
CHANGE IN INDUSTRIAL JOB MIX VALUES IN TRADED CLUSTERS, 2001 THROUGH 2015, STATES

Clusters With the Widest Range of Values Across the States	Three Highest Values			Arizona Value	Arizona Rank*	Three Lowest Values		
Business Services	DC 1.4	RI 1.2	PA 1.1	-0.12	34	MA -1.0	ID -1.1	DE -4.4
Financial Services	DE 3.3	RI 0.6	NH 0.6	0.39	6	AK -0.9	UT -1.0	MA -1.0
Information Technology & Analytical Instruments	WI 0.7	WA 0.7	DE 0.5	-1.27	47	NH -1.5	ID -2.2	VT -2.3
Education and Knowledge Creation	NM 1.3	MA 0.6	NC 0.2	0.03	16	IL -0.4	DE -0.9	DC -1.4
Federal Government	VA 0.7	VT 0.4	WV 0.4	0.05	19	UT -0.5	AK -1.0	DC -1.8
Oil and Gas Production and Transportation	ND 2.1	OK 1.3	WY 0.7	-0.06	18	IL -0.2	NJ -0.2	DE -0.2
Aerospace Vehicles and Defense	SC 0.4	GA 0.3	NH 0.2	-0.40	50	WA -0.3	AZ -0.4	KS -1.5
Automotive	AL 0.5	MS 0.4	SC 0.1	0.08	23	OH -0.2	DE -0.5	MI -1.2
Farming and Ranching	ND 1.0	SD 0.5	KY 0.4	-0.20	47	ME -0.2	VT -0.2	NM -0.3
Hospitality and Tourism	NV 1.1	MS 0.4	DE 0.2	0.08	9	CT -0.2	MT -0.2	ND -0.2
Biopharmaceuticals	WV 0.5	VT 0.3	RI 0.3	0.08	15	PA -0.2	CT -0.5	NJ -0.7

Note: The industrial mix values are expressed as a percentage difference from the national average.
* Rank among the 50 states and the District of Columbia; a rank of 1 indicates the highest industrial mix value.

Source: Calculated from data provided by Emsi.

JOB QUALITY BY METROPOLITAN AREA

For this analysis, the 34 metropolitan areas nationally that had a population of at least 2 million in 2015 were selected.[4] Fifteen of these metro areas, including Phoenix, are located in the 10 western states. In addition, the 16 metro areas located in the western states, including Tucson, with a population of between 0.5-and-2 million were selected. There is a considerable gap in size between the 15 largest metro areas in the West, each with a population of at least 2 million, and Salt Lake City, the next-largest western metro at 1.17 million residents. Tucson was the only other western metro to top 1 million (1.01 million).

Job Quality in 2015

Job quality in 2015 was greater than the national average in 27 of the 34 most-populous metro areas, as seen in Table 26. The median was 2.35. There was no significant difference in job quality between the 15 large western metros and the other 19 large metros.

Among the 34 most-populous metro areas, San Jose had by far the highest job quality. It was followed by Washington D.C., Boston, Seattle, San Francisco, Denver, and Austin, each with job quality greater than 6. In contrast, job quality was less than -4 in four large metros: Miami, Orlando, Riverside, and Las Vegas. At 1.31, the Phoenix metro area ranked 10th among the 15 large western metros and 24th among the 34 large metros nationally.

The total industrial mix in 2015 was greater than the U.S. average in 10 of the 15 large western metros and in 16 of the 19 other large metros. Among all 34 large metros, the median was 2.51. The total industrial mix was more than 6 in seven large metros, but was less than -6 in four large metros. The Phoenix metro area (0.54) ranked 10th among the large western metros and 26th among all large metros.

The total occupational mix in 2015 was greater than the U.S. average in 12 large western metros and in 16 of the other large metros. Among all 34 large metros, the median was 2.54. The total occupational mix was more than 6 in six large metros, but was less than -6 in three large metros. The Phoenix metro area (2.07) ranked 10th among the large western metros and 21st among all large metros.

Thus, job quality in 2015 was related to metro size, with 79 percent of the large metro areas being above the national average. The proportion above average was 76 percent for the total industrial mix and 82 percent for the total occupational mix.

In contrast, job quality in 2015 was greater than the national average in only 25 percent of the 16 western metro areas with a population of between 0.5-and-2 million. The share above average was 25 percent for the total industrial mix and 31 percent for the total occupational mix.

Among these 16 mid-sized western metro areas, median job quality in 2015 was -2.94. As seen in the second part of Table 26, Salt Lake City had by far the highest job quality at 6.61, the seventh-highest value among 31 western metros of at least 500,000 residents. The only other mid-sized western metros with job quality above the national average were Albuquerque, Ogden,

[4] The San Jose metro area, with an estimated population of 1.98 million in 2015, is included in the group of at least two million residents,

TABLE 26
JOB QUALITY, 2015, METROPOLITAN AREAS

Metro Areas Nationally of at Least 2 Million Residents

		Total Industrial Job Mix*	Total Occupation-al Job Mix*	Job Quality**	Industrial Job Mix: Traded Clusters	Industrial Job Mix: Total Industrial Job Mix*
1.	**San Jose^**	31.12	20.81	25.97	31.27	-0.17
2.	Washington D.C.	11.09	12.74	11.92	10.73	0.36
3.	Boston	8.26	10.61	9.44	7.26	1.01
4.	**Seattle**	9.82	7.32	8.57	9.26	0.57
5.	**San Francisco**	7.34	8.83	8.09	7.96	-0.63
6.	**Denver**	6.33	6.99	6.66	5.84	0.49
7.	**Austin**	6.55	5.51	6.03	6.07	0.49
8.	Minneapolis	4.87	4.43	4.65	4.49	0.38
9.	Baltimore	3.27	4.94	4.11	2.76	0.51
10.	Detroit	3.05	3.56	3.31	3.45	-0.41
11.	New York	2.34	4.14	3.24	2.07	0.25
12.	Kansas City	3.69	2.61	3.15	3.21	0.49
13.	**Houston**	3.93	2.31	3.12	4.39	-0.45
14.	Philadelphia	3.00	3.07	3.04	2.99	0.02
15.	**Portland**	2.85	3.21	3.03	3.57	-0.71
16.	**Dallas**	3.45	1.95	2.70	3.93	-0.47
17.	Chicago	2.07	2.83	2.45	2.33	-0.26
18.	Cleveland	2.32	2.17	2.25	1.40	0.93
19.	Cincinnati	3.10	1.37	2.24	3.32	-0.21
20.	Atlanta	0.99	3.28	2.14	1.85	-0.87
21.	Columbus	2.37	1.71	2.04	1.83	0.55
22.	Pittsburgh	2.65	0.96	1.81	1.68	0.98
23.	**San Diego**	0.72	2.47	1.60	2.14	-1.44
24.	**Phoenix**	0.54	2.07	1.31	1.01	-0.48
25.	St. Louis	1.86	0.58	1.22	2.62	-0.75
26.	Charlotte	1.04	1.13	1.09	1.39	-0.34
27.	**Sacramento**	-0.79	2.76	0.99	-3.01	2.21
28.	Tampa	-0.46	-0.55	-0.51	0.38	-0.84
29.	**Los Angeles**	-3.17	0.84	-1.17	-0.31	-2.88
30.	**San Antonio**	-2.22	-2.22	-2.22	-0.98	-1.23
31.	Miami	-6.20	-2.96	-4.58	-2.78	-3.41
32.	Orlando	-9.06	-6.21	-7.64	-6.26	-2.80
33.	**Riverside**	-11.04	-7.63	-9.34	-6.85	-4.21
34.	**Las Vegas**	-11.59	-9.15	-10.37	-8.67	-2.92

Note: Metro areas in the 10 western states are shown in bold.
^ The population of the San Jose metro area is estimated to be 1.98 million.

(continued)

TABLE 26 (continued)
JOB QUALITY, 2015, METROPOLITAN AREAS

Metro Areas in the West With Between 500,000 and 2 Million Residents

		Total Industrial Job Mix*	Total Occupation-al Job Mix*	Job Quality**	Industrial Job Mix: Traded Clusters	Industrial Job Mix: Total Industrial Job Mix*
1.	Salt Lake City	7.73	5.48	6.61	5.17	2.56
2.	Albuquerque	2.32	1.38	1.85	0.54	1.79
3.	Ogden	2.92	-0.04	1.44	2.88	0.05
4.	Provo	1.60	1.25	1.43	1.32	0.28
5.	Colorado Springs	-2.39	1.14	-0.63	-1.09	-1.29
6.	Boise	-1.96	0.19	-0.89	-1.16	-0.78
7.	Tucson	-1.70	-0.57	-1.14	-0.58	-1.13
8.	Spokane	-2.40	-2.79	-2.60	-3.50	1.11
9.	Oxnard	-5.15	-1.42	-3.29	-2.30	-2.87
10.	Santa Rosa	-10.16	-3.54	-6.85	-7.11	-3.06
11.	El Paso	-5.91	-8.29	-7.10	-5.05	-0.85
12.	Bakersfield	-6.83	-7.67	-7.25	-8.30	1.47
13.	Fresno	-10.41	-7.70	-9.06	-10.45	0.03
14.	Stockton	-10.70	-9.52	-10.11	-10.31	-0.39
15.	Modesto	-12.54	-9.96	-11.25	-10.79	-1.77
16.	McAllen	-12.75	-12.15	-12.45	-8.49	-4.25

Note: The sum of the traded clusters and nontraded clusters does not equal the industrial mix value due to unclassified activities.

* The industrial mix and the occupational mix are expressed as a percentage difference from the national average.
** Total job quality is calculated as the average of the industrial mix and the occupational mix, expressed as a percentage difference from the national average.

Source: Calculated from data provided by Emsi.

and Provo. Thus, all three metro areas in Utah of at least 500,000 population had strong job qualities. In contrast, job quality was less than -6 in seven of the 16 mid-sized western metros, including a value of less than -10 in Stockton, Modesto, and McAllen. At -1.14, the Tucson metro area ranked seventh among the 16 mid-sized western metros.

The total industrial mix in 2015 was greater than the U.S. average in only four mid-sized western metros; the median was -3.77. The total industrial mix was less than -5 in eight mid-sized western metros. The Tucson metro area (-1.70) ranked fifth.

The occupational mix in 2015 was greater than the U.S. average in five mid-sized western metros; the median value was -2.10. The total occupational mix was less than -7 in six mid-sized western metros. The Tucson metro area (-0.57) ranked seventh.

Clusters

The division of the total industrial mix into traded clusters and nontraded clusters also is shown in Table 26 for 2015. The correlation of the traded and nontraded values across the 50 metro

areas examined in this section was relatively low at 0.38. The traded cluster value was very highly correlated to the total industrial mix (0.98), while the nontraded cluster correlation to the total industrial mix was lower at 0.55.

The traded cluster value was highest in the San Jose metro area at 31.27, followed by Washington, D.C. at 10.73 and Seattle at 9.26. The lowest values among the 34 most-populous metro areas were -8.67 in Las Vegas, -6.85 in Riverside, and -6.26 in Orlando, but six of the 16 mid-sized western metros had a comparably low or lesser value. Twenty-seven of the 34 most-populous metro areas had a positive value, but only four of the 16 mid-sized western metros had a value greater than the U.S. average. Metro Phoenix, with a value of 1.01, ranked 26th among the 34 largest metros nationwide. With a value of -0.58, Metro Tucson ranked fifth among the 16 mid-sized western metros.

In the San Jose metro area, only eight high-technology industries accounted for most of the extremely high traded cluster industrial mix value, accounting for 29.02 of the total value of 31.27 in 2015. These eight industries were spread across five traded clusters. The industrial mix values for the clusters and industries are shown in parentheses in the following list:

- Information technology and analytical instruments cluster (18.25), particularly the electronic computer manufacturing (9.44), semiconductor and related device manufacturing (3.97), and software publishing (2.09) industries.
- Marketing, design, and publishing cluster (6.52), due to the Internet publishing and broadcasting and web search portals industry (6.57).
- Business services cluster (4.75), largely due to the custom computer programming (2.40) and computer systems design (1.75) industries.
- Education and knowledge creation cluster (1.98), due to the research and development in the physical, engineering, and life sciences (except biotechnology) industry (1.80).
- Distribution and electronic commerce (1.14), due to the computer and computer peripheral equipment and software merchant wholesalers industry (1.00).

The other large metro areas with high traded cluster industrial mix values in 2015 also were heavily dependent on a small number of clusters and industries within those clusters, with high-tech activities of disproportionate significance:

- Washington, D.C (10.73), largely a result of the federal government cluster (8.84) and the business services cluster (3.75), with the computer systems design industry (2.15) the largest contributor to the latter.
- Seattle (9.26), largely due to the aircraft manufacturing industry (4.13) in the aerospace vehicles and defense cluster (4.28) and the software publishers industry (3.87) within the information technology and analytical instruments cluster (3.83).
- San Francisco (7.96), with particular contributions from four clusters: business services (3.49), largely from the custom computer programming (1.50) and corporate, subsidiary, and regional managing offices (1.06) industries; information technology and analytical instruments (1.73), especially the software publishing industry (0.99); marketing, design, and publishing (1.57), almost entirely due to the Internet publishing and broadcasting and web search portals industry (1.45); and education and knowledge creation (1.19), due to two research and development industries (1.36).

- Boston (7.26), particularly a result of three clusters: information technology and analytical instruments (2.51), especially the software publishing industry (1.26); education and knowledge creation (1.95), due to two research and development industries (2.07); and business services (1.82), with contributions from two computer-related industries (0.96).
- Austin (6.07), particularly due to the information technology and analytical instruments cluster (3.99), especially the electronic computer manufacturing (1.88) and semiconductor and related device manufacturing (1.33) industries. Also, the distribution and electronic commerce cluster (1.14), due to the computer and computer peripheral equipment and software merchant wholesalers industry (2.05), and the business services cluster (1.37) due to two computer-related industries (1.52).
- Denver (5.84), largely the result of the financial services cluster (2.40), especially the open-end investment funds industry (1.88), and the business services cluster (2.18), due to various industries, including engineering services.

Among most of the 34 most-populous metro areas, the nontraded cluster value in 2015 was between -1 and 1. Only Sacramento had a higher value, due to its large employment share in the above-average-paying state and local government cluster — Sacramento is the capital of California. Seven of the large metros had a value less than -1. With a value of -0.48, the Phoenix area ranked 22nd. More variation in the nontraded cluster value was present among the 16 mid-sized western metros, with four having a value of more than 1 and six having a value of less than -1. The Tucson area ranked 11th with a value of -1.13.

Across the metro areas, the industrial mix values in the business services cluster were the most variable of any cluster in 2015, with 18 of the 50 metros analyzed in this section having a value of greater than 1 and 14 metros having a value of less than -1. Industrial mix values across the 50 metros ranged from 4.75 in San Jose to –2.96 in McAllen. Business services had the highest median value among the 50 metros, indicating that very populous metros tend to have the highest concentrations of this cluster.

The financial services cluster exhibited the next-largest variation across the 50 metros, with six metros having an industrial mix value of more than 1, led by New York at 3.17, and five metros having values slightly less than -1. Considerable variation also was present in the federal government cluster, with seven metros having a value greater than 1, including Washington, D.C. at 8.84, Ogden at 4.63, and Baltimore at 3.35; three metros had a value of slightly less than 1. Eight metros had an industrial mix value of more than 1 in the information technology and analytical instruments cluster, including San Jose at 18.25, Portland at 4.40, Austin at 3.99, Seattle at 3.83, and Boise at 3.80. A few metros had large industrial mix values in other clusters, including Seattle (4.28) and Tucson (3.49) in the aerospace vehicles and defense cluster; San Jose (6.52) in the marketing, design, and publishing cluster; Houston (3.07) in the oil and gas production and transportation cluster; Albuquerque (2.88) in the education and knowledge creation cluster; Las Vegas (-3.19) and Orlando (-2.81) in the hospitality and tourism cluster; and Bakersfield (-4.73) and Fresno (-2.65) in the agricultural inputs and services cluster.

Phoenix metro area. The traded cluster industrial mix value was 1.01 but the nontraded cluster value was -0.48 in the Phoenix area in 2015. Among the traded clusters, three high-paying

clusters and one low-paying cluster made a significant positive impact on the traded cluster value:

- Financial services cluster (1.24). The value ranked third among the 15 largest western metros and among the 31 largest western metros, and fifth among the nation's 34 largest metros. The largest impacts came from the open-end investment funds (0.38), securities brokerage (0.37), and financial transactions processing, reserve, and clearinghouse activities (0.29) industries.
- Information technology and analytical instruments cluster (0.84). The value ranked sixth among the 15 largest western metros, ninth among the 31 largest western metros, and eighth among the nation's 34 largest metros. The relatively high value was due to the semiconductor and related device manufacturing industry (1.19).
- Aerospace vehicles and defense cluster (0.50). The value ranked fourth among the 15 largest western metros, sixth among the 31 largest western metros, and fifth among the nation's 34 largest metros. The largest contributions came from the search, detection, navigation, guidance, aeronautical, and nautical system and instrument manufacturing (0.20) and aircraft engine and engine parts manufacturing (0.15) industries.
- Farming and ranching cluster (0.46). The value ranked seventh among the 15 largest western metros, 11th among the 31 largest western metros, and 14th among the nation's 34 largest metros. The Phoenix area has a below-average share of this very low-paying activity, in both crop production and animal production.

A few high-paying clusters had a moderate negative impact on the Phoenix area's traded cluster industrial mix value:

- Federal government cluster (-0.60). The value ranked 12th among the 15 largest western metros, 25th among the 31 largest western metros, and 27th among the nation's 34 largest metros. The civilian portion of the cluster was responsible (-0.66).
- Oil and gas production and transportation cluster (-0.40). The value ranked ninth among the 15 largest western metros, 17th among the 31 largest western metros, and 17th among the nation's 34 largest metros. The Phoenix area was below average in each of the 12 industries.
- Education and knowledge creation (-0.33). The value ranked 13th among the 15 largest western metros, 20th among the 31 largest western metros, and 29th among the nation's 34 largest metros. The Phoenix area was particularly below average in the three research and development industries (-0.32).

Tucson metro area. The traded cluster industrial mix value was -0.58 and the nontraded cluster value was -1.00 in the Tucson area in 2015. Among the traded clusters, two high-paying clusters and one low-paying cluster made a significant positive impact on the traded cluster value:

- Aerospace vehicles and defense cluster (3.49). The value ranked first among the 16 mid-sized western metros and second among the 31 largest western metros. The guided missile and space vehicle manufacturing industry (3.64) was wholly responsible.
- Federal government cluster (1.07). The value ranked fifth among the 16 mid-sized western metros and sixth among the 31 largest western metros. The civilian portion of the cluster was responsible (1.15).
- Farming and ranching cluster (0.46). The value ranked second among the 16 mid-sized western metros and fifth among the 31 largest western metros. The Tucson area has a

below-average share of this very low-paying activity, in both crop production and animal production.

Three high-paying clusters had a significant negative impact on the Tucson area's traded cluster industrial mix value:

- Business services cluster (-2.09). The value ranked 12th among the 16 mid-sized western metros and 27th among the 31 largest western metros. The corporate, subsidiary, and regional managing offices (-0.85) and telemarketing bureaus and other contact centers (-0.47) industries had the greatest negative effects.
- Financial services cluster (-0.92). The value ranked 11th among the 16 mid-sized western metros and 26th among the 31 largest western metros. The securities brokerage industry (-0.32) had the largest negative effect.
- Distribution and electronic commerce cluster (-0.74). The value ranked 13th among the 16 mid-sized western metros and 28th among the 31 largest western metros. Most industries in this cluster had a small negative effect.

Change in Job Quality

While job quality in 2015 was considerably above the national average in most of the 34 most-populous metro areas, the change in job quality between 2001 and 2015 in these areas typically was slightly less than the national average. The median change in the 15 large western metros was equal to the median change of the other 19 large metros. There also was little difference in the rate of change between the 34 large metro areas and the 16 mid-sized western metro areas.

The change in job quality between 2001 and 2015 was greater than the national average in only 13 of the 34 most-populous metro areas, as seen in Table 27. The median was -0.36. Only three of these metros had an increase of at least 1. Seattle experienced the largest increase in job quality, followed by Kansas City and Pittsburgh. In contrast, job quality fell by more than 1 in 13 of the 34 large metros, with the greatest declines in Austin, New York, Boston, and Philadelphia. The change of -0.81 in the Phoenix metro area ranked ninth among the 15 large western metros and 21st among the 34 large metros nationally.

The change in the total industrial mix between 2001 and 2015 was greater than the U.S. average in only four of the 15 large western metros and in six of the other 19 large metros. Among all 34 large metros, the median was -0.31. The Phoenix metro area, which had a decline of -1.31, ranked ninth among the large western metros and 20th among all large metros.

The change in the total occupational mix between 2001 and 2015 was greater than the U.S. average in seven large western metros and in six of the other large metros. Among all 34 large metros, the median was -0.27. The Phoenix metro area (-0.31) ranked eighth among the large western metros and 18th among all large metros.

Between 2001 and 2007, the large western metros as a whole performed more poorly than the other large metros on the change in job quality, but this was reversed during the 2007-to-2015 period. The Phoenix metro area compared poorly between 2001 and 2007, but was above the median large metro between 2007 and 2015, on both the total industrial mix and the total occupational mix.

TABLE 27
CHANGE IN JOB QUALITY, METROPOLITAN AREAS

Metro Areas Nationally of at Least 2 Million Residents

	Total Industrial Job Mix *			Total Occupational Job Mix*			Job Quality**		
	2001-07	2007-15	2001-15	2001-07	2007-15	2001-15	2001-07	2007-15	2001-15
Atlanta	-2.99	-0.27	-3.26	-0.97	-0.20	-1.17	-1.98	-0.24	-2.22
Austin	-3.12	-2.06	-5.18	-1.15	-0.29	-1.44	-2.14	-1.18	-3.31
Baltimore	0.56	0.22	0.78	0.30	-0.16	0.14	0.43	0.03	0.46
Boston	-2.75	-1.76	-4.51	-0.78	-0.56	-1.34	-1.77	-1.16	-2.93
Charlotte	-0.52	0.35	-0.17	0.23	0.53	0.76	-0.15	0.44	0.30
Chicago	-1.42	-0.22	-1.64	-0.69	-0.40	-1.09	-1.06	-0.31	-1.37
Cincinnati	0.97	-0.18	0.79	0.45	-0.16	0.29	0.71	-0.17	0.54
Cleveland	0.38	-0.84	-0.46	0.31	-0.41	-0.10	0.35	-0.63	-0.28
Columbus	0.73	0.17	0.90	0.49	-0.09	0.40	0.61	0.04	0.65
Dallas	-0.25	0.04	-0.21	-0.10	0.23	0.13	-0.18	0.14	-0.04
Denver	-0.41	0.96	0.55	-0.28	0.71	0.43	-0.35	0.84	0.49
Detroit	-1.22	-0.25	-1.47	-0.23	0.22	-0.01	-0.73	-0.02	-0.74
Houston	-1.31	-1.39	-2.70	-0.56	-0.28	-0.84	-0.94	-0.84	-1.77
Kansas City	0.86	0.90	1.76	0.47	0.46	0.93	0.67	0.68	1.35
Las Vegas	0.99	-0.84	0.15	1.00	-0.78	0.22	1.00	-0.81	0.18
Los Angeles	-1.78	-1.70	-3.48	-0.91	-0.48	-1.39	-1.35	-1.09	-2.44
Miami	-0.66	-1.50	-2.16	-0.21	-1.06	-1.27	-0.44	-1.28	-1.72
Minneapolis	-0.31	0.07	-0.24	-0.24	0.01	-0.23	-0.28	0.04	-0.23
New York	-1.48	-2.77	-4.25	-0.78	-1.12	-1.90	-1.13	-1.95	-3.08
Orlando	0.67	-1.01	-0.34	0.16	-1.25	-1.09	0.41	-1.13	-0.72
Philadelphia	0.11	-3.94	-3.83	-0.01	-1.18	-1.19	0.05	-2.56	-2.51
Phoenix	-1.84	0.53	-1.31	-0.60	0.29	-0.31	-1.22	0.41	-0.81
Pittsburgh	1.15	1.01	2.16	-0.10	0.64	0.54	0.53	0.83	1.35
Portland	-1.11	1.02	-0.09	-0.55	0.85	0.30	-0.83	0.94	0.11
Riverside	0.98	-1.12	-0.14	-0.09	-0.50	-0.59	0.45	-0.81	-0.36
Sacramento	-1.21	-1.48	-2.69	-0.26	-0.45	-0.71	-0.74	-0.97	-1.70
Saint Louis	0.12	-0.40	-0.28	0.20	-0.61	-0.41	0.16	-0.51	-0.35
San Antonio	-0.20	0.02	-0.18	0.17	0.33	0.50	-0.02	0.18	0.16
San Diego	0.00	1.21	1.21	-0.08	0.30	0.22	-0.04	0.76	0.72
San Francisco	-3.88	1.63	-2.25	-1.30	0.98	-0.32	-2.59	1.31	-1.29
San Jose	-6.93	4.88	-2.05	-3.43	2.26	-1.17	-5.18	3.57	-1.61
Seattle	-0.02	2.33	2.31	0.02	1.14	1.16	0.00	1.74	1.74
Tampa	-0.31	1.02	0.71	-0.03	0.01	-0.02	-0.17	0.52	0.35
Washington DC	-0.47	-1.31	-1.78	0.06	-0.74	-0.68	-0.20	-1.03	-1.23

Note: Large metro areas in the 10 western states are shown in bold.

(continued)

TABLE 27 (continued)
CHANGE IN JOB QUALITY, METROPOLITAN AREAS

Metro Areas in the West With Between 500,000 and 2 Million Residents

	Total Industrial Job Mix *			Total Occupational Job Mix*			Job Quality**		
	2001-07	2007-15	2001-15	2001-07	2007-15	2001-15	2001-07	2007-15	2001-15
Albuquerque	-1.07	-1.21	-2.28	-0.79	-1.10	-1.89	-0.93	-1.16	-2.09
Bakersfield	-0.74	0.36	-0.38	-0.54	-0.69	-1.23	-0.64	-0.16	-0.81
Boise	-5.03	-3.23	-8.26	-1.06	-0.53	-1.59	-3.05	-1.88	-4.93
Colorado Springs	-3.96	-0.83	-4.79	-0.87	-0.52	-1.39	-2.42	-0.68	-3.09
El Paso	0.12	-0.22	-0.10	-0.26	-1.00	-1.26	-0.07	-0.61	-0.68
Fresno	1.73	-0.36	1.37	1.02	0.20	1.22	1.38	-0.08	1.30
McAllen	1.19	-0.29	0.90	-0.98	-0.55	-1.53	0.10	-0.42	-0.32
Modesto	-0.23	0.11	-0.12	0.37	-0.71	-0.34	0.07	-0.30	-0.23
Ogden	0.10	0.54	0.64	0.47	0.20	0.67	0.29	0.37	0.66
Oxnard	0.52	-4.42	-3.90	-0.19	-1.72	-1.91	0.17	-3.07	-2.91
Provo	0.32	2.12	2.44	0.37	1.29	1.66	0.35	1.71	2.05
Salt Lake City	0.87	-1.64	-0.77	0.13	0.64	0.77	0.50	-0.50	0.00
Santa Rosa	-2.50	-1.40	-3.90	-1.20	-1.42	-2.62	-1.85	-1.41	-3.26
Spokane	-0.11	1.67	1.56	-0.17	0.66	0.49	-0.14	1.17	1.03
Stockton	0.22	0.49	0.71	-0.25	-0.54	-0.79	-0.02	-0.02	-0.04
Tucson	-0.14	-0.84	-0.98	0.36	-1.00	-0.64	0.11	-0.92	-0.81

* Expressed as a percentage difference from the national average.
** Job quality is calculated as the average of the industrial mix and the occupational mix, expressed as a percentage difference from the national average.

Source: Calculated from data provided by Emsi.

Among the 16 western metro areas with a population of between 0.5-and-2 million, the change in job quality between 2001 and 2015 was greater than the national average in only four, as seen in the second part of Table 27. The median value was -0.50, slightly worse than the median of the large metro areas.

Among these 16 mid-sized western metro areas, Provo had the greatest gain in job quality, followed by Fresno and Spokane, the only metros with an increase of at least 1. Five of the metros experienced a decrease of at least 1, with the largest losses in Boise, Santa Rosa, Colorado Springs, and Oxnard. The change in value of -0.81 in the Tucson metro area ranked tied for 10th among the 16 mid-sized western metros.

The change in the total industrial mix between 2001 and 2015 was greater than the U.S. average in six of the mid-sized western metros; the median was -0.25, comparable to the large metro areas. The Tucson metro area, which had a decline of -0.98, ranked 11th among the mid-sized western metros.

The change in the total occupational mix between 2001 and 2015 was greater than the U.S. average in five of the mid-sized western metros. The median was -1.01, worse than in the large metro areas. The Tucson metro area had a value of -0.64, ranking seventh among the mid-sized western metros.

Between 2001 and 2007, the mid-sized western metros as a whole performed slightly better than the large metros on the change in job quality, but this was reversed during the 2007-to-2015 period. The Tucson metro area compared poorly on the change in the total industrial mix in each period and on the change in the total occupational mix between 2007 and 2015, but was above the median of the mid-sized western metros between 2001 and 2007 on the change in the total occupational mix.

Clusters

The division of the total industrial mix into traded clusters and nontraded clusters is shown in Table 28 for the change between 2001 and 2015. There was no correlation between the traded and nontraded values across the 50 metro areas examined in this section for the change between 2001 and 2015. The traded cluster value was highly correlated to the total industrial mix (0.88), while the nontraded cluster correlation to the total industrial mix was lower at 0.39.

Among the 34 most-populous metro areas, the change in the traded cluster value between 2001 and 2015 was highest in Kansas City at 2.39, followed by Las Vegas at 2.19 and Tampa at 1.70. The lowest values were -4.04 in Boston, -4.04 in Austin, and -2.97 in Philadelphia. Only 10 of the 34 most-populous metro areas had a positive value, with a median of -0.60. Metro Phoenix, with a value of -1.62, ranked 26th among the 34 largest metros nationwide.

Only three of the 16 mid-sized western metros had a positive change in the traded cluster job mix between 2001 and 2015, with McAllen having the largest gain of any of the 50 metro areas at 2.99. Three of the 16 mid-sized western metros had a loss larger than any of the 34 most-populous metros. With a value of -2.52, Metro Tucson ranked 11th among the 16 mid-sized western metros.

TABLE 28
CHANGE IN INDUSTRIAL JOB MIX, 2001 THROUGH 2015, METROPOLITAN AREAS

Metro Areas Nationally of at Least 2 Million Residents

		Clusters	
	Total	**Traded**	**Non-traded**
Atlanta	-3.26	-2.19	-1.07
Austin	-5.18	-4.04	-1.14
Baltimore	0.77	0.83	-0.05
Boston	-4.51	-4.04	-0.46
Charlotte	-0.17	-0.26	0.09
Chicago	-1.64	-1.08	-0.56
Cincinnati	0.80	-0.24	1.04
Cleveland	-0.46	-0.57	0.11
Columbus	0.90	-0.15	1.04
Dallas	-0.21	-0.50	0.29
Denver	0.55	-0.07	0.62
Detroit	-1.47	-1.05	-0.44
Houston	-2.70	-2.47	-0.23
Kansas City	1.76	2.39	-0.63
Las Vegas	0.15	2.19	-2.04
Los Angeles	-3.48	-2.06	-1.45
Miami	-2.16	-0.09	-2.07
Minneapolis	-0.24	-1.56	1.31
New York	-4.25	-2.91	-1.34
Orlando	-0.34	0.74	-1.08
Philadelphia	-3.83	-2.97	-0.85
Phoenix	-1.31	-1.62	0.29
Pittsburgh	2.17	0.70	1.47
Portland	-0.09	-0.79	0.70
Riverside	-0.14	0.30	-0.46
Sacramento	-2.69	-2.32	-0.40
Saint Louis	-0.28	-0.64	0.35
San Antonio	-0.18	0.26	-0.44
San Diego	1.21	1.20	-0.03
San Francisco	-2.25	-0.88	-1.40
San Jose	-2.05	-0.86	-1.22
Seattle	2.31	1.13	1.18
Tampa	0.71	1.70	-1.00
Washington DC	-1.78	-1.02	-0.75

Metro Areas in the West With Between 500,000 and 2 Million Residents

		Clusters	
	Total	**Traded**	**Non-traded**
Albuquerque	-2.27	-2.76	0.49
Bakersfield	-0.38	-1.17	0.78
Boise	-8.25	-8.50	0.25
Colorado Springs	-4.79	-5.50	0.70
El Paso	-0.10	-0.05	-0.05
Fresno	1.37	1.18	0.17
McAllen	0.91	2.99	-2.08
Modesto	-0.12	-0.72	0.58
Ogden	0.64	-1.15	1.78
Oxnard	-3.90	-4.12	0.19
Provo	2.44	0.42	2.02
Salt Lake City	-0.77	-2.50	1.72
Santa Rosa	-3.90	-3.07	-0.85
Spokane	1.56	-0.27	1.83
Stockton	0.72	-0.09	0.79
Tucson	-0.98	-2.52	1.53

Note: Large metro areas in the 10 western states are shown in bold.

Note: The change in the industrial mix is expressed as a percentage difference from the national average.

Note: The sum of the traded clusters and nontraded clusters does not equal the total industrial mix value due to unclassified activities included in the total.

Source: Calculated from data provided by Emsi.

Among the seven metro areas that experienced an improvement of at least 1 in the traded cluster industrial mix value between 2001 and 2015, a variety of economic activities contributed:

- McAllen (2.99). The agricultural inputs and services cluster had the largest effect at 0.71.
- Kansas City (2.39). The business services cluster had the largest impact (1.51), largely due to a gain in the corporate, subsidiary, and regional managing offices industry (1.08).
- Las Vegas (2.19). The hospitality and tourism cluster (1.13), specifically in the casino hotels industry (1.24), had the largest effect, as the employment share in this low-paying cluster fell. The business services cluster (0.63) also contributed due to the corporate, subsidiary, and regional managing offices industry (0.92).
- Tampa (1.70). The improvement came from the business services cluster (1.68), with the corporate, subsidiary, and regional managing offices (0.94) and the professional employer organizations (0.71) industries contributing.
- San Diego (1.20). The aerospace vehicles and defense cluster (0.60) had the greatest effect.
- Fresno (1.18). The farming and ranching (0.78) and agricultural inputs and services (0.42) clusters had the greatest impact, due to declines in the employment shares.
- Seattle (1.13). The information technology and analytical instruments cluster (1.09) was of particular significance, largely due to the software publishers industry (0.98).

Among the 34 most-populous metro areas, the 2001-to-2015 change in the nontraded cluster value ranged from -2.07 to 1.47, but only 12 of the metros had a positive value. With a value of -0.29, the Phoenix area ranked 10th. Among the 16 mid-sized western metros, the change in the nontraded cluster value ranged from -2.08 to 2.02, with 13 metros having a value of more than 1. The Tucson area ranked fifth with a value of 1.53.

The 2001-to-2015 change in the industrial mix in the business services cluster was the most variable of any cluster, with 12 of the 50 metros analyzed in this section having a value of greater than 0.5 and 19 metros having a value of less than -0.5. The change in value in this cluster ranged from -2.28 in Boise to 1.93 in Pittsburgh.

The financial services cluster exhibited the next-largest variation across the 50 metros, with seven metros having a change in the industrial mix of more than 0.5, led by Dallas at 1.17, and 10 metros having values less than -1, including Salt Lake City at -2.53. In the information technology and analytical instruments cluster, two metros had a change in value of more than 0.5, including Seattle at 1.09, while 15 metros had a decrease of at least -0.5, with four metros suffering a decrease of at least 4.

Phoenix metro area. The 2001-to-2015 change in the traded cluster industrial mix was -1.62 but the nontraded cluster change was 0.29 in the Phoenix area. The largest positive impact among the traded clusters came from the financial services cluster (0.41). The change ranked third among the 15 largest western metros, seventh among the 31 largest western metros, and fifth among the nation's 34 largest metros. The open-end investment funds industry had a change of 0.53.

The change in the information technology and analytical instruments cluster was -1.53, ranking 13th among the 15 largest western metros, 25th among the 31 largest western metros, and 32nd

among the nation's 34 largest metros. The decline occurred in the semiconductor and related device manufacturing industry (-1.53). Thus, the decrease in this one industry was nearly equal to the overall decline in the traded clusters.

Tucson metro area. The 2001-to-2015 change in the traded cluster industrial mix was -2.52 but the nontraded cluster change was 1.53 in the Tucson area. Two high-paying, high-tech clusters accounted for most of the decline in the traded clusters:

- Information technology and analytical instruments cluster (-1.91), ranking 14th among the 16 mid-sized western metros and 27th among the 31 largest western metros. The electronic computer manufacturing (-1.20) and software publishers (-0.40) industries were primarily responsible for the loss.
- Aerospace vehicles and defense cluster (-1.28), last among the 31 largest western metros. The aircraft manufacturing (-0.58) and guided missile and space vehicle manufacturing (-0.80) industries accounted for the decline.

The largest positive impact on the change in the traded cluster came from the federal government cluster (0.64) — the largest gain among the 31 most-populous western metros.

APPENDIX
SUMMARY OF CLUSTERS

	Employment, 2015			U.S. Earnings, 2015	
	United States	Arizona	AZ Share	Aver-age	Aggre-gate*
Traded Clusters					
Business Services	11,648,000	265,934	2.28%	$85,435	$995.2
Distribution and Electronic Commerce	6,525,792	113,813	1.74	76,432	498.8
Financial Services	5,316,204	124,155	2.34	93,653	497.9
Federal Government	4,863,488	88,159	1.81	82,513	401.3
Education and Knowledge Creation	3,654,377	53,946	1.48	65,480	239.3
Info Tech & Analytical Instruments	1,266,905	32,054	2.53	136,007	172.3
Marketing, Design, and Publishing	2,251,038	35,209	1.56	76,088	171.3
Transportation and Logistics	2,368,262	45,559	1.92	66,223	156.8
Hospitality and Tourism	3,811,771	82,860	2.17	37,764	143.9
Oil & Gas Production and Transportation	1,601,746	10,900	0.68	87,833	140.7
Insurance Services	1,471,296	28,407	1.93	94,377	138.9
Farming and Ranching	2,651,315	32,058	1.21	30,259	80.2
Construction Products and Services	978,231	10,777	1.10	79,469	77.7
Production Tech & Heavy Machinery	1,000,944	6,168	0.62	77,203	77.3
Food Processing and Manufacturing	1,137,506	12,521	1.10	66,476	75.6
Aerospace Vehicles and Defense	619,934	30,942	4.99	120,914	75.0
Automotive	985,295	4,663	0.47	74,749	73.7
Performing Arts	1,695,612	28,957	1.71	27,750	47.1
Biopharmaceuticals	285,755	2,175	0.76	153,072	43.7
Plastics	640,256	4,323	0.68	66,035	42.3
Communications Equipment & Services	373,220	8,681	2.33	102,351	38.2
Metalworking Technology	514,734	4,529	0.88	65,474	33.7
Upstream Metal Manufacturing	411,860	4,225	1.03	76,595	31.5
Video Production and Distribution	327,303	1,948	0.60	94,331	30.9
Medical Devices	285,758	6,111	2.14	104,301	29.8
Paper and Packaging	372,778	2,189	0.59	79,883	29.8
Downstream Metal Products	449,322	7,808	1.74	64,951	29.2
Electric Power Generation & Transmissio	191,024	1,769	0.93	150,835	28.8
Printing Services	537,073	7,859	1.46	53,227	28.6
Lighting and Electrical Equipment	333,029	2,587	0.78	83,399	27.8
Water Transportation	323,614	232	0.07	84,803	27.4
Downstream Chemical Products	294,867	2,312	0.78	86,330	25.5
Livestock Processing	511,798	1,788	0.35	46,527	23.8
Agricultural Inputs and Services	665,638	14,805	2.22	33,646	22.4
Wood Products	424,327	4,015	0.95	48,771	20.7
Upstream Chemical Products	167,717	1,086	0.65	120,432	20.2
Furniture	413,135	6,828	1.65	48,281	19.9
Vulcanized and Fired Materials	273,931	2,312	0.84	62,964	17.2
Recreational and Small Electric Goods	229,895	4,706	2.05	61,576	14.2
Textile Manufacturing	226,178	1,356	0.60	56,866	12.9
Trailers, Motor Homes, and Appliances	148,754	825	0.55	64,955	9.7

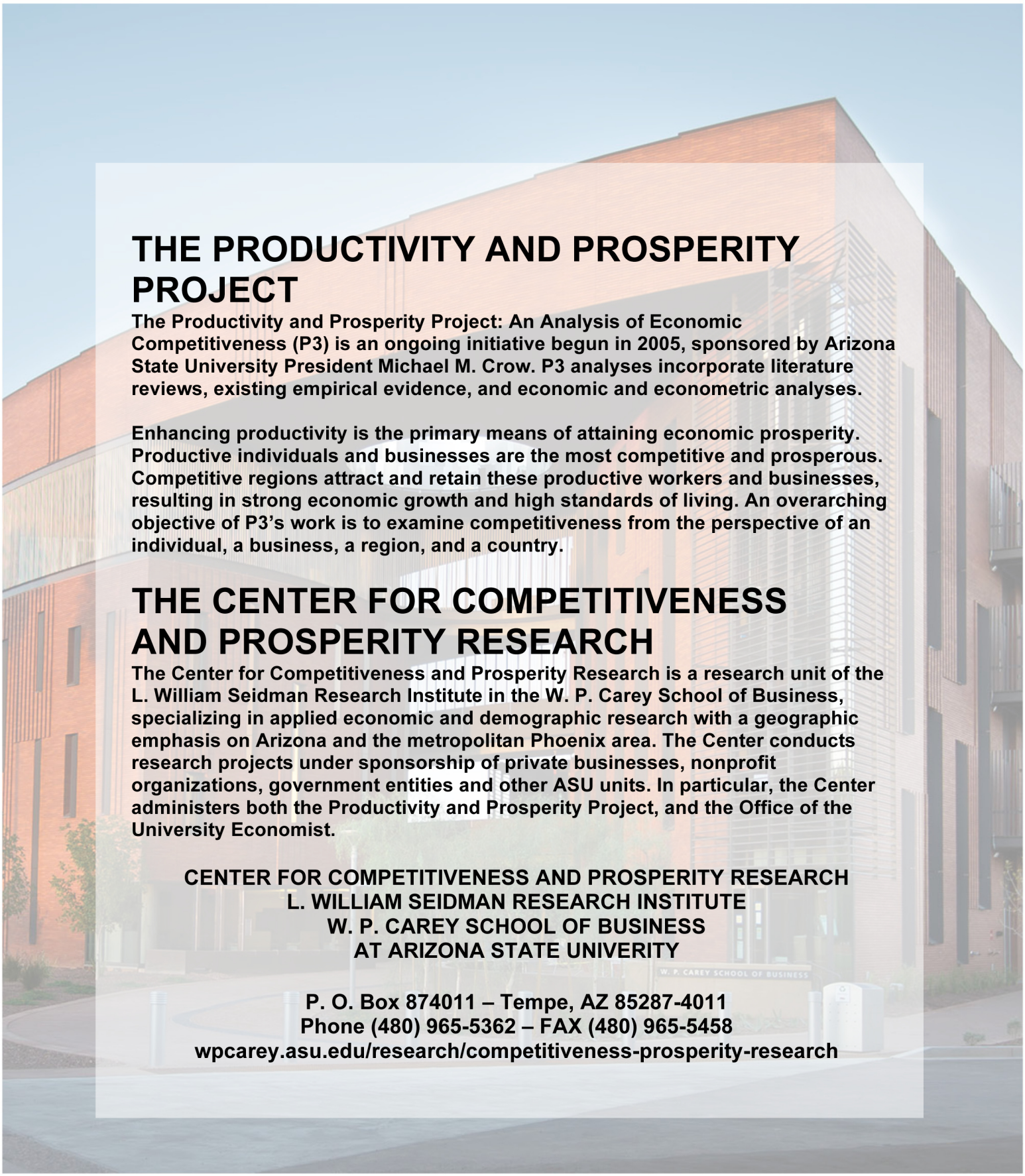
(continued)

APPENDIX (continued)
SUMMARY OF CLUSTERS

	Employment, 2015			U.S. Earnings, 2015	
	United States	Arizona	AZ Share	Aver-age	Aggre-gate*
Traded Clusters (continued)					
Nonmetal Mining	143,553	2,344	1.63%	$65,449	$9.4
Apparel	229,053	1,933	0.84	38,889	8.9
Environmental Services	119,325	1,188	1.00	69,421	8.3
Coal Mining	83,439	615	0.74	89,885	7.5
Forestry	182,383	676	0.37	39,682	7.2
Fishing and Fishing Products	132,264	378	0.29	42,752	5.7
Metal Mining	65,286	11,582	17.74	83,481	5.5
Jewelry and Precious Metals	44,661	746	1.67	50,595	2.3
Music and Sound Recording	39,717	546	1.37	50,922	2.0
Leather and Related Products	41,318	417	1.01	48,046	2.0
Tobacco	13,964	5	0.03	116,089	1.6
Footwear	19,656	87	0.44	52,839	1.0
TOTAL TRADED	63,364,299	1,122,066	1.77	74,685	4,732.3
Nontraded Clusters					
State and Local Government	19,291,824	355,198	1.84	69,883	1,348.2
Local Health Services	17,519,999	329,336	1.88	62,012	1,086.4
Local Real Estate, Constr & Developmt	18,104,740	395,734	2.19	45,522	824.2
Local Commercial Services	11,796,642	213,560	1.81	46,097	543.8
Local Hospitality Establishments	13,478,079	260,804	1.94	20,386	274.8
Local Financial Services	3,418,657	78,081	2.28	69,679	238.2
Local Motor Vehicle Products & Services	4,955,846	99,589	2.01	43,311	214.6
Local Food & Bev Processing & Distrib	5,728,131	108,176	1.89	30,165	172.8
Local Personal Services (Non-Medical)	7,928,679	141,637	1.79	21,725	172.3
Local Community & Civic Organizations	5,664,552	78,711	1.39	28,413	160.9
Local Logistical Services	3,434,176	68,586	2.00	42,074	144.5
Local Retailing of Clothing & Genl Merch	5,230,009	104,129	1.99	26,088	136.4
Local Utilities	1,321,383	23,716	1.79	96,432	127.4
Local Household Goods and Services	2,576,260	54,559	2.12	32,941	84.9
Local Entertainment and Media	1,830,408	36,197	1.98	43,765	80.1
Local Education and Training	1,897,365	36,439	1.92	34,123	64.7
Local Industrial Products and Services	725,142	11,661	1.61	55,897	40.5
TOTAL NONTRADED	124,901,892	2,396,111	1.92	45,754	5,714.7
TOTAL	188,266,191	3,518,177	1.87	55,491	10,447.1

* Value in billions.

Sources: Employment and earnings are from Emsi. Most of the cluster definitions are from the Institute for Strategy and Competitiveness, Harvard Business School.



THE PRODUCTIVITY AND PROSPERITY PROJECT

The Productivity and Prosperity Project: An Analysis of Economic Competitiveness (P3) is an ongoing initiative begun in 2005, sponsored by Arizona State University President Michael M. Crow. P3 analyses incorporate literature reviews, existing empirical evidence, and economic and econometric analyses.

Enhancing productivity is the primary means of attaining economic prosperity. Productive individuals and businesses are the most competitive and prosperous. Competitive regions attract and retain these productive workers and businesses, resulting in strong economic growth and high standards of living. An overarching objective of P3's work is to examine competitiveness from the perspective of an individual, a business, a region, and a country.

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The Center for Competitiveness and Prosperity Research is a research unit of the L. William Seidman Research Institute in the W. P. Carey School of Business, specializing in applied economic and demographic research with a geographic emphasis on Arizona and the metropolitan Phoenix area. The Center conducts research projects under sponsorship of private businesses, nonprofit organizations, government entities and other ASU units. In particular, the Center administers both the Productivity and Prosperity Project, and the Office of the University Economist.

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