



REGIONAL ECONOMIC COMPETITIVENESS, PART 2: ECONOMIC CLUSTERS IN ARIZONA

May 2023

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**A Report from the Productivity and Prosperity Project (P3),
Supported by the Office of the University Economist**

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SUMMARY

Arizona's subpar performance on measures of productivity and prosperity can largely be traced to three factors:

- Traded clusters accounting for a below-average share of total employment. In 2021, the share was 31.2 percent in Arizona and 32.7 percent for the nation. Traded clusters drive the economy and on average pay much higher wages than nontraded activities.
- Low average earnings per worker, even after adjustment for the cost of living. Among traded clusters, Arizona's shortfall from the U.S. average was 11 percent.
- Low per capita employment. Arizona's traded cluster figure was 11 percent less than the national average. While Arizona's age distribution contributes to the subpar per capita employment, the state's workforce participation rate is below the national average even among those of prime working age.

Traded clusters accounted for only 40.6 percent of total aggregate earnings in Arizona in 2021, compared to 45.2 percent nationally. Aggregate earnings are calculated as employment times average earnings per worker. Per capita aggregate earnings adjusted for the cost of living was 21 percent less than the U.S. average in Arizona in the traded clusters.

Arizona compares particularly poorly in some of the nation's largest and highest-paying traded clusters. Of particular interest is that adjusted average earnings per worker is far below the national average in particular high-paying industries in these key traded clusters. The large differentials suggest that the nature of the work performed in Arizona in these industries is fundamentally different from the national norm, requiring fewer skills and therefore lower paying. For example, a manufacturing facility in Arizona may primarily employ lower-paid production workers, while the typical facility nationally may be better balanced, with more higher-paid workers in business, finance, and technical professional occupations.

Very low adjusted average earnings per worker in Arizona relative to the national average is particularly prevalent in the financial services cluster. In five of the six largest industries in that cluster, Arizona's adjusted average earnings in 2021 was at least 38 percent below average. Similarly large differentials existed in the Internet publishing and Web search industry and the research and development in biotechnology industry. Differentials of 20-to-25 percent were present in such high-tech industries as custom computer programming, software publishing, semiconductor manufacturing, and data processing and hosting. Other high-paying industries in which adjusted average earnings in Arizona was at least 20 percent below average include property and casualty insurance carriers, management consulting, and marketing consulting.

Among metropolitan areas, a strong relationship exists between metro area size, as measured by employment, and many economic measures. When Arizona's metro areas are compared to similarly sized metro areas, each of Arizona's two populous metro areas — Phoenix and Tucson — and most of the state's five smaller metro areas compare poorly on traded cluster share of total employment and total aggregate earnings, per capita employment, average earnings per worker adjusted for the cost of living, and adjusted per capita aggregate earnings. Not only does Metro Phoenix compare poorly to its peers, on each measure it is below the average of metro areas approximately the size of Metro Tucson.

INTRODUCTION TO REGIONAL ECONOMICS

At a subnational level, a region can be defined in various ways, such as a grouping of states, a single state, a metropolitan area, or a labor market area. Regional economics, sometimes referred to as “spatial economics,” has been described as addressing the question of “what is where, and why — and so what?”¹ Regional economics has three “foundation stones:”

- Natural resource advantages. The unequal distribution of climate, minerals, soil, topography, and most other natural features helps to explain the location of many kinds of economic activity. In economic terms, this is “imperfect factor mobility.” The complete or partial immobility of land and other productive factors is one essential part of any explanation of what is where. Such immobility lies at the heart of the comparative advantage that various regions enjoy for specialization in production and trade.
- Economies of spatial concentration. In economic terms, this is “imperfect divisibility.” Economies of scale can result from the concentration of an economic activity in a particular location. Such concentrations have been described as clusters, discussed in the next section of this paper.
- Costs of transportation and communication. Such costs vary by location. In economic terms, this is “imperfect mobility of goods and services.”

As the distribution of economic activity over space changes, there are important consequences for individuals and for communities. For example, electronics manufacturing once was a dominant economic activity in the Phoenix area. This industry declined from the 1990s until recently relative to the overall economy — at a disproportionate rate relative to the nation. The decline had a substantial impact on workers — many of whom had to move from the Phoenix area to find work — and on the communities in which the manufacturing facilities were located. Empty buildings and reduced consumer consumption put a strain on city finances. The impacts were especially large due to the high average wage paid by the electronics manufacturers and by the lower wages paid by companies that eventually occupied the empty space.

A key concept in regional economics is the distinction between “traded” economic activities and other economic activities.

Traded Economic Activities

Goods and services sold to customers (individuals or businesses) who are not residents of a region are referred to as “traded” economic activities. Synonyms for “traded” include “tradable,” “export,” and “basic.”² 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. Since no region produces all of the goods desired by its residents, money leaves the region when purchases of goods manufactured in other regions are made. Expenditures by residents while visiting another region is another form of leakage.

¹ The discussion in this paragraph is from Edgar M. Hoover and Frank Giarratani, *An Introduction to Regional Economics*, <https://researchrepository.wvu.edu/rri-web-book/4/>.

² The definition of “export” in this situation applies to any sale to a customer from outside the region and is not limited to international exports.

Few economic activities sell wholly to customers outside the region or entirely to regional residents, but in many cases, customers are predominantly from either the region or from other regions. Many manufacturing, mining, and agricultural activities have a high percentage of sales made to customers from outside the region. For example, a high percentage of the aerospace goods manufactured in Arizona are sold to customers outside the state. Other activities that import money into a region include tourism and some services, such as call centers of a national company that serve a market area greater than the region. The migration of affluent retirees also is a sort of traded activity, since these migrants bring with them their retirement incomes, and sometimes their savings, which originated elsewhere; these monies would not be part of the local economy if the retiree had not migrated.

A few traded activities, such as a copper mine, are location specific but most traded activities can locate anywhere since their customers are spread out across the country or the globe. Traded activities tend to concentrate geographically in relatively few regions. For example, high-technology activities are disproportionately found in a handful of locations, such as the Silicon Valley and Boston. This concentration is due to factors other than customer location, as discussed in the next section of this paper.

In contrast to traded activities, nontraded (or “local”) economic activities are location specific since they sell their goods and services primarily to regional customers (which consist of local companies as well as individuals). Local economic activities do not display significant geographic concentrations across the country. Instead, their presence largely is proportional to a region’s size, as defined by purchasing power.

While an integral part of a regional economy, nontraded activities do not import money into the regional economy. Their presence in the region is due to traded activities — the expenditures made locally by companies selling traded goods and services and by the employees of these businesses. In this way, traded activities “drive” the regional economy while nontraded activities respond to the growth occurring in traded activities.

To illustrate the relationship between traded and nontraded activities, consider the extreme case of a community that is wholly dependent on one traded activity. In some mining towns, the output of the mine is the sole traded product. No one lived in the area until the mine began to hire workers. While the mine is operating, a variety of nontraded activities spring up to serve those employed at the mine. When the mine closes, the mine’s employees leave the town to find jobs elsewhere and the businesses engaged in nontraded activities immediately lose many of their customers. A community cannot survive by selling goods and services to each other because of leakages of local monies. Some former mining towns have survived by attracting other traded activities, such as tourism. Otherwise, without a means of importing money into the community to offset the leakages, the nontraded businesses in a former mining town eventually shut down, resulting in a ghost town.

Regional economic development interests do not need to be concerned with attracting companies to serve local residents and businesses. If an unmet demand is present, a company will fill the

opening without any intervention from local governments or economic development agencies.^{3 4} Regional economic development focuses on traded activities since communities located outside the region — elsewhere in the same state, in other states, or in other nations — are competing to become the home of these traded activities.

Discussion

Every regional economy has both traded and untraded economic activities; each type of activity is integral. For example, in a smaller region, the addition of a specialized retailer “plugs a leak.” That is, consumers of the specialized product can buy it locally, keeping their money within the regional economy. This has the same effect on regional dollars as a traded activity with an equivalent sales volume moving into the region. However, there is a key distinction between traded and untraded activities: the capacity for growth in a regional economy is severely limited unless growth in traded activities occurs. In addition, most traded activities pay considerably higher wages than most nontraded activities, and more generally have a larger “footprint” on the region than a nontraded activity with the same number of employees.

The inherent emphasis in a regional economy on traded activities should not be confused with “mercantilism,” or what more accurately is called “neomercantilism.” Generally associated with national economies rather than regional economies, neomercantilism emphasizes exports (generally, international exports), usually through the use of protectionist policies.

In Arizona, construction and real estate have been misidentified as driving activities. In reality, only a small portion of these activities are traded — construction and real estate largely respond to growth in the traded portion of the economy. Due to the state’s historically high growth rate and the high cyclical nature of the growth rate, growth-related activities such as construction and real estate make up relatively large shares of the economy and are highly cyclical. As long as the state’s traded activities continue to grow at an above-average pace, construction and real estate will remain disproportionately large pieces of the Arizona economy. At times, due to cyclical and artificial booms as in the mid-2000s, construction and real estate temporarily appear to drive the economy, but they should not be considered to be traded activities.

³ This assumes that the unmet demand is large enough to result in a profitable operation. Residents of small communities often have to travel to other communities to make purchases (or make online purchases) because the unmet demand in the community is inadequate to attract a merchant to the community.

⁴ However, cities within a metropolitan area compete with each other to attract companies serving the local population in order to receive the tax benefits of the economic activity. This competition is unhealthy from the perspective of the metro area.

INTRODUCTION TO ECONOMIC CLUSTERS

This paper examines economic clusters as a potential explanation for the low productivity and prosperity found across most of Arizona. (See the first paper in this series *Regional Economic Competitiveness, Part 1: Productivity and Prosperity in Arizona* at <https://economist.asu.edu/>.)

In this three-part series of papers on regional economic competitiveness, Arizona is the primary focus. However, as seen in the first paper, the productivity and prosperity of a state is in part dependent on the geographic distribution of economic activities across a state. Even after adjusting for the cost of living, productivity and prosperity typically are highest in very populous metropolitan areas and decline with urban size. The concentration of traded economic clusters also is highest in large metro areas and decline with size, as discussed later in this second paper of the series. Thus, as in many economic analyses, metropolitan areas are the preferred geographic unit of measure since they are essentially synonymous with labor markets and exhibit variations in economic measures related to urban size. Within any state, the level and nature of economic activity can vary widely from one labor market to another.

Economic Clusters

The Institute for Strategy and Competitiveness (ISC) at the Harvard Business School, directed by Professor Michael Porter, is a leading research unit on economic clusters. According to the ISC, “A cluster is a geographic concentration of related companies, organizations, and institutions in a particular field that can be present in a region, state, or nation. Clusters arise because they raise a company's productivity, which is influenced by local assets and the presence of like firms, institutions, and infrastructure that surround it.”⁵ The ISC states that clusters increase productivity and operational efficiency, stimulate and enable innovation, and facilitate commercialization and new business formation.

The U.S. Cluster Mapping Project is a national economic development initiative led by the ISC in partnership with the U.S. Department of Commerce and the U.S. Economic Development Administration.⁶ The goal is “to promote economic growth and national competitiveness.” According to the ISC, “Regional economies are the building blocks of U.S. competitiveness. The nation’s ability to produce high-value products and services depends on the creation and strengthening of regional clusters of industries that become hubs of innovation. Clusters, which are regional concentrations of related industries, are a striking feature of all modern economies, making regions uniquely competitive for jobs and private investment.”

Traded Versus Local Clusters

The ISC has categorized each industry defined in the North American Industry Classification System (NAICS) as being either traded or local, though it acknowledges that an industry may have both elements. This categorization was made using three criteria, all related to employment specialization and concentration across regions of the United States. If an industry met the requirement for tradability on all three criteria, it was considered to be traded; if it did not meet

⁵ From <http://www.isc.hbs.edu/competitiveness-economic-development/frameworks-and-key-concepts/Pages/clusters.aspx>.

⁶ The Institute’s website is <http://www.isc.hbs.edu>. A link to the Cluster Mapping Project is available from this website; the direct address is <http://www.clustermapping.us/>.

any of the three requirements, it was designated as nontraded. Further research was conducted on those industries meeting one or two of the criteria.

The ISC categorizes industries into one of 51 traded clusters or 16 local clusters. Most of the clusters are divided into subclusters. No industry was included in more than one cluster, though an industry may have connections to more than one cluster. The grouping of the industries was based on “co-location patterns and other regional data to find inter-industry linkages.”⁷

County Business Patterns, a product of the U.S. Department of Commerce, Census Bureau, was the primary dataset used by the ISC. This dataset does not include the public sector or most of the agriculture sector. As discussed in the following subsection on employment and earnings data, the analysis presented in this paper includes data for all industries. Two traded sectors — for farming and ranching and for the federal government — were added to those defined by the ISC, resulting in 53 traded clusters. One additional nontraded cluster — for state and local governments — was created, resulting in 17 nontraded clusters.

Characteristics of the Clusters

Aggregate earnings, calculated as employment times average earnings per worker, is the primary measure used in this paper. Employment is an inferior measure of economic activity since it does not consider the number of hours worked or the hourly wage. In any region, cluster size as measured by employment or aggregate earnings varies widely across both the traded clusters and the nontraded clusters. Average earnings per worker also differs considerably, particularly across the traded clusters.

A summary of the national data by cluster in 2022 is presented in Table 1, with the clusters listed by aggregate earnings. Traded clusters accounted for only 32.7 percent of total employment but for 45.2 percent of aggregate earnings. Average earnings per worker in the traded clusters was 38 percent higher than the overall total and 70 percent higher than the total of the nontraded clusters.

Among the 53 traded clusters, just one — business services — accounted for 24 percent of the total traded aggregate earnings. The two largest clusters accounted for 35 percent, the top four for 52 percent, and the top seven for two-thirds of the total. Nine clusters each accounted for at least 3 percent of the traded cluster total; in each of these, average earnings per worker was greater than the overall average.

Summary Categories and Subcategories

In addition to providing data on individual clusters, this report includes three summary categories. The 53 traded clusters are added together into a traded total. Similarly, the 17 nontraded clusters are summed into a nontraded total. The overall total is the sum of the traded total and the nontraded total.

⁷ “Categorization of Traded and Local Industries in the US Economy,” available from <http://clustermapping.us/content/cluster-mapping-methodology>.

TABLE 1
CLUSTERS, UNITED STATES, 2022

| | Employment | Average Earnings | Aggregate Earnings | |
|--|-------------|------------------|--------------------|----------------|
| | | | Millions | Share of Total |
| TOTAL | 166,456,590 | \$79,780 | \$13,279,931 | |
| TOTAL TRADED | 54,495,081 | 110,199 | 6,005,312 | 100.0% |
| Business Services | 10,799,782 | 134,477 | 1,452,326 | 24.2 |
| Distribution and Electronic Commerce | 6,832,038 | 96,321 | 658,071 | 11.0 |
| Financial Services | 2,242,293 | 227,691 | 510,550 | 8.5 |
| Federal Government | 4,917,536 | 98,725 | 485,483 | 8.1 |
| Education and Knowledge Creation | 3,535,561 | 93,783 | 331,575 | 5.5 |
| Information Tech & Analytical Instruments | 1,492,004 | 202,773 | 302,539 | 5.0 |
| Marketing, Design, and Publishing | 1,836,450 | 139,759 | 256,661 | 4.3 |
| Transportation and Logistics | 2,251,012 | 91,904 | 206,876 | 3.4 |
| Insurance Services | 1,506,584 | 121,119 | 182,476 | 3.0 |
| Hospitality and Tourism | 2,892,643 | 57,074 | 165,096 | 2.7 |
| Construction Products and Services | 1,079,785 | 93,566 | 101,032 | 1.7 |
| Food Processing and Manufacturing | 1,252,430 | 75,249 | 94,245 | 1.6 |
| Production Technology and Heavy Machinery | 951,501 | 93,231 | 88,709 | 1.5 |
| Automotive | 1,010,122 | 87,710 | 88,598 | 1.5 |
| Aerospace Vehicles and Defense | 617,620 | 141,363 | 87,308 | 1.5 |
| Oil and Gas Production and Transportation | 522,605 | 160,487 | 83,871 | 1.4 |
| Farming and Ranching | 1,339,700 | 51,401 | 68,862 | 1.1 |
| Biopharmaceuticals | 343,470 | 165,919 | 56,988 | 0.9 |
| Plastics | 678,767 | 81,732 | 55,477 | 0.9 |
| Video Production and Distribution | 361,203 | 121,431 | 43,861 | 0.7 |
| Communications Equipment and Services | 287,297 | 145,034 | 41,668 | 0.7 |
| Performing Arts | 640,572 | 61,877 | 39,637 | 0.7 |
| Downstream Metal Products | 478,362 | 81,137 | 38,813 | 0.6 |
| Medical Devices | 307,726 | 121,821 | 37,488 | 0.6 |
| Upstream Metal Manufacturing | 381,426 | 97,747 | 37,283 | 0.6 |
| Metalworking Technology | 448,837 | 80,587 | 36,170 | 0.6 |
| Lighting and Electrical Equipment | 325,029 | 106,664 | 34,669 | 0.6 |
| Livestock Processing | 540,024 | 63,551 | 34,319 | 0.6 |
| Paper and Packaging | 360,212 | 91,783 | 33,061 | 0.6 |
| Water Transportation | 310,072 | 104,578 | 32,427 | 0.5 |
| Electric Power Generation and Transmission | 167,388 | 188,802 | 31,603 | 0.5 |
| Downstream Chemical Products | 283,215 | 106,567 | 30,181 | 0.5 |
| Wood Products | 414,164 | 68,246 | 28,265 | 0.5 |
| Agricultural Inputs and Services | 536,756 | 50,467 | 27,088 | 0.5 |
| Printing Services | 404,892 | 66,666 | 26,993 | 0.4 |
| Furniture | 400,134 | 61,905 | 24,770 | 0.4 |
| Upstream Chemical Products | 167,955 | 146,481 | 24,602 | 0.4 |
| Vulcanized and Fired Materials | 250,499 | 76,629 | 19,195 | 0.3 |
| Recreational and Small Electric Goods | 207,792 | 85,304 | 17,725 | 0.3 |
| Trailers, Motor Homes, and Appliances | 176,488 | 83,651 | 14,764 | 0.2 |
| Textile Manufacturing | 188,730 | 70,190 | 13,247 | 0.2 |
| Environmental Services | 139,146 | 84,763 | 11,794 | 0.2 |
| Nonmetal Mining | 103,002 | 93,413 | 9,622 | 0.2 |

(continued)

TABLE 1 (continued)
CLUSTER TOTALS, UNITED STATES, 2022

| | Employment | Average Earnings | Aggregate Earnings | |
|--|--------------------|------------------|--------------------|----------------|
| | | | Millions | Share of Total |
| Apparel | 131,244 | \$58,454 | \$7,672 | 0.1% |
| Forestry | 95,583 | 67,010 | 6,405 | 0.1 |
| Metal Mining | 47,144 | 130,125 | 6,135 | 0.1 |
| Coal Mining | 42,675 | 116,776 | 4,983 | 0.1 |
| Fishing and Fishing Products | 64,153 | 66,289 | 4,253 | 0.1 |
| Music and Sound Recording | 35,401 | 92,983 | 3,292 | 0.1 |
| Leather and Related Products | 42,970 | 56,690 | 2,436 | 0.0 |
| Jewelry and Precious Metals | 25,889 | 72,393 | 1,874 | 0.0 |
| Tobacco | 11,144 | 110,407 | 1,230 | 0.0 |
| Footwear | 16,051 | 64,937 | 1,042 | 0.0 |
| TOTAL NONTRADED | 111,961,509 | 64,974 | 7,274,619 | 100.0 |
| State and Local Government | 19,179,659 | 85,618 | 1,642,115 | 22.6 |
| Local Health Services | 17,433,052 | 81,412 | 1,419,251 | 19.5 |
| Local Real Estate, Construction, Development | 13,082,886 | 75,699 | 990,359 | 13.6 |
| Local Commercial Services | 10,054,113 | 72,244 | 726,346 | 10.0 |
| Local Hospitality Establishments | 13,058,311 | 28,837 | 376,566 | 5.2 |
| Local Financial Services | 3,394,304 | 108,179 | 367,194 | 5.0 |
| Local Motor Vehicle Products and Services | 4,801,866 | 63,091 | 302,953 | 4.2 |
| Local Community and Civic Organizations | 5,889,817 | 38,118 | 224,506 | 3.1 |
| Local Food & Beverage Process, Distribution | 4,479,060 | 45,590 | 204,202 | 2.8 |
| Local Logistical Services | 3,117,629 | 63,178 | 196,965 | 2.7 |
| Local Personal Services (Non-Medical) | 5,764,349 | 33,230 | 191,550 | 2.6 |
| Local Retailing, Clothing & Genl Merchandise | 4,509,586 | 36,420 | 164,238 | 2.3 |
| Local Utilities | 1,080,018 | 130,119 | 140,531 | 1.9 |
| Local Household Goods and Services | 2,421,858 | 48,899 | 118,427 | 1.6 |
| Local Education and Training | 1,791,692 | 47,120 | 84,424 | 1.2 |
| Local Entertainment and Media | 1,348,125 | 60,907 | 82,110 | 1.1 |
| Local Industrial Products and Services | 555,185 | 77,238 | 42,881 | 0.6 |

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School.

Most high-technology activities are traded activities with high average earnings. The definition of high technology used in three papers related to STEM that were published in February 2021 (<https://economist.asu.edu/>) do not completely align with ISC’s cluster definitions:

- Aerospace Vehicles and Defense: every industry in this cluster was defined as high tech.
- Biopharmaceuticals: every industry in this cluster was defined as high tech.
- Business Services: every industry in the computer services and engineering services subclusters was defined as high tech, but just two of the 26 other industries in the cluster are high tech.
- Communications Equipment and Services: six of the eight industries in this cluster was defined as high tech.

- Education and Knowledge Creation: three of the four industries in the research organizations subcluster is high tech, but none of the cluster's other industries are high tech.
- Information Technology and Analytical Instruments: every industry in this cluster was defined as high tech.
- Other clusters: no more than one high-tech industry is included in any of the other clusters.

Employment and Earnings Data

All economic data produced by the federal government are subject to disclosure restrictions, which are in place to prevent data on a particular company from being released or otherwise ascertained. These restrictions result in considerable data being withheld from publication for subnational geographies and create serious limitations to conducting economic analyses by state and more so by metropolitan area.

The employment and average earnings data used for this paper were obtained from Lightcast (formerly Emsi, www.economicmodeling.com), a private-sector labor market data company providing selected economic and related data for the nation, states, counties, and metropolitan areas by industry and occupation. Lightcast updates the data quarterly; the state data used in this report come from the first quarter 2023 data release. Lightcast provides annual employment and average earnings data by industry for 2001 through 2022. Occupational employment estimates are available for 2001 through 2021; occupational earnings data are available for 2005 through 2021.

Lightcast uses a variety of sources, predominantly federal government agencies, to develop its data, which are available only to subscribers. The advantage of using the Lightcast data is that Lightcast imputes values for the large volume of data that are withheld by the federal government due to the federal disclosure restrictions.

Employment and earnings are reported by Lightcast 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 industrial data follow the hierarchical NAICS, in which 20 sectors are the most aggregated level; subsectors, industry groups, and industries are progressively more detailed. In this paper, industries are grouped into subclusters and clusters based largely in the ISC's designations.

The QCEW includes wage and salary employees who are covered by the unemployment insurance program. The second category of data from Lightcast is wage and salary workers who are not covered by unemployment insurance. 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. The fourth category includes individuals with earnings from self-employment, but who are either primarily retired or primarily work at a wage and salary job and are counted in one of the first two categories. In this report, the sum of the first three categories is used.

Comparison of Geographic Areas

A standard method of comparing economic activity across geographic areas is to calculate the share of the overall activity contributed by an industry or a cluster. However, this type of comparison is less than desirable if the overall level of economic activity in a region is much different from average. The alternative is to express the economic data on a per capita basis. In a comparison of a region with relatively little per capita economic activity to a region with above-average per capita activity, using shares to determine the importance of industries or clusters is misleading — an activity's share of the economy may be higher in the region with low per capita employment but its per capita activity may be lower. Overall per capita employment in 2022 was 7.6 percent lower in Arizona than the national average.

The annual population figures used to calculate the per capita figures typically come from the U.S. Census Bureau. The estimates are expressed as of July 1. After each decennial census, the Census Bureau revises its estimates for the last decade. The revised estimates for 2010 through 2019 are not yet available from the Census Bureau, but an interim series has been produced by the U.S. Department of Commerce's Bureau of Economic Analysis (BEA).

Average earnings per worker is adjusted for regional differences in the cost of living using the regional price parity (RPP) estimates produced by the BEA (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>). RPP estimates are available annually from 2008 through 2021 for states and metro areas, expressed as a percentage of the national average, which is set equal to 100.

The primary measure used in this analysis is adjusted per capita aggregate earnings, the result of multiplying per capita employment by average earnings adjusted for the cost of living.

In addition to its rank among the 50 states and the District of Columbia, Arizona is ranked among 15 comparison states:

- 10 Western states: Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Texas, Utah, and Washington.
- Five South Atlantic states: Florida, Georgia, North Carolina, South Carolina, and Virginia.

ECONOMIC CLUSTERS BY STATE

In this section, overall measures of the traded economy are examined first, followed by detailed looks at the largest traded clusters. The year of the latest data varies between 2021 and 2022. The latest year of cost-of-living estimates used to compare states on adjusted average earnings and adjusted per capita aggregate earnings is 2021. Other data extend through 2022.

Overall State Traded Cluster

Several measures can be used to evaluate the strength of a state's aggregation of traded clusters:

- Share of total employment.
- Share of aggregate earnings.
- Per capita employment.
- Average earnings adjusted for the cost of living.
- Per capita aggregate earnings adjusted for the cost of living. This is considered to be the best of the measures, calculated using per capita employment and adjusted average earnings, but is not available for 2022.

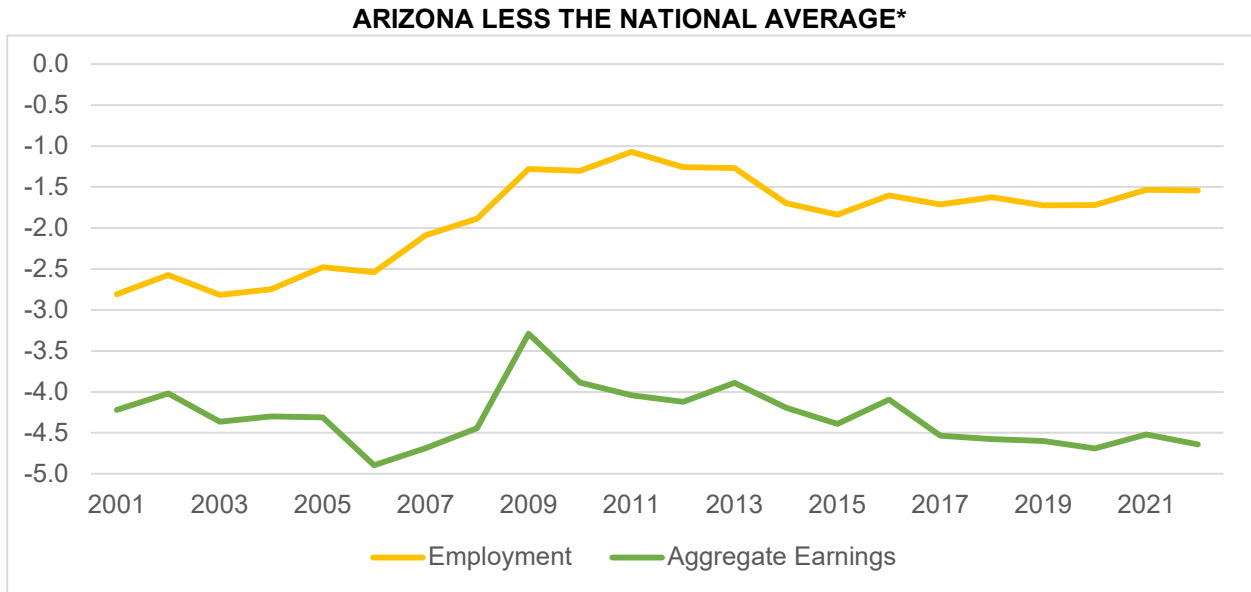
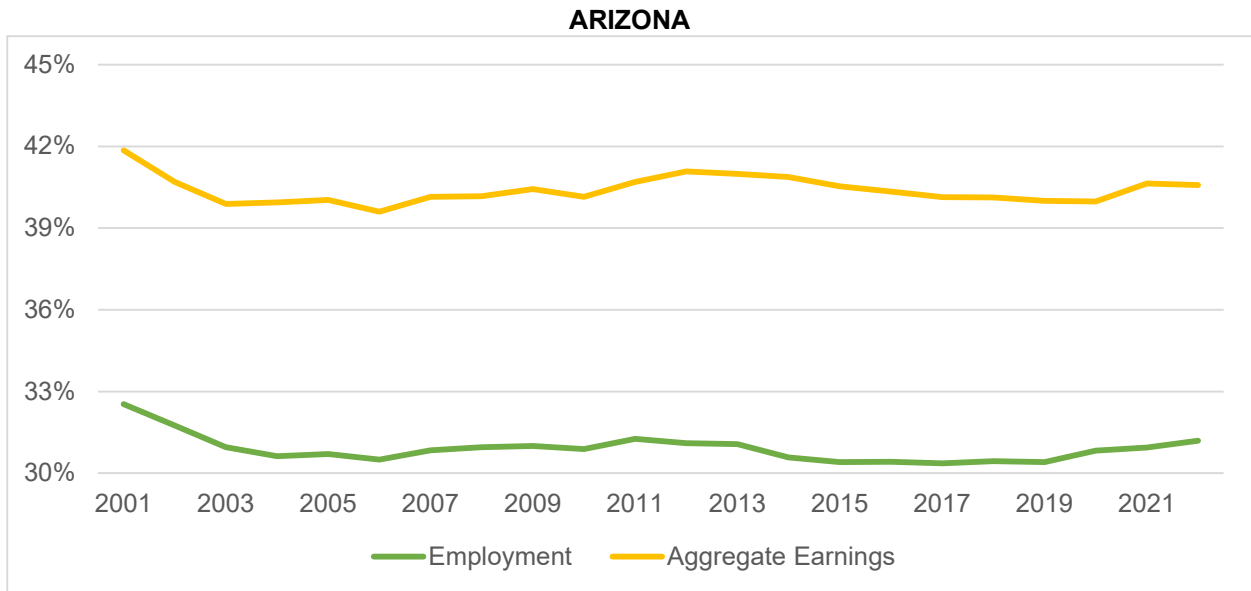
In each of these measures, the aggregate traded cluster in the District of Columbia in 2021/2022 was larger than each state by a wide margin. Massachusetts, which ranked second on adjusted per capita aggregate earnings, ranked in the top 10 on each measure. Washington, with the third-highest adjusted per capita aggregate earnings, also ranked high on each measure, as did Virginia, which ranked fifth on adjusted per capita aggregate earnings. Several states did not have strong figures on the employment measures, but ranked in the top 10 on adjusted average earnings and adjusted per capita aggregate earnings: California, Connecticut, New Hampshire, and New York. The only other states with adjusted per capita aggregate earnings above the U.S. average were Colorado, Illinois, Maryland, Minnesota, North Dakota, and Utah. Adjusted per capita aggregate earnings was above average in only 14 states.

Arizona compares poorly on each of the measures:

- Share of total employment. In 2022, Arizona's share was 31.2 percent, less than the national average of 32.7 percent, ranking 39th among all states and 13th among the 15 comparison states.
- Share of aggregate earnings. In 2022, Arizona's share was 40.6 percent, less than the national average of 45.2 percent, ranking 38th among all states and 13th among the 15 comparison states.
- Per capita employment. In 2022, Arizona's figure was 144.0 per 1,000 residents, less than the national average of 163.5, ranking 44th among all states and 13th among the 15 comparison states.
- Average earnings adjusted for the cost of living. In 2021, Arizona's figure of \$96,532 was 10.9 percent less than the U.S. average, but ranked 22nd among all states and eighth among the 15 comparison states.
- Per capita aggregate earnings adjusted for the cost of living. In 2021, Arizona's figure of \$13,637 was 20.9 percent less than the U.S. average and ranked 38th among all states and 11th among the 15 comparison states.

The time series of Arizona's traded cluster share is shown in Chart 1. The share declined in the early 2000s and was little changed thereafter. Relative to the national average, Arizona's

**CHART 1
TRADED CLUSTER SHARE, ARIZONA**



* Measured as the percentage-point difference in the share.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School.

employment share improved between 2005 and 2011 but the aggregate earnings share was lower in 2022 than in most of the prior years.

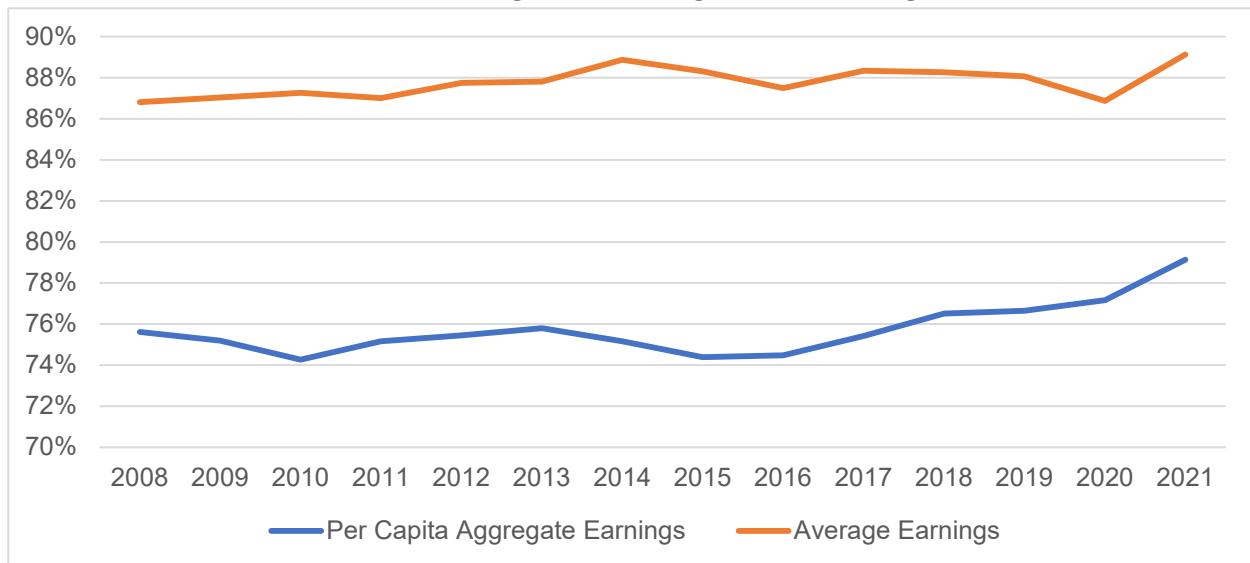
In Chart 2, the time series of Arizona’s earnings as a percentage of the U.S. average are displayed. There has been little change over time in adjusted average earnings per worker, but some improvement occurred after 2017 in adjusted per capita aggregate earnings. This advance was due to a slight rise in per capita employment, which increased from a low of 84.2 percent of the national average in 2015 to between 88-and-89 percent from 2020 through 2022.

Individual Traded Clusters and Subclusters

Table 2 presents per capita aggregate earnings adjusted for the cost of living and its two components — per capita employment and adjusted average earnings per worker — for each of Arizona’s traded clusters relative to the national average, with ranks among all states and among the comparison states. The clusters are listed in order of size based on U.S. aggregate earnings in 2021. Many of the clusters are heavily concentrated in a relatively few states, explaining how Arizona’s ratio to the national average can be so low in many clusters while its rank is not as low.

In Table 3, a summary is provided for adjusted per capita aggregate earnings in 2021. Among the 10 largest traded clusters nationally, Arizona’s figure exceeded the U.S. average by a modest amount in two: the information technology and analytical instruments cluster and the hospitality and tourism cluster. Among all 53 traded clusters, Arizona’s figure was greater than the U.S. average in only seven, while in 57 percent of the traded clusters, Arizona’s figure was less than

CHART 2
TRADED CLUSTER EARNINGS ADJUSTED FOR THE COST OF LIVING, ARIZONA
RELATIVE TO THE NATIONAL AVERAGE



Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School.

**TABLE 2
CLUSTERS, ARIZONA, 2021**

| | Adjusted Per Capita Aggregate Earnings | | | | Employment Per 1,000 Residents | | | | Average Earnings Adjusted for the Cost of Living | | | |
|---|--|--------|-------|----|--------------------------------|--------|-------|----|--|--------|-------|----|
| | AZ | Ratio^ | Rank* | | AZ | Ratio^ | Rank* | | AZ | Ratio^ | Rank* | |
| | | | 51 | 15 | | | 51 | 15 | | | 51 | 15 |
| Total | \$33,560 | 0.88 | 38 | 11 | 456.58 | 0.93 | 43 | 14 | \$73,502 | 0.94 | 24 | 8 |
| Total Traded | 13,637 | 0.79 | 38 | 11 | 141.27 | 0.89 | 44 | 13 | 96,532 | 0.89 | 22 | 8 |
| Total Nontraded | 19,923 | 0.95 | 33 | 8 | 315.31 | 0.95 | 41 | 11 | 63,184 | 1.00 | 19 | 5 |
| Traded Clusters | | | | | | | | | | | | |
| Business Services | 3,361 | 0.82 | 25 | 11 | 34.53 | 1.11 | 9 | 5 | 97,335 | 0.74 | 46 | 14 |
| Distribution and Electronic Commerce | 1,806 | 0.95 | 22 | 8 | 20.36 | 1.03 | 19 | 7 | 88,695 | 0.93 | 34 | 10 |
| Financial Services | 1,398 | 0.93 | 12 | 4 | 10.34 | 1.55 | 5 | 2 | 135,281 | 0.60 | 44 | 14 |
| Federal Government | 1,242 | 0.86 | 28 | 9 | 12.93 | 0.87 | 32 | 11 | 96,027 | 0.99 | 13 | 3 |
| Education and Knowledge Creation | 469 | 0.49 | 30 | 10 | 6.47 | 0.63 | 32 | 10 | 72,524 | 0.79 | 26 | 11 |
| Information Tech and Analytical Instruments | 889 | 1.01 | 12 | 8 | 5.22 | 1.21 | 12 | 7 | 170,390 | 0.84 | 12 | 6 |
| Marketing, Design, and Publishing | 299 | 0.39 | 29 | 12 | 3.70 | 0.69 | 28 | 12 | 80,814 | 0.57 | 37 | 13 |
| Transportation and Logistics | 537 | 0.93 | 29 | 8 | 6.06 | 0.93 | 31 | 10 | 88,584 | 1.00 | 23 | 6 |
| Insurance Services | 427 | 0.81 | 27 | 5 | 4.33 | 0.96 | 21 | 4 | 98,747 | 0.84 | 41 | 13 |
| Hospitality and Tourism | 466 | 1.07 | 14 | 6 | 7.90 | 1.00 | 21 | 7 | 59,020 | 1.07 | 8 | 4 |
| Construction Products and Services | 203 | 0.69 | 45 | 13 | 1.92 | 0.60 | 48 | 15 | 105,429 | 1.15 | 8 | 1 |
| Food Processing and Manufacturing | 155 | 0.57 | 38 | 12 | 2.12 | 0.58 | 40 | 12 | 72,816 | 0.99 | 25 | 4 |
| Aerospace Vehicles and Defense | 650 | 2.57 | 5 | 2 | 4.63 | 2.50 | 5 | 2 | 140,316 | 1.03 | 11 | 4 |
| Production Tech and Heavy Machinery | 98 | 0.39 | 41 | 13 | 0.96 | 0.34 | 43 | 13 | 102,261 | 1.13 | 6 | 1 |
| Automotive | 87 | 0.35 | 30 | 9 | 0.81 | 0.27 | 31 | 9 | 107,049 | 1.27 | 3 | 2 |
| Oil and Gas Production and Transportation | 15 | 0.06 | 34 | 8 | 0.12 | 0.08 | 34 | 9 | 124,493 | 0.81 | 31 | 6 |
| Farming and Ranching | 114 | 0.56 | 35 | 10 | 2.08 | 0.52 | 38 | 12 | 55,107 | 1.09 | 17 | 3 |
| Biopharmaceuticals | 53 | 0.32 | 33 | 8 | 0.56 | 0.56 | 28 | 7 | 93,039 | 0.57 | 45 | 11 |
| Plastics | 59 | 0.37 | 44 | 13 | 0.87 | 0.43 | 44 | 13 | 67,449 | 0.86 | 46 | 14 |
| Video Production and Distribution | 21 | 0.16 | 28 | 13 | 0.30 | 0.29 | 27 | 12 | 69,628 | 0.57 | 33 | 12 |
| Communications Equipment and Services | 132 | 1.07 | 13 | 7 | 1.21 | 1.40 | 10 | 6 | 109,289 | 0.77 | 27 | 9 |
| Downstream Metal Products | 189 | 1.71 | 9 | 1 | 1.33 | 0.95 | 27 | 7 | 142,421 | 1.81 | 1 | 1 |
| Medical Devices | 133 | 1.23 | 14 | 3 | 1.15 | 1.26 | 14 | 3 | 115,528 | 0.98 | 15 | 4 |
| Performing Arts | 53 | 0.50 | 29 | 10 | 1.45 | 0.84 | 26 | 9 | 36,415 | 0.59 | 31 | 11 |
| Upstream Metal Manufacturing | 43 | 0.41 | 33 | 7 | 0.51 | 0.46 | 32 | 7 | 83,889 | 0.91 | 36 | 11 |
| Metalworking Technology | 39 | 0.38 | 39 | 10 | 0.53 | 0.40 | 39 | 10 | 74,225 | 0.95 | 31 | 8 |

(continued)

TABLE 2 (continued)
TRADED CLUSTERS, ARIZONA, 2021

| | Adjusted Per Capita Aggregate Earnings | | | | Employment Per 1,000 Residents | | | | Average Earnings Adjusted for the Cost of Living | | | |
|--|--|--------------------|-------|----|--------------------------------|--------------------|-------|----|--|--------------------|-------|----|
| | AZ | Ratio [^] | Rank* | | AZ | Ratio [^] | Rank* | | AZ | Ratio [^] | Rank* | |
| Lighting and Electrical Equipment | \$42 | 0.42 | 37 | 12 | 0.41 | 0.42 | 40 | 13 | \$101,994 | 0.98 | 21 | 7 |
| Livestock Processing | 20 | 0.20 | 42 | 12 | 0.30 | 0.19 | 44 | 13 | 66,019 | 1.09 | 13 | 1 |
| Paper and Packaging | 26 | 0.28 | 40 | 12 | 0.34 | 0.32 | 40 | 12 | 76,855 | 0.86 | 45 | 15 |
| Electric Power Generation & Transmission | 42 | 0.45 | 44 | 13 | 0.28 | 0.55 | 44 | 13 | 151,298 | 0.81 | 48 | 15 |
| Water Transportation | 4 | 0.04 | 44 | 12 | 0.04 | 0.05 | 43 | 12 | 89,082 | 0.88 | 27 | 6 |
| Downstream Chemical Products | 20 | 0.23 | 43 | 13 | 0.24 | 0.28 | 44 | 13 | 83,015 | 0.81 | 38 | 10 |
| Wood Products | 33 | 0.42 | 41 | 14 | 0.53 | 0.44 | 40 | 14 | 62,224 | 0.95 | 33 | 10 |
| Agricultural Inputs and Services | 76 | 0.96 | 16 | 5 | 1.48 | 0.92 | 16 | 6 | 51,326 | 1.04 | 19 | 2 |
| Printing Services | 52 | 0.67 | 36 | 10 | 0.81 | 0.67 | 37 | 11 | 64,428 | 1.00 | 19 | 3 |
| Furniture | 60 | 0.85 | 23 | 6 | 0.98 | 0.83 | 24 | 7 | 61,203 | 1.02 | 22 | 2 |
| Upstream Chemical Products | 24 | 0.35 | 38 | 10 | 0.22 | 0.43 | 36 | 10 | 112,333 | 0.81 | 36 | 11 |
| Vulcanized and Fired Materials | 19 | 0.34 | 39 | 11 | 0.27 | 0.37 | 40 | 13 | 68,699 | 0.92 | 36 | 9 |
| Recreational and Small Electric Goods | 37 | 0.74 | 25 | 10 | 0.50 | 0.83 | 26 | 9 | 74,180 | 0.90 | 27 | 9 |
| Trailers, Motor Homes, and Appliances | 10 | 0.24 | 30 | 9 | 0.14 | 0.27 | 30 | 9 | 70,565 | 0.89 | 25 | 8 |
| Textile Manufacturing | 8 | 0.20 | 35 | 10 | 0.13 | 0.23 | 34 | 10 | 60,429 | 0.90 | 33 | 9 |
| Environmental Services | 21 | 0.61 | 38 | 12 | 0.27 | 0.65 | 37 | 12 | 77,888 | 0.94 | 22 | 7 |
| Nonmetal Mining | 16 | 0.58 | 41 | 13 | 0.17 | 0.56 | 42 | 13 | 91,326 | 1.02 | 24 | 8 |
| Apparel | 7 | 0.31 | 41 | 13 | 0.15 | 0.38 | 42 | 14 | 45,066 | 0.81 | 33 | 9 |
| Forestry | 3 | 0.17 | 40 | 13 | 0.05 | 0.16 | 41 | 13 | 66,517 | 1.03 | 16 | 9 |
| Metal Mining | 174 | 9.91 | 4 | 2 | 1.44 | 10.29 | 4 | 2 | 120,811 | 0.96 | 20 | 9 |
| Coal Mining | 1 | 0.10 | 23 | 6 | 0.01 | 0.08 | 23 | 6 | 136,723 | 1.22 | 7 | 2 |
| Fishing and Fishing Products | 0 | 0.03 | 45 | 14 | 0.01 | 0.03 | 45 | 14 | 48,947 | 0.76 | 36 | 11 |
| Music and Sound Recording | 1 | 0.14 | 40 | 15 | 0.02 | 0.23 | 41 | 15 | 50,657 | 0.58 | 32 | 12 |
| Leather and Related Products | 3 | 0.45 | 46 | 15 | 0.06 | 0.44 | 47 | 14 | 54,954 | 1.02 | 23 | 6 |
| Jewelry and Precious Metals | 3 | 0.47 | 21 | 7 | 0.06 | 0.76 | 17 | 6 | 43,853 | 0.62 | 39 | 12 |
| Tobacco | 1 | 0.15 | 23 | 7 | 0.01 | 0.24 | 17 | 6 | 67,437 | 0.63 | 31 | 13 |
| Footwear | 0 | 0.04 | 41 | 14 | 0.01 | 0.12 | 38 | 12 | 21,072 | 0.35 | 46 | 15 |

Note: The traded clusters are listed in order of per capita aggregate earnings in the nation.

* The rank is among the 51 “states” (including the District of Columbia) and the 15 comparison states.

[^] The ratio is relative to the national average.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living adjustment uses the 2021 regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

TABLE 3
TRADED CLUSTER SUMMARY, ARIZONA, 2021
Per Capita Aggregate Earnings Adjusted for the Cost of Living

| Ratio to U.S. Average | All 53* | Top 10** | Rank Among All States | All 53* | Top 10** | Rank Among Comp States[^] | All 53* | Top 10** |
|------------------------------|----------------|-----------------|------------------------------|----------------|-----------------|---|----------------|-----------------|
| 1.1 or More | 4 | 0 | 1 to 10 | 3 | 0 | 1 to 3 | 4 | 0 |
| 1.00 to 1.09 | 3 | 2 | 11 to 20 | 6 | 3 | 4 to 6 | 6 | 3 |
| 0.90 to 0.99 | 4 | 3 | 21 to 30 | 16 | 7 | 7 to 9 | 12 | 4 |
| 0.70 to 0.89 | 5 | 3 | 31 to 40 | 14 | 0 | 10 to 12 | 17 | 3 |
| Less Than 0.70 | 37 | 2 | 41 to 51 | 14 | 0 | 13 to 15 | 14 | 0 |

* All 53 Traded clusters

** 10 largest traded clusters nationally

[^] 15 comparison states

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living adjustment uses the 2021 regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

half of the national average. Arizona compared slightly better on the rankings, but it ranked in the bottom 40 percent of all states and of the comparison states in more than half of the 53 clusters.

In addition to the information technology and analytical instruments cluster and the hospitality and tourism cluster, Arizona’s adjusted per capita aggregate earnings figure in 2021 was greater than the U.S. average in the following five traded clusters:

- Aerospace vehicles and defense. Arizona’s adjusted per capita aggregate earnings figure was 2.57 times the national average, ranking fifth nationally and second among the comparison states. This cluster provided the sixth-largest aggregate earnings (4.8 percent of the total) of the traded clusters in Arizona; it ranked only 13th nationally. Arizona was particularly above average in the missiles and space vehicles subcluster, ranking first in the nation, but also was above average in the other two subclusters: the aircraft subcluster and the search and navigation equipment subcluster. In each of the three subclusters, Arizona’s strength was in per capita employment; adjusted average earnings ranged from average to a little below the national average.
- Metal mining. Arizona ranked fourth nationally and second among the comparison states with an adjusted per capita aggregate earnings figure 9.91 times the national average. However, this cluster accounted for only 1.3 percent of the state’s total traded cluster aggregate earnings. Arizona’s strength was in per capita employment; adjusted average earnings was slightly below the national average.
- Communication equipment and services. Arizona ranked 13th nationally but only seventh among the comparison states with an adjusted per capita aggregate earnings figure 7 percent higher the national average. This cluster accounted for only 1.0 percent of the state’s total traded cluster aggregate earnings. Arizona was above average on adjusted per capita aggregate earnings in the communications services subcluster, with very high per capita employment but low adjusted average earnings. Arizona’s adjusted per capita

aggregate earnings was considerably below average in the other two subclusters of communications equipment and communications equipment components.

- Medical devices. Arizona ranked 14th nationally and third among the comparison states with an adjusted per capita aggregate earnings figure 23 percent higher than the national average. However, this cluster accounted for only 1.0 percent of the state's total traded cluster aggregate earnings. Arizona was above average in the surgical and dental instruments and supplies subcluster but was below average in the optical instruments and ophthalmic goods subcluster.
- Downstream metal products. The strong figures for this cluster may be due to a data reporting error. In one of the larger industries within this cluster, the adjusted average earnings figure jumped to more than \$425,000 in 2021, more than three times larger than Arizona's average for the industry in the prior year and nearly four times as high as the national average for the industry in 2021. Arizona's per capita employment figure in 2021 in this cluster was a little less than the national average.

In contrast to the state's strong performance in the preceding traded clusters, adjusted per capita aggregate earnings in Arizona in 2021 was below the national average in eight of the nation's nine largest traded clusters. These eight clusters combined accounted for 68 percent of the nation's total traded cluster aggregate earnings.

Arizona's performance in each of the nation's 10 largest clusters is examined in detail below. Each of the top 10 clusters accounted for at least 2.7 percent of the nation's traded total aggregate earnings; the next largest cluster's share was 1.7 percent.

Business Services

Business services was the nation's largest traded cluster in 2022, accounting for 24.2 percent of the traded total based on aggregate earnings and 19.8 percent based on employment. Average earnings was 22 percent more than the traded total.

Adjusted per capita aggregate earnings in Arizona in the business services cluster was 18 percent less than the U.S. average in 2021, ranking 25th nationally and 11th among the comparison states. All of the shortfall was due to far below-average adjusted average earnings — 26 percent below average, ranking 46th nationally and 14th among the comparison states. Employment per capita in Arizona was 11 percent above average, ranking ninth nationally and fifth among the comparison states.

Adjusted per capita aggregate earnings relative to the nation decreased in Arizona from 2008 through 2012 in the business services cluster due to a decline in per capita employment, but was little changed after that. The decrease in per capita employment returned the ratio to the U.S. average to a level similar to the early 2000s. Thus, over time, there has been little change in this cluster's intensity in Arizona versus the U.S. average.

The business services cluster consists of eight subclusters. Arizona's adjusted per capita aggregate earnings in 2021 ranged across the subclusters from considerably above average to substantially below average (see Table 4). Per capita employment in the business support services subcluster was 2.49 times the national average (ranked second). However, this is a

relatively low-paying subcluster and Arizona's adjusted average earnings was 17 percent below average (ranked 41st). Per capita employment in Arizona was above average in most of this subcluster's industries, but the big differences were in the professional employer organizations industry (which largely is involved with employee leasing) and the telemarketing industry, whose adjusted average earnings was particularly low. The other subcluster in which Arizona's per capita employment was above average was employment placement services, also a relatively low-paying subcluster.

The business services cluster consists of 33 industries. In the nation, six industries, five of which were high paying, accounted for 78 percent of the cluster's aggregate earnings in 2021: corporate, subsidiary, and regional managing offices; custom computer programming services; computer systems design services; engineering services; management consulting; and data processing and hosting. Adjusted average earnings per worker in Arizona was below average in each of these industries, by more than 20 percent in three. Per capita employment in Arizona was below the U.S. average in five of these industries, by at least 15 percent in four. Arizona's adjusted per capita aggregate earnings was below average in the same five industries, by between 18-and-45 percent. The shortfall in the largest of these industries was 43 percent. Arizona's per capita figures were above average in data processing and hosting, the smallest of the six industries.

Among the other 27 industries in the cluster, adjusted average earnings per worker in Arizona was below average in 21, per capita employment was below average in 12, and adjusted per capita aggregate earnings was below average in 18. Among all 33 industries, Arizona was above average on adjusted per capita aggregate earnings in 10, eight of which were among the cluster's lowest-paying industries.

Arizona's considerably below average adjusted per capita aggregate earnings in 2021 in the business services cluster can largely be traced to three factors:

- Low adjusted average earnings per worker in the majority of the other industries, including each of the five largest. The much lower adjusted average earnings in Arizona in many of the industries suggests that the nature of the work conducted in Arizona is different from the national average, disproportionately performed by less-skilled workers who earn considerably lower wages than the average wage in the national industry.
- Subpar per capita employment in each of the five largest industries.
- Employment in Arizona was heavily tilted to the lower-paying industries.

Marketing, Design, and Publishing

Based on aggregate earnings, marketing, design, and publishing was the nation's seventh-largest traded cluster in 2022, accounting for 4.3 percent of the traded total. It ranked eighth based on employment, with a share of 3.4 percent. Average earnings was 27 percent more than the traded total.

Adjusted per capita aggregate earnings in Arizona in the marketing, design, and publishing cluster was a very substantial 61 percent less than the U.S. average in 2021, ranking 29th nationally and 12th among the comparison states. Low adjusted average earnings per worker accounted for 63 percent of the shortfall. Adjusted average earnings in Arizona was 43 per cent

below average, ranking 37th nationally and 13th among the comparison states. Employment per capita was 31 percent below average, ranking 28th nationally and 12th among the comparison states.

Relative to the nation, adjusted per capita aggregate earnings fell in Arizona in the marketing, design, and publishing cluster between 2008 and 2021. Arizona's per capita employment relative to the nation dropped between 2008 and 2011; adjusted average earnings declined between 2012 and 2021 relative to the nation.

The marketing, design, and publishing cluster consists of four subclusters. Adjusted per capita aggregate earnings in Arizona was considerably below the national average in all four (see Table 5), particularly in the publishing subcluster, which nationally was the largest and highest paying of the four subclusters. Arizona was far below the U.S. average in this subcluster on both per capita employment and adjusted average earnings. In each of the other subclusters, per capita employment and adjusted average earnings were below average in Arizona.

The marketing, design, and publishing cluster consists of 22 industries. The very high-paying industry of Internet publishing and broadcasting and Web search portals accounted for 42 percent of this cluster's aggregate earnings in 2021 in the nation. In this industry in Arizona, per capita employment was 47 percent less than the U.S. average and adjusted average earnings per worker was 63 percent less than the U.S. average. Adjusted per capita aggregate earnings was 80 percent less than the U.S. average.

Two other industries each accounted for more than 10 percent of the cluster's aggregate earnings in the nation. In the marketing consulting industry in Arizona, per capita employment was nearly equal to the U.S. average but adjusted average earnings per worker was 21 percent below average, as was adjusted per capita aggregate earnings. In the advertising agencies industry in Arizona, per capita employment was 43 percent less than the U.S. average and adjusted average earnings per worker was 29 percent below average. Adjusted per capita aggregate earnings was 60 percent below the U.S. average.

In 16 of the other 19 industries in the cluster, adjusted per capita aggregate earnings in Arizona was less than the U.S. average; it was less than half of the average in 12 of these industries. Each of the three industries in which Arizona was above average paid low wages. Per capita employment was below average in all but three of these industries in Arizona; adjusted average earnings per worker was below average in all but four.

Arizona's very poor performance on adjusted per capita aggregate earnings in the marketing, design, and publishing cluster in 2021 resulted both from low per capita employment and low adjusted average earnings per worker in nearly all of the industries, including the three largest.

Information Technology and Analytical Instruments

Based on aggregate earnings, information technology and analytical instruments (IT) was the nation's sixth-largest traded cluster in 2022, accounting for 5.0 percent of the traded total. It ranked 10th based on employment, with a share of 2.7 percent. Average earnings was 84 percent more than the traded total, the second highest of any traded cluster.

**TABLE 4
SUBCLUSTERS IN THE BUSINESS SERVICES CLUSTER, ARIZONA, 2021**

| | Adjusted Per Capita Aggregate Earnings | | | | Employment Per 1,000 Residents | | | | Average Earnings Adjusted for the Cost of Living | | | |
|-------------------------------------|---|--------|-------|----|-----------------------------------|--------|-------|----|---|--------|-------|----|
| | | | Rank* | | | | Rank* | | | | Rank* | |
| | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 |
| Total Cluster | \$3,361 | 0.82 | 25 | 11 | 34.53 | 1.11 | 9 | 5 | \$97,335 | 0.74 | 46 | 14 |
| Computer Services | 1,012 | 0.72 | 22 | 9 | 7.59 | 0.88 | 20 | 9 | 133,291 | 0.82 | 28 | 12 |
| Corporate Headquarters | 666 | 0.57 | 38 | 12 | 4.82 | 0.68 | 37 | 12 | 138,295 | 0.83 | 40 | 12 |
| Consulting Services | 393 | 0.70 | 22 | 9 | 3.92 | 0.85 | 21 | 11 | 100,173 | 0.82 | 33 | 10 |
| Engineering Services | 331 | 0.82 | 30 | 12 | 2.80 | 0.84 | 35 | 14 | 118,137 | 0.98 | 18 | 6 |
| Business Support Services | 765 | 2.08 | 2 | 1 | 12.61 | 2.49 | 2 | 1 | 60,651 | 0.83 | 41 | 14 |
| Architectural and Drafting Services | 71 | 0.89 | 16 | 6 | 0.75 | 0.94 | 17 | 7 | 94,423 | 0.94 | 29 | 9 |
| Employment Placement Services | 89 | 1.26 | 11 | 5 | 1.23 | 1.36 | 8 | 4 | 72,408 | 0.92 | 38 | 10 |
| Ground Passenger Transportation | 34 | 0.79 | 14 | 4 | 0.81 | 1.00 | 15 | 6 | 42,687 | 0.79 | 15 | 4 |

**TABLE 5
SUBCLUSTERS IN THE MARKETING, DESIGN, AND PUBLISHING CLUSTER, ARIZONA, 2021**

| | Adjusted Per Capita Aggregate Earnings | | | | Employment Per 1,000 Residents | | | | Average Earnings Adjusted for the Cost of Living | | | |
|----------------------------------|---|--------|-------|----|-----------------------------------|--------|-------|----|---|--------|-------|----|
| | | | Rank* | | | | Rank* | | | | Rank* | |
| | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 |
| Total Cluster | \$299 | 0.39 | 29 | 12 | 3.70 | 0.69 | 28 | 12 | \$80,814 | 0.57 | 37 | 13 |
| Publishing | 89 | 0.22 | 24 | 10 | 0.83 | 0.49 | 27 | 10 | 106,432 | 0.45 | 25 | 10 |
| Other Marketing-Related Services | 111 | 0.61 | 32 | 12 | 1.35 | 0.84 | 23 | 10 | 82,737 | 0.73 | 42 | 13 |
| Advertising-Related Services | 63 | 0.53 | 32 | 12 | 0.90 | 0.76 | 29 | 11 | 70,616 | 0.69 | 38 | 13 |
| Design Services | 36 | 0.65 | 29 | 11 | 0.63 | 0.72 | 31 | 12 | 57,325 | 0.90 | 21 | 6 |

Note: The subclusters are listed in order of per capita aggregate earnings in the nation.

* The rank is among the 51 “states” (including the District of Columbia) and the 15 comparison states.

^ The ratio is relative to the national average.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living adjustment uses the 2021 regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

Adjusted per capita aggregate earnings in Arizona in the IT cluster was 1 percent greater than the U.S. average in 2021, ranking 12th nationally but only eighth among the comparison states. Adjusted average earnings per worker was 16 percent below average, though ranking 12th nationally and sixth among the comparison states. Employment per capita was 21 percent above average, ranking 12th nationally and seventh among the comparison states.

Adjusted per capita aggregate earnings relative to the nation dropped in Arizona from 2011 through 2021 in the IT cluster. Per capita employment continued its long and substantial decline versus the nation through 2017 and adjusted average earnings in the IT cluster fell between 2019 and 2021. By 2022, per capita employment relative to the nation had rebounded somewhat but still was no higher than in 2015.

The IT cluster consists of eight subclusters. While the cluster's adjusted per capita aggregate earnings in 2021 in Arizona was marginally higher than the national average, the figure was below average in seven of the eight subclusters. In each of these seven subclusters, per capita employment was considerably below average; adjusted average earnings was below average in five (see Table 6). In contrast, in the semiconductor subcluster, Arizona's adjusted per capita aggregate earnings was 3.74 times the national average, ranking third in the nation. Per capita employment was 4.65 times the national average, but adjusted average earnings was 19 percent below average.

The IT cluster consists of 23 industries. The very high-paying industry of software publishers accounted for 46 percent of this cluster's aggregate earnings in 2021 in the nation. In this industry in Arizona, per capita employment was 31 percent less than the U.S. average and adjusted average earnings per worker was 20 percent less than the U.S. average. Adjusted per capita aggregate earnings was 45 percent below the U.S. average.

Arizona had little economic activity in the extremely high-paying industry of electronic computer manufacturing, which accounted for 14 percent of this cluster's aggregate earnings in 2021 in the nation. In this industry in Arizona, per capita employment was 92 percent less than the U.S. average and adjusted average earnings per worker was 69 percent less than the U.S. average. Adjusted per capita aggregate earnings was 97 percent below the U.S. average.

In contrast, Arizona was far above average in the very high-paying industry of semiconductor and related device manufacturing, which accounted for 15 percent of this cluster's aggregate earnings in 2021 in the nation. In this industry in Arizona, per capita employment was 5.0 times the U.S. average, but adjusted average earnings per worker was 20 percent less than the U.S. average. Adjusted per capita aggregate earnings was 4.0 times the U.S. average.

Among the other 20 industries in the cluster, adjusted per capita aggregate earnings in Arizona in 2021 was less than the U.S. average in 16; it was less than half of the average in 11 of these industries. Per capita employment was below average in 15 of these industries and less than half of the average in seven. Adjusted average earnings per worker was below average in 15 industries.

Arizona's relatively good showing on adjusted per capita aggregate earnings in the IT cluster in 2019 was based on very high per capita employment in just one industry, indicating that diversifying activities in this high-paying cluster would be advantageous. Further, the well below-average adjusted average earnings figure in the semiconductor industry indicates that Arizona's semiconductor activities are disproportionately tilted to lower-paying production, with disproportionately lesser activity in higher-paying occupations, such as research and development.

Education and Knowledge Creation

Based on aggregate earnings, education and knowledge creation was the nation's fifth-largest traded cluster in 2022, accounting for 5.5 percent of the traded total. It ranked fourth based on employment, with a share of 6.5 percent. Average earnings per worker was 15 percent less than the traded total.

Adjusted per capita aggregate earnings in Arizona in the education and knowledge creation cluster was far lower (51 percent) than the U.S. average in 2021, but did not rank as low at 30th nationally and 10th among the comparison states. Per capita employment accounted for 69 percent of the shortfall — it was 37 percent less than the U.S. average, ranking 32nd nationally and 10th among the comparison states. Adjusted average earnings was 21 percent below average, ranking 26th nationally and 11th among the comparison states.

Adjusted per capita aggregate earnings relative to the nation fluctuated in Arizona in a narrow range from 2008 through 2021 in the education and knowledge creation cluster.

The education and knowledge creation cluster consists of five subclusters. In the nation's largest (and highest paying) subcluster — research organizations — Arizona's adjusted per capita aggregate earnings in 2021 was 73 percent below average, due to very low per capita employment and low adjusted average earnings (see Table 7). Arizona also was far below average in the colleges, universities, and professional schools subcluster, which consists only of private-sector businesses.

The education and knowledge creation cluster consists of 16 industries. In the nation, three industries accounted for 83 percent of the cluster's aggregate earnings in 2021. The relatively low-paying private-sector universities industry was the largest in the cluster. Per capita employment in Arizona was 45 percent below average and adjusted average earnings per worker was 11 percent below average. Adjusted per capita aggregate earnings was 51 percent below the U.S. average.

The other two large industries were very high-paying research and development industries. In the R&D in the physical, engineering, and life sciences other than biotechnology and nanotechnology industry, per capita employment in Arizona was a very substantial 71 percent below the U.S. average and adjusted average earnings per worker was 14 percent below average, resulting in adjusted per capita aggregate earnings being 76 percent below average. In the R&D in biotechnology industry, per capita employment in Arizona was 65 percent below the U.S. average and adjusted average earnings per worker was 40 percent below average, resulting in adjusted per capita aggregate earnings being 79 percent below average.

TABLE 6
SUBCLUSTERS IN THE INFORMATION TECHNOLOGY AND ANALYTICAL INSTRUMENTS CLUSTER,
ARIZONA, 2021

| | Adjusted Per Capita Aggregate Earnings | | | | Employment Per 1,000 Residents | | | | Average Earnings Adjusted for the Cost of Living | | | |
|------------------------------------|---|--------|-------|----|-----------------------------------|--------|-------|----|---|--------|-------|----|
| | | | Rank* | | | | Rank* | | | | Rank* | |
| | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 |
| Total Cluster | \$889 | 1.01 | 12 | 8 | 5.22 | 1.21 | 12 | 7 | \$170,390 | 0.84 | 12 | 6 |
| Software Publishers | 220 | 0.55 | 19 | 8 | 1.16 | 0.69 | 19 | 8 | 190,604 | 0.80 | 21 | 8 |
| Semiconductors | 551 | 3.74 | 3 | 3 | 3.03 | 4.65 | 3 | 3 | 181,940 | 0.81 | 13 | 7 |
| Computers and Peripherals | 5 | 0.04 | 35 | 13 | 0.05 | 0.11 | 37 | 13 | 95,267 | 0.31 | 39 | 14 |
| Process and Laboratory Instruments | 57 | 0.76 | 20 | 7 | 0.41 | 0.69 | 27 | 8 | 139,035 | 1.09 | 5 | 3 |
| Electronic Components | 41 | 0.82 | 21 | 7 | 0.43 | 0.79 | 24 | 7 | 95,469 | 1.05 | 8 | 3 |
| Medical Apparatus | 10 | 0.25 | 26 | 11 | 0.09 | 0.35 | 26 | 11 | 110,879 | 0.74 | 31 | 8 |
| Audio and Visual Equipment | 3 | 0.22 | 28 | 12 | 0.03 | 0.54 | 24 | 11 | 87,350 | 0.41 | 40 | 12 |
| Software Reproducing | 1 | 0.24 | 24 | 10 | 0.01 | 0.38 | 26 | 9 | 109,879 | 0.64 | 26 | 11 |

TABLE 7
SUBCLUSTERS IN THE EDUCATION AND KNOWLEDGE CREATION CLUSTER, ARIZONA, 2021

| | Adjusted Per Capita Aggregate Earnings | | | | Employment Per 1,000 Residents | | | | Average Earnings Adjusted for the Cost of Living | | | |
|---|---|--------|-------|----|-----------------------------------|--------|-------|----|---|--------|-------|----|
| | | | Rank* | | | | Rank* | | | | Rank* | |
| | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 |
| Total Cluster | \$469 | 0.49 | 30 | 10 | 6.47 | 0.63 | 32 | 10 | \$72,524 | 0.79 | 26 | 11 |
| Research Organizations | 125 | 0.27 | 34 | 13 | 0.89 | 0.35 | 38 | 14 | 140,624 | 0.77 | 25 | 11 |
| Colleges, Universities & Professional Schools | 180 | 0.49 | 28 | 7 | 3.31 | 0.55 | 33 | 9 | 54,232 | 0.90 | 23 | 8 |
| Training Programs | 58 | 1.05 | 17 | 8 | 0.96 | 1.04 | 19 | 8 | 59,675 | 1.01 | 26 | 9 |
| Educational Support Services | 94 | 2.32 | 2 | 1 | 1.18 | 2.08 | 3 | 1 | 79,764 | 1.12 | 11 | 1 |
| Professional Organizations | 12 | 0.42 | 32 | 11 | 0.13 | 0.49 | 33 | 11 | 97,806 | 0.86 | 26 | 8 |

Note: The subclusters are listed in order of per capita aggregate earnings in the nation.

* The rank is among the 51 “states” (including the District of Columbia) and the 15 comparison states.

^ The ratio is relative to the national average.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living adjustment uses the 2021 regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

Among the other 13 industries in the cluster, adjusted average earnings per worker in Arizona in 2021 was below average in seven, per capita employment was below average in five, and adjusted per capita aggregate earnings was below average in eight.

Arizona's very poor performance on adjusted per capita aggregate earnings in the education and knowledge creation cluster in 2021 resulted primarily from very low per capita employment in each of the three largest industries. Low adjusted average earnings per worker in these industries also contributed.

Financial Services

Based on aggregate earnings, financial services was the nation's third-largest traded cluster in 2022, accounting for 8.5 percent of the traded total. It ranked seventh based on employment, with a share of 4.1 percent. Average earnings per worker was more than double the traded total, the highest of any cluster.

Adjusted per capita aggregate earnings in Arizona in the financial services cluster was 7 percent less than the U.S. average in 2021, but ranked 12th nationally and fourth among the comparison states. All of the shortfall was due to very low adjusted average earnings — 40 percent below average, ranking 44th nationally and 14th among the comparison states. In contrast, employment per capita was 55 percent above average, ranking fifth nationally and second among the comparison states. Adjusted per capita aggregate earnings relative to the nation increased in Arizona from 2008 through 2021, due largely to gains in Arizona's per capita employment. Adjusted average earnings during this period rose somewhat relative to the nation.

The financial services cluster consists of five subclusters, two of which are quite small (see Table 8). Adjusted per capita aggregate earnings in Arizona was considerably above the national average in the credit intermediation subcluster, with per capita employment 2.1 times the U.S. average but adjusted average earnings 16 percent below average. Adjusted per capita aggregate earnings in Arizona was 13 percent below average in the securities brokers, dealers, and exchanges subcluster, with per capita employment 1.57 times the U.S. average but adjusted average earnings 45 percent below average. Adjusted per capita aggregate earnings in Arizona was 64 percent below average in the financial investment activities subcluster, with per capita employment 22 percent less than the U.S. average and adjusted average earnings 54 percent below average.

The financial services cluster consists of 30 industries. In the nation, the three largest industries— portfolio management; securities brokerage; and investment banking and securities dealing — were extremely high paying and accounted for 48 percent of the cluster's aggregate earnings in 2021. Adjusted average earnings per worker in Arizona was at least 45 percent below average in each of these industries. Per capita employment in Arizona was far below the U.S. average in two of these industries, but was considerably above average in securities brokerage. Adjusted per capita aggregate earnings was below average in each of the three industries, including 83 percent below average in the largest industry of portfolio management and 71 percent below average in investment banking and securities dealing.

Three other industries — investment advice; real estate credit; and financial transactions processing, reserve, and clearinghouse activities — also were sizable nationally. Per capita employment in Arizona was above average in each of these three industries, but adjusted average earnings was below average, including shortfalls of 51 percent in the financial transactions industry and 38 percent in investment advice.

The top six industries accounted for 76 percent of the cluster’s aggregate earnings in 2021. Among the other 24 industries in the cluster, adjusted average earnings per worker in Arizona was below average in 18, per capita employment was below average in 16, and adjusted per capita aggregate earnings was below average in 18. The per capita figure in Arizona was less than half of the U.S. average in 12 industries based on employment and in 15 based on adjusted aggregate earnings. The industries in which Arizona was above average on a per capita basis were predominantly among the cluster’s lowest-paying industries.

Arizona’s below-average performance on adjusted per capita aggregate earnings in the financial services cluster in 2021 resulted primarily from very low adjusted average earnings per worker in five of the six largest industries. Per capita employment was low in two of the largest industries and very low in half of the 24 smaller industries. Low adjusted average earnings in the majority of these 24 industries also contributed. The large differential in adjusted average earnings in many industries indicates that the nature of the work performed in Arizona is much different from the national norm, requiring lesser skills and therefore paying lower wages.

Insurance Services

Insurance services was the nation’s ninth-largest traded cluster in 2022, accounting for 3.0 percent of the traded total based on aggregate earnings and 2.8 percent based on employment. Average earnings per worker was 10 percent more than the traded total.

Adjusted per capita aggregate earnings in Arizona in the insurance services cluster was 19 percent less than the U.S. average in 2021, ranking 27th nationally and fifth among the comparison states. Per capita employment was only 4 percent less than the U.S. average; adjusted average earnings per worker was 16 percent below average, ranking 41st nationally and 13th among the comparison states. Adjusted average earnings accounted for 83 percent of the shortfall in adjusted per capita aggregate earnings.

Relative to the nation, adjusted per capita aggregate earnings rose considerably in Arizona in the insurance services from 2008 through 2014 due to a gain in per capita employment. It rose only a little further after that.

The insurance services cluster consists of three subclusters, but one — insurance carriers — is dominant (see Table 9). Arizona’s adjusted per capita aggregate earnings in 2021 was 17 percent below average in the insurance carriers and insurance-related services subclusters. In the insurance carriers subcluster, adjusted average earnings was 14 percent below average (ranked 40th) and per capita employment was 3 percent below average. The shortfall in the insurance-related services subcluster was entirely due to adjusted average earnings being 25 percent below average (ranked 47th) — per capita employment was 10 percent above average. Arizona was far below average on per capita employment in the smaller reinsurance carriers subcluster.

**TABLE 8
SUBCLUSTERS IN THE FINANCIAL SERVICES CLUSTER, ARIZONA, 2021**

| | Adjusted Per Capita Aggregate Earnings | | | | Employment Per 1,000 Residents | | | | Average Earnings Adjusted for the Cost of Living | | | |
|-------------------------------------|---|--------|-------|----|-----------------------------------|--------|-------|----|---|--------|-------|----|
| | | | Rank* | | | | Rank* | | | | Rank* | |
| | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 |
| Total Cluster | \$1,398 | 0.93 | 12 | 4 | 10.34 | 1.55 | 5 | 2 | \$135,281 | 0.60 | 44 | 14 |
| Financial Investment Activities | 196 | 0.36 | 27 | 10 | 1.49 | 0.78 | 21 | 8 | 131,833 | 0.46 | 44 | 14 |
| Securities Brokers and Exchanges | 445 | 0.87 | 11 | 1 | 2.75 | 1.57 | 7 | 1 | 161,553 | 0.55 | 49 | 14 |
| Credit Intermediation | 748 | 1.77 | 5 | 3 | 6.03 | 2.10 | 4 | 2 | 124,014 | 0.84 | 30 | 12 |
| Credit Bureaus | 7 | 0.49 | 15 | 7 | 0.04 | 0.60 | 17 | 8 | 161,094 | 0.82 | 20 | 6 |
| Monetary Authorities – Central Bank | 2 | 0.18 | 27 | 11 | 0.02 | 0.25 | 27 | 11 | 112,742 | 0.73 | 39 | 15 |

**TABLE 9
SUBCLUSTERS IN THE INSURANCE SERVICES CLUSTER, ARIZONA, 2021**

| | Adjusted Per Capita Aggregate Earnings | | | | Employment Per 1,000 Residents | | | | Average Earnings Adjusted for the Cost of Living | | | |
|----------------------------|---|--------|-------|----|-----------------------------------|--------|-------|----|---|--------|-------|----|
| | | | Rank* | | | | Rank* | | | | Rank* | |
| | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 |
| Total Cluster | \$427 | 0.81 | 27 | 5 | 4.33 | 0.96 | 21 | 4 | \$98,747 | 0.84 | 41 | 13 |
| Insurance Carriers | 382 | 0.83 | 24 | 4 | 3.79 | 0.97 | 19 | 4 | 100,729 | 0.86 | 40 | 12 |
| Insurance-Related Services | 44 | 0.83 | 30 | 8 | 0.53 | 1.10 | 19 | 5 | 83,167 | 0.75 | 47 | 14 |
| Reinsurance Carriers | 2 | 0.12 | 33 | 9 | 0.01 | 0.11 | 34 | 11 | 163,903 | 1.01 | 16 | 3 |

Note: The subclusters are listed in order of per capita aggregate earnings in the nation.

* The rank is among the 51 “states” (including the District of Columbia) and the 15 comparison states.

^ The ratio is relative to the national average.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living adjustment uses the 2021 regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

The insurance services cluster consists of eight industries. Three industries in this cluster — direct property and casualty insurance carriers, direct health insurance carriers, and direct life insurance carriers — accounted for 81 percent of the cluster’s aggregate earnings in 2021 in the nation. Adjusted average earnings per worker in Arizona ranged from 9-to-21 percent below average in each of these three industries. Per capita employment in Arizona was 27 percent above average in the property/casualty insurance industry, with adjusted per capita aggregate earnings at the national average. Per capita employment was near average in the life insurance industry, with adjusted per capita aggregate earnings being 19 percent less than the U.S. average. In the health insurance industry, per capita employment was 61 percent below average and adjusted per capita aggregate earnings was 64 percent below average.

In the other five industries in the cluster, per capita employment in Arizona was below average in two. Adjusted average earnings per worker and adjusted per capita aggregate earnings were less than the U.S. average in three.

Arizona’s considerably below-average adjusted per capita aggregate earnings in the insurance services cluster in 2021 resulted primarily from low adjusted average earnings per worker, particularly in each of the three largest industries. The low adjusted average earnings in the insurance services cluster indicates that the job mix differs from the national average, tilted to occupations with lower wages and/or to less-experienced workers in other occupations. Very low per capita employment in the direct health insurance carriers also contributed to the cluster’s below-average adjusted per capita aggregate earnings.

Federal Government

Based on aggregate earnings, federal government was the nation’s fourth-largest traded cluster in 2022, accounting for 8.1 percent of the traded total. It ranked third based on employment, with a share of 9.0 percent. Average earnings per worker was 10 percent less than the traded total.

Adjusted per capita aggregate earnings in Arizona in the federal government cluster was 14 percent less than the U.S. average in 2021, ranking 28th nationally and ninth among the comparison states. Below-average per capita employment accounted for 93 percent of the shortfall. Adjusted per capita aggregate earnings relative to the nation rose in Arizona from 2009 through 2011 due to a gain in adjusted average earnings, but held steady after that.

The federal government cluster consists of only two subclusters. Arizona’s adjusted per capita aggregate earnings in 2021 was 12 percent below average in the civilian subcluster and 19 percent below average in the military subcluster, each primarily due to low per capita employment (see Table 10).

The federal government cluster consists of three industries. In Arizona in 2021, per capita employment was below the U.S. average in each of the three industries. The shortfall was least in the highest-paying and largest industry of federal civilian workers other than the Postal Service, which accounted for 68 percent of the cluster’s aggregate earnings. Adjusted average earnings per worker was near the U.S. average in each industry. Adjusted per capita aggregate earnings was 10 percent below average in the federal civilian workers other than the Postal Service

industry, 19 percent below average in the military industry, and 26 percent below average in the Postal Service industry.

Arizona's below-average adjusted per capita aggregate earnings in the federal government cluster in 2021 resulted from low per capita employment in each industry.

Distribution and Electronic Commerce

Distribution and electronic commerce was the nation's second-largest traded cluster in 2022, accounting for 11.0 percent of the traded total based on aggregate earnings and 12.5 percent based on employment. Average earnings per worker was 13 percent less than the traded total.

Adjusted per capita aggregate earnings in Arizona in the distribution and electronic commerce cluster was 5 percent less than the U.S. average in 2021, ranking 22nd nationally and eighth among the comparison states. All of the shortfall was due to low adjusted average earnings — 7 percent below average, ranking 34th nationally and 10th among the comparison states. Employment per capita was 3 percent above average, ranking 19th nationally and seventh among the comparison states.

Adjusted per capita aggregate earnings in the distribution and electronic commerce relative to the nation increased in Arizona from 2019 through 2021, due to a large gain in Arizona's per capita employment. Adjusted average earnings during this period fell relative to the nation.

The distribution and electronic commerce cluster consists of 26 subclusters. Adjusted per capita aggregate earnings in Arizona was above the national average in seven subclusters. Per capita employment was above average in each of these subclusters; adjusted average earnings was above average in five of the seven. In contrast, adjusted per capita aggregate earnings in Arizona was at least 40 percent below the national average in 10 subclusters.

Arizona statistics for the eight largest subclusters in the nation are shown in Table 11. Among these subclusters, Arizona's adjusted per capita aggregate earnings ranged from considerably above average in the wholesale of electrical and electronic goods subcluster to far below average in the wholesale trade agents and brokers subcluster.

The distribution and electronic commerce cluster consists of 60 industries. In the nation, seven industries each accounted for more than 5 percent of the cluster's aggregate earnings in 2021 and collectively accounted for 57 percent of the total. Most of these industries were relatively high paying, but the largest — general warehousing and storage — pays relatively low wages. Adjusted average earnings per worker in Arizona was below average in five of these industries; per capita employment was below the U.S. average in three. Adjusted per capita aggregate earnings was below average in three industries, including 47 percent below average in the second-largest industry of wholesale trade agents and brokers, but was more than 20 percent above average in four of the seven largest industries.

Among the other 53 industries in the cluster, adjusted average earnings per worker in Arizona was below average in 32, per capita employment was below average in 38, and adjusted per capita aggregate earnings was below average in 43.

TABLE 10
SUBCLUSTERS IN THE FEDERAL GOVERNMENT CLUSTER, ARIZONA, 2021

| | Adjusted Per Capita Aggregate Earnings | | | | Employment Per 1,000 Residents | | | | Average Earnings Adjusted for the Cost of Living | | | |
|---------------|--|------|-------|----|--------------------------------|------|-------|----|--|------|-------|----|
| | AZ | | Rank* | | AZ | | Rank* | | AZ | | Rank* | |
| | | | 51 | 15 | | | 51 | 15 | | | 51 | 15 |
| Total Cluster | \$1,242 | 0.86 | 28 | 9 | 12.93 | 0.87 | 32 | 11 | \$96,027 | 0.99 | 13 | 3 |
| Civilian | 985 | 0.88 | 26 | 7 | 8.06 | 0.89 | 25 | 7 | 122,121 | 0.98 | 13 | 5 |
| Military | 257 | 0.81 | 30 | 12 | 4.87 | 0.84 | 32 | 12 | 52,837 | 0.96 | 25 | 12 |

TABLE 11
LARGEST SUBCLUSTERS IN THE DISTRIBUTION AND ELECTRONIC COMMERCE CLUSTER, ARIZONA, 2021

| | Adjusted Per Capita Aggregate Earnings | | | | Employment Per 1,000 Residents | | | | Average Earnings Adjusted for the Cost of Living | | | |
|---|--|------|-------|----|--------------------------------|------|-------|----|--|------|-------|----|
| | AZ | | Rank* | | AZ | | Rank* | | AZ | | Rank* | |
| | | | 51 | 15 | | | 51 | 15 | | | 51 | 15 |
| Total Cluster | \$1,806 | 0.95 | 22 | 8 | 20.36 | 1.03 | 19 | 7 | \$88,695 | 0.93 | 34 | 10 |
| Wholesale, Professional & Comml Equipment | 350 | 1.15 | 8 | 4 | 2.20 | 1.05 | 14 | 6 | 159,221 | 1.10 | 8 | 2 |
| Warehousing and Storage | 328 | 1.19 | 13 | 3 | 6.71 | 1.31 | 10 | 2 | 48,827 | 0.90 | 48 | 14 |
| Wholesale Trade Agents & Brokers | 103 | 0.53 | 39 | 12 | 0.76 | 0.53 | 40 | 13 | 135,739 | 1.00 | 20 | 7 |
| Electronic and Catalog Shopping | 214 | 1.19 | 5 | 3 | 2.88 | 1.59 | 4 | 3 | 74,259 | 0.75 | 18 | 7 |
| Wholesale of Electrical Goods | 194 | 1.53 | 4 | 2 | 1.55 | 1.47 | 4 | 2 | 125,327 | 1.04 | 11 | 7 |
| Wholesale, Industrial Machinery & Equipment | 93 | 0.75 | 33 | 10 | 0.87 | 0.69 | 36 | 11 | 107,443 | 1.08 | 9 | 2 |
| Wholesale, Drugs & Sundries | 120 | 0.97 | 19 | 6 | 0.89 | 1.19 | 10 | 3 | 134,443 | 0.81 | 47 | 15 |
| Wholesale of Food Products | 66 | 0.91 | 19 | 7 | 0.76 | 0.94 | 21 | 10 | 86,714 | 0.97 | 21 | 4 |

Note: The subclusters are listed in order of per capita aggregate earnings in the nation.

* The rank is among the 51 “states” (including the District of Columbia) and the 15 comparison states.

^ The ratio is relative to the national average.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living adjustment uses the 2021 regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

Arizona's slightly below-average adjusted per capita aggregate earnings in the distribution and electronic commerce cluster in 2021 primarily resulted from below-average adjusted average earnings per worker in each of the five largest industries.

Transportation and Logistics

Based on aggregate earnings, transportation and logistics was the nation's eighth-largest traded cluster in 2022, accounting for 3.4 percent of the traded total. It ranked sixth based on employment, with a share of 4.1 percent. Average earnings per worker was 17 percent less than the traded total.

Adjusted per capita aggregate earnings in Arizona in the transportation and logistics cluster was 7 percent less than the U.S. average in 2021, ranking 29th nationally and eighth among the comparison states. All of the shortfall was due to below-average per capita employment — 7 percent below average, ranking 31st nationally and 10th among the comparison states. Adjusted average earnings per worker was equal to the U.S. average, ranking 23rd nationally and sixth among the comparison states.

Adjusted per capita aggregate earnings relative to the nation decreased in Arizona from 2011 through 2021 in the transportation and logistics cluster, largely due to a decline in adjusted average earnings, but per capita employment also slipped.

The transportation and logistics cluster consists of six subclusters. Adjusted per capita aggregate earnings and per capita employment in Arizona was greater than the national average in just one subcluster: air transportation (see Table 12). Adjusted average earnings was close to the U.S. average in five of the subclusters.

The transportation and logistics cluster consists of 18 industries. In the nation, the six largest industries accounted for 88 percent of the cluster's aggregate earnings in 2021. Adjusted average earnings per worker in Arizona was not far from the national average in any of these industries. Per capita employment and adjusted per capita aggregate earnings in Arizona were above the U.S. average in two of these industries: scheduled passenger air transportation and other support activities for air transportation.

Among the other 12 industries in the cluster, adjusted average earnings per worker in Arizona was below average in nine, per capita employment was below average in eight, and adjusted per capita aggregate earnings was below average in eight.

Arizona's below-average adjusted per capita aggregate earnings in the transportation and logistics cluster in 2021 primarily resulted from below-average per capita employment in four of the five largest industries.

Hospitality and Tourism

Based on aggregate earnings, hospitality and tourism was the nation's 10th-largest traded cluster in 2022, accounting for 2.7 percent of the traded total. It ranked fifth based on employment, with a share of 5.3 percent. Average earnings per worker was quite low at 48 percent less than the traded total, fourth lowest of the 53 traded clusters.

Adjusted per capita aggregate earnings in Arizona in the hospitality and tourism cluster was 7 percent higher than the U.S. average in 2021, ranking 14th nationally and sixth among the comparison states. Nearly all of the advantage relative to the U.S. average was due to above-average adjusted average earnings — 7 percent above average, ranking eighth nationally and fourth among the comparison states. Employment per capita was barely greater than the U.S. average, ranking 21st nationally and seventh among the comparison states.

Adjusted per capita aggregate earnings relative to the nation increased in Arizona from 2009 through 2018 in the hospitality and tourism cluster, but dropped from 2018 to 2021 back to the 2009 level. This pattern was largely due to adjusted average earnings. Per capita employment fell from nearly 20 percent above average in 2001 to slightly below average in 2022.

The hospitality and tourism cluster consists of seven subclusters. Arizona's adjusted per capita aggregate earnings in 2021 was considerably above average in two, near average in two, and considerably below average in the other three (see Table 13). In the largest subcluster, accommodations and related services, Arizona was slightly above average on adjusted per capita aggregate earnings, a result of above-average per capita employment but somewhat below-average adjusted average earnings. The next two-largest subclusters — spectator sports and tourism-related services — were largely responsible for the cluster's adjusted per capita aggregate earnings being above average. Tourism-related services includes such industries as travel agencies, tour operators, and scenic and sightseeing transportation.

The hospitality and tourism cluster consists of 31 industries. In the nation, the three largest industries— hotels and motels (except casino hotels); sports teams and clubs; and casino hotels — accounted for 59 percent of the cluster's aggregate earnings in 2021. Adjusted average earnings per worker in Arizona was below average in the very high-paying sports teams and clubs industry but above average in the two lodging industries. Per capita employment in Arizona was far below the U.S. average in the casino hotels industry, but was considerably above average in the other two. Adjusted per capita aggregate earnings was 58 percent above average in sports teams and clubs industry and 32 percent above average in the hotels and motels (except casino hotels) industry.

Among the other 28 industries in the cluster, adjusted average earnings per worker in Arizona was below average in 18, per capita employment was below average in 15, and adjusted per capita aggregate earnings was below average in 18.

Two industries are largely responsible for Arizona's above-average adjusted per capita aggregate earnings in the hospitality and tourism cluster: hotels and motels, and sports teams and clubs. In the latter industry, adjusted average earnings is quite high relative to all of the other hospitality and tourism industries.

**TABLE 12
SUBCLUSTERS IN THE TRANSPORTATION AND LOGISTICS CLUSTER, ARIZONA, 2021**

| | Adjusted Per Capita Aggregate Earnings | | | | Employment Per 1,000 Residents | | | | Average Earnings Adjusted for the Cost of Living | | | |
|-------------------------------|---|--------|-------|----|-----------------------------------|--------|-------|----|---|--------|-------|----|
| | | | Rank* | | | | Rank* | | | | Rank* | |
| | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 |
| Total Cluster | \$537 | 0.93 | 29 | 8 | 6.06 | 0.93 | 31 | 10 | \$88,584 | 1.00 | 23 | 6 |
| Air Transportation | 258 | 1.30 | 11 | 7 | 2.65 | 1.39 | 9 | 6 | 97,496 | 0.94 | 19 | 7 |
| Trucking | 148 | 0.77 | 32 | 9 | 1.90 | 0.75 | 31 | 9 | 77,861 | 1.03 | 32 | 6 |
| Ground Transportation Support | 69 | 0.71 | 28 | 10 | 0.91 | 0.75 | 25 | 9 | 76,200 | 0.95 | 35 | 9 |
| Rail Transportation | 44 | 0.68 | 39 | 9 | 0.42 | 0.65 | 42 | 10 | 102,829 | 1.05 | 22 | 9 |
| Specialty Air Transportation | 15 | 0.78 | 18 | 8 | 0.12 | 0.93 | 16 | 8 | 122,388 | 0.83 | 30 | 10 |
| Bus Transportation | 3 | 0.61 | 36 | 10 | 0.06 | 0.64 | 35 | 11 | 54,429 | 0.95 | 24 | 10 |

**TABLE 13
SUBCLUSTERS IN THE HOSPITALITY AND TOURISM CLUSTER, ARIZONA, 2021**

| | Adjusted Per Capita Aggregate Earnings | | | | Employment Per 1,000 Residents | | | | Average Earnings Adjusted for the Cost of Living | | | |
|--|---|--------|-------|----|-----------------------------------|--------|-------|----|---|--------|-------|----|
| | | | Rank* | | | | Rank* | | | | Rank* | |
| | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 | AZ | Ratio^ | 51 | 15 |
| Total Cluster | \$466 | 1.07 | 14 | 6 | 7.90 | 1.00 | 21 | 7 | \$59,020 | 1.07 | 8 | 4 |
| Accommodations and Related Services | 212 | 1.01 | 16 | 6 | 4.88 | 1.08 | 20 | 8 | 43,343 | 0.94 | 11 | 3 |
| Spectator Sports | 127 | 1.47 | 6 | 3 | 0.59 | 1.28 | 6 | 3 | 216,853 | 1.14 | 14 | 4 |
| Tourism-Related Services | 69 | 1.53 | 10 | 4 | 0.99 | 1.58 | 11 | 4 | 69,618 | 0.97 | 15 | 6 |
| Other Tourism Attractions | 31 | 0.94 | 26 | 9 | 0.79 | 0.83 | 33 | 12 | 38,895 | 1.13 | 9 | 2 |
| Cultural and Educational Entertainment | 21 | 0.79 | 28 | 6 | 0.41 | 0.84 | 29 | 7 | 50,729 | 0.95 | 12 | 4 |
| Amusement Parks and Arcades | 5 | 0.23 | 31 | 13 | 0.22 | 0.40 | 26 | 13 | 22,988 | 0.59 | 39 | 13 |
| Gambling Facilities | 1 | 0.09 | 44 | 13 | 0.02 | 0.06 | 44 | 13 | 81,913 | 1.63 | 6 | 2 |

Note: The subclusters are listed in order of per capita aggregate earnings in the nation.

* The rank is among the 51 “states” (including the District of Columbia) and the 15 comparison states.

^ The ratio is relative to the national average.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living adjustment uses the 2021 regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

ECONOMIC CLUSTERS BY METROPOLITAN AREA

This section focuses on data for 2019 from Lightcast’s second quarter 2021 data release. Prior research revealed that even after adjusting for the cost of living, various economic measures are positively correlated with metro size, as measured by population or employment.⁸ Due to the relationship between metro area size and economic activity, instead of comparing each metro area to the average of the 384 metro areas, each metro area is compared to a size-class average. Any number of size classes could be devised. For this analysis of clusters, the nation’s 384 metropolitan areas are grouped into six size classes by the number of workers in 2019. The selection of the size classes was based in part on natural breaks across the metro areas in the distribution of 2019 employment:

- 36 metro areas with employment of at least 1 million, accounting for less than 10 percent of the number of metro areas but 59 percent of the nation’s metro area employment. In this paper, this group is referred to as size class 1 or “SC1.”
- 45 metro areas with employment of between 350,000 and 999,999, accounting for 12 percent of metro areas and 16 percent of metro area employment. This is “SC2.”
- 48 metro areas with employment of between 200,000 and 349,999, accounting for 12.5 percent of metro areas but only 8.6 percent of metro area employment. This is “SC3.”
- 61 metro areas with employment of between 125,000 and 199,999, accounting for 16 percent of metro areas but only 6.7 percent of metro area employment. This is “SC4.”
- 71 metro areas with employment of between 75,000 and 124,999, accounting for 18.5 percent of metro areas but only 4.7 percent of metro area employment. This is “SC5.”
- 123 metro areas with employment of less than 75,000, accounting for 32 percent of metro areas but only 4.7 percent of metro area employment. This is “SC6.”

Arizona has seven metro areas:

- Metro Phoenix-Mesa-Chandler (Maricopa and Pinal counties), with 2019 employment of 2,372,262, ranked 12th in size among the 36 metro areas in size class 1. Its employment accounted for 72.2 percent of the state’s total.
- Metro Tucson (Pima County), with 2019 employment of 442,378, ranked 24th in size among the 45 metro areas in size class 2. Its employment accounted for 13.5 percent of the state’s total.
- Metro Yuma (Yuma County), with 2019 employment of 80,425, ranked 59th in size among the 71 metro areas in size class 5. Its employment accounted for 2.4 percent of the state’s total.
- Metro Prescott Valley-Prescott (Yavapai County), with 2019 employment of 76,629, ranked 62nd in size among the 71 metro areas in size class 5. Its employment accounted for 2.3 percent of the state’s total.
- Metro Flagstaff (Coconino County), with 2019 employment of 69,988, ranked 13th in size among the 123 metro areas in size class 6. Its employment accounted for 2.1 percent of the state’s total.

⁸ For example, see the May 2017 Office of the University Economist papers “The Geographic Distribution of Average Earnings Per Worker” and “Job Quality in the Metropolitan Areas of the United States,” available from <https://economist.asu.edu/>.

- Metro Lake Havasu City-Kingman (Mohave County), with 2019 employment of 58,865, ranked 53rd in size among the 123 metro areas in size class 6. Its employment accounted for 1.8 percent of the state's total.
- Metro Sierra Vista-Douglas (Cochise County), with 2019 employment of 43,742, ranked 97th in size among the 123 metro areas in size class 6. Its employment accounted for 1.3 percent of the state's total.

Size Class Comparisons

Table 14 compares the six size classes on various measures. On each measure, the value is highest in size class 1, second highest in SC2, and third highest in SC3. Thus there is a strong positive correlation with metro size.

In Table 15, adjusted per capita aggregate earnings are displayed by size class for the largest traded clusters in the nation. With the exception of the federal government cluster, each of the 10 largest traded clusters demonstrate a positive relationship with metro size. In contrast, smaller traded clusters infrequently display this relationship.

Metropolitan Phoenix, Size Class 1

Share of Activity

Based on employment, the traded clusters accounted for 30.8 percent of the total in Metro Phoenix in 2019; the percentage was less than the size-class average of 32.4 percent and ranked 29th among the 36 metro areas in size class 1. Metro Phoenix's shortfall was greater based on aggregate earnings, with its traded sector share of 40.1 percent well below the SC1 average of 46.5 percent; Metro Phoenix ranked 32nd.

The time series of the traded share of total activity in Metro Phoenix expressed as the difference from the size-class average is presented in Chart 3. The total traded share in Metro Phoenix was less than the SC1 average throughout the 2001-to-2020 period. Based on employment, the differential narrowed between 2006 and 2013 but then returned to near the 2007 differential. In contrast, based on aggregate earnings, the shortfall from the size-class average in Metro Phoenix was least in 2002 and greatest in 2020.

Per Capita Employment and Adjusted Per Capita Aggregate Earnings

In 2019, total employment per 1,000 residents in Metro Phoenix was 489, which was 6 percent less than the average of size class 1 and ranked 30th of the 36 metro areas in the size class (see Table 16). Metro Phoenix also ranked 30th on per capita total aggregate earnings after adjusting for the cost of living, with its figure of \$31,775 below the size-class average by 18 percent.

Metro Phoenix compared less favorably in 2019 among the traded clusters, with its total traded employment of 151 per 1,000 residents 11 percent less than the average of size class 1, ranked 30th. Metro Phoenix also ranked 30th on adjusted per capita traded aggregate earnings, with its figure of \$12,750 below the size-class average by 29 percent.

Ten traded clusters nationally each accounted for more than 3 percent of the traded total aggregate earnings in 2019. The same 10 clusters each accounted for more than 3 percent of the

TABLE 14
TRADED CLUSTER STATISTICS BY SIZE CLASS, 2019

| Size Class: Metro Area Employment | Share of Size Class Total | | Per Capita | | Average Earnings Per Worker* | Cost of Living |
|--------------------------------------|---------------------------|------------|------------------------|------------|------------------------------------|-------------------|
| | Aggregate Earnings* | Employment | Aggregate Earnings* | Employment | | |
| 1: At Least 1 Million | 46.5% | 32.4% | \$18,017 | 169 | \$106,482 | 105.7 |
| 2: 350,000 to 999,999 | 42.1 | 31.3 | 14,178 | 160 | 88,552 | 96.9 |
| 3: 200,000 to 349,999 | 39.4 | 30.0 | 11,468 | 142 | 80,889 | 96.8 |
| 4: 125,000 to 199,999 | 37.0 | 29.1 | 10,647 | 138 | 77,224 | 94.6 |
| 5: 75,000 to 124,999 | 37.4 | 28.7 | 10,570 | 137 | 77,396 | 94.3 |
| 6: Less Than 75,000 | 38.1 | 30.0 | 9,855 | 133 | 74,191 | 92.5 |

*Adjusted for regional differences in the cost of living.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost-of-living adjustment uses the 2019 regional price parity figures from the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

TABLE 15
COMPARISON OF SIZE CLASSES: ADJUSTED PER CAPITA AGGREGATE EARNINGS
IN THE LARGEST TRADED CLUSTERS, 2019*

| Traded Cluster | U.S. | Size Class | | | | | |
|---|---------|------------|---------|---------|---------|---------|---------|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| Business Services | \$3,579 | \$4,739 | \$2,978 | \$2,214 | \$1,558 | \$1,402 | \$1,063 |
| Distribution and Electronic Commerce | 1,659 | 1,833 | 1,442 | 1,127 | 930 | 860 | 785 |
| Federal Government | 1,339 | 1,299 | 1,708 | 1,401 | 1,294 | 1,506 | 1,716 |
| Financial Services | 1,190 | 1,796 | 882 | 453 | 375 | 359 | 222 |
| Education and Knowledge Creation | 829 | 1,101 | 764 | 605 | 370 | 320 | 324 |
| Information Technology and Analytical Instruments | 683 | 1,009 | 512 | 397 | 232 | 157 | 138 |
| Marketing, Design, and Publishing | 605 | 942 | 290 | 253 | 164 | 128 | 101 |
| Transportation and Logistics | 553 | 652 | 462 | 434 | 344 | 453 | 382 |
| Insurance Services | 509 | 565 | 774 | 344 | 272 | 345 | 131 |
| Hospitality and Tourism | 498 | 622 | 382 | 304 | 377 | 401 | 255 |
| Oil and Gas Production and Transportation | 303 | 255 | 215 | 197 | 252 | 716 | 208 |
| Construction Products and Services | 279 | 236 | 268 | 291 | 316 | 412 | 252 |
| Aerospace Vehicles and Defense | 267 | 329 | 274 | 418 | 159 | 77 | 80 |
| Automotive | 258 | 192 | 232 | 305 | 317 | 300 | 450 |
| Production Technology and Heavy Machinery | 253 | 174 | 290 | 214 | 431 | 298 | 406 |
| Food Processing and Manufacturing | 244 | 173 | 231 | 280 | 317 | 373 | 416 |
| Farming and Ranching | 185 | 58 | 145 | 217 | 318 | 231 | 328 |
| Plastics | 145 | 111 | 156 | 139 | 203 | 140 | 267 |

Notes:

- The clusters are listed in order of value in the nation in 2019.
- The highest and lowest values within a cluster are shaded.
- The size classes are based on total employment in 2019: (1) at least 1 million; (2) 350,000 to 999,999; (3) 200,000 to 349,999; (4) 125,000 to 199,999; (5) 75,000 to 124,999; (6) less than 75,000.

* Aggregate earnings are adjusted for regional differences in the cost of living.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost-of-living adjustment uses the 2019 regional price parity figures (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>) from the U.S. Department of Commerce, Bureau of Economic Analysis.

CHART 3
TRADED CLUSTER SHARE, METROPOLITAN PHOENIX LESS THE AVERAGE
OF SIZE CLASS 1, 2001 TO 2020*



* Measured as the percentage-point difference in the share.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School.

SC1 traded total, though the rank of the clusters differed slightly. In Metro Phoenix, the marketing, design, and publishing cluster had a share less than 3 percent and was replaced among the top 10 by the aerospace vehicles and defense cluster, which contributed 4.4 percent of the total. The nation’s 10 largest traded clusters accounted for nearly 74 percent of the national traded total aggregate earnings in 2019, with a higher share of nearly 81 percent in SC1. The share was almost 82 percent in Metro Phoenix. Thus, these large traded clusters were more heavily concentrated in the largest metro areas, including Phoenix, than in the rest of the nation. Substituting the aerospace vehicles and defense cluster for the marketing, design, and publishing cluster in Metro Phoenix, its 10 largest traded clusters accounted for 84 percent of the traded total aggregate earnings.

Among the 10 largest traded clusters nationally and in size class 1 in 2019, per capita employment in Metro Phoenix exceeded the size-class average in four — business services; financial services; information technology and analytical instruments; and insurance services — but adjusted per capita aggregate earnings was below average in all 10. Adjusted per capita aggregate earnings in Metro Phoenix was less than half the size-class average in the education and knowledge creation; marketing, design, and publishing; and federal government clusters. Despite the low adjusted per capita aggregate earnings figures, Metro Phoenix ranked above the middle of the 36 metro areas in three clusters and ranked among the bottom seven (roughly bottom 20 percent) only in the federal government cluster.

**TABLE 16
SELECTED CLUSTERS, METROPOLITAN PHOENIX, 2019**

| | Employment Per 1,000 Residents | | | Adjusted Per Capita Aggregate Earnings | | | Average Earnings Adjusted for the Cost of Living | | |
|---|--------------------------------|-------|---------|--|-------|---------|--|-------|---------|
| | Phoenix | Rank* | Ratio** | Phoenix | Rank* | Ratio** | Phoenix | Rank* | Ratio** |
| Total | 489.40 | 30 | 0.94 | \$31,775.4 | 30 | 0.82 | \$64,928 | 30 | 0.88 |
| Total Traded | 150.91 | 30 | 0.89 | 12,750.4 | 30 | 0.71 | 84,490 | 31 | 0.79 |
| Total Nontraded | 338.49 | 29 | 0.96 | 19,024.9 | 28 | 0.92 | 56,206 | 26 | 0.96 |
| 10 Largest Traded Clusters in U.S. & SC1:^ | | | | | | | | | |
| Business Services | 41.61 | 12 | 1.07 | 3,407.1 | 28 | 0.72 | 81,889 | 35 | 0.67 |
| Distribution and Electronic Commerce | 19.87 | 21 | 0.95 | 1,687.2 | 21 | 0.92 | 84,913 | 19 | 0.97 |
| Financial Services | 12.92 | 4 | 1.46 | 1,435.5 | 11 | 0.80 | 111,149 | 34 | 0.55 |
| Information Tech and Analytical Instruments | 5.77 | 9 | 1.03 | 896.2 | 9 | 0.89 | 155,255 | 7 | 0.87 |
| Federal Government | 7.93 | 30 | 0.61 | 621.6 | 32 | 0.48 | 78,420 | 29 | 0.79 |
| Transportation and Logistics | 7.15 | 18 | 0.95 | 589.8 | 19 | 0.90 | 82,507 | 21 | 0.96 |
| Hospitality and Tourism | 9.67 | 15 | 0.84 | 582.9 | 13 | 0.94 | 60,290 | 12 | 1.11 |
| Insurance Services | 5.37 | 16 | 1.07 | 469.1 | 21 | 0.83 | 87,406 | 35 | 0.78 |
| Education and Knowledge Creation | 7.25 | 22 | 0.58 | 460.5 | 27 | 0.42 | 63,468 | 28 | 0.72 |
| Marketing, Design, and Publishing | 4.60 | 26 | 0.60 | 298.1 | 29 | 0.32 | 64,829 | 33 | 0.53 |
| Others Among Top 10 in Metro Phoenix:^ | | | | | | | | | |
| Aerospace Vehicles and Defense | 4.43 | 7 | 1.83 | 556.7 | 8 | 1.69 | 125,640 | 21 | 0.92 |
| Selected Other Traded Clusters:^^ | | | | | | | | | |
| Downstream Metal Products | 1.51 | 11 | 1.44 | 119.4 | 10 | 1.61 | 78,916 | 5 | 1.12 |
| Farming and Ranching | 1.54 | 16 | 1.28 | 80.0 | 15 | 1.39 | 51,871 | 10 | 1.08 |
| Metal Mining | 0.55 | 1 | 19.73 | 63.6 | 1 | 20.82 | 114,559 | 10 | 1.06 |
| Furniture | 1.16 | 8 | 1.49 | 61.6 | 9 | 1.40 | 53,275 | 31 | 0.94 |
| Agricultural Inputs and Services | 0.46 | 13 | 0.97 | 23.7 | 13 | 1.19 | 51,081 | 3 | 1.23 |

* The rank is among the 36 metropolitan areas in size class 1.

** The ratio is relative to the average of size class 1.

^ Based on adjusted per capita aggregate earnings.

^^ Those with higher adjusted per capita aggregate earnings in Metro Phoenix than the size-class average.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living uses the 2019 regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

In addition to the 10 largest traded clusters nationally and in SC1, Table 16 presents the Metro Phoenix data for 2019 for each of the other traded clusters in which adjusted per capita aggregate earnings was above the size-class average — just six of the 53 traded clusters. Of these six, only aerospace vehicles and defense contributed at least 1 percent of the traded total aggregate earnings in Metro Phoenix. Metro Phoenix ranked among the top seven metro areas only in metal mining (ranked first). Per capita employment was greater than the SC1 average in 12 of the 53 traded clusters.

Adjusted Average Earnings Per Worker

The larger deficits in Metro Phoenix in 2019 versus the size-class average based on adjusted per capita aggregate earnings than on per capita employment, overall and in most clusters, indicates that average earnings per worker adjusted for the cost of living was lower in Metro Phoenix than the SC1 average. In 2019, overall adjusted average earnings per worker was \$64,928 in Metro Phoenix, 12 percent less than the adjusted size-class average and seventh lowest among the 36 metro areas. For the traded total, adjusted average earnings per worker in 2019 was \$84,490 in Metro Phoenix, 21 percent less than the size-class average.

The time series of average earnings per worker adjusted for the cost of living in Metro Phoenix expressed as a percentage of the adjusted size-class average is shown in Chart 4. The series begins in 2008 since this was the first year of cost-of-living estimates. The Metro Phoenix percentage of the size-class average did not change much between 2008 and 2020 overall or for the traded total.

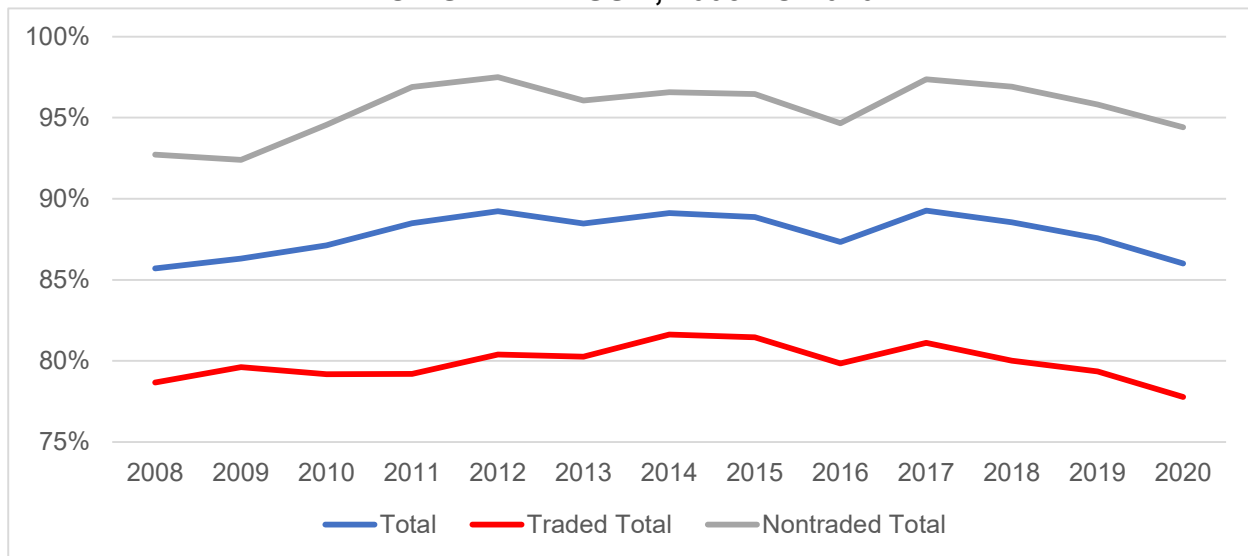
Among the 10 largest traded clusters in the size class, adjusted average earnings in Metro Phoenix was higher than the size-class average only in the low-paying tourism cluster. The shortfall exceeded 20 percent in six of the top 10 traded clusters and included ranks of 35th in business services, 34th in financial services, 33rd in marketing, design, and publishing, and 35th in insurance services. Adjusted average earnings was greater than the SC1 average in only 11 of the 53 traded clusters.

Of the six clusters in which adjusted per capita aggregate earnings in Metro Phoenix exceeded the size-class average, adjusted average earnings per worker was greater than the overall traded cluster average in only two: aerospace vehicles and defense and metal mining. Adjusted average earnings per worker was between 37-and-40 percent below the overall traded cluster average in the agricultural inputs and services; farming and ranching; and furniture clusters.

Comparison to Size Class 2

In many regards, Metro Phoenix, whose 2019 employment was 2.37 million, is more similar to metro areas in size class 2 — those with employment between 350,000 and 999,999 — than to the large metro areas in size class 1. Total traded per capita aggregate earnings adjusted for the cost of living in Metro Phoenix in 2019 was 10 percent less than the average of size class 2. Per capita employment was 6 percent below, and adjusted average earnings was 5 percent below, the SC2 average. The traded cluster shares of total employment and total aggregate earnings also were less than the SC2 average. On each of these measures, the figure for Metro Phoenix was higher than the average of size class 3.

CHART 4
AVERAGE EARNINGS PER WORKER ADJUSTED FOR THE COST OF LIVING,
METROPOLITAN PHOENIX AS A PERCENTAGE OF THE AVERAGE
OF SIZE CLASS 1, 2008 TO 2020



Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living uses the regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

Detail for Selected Clusters

An in-depth analysis for Metro Phoenix at the industry level was undertaken in seven of the 10 largest traded clusters (in the nation and in SC1). The distribution and electronic commerce; transportation and logistics; and hospitality and tourism clusters were not examined in detail since Metro Phoenix was not far below average on the per capita measures, and average earnings per worker nationally was not particularly high, in these clusters in 2019.

Business services. This cluster consists of eight subclusters and 33 industries. Though per capita employment in this cluster was 7 percent above the SC1 average in Metro Phoenix in 2019, adjusted average earnings per worker was 33 percent below average, second lowest in the size class. Adjusted per capita aggregate earnings was 28 percent below average, ninth lowest.

In size class 1, five high-paying industries — corporate, subsidiary, and regional managing offices; custom computer programming services; computer systems design services; engineering services; and management consulting — accounted for 73 percent of the cluster’s aggregate earnings in 2019. Adjusted average earnings per worker in Metro Phoenix was below average in each of these industries, ranking among the bottom eight of the 36 metro areas in four industries. Per capita employment in Metro Phoenix was below the SC1 average in each of these industries, by at least 25 percent in four industries. Adjusted per capita aggregate earnings was below average in each of the five industries, by between 26-and-54 percent. The greatest shortfall was in the largest and highest paying of these five industries: corporate, subsidiary, and regional managing offices.

Among the other 28 industries in the cluster, adjusted average earnings per worker in Metro Phoenix was below average in 23, per capita employment was below average in 15, and adjusted per capita aggregate earnings was below average in 19. The adjusted per capita aggregate earnings figure was less than half of the SC1 average in seven of the 28 industries. The industries in which Metro Phoenix was above average on a per capita basis were primarily among the cluster's lowest-paying industries.

Thus, Metro Phoenix's poor performance on adjusted per capita aggregate earnings in 2019 in the business services cluster resulted primarily from subpar adjusted average earnings per worker and per capita employment in each of the five largest industries. Low adjusted average earnings in the majority of the other industries also contributed.

Financial services. This cluster consists of five subclusters and 30 industries. Though per capita employment in this cluster in Metro Phoenix in 2019 was 46 percent above the SC1 average and ranked fourth, adjusted average earnings per worker was 45 percent below average, third lowest in the size class. Adjusted per capita aggregate earnings was 20 percent below average, but ranked 11th.

In size class 1, four extremely high-paying industries — portfolio management; securities brokerage; investment banking and securities dealing; and investment advice — accounted for 64 percent of the cluster's aggregate earnings in 2019. Adjusted average earnings per worker in Metro Phoenix was at least 42 percent below average in each of these industries, each ranking between lowest and sixth lowest of the 36 metro areas. Per capita employment in Metro Phoenix was far below the SC1 average in two of these industries, but was considerably above average in one. Adjusted per capita aggregate earnings was below average in each of the four industries, including 89 percent below average in the largest industry of portfolio management, 78 percent below average in investment banking and securities dealing; and 44 percent below average in the investment advice industry.

Among the other 26 industries in the cluster, adjusted average earnings per worker in Metro Phoenix was below average in 22, per capita employment was below average in 17, and adjusted per capita aggregate earnings was below average in 18. The per capita figure in Metro Phoenix was less than half of the SC1 average in 13 industries based on employment and in 15 based on adjusted aggregate earnings. The industries in which Metro Phoenix was above average on a per capita basis were predominantly among the cluster's lowest-paying industries.

Thus, Metro Phoenix's poor performance on adjusted per capita aggregate earnings in the financial services cluster in 2019 resulted primarily from very low adjusted average earnings per worker in each of the four largest industries. Very low per capita employment in half of the other industries also contributed, as did low adjusted average earnings in the majority of the other industries.

Federal government. This cluster consists of two subclusters and three industries. In Metro Phoenix in 2019, per capita employment was 39 percent less than the SC1 average, the seventh-lowest figure among the 36 metro areas. Adjusted average earnings per worker was 21 percent

below average, eighth lowest in the size class. Adjusted per capita aggregate earnings was 52 percent below average, fifth lowest in the size class.

In Metro Phoenix in 2019, per capita employment was 54 percent below the size-class average and fifth lowest in the size class in the highest-paying and largest industry of federal civilian workers other than the Postal Service, which accounted for 75 percent of the cluster's aggregate earnings. Combined with adjusted average earnings per worker of 11 percent below average, adjusted per capita aggregate earnings was 59 percent below average. Metro Phoenix ranked among the bottom five metro areas on both of the per capita measures.

In the moderate-paying Postal Service industry, per capita employment in Metro Phoenix was 26 percent below average but adjusted average earnings per worker was near average, resulting in adjusted per capita aggregate earnings 28 percent below average. Metro Phoenix ranked fifth lowest on both of the per capita measures. In the low-paying military industry, per capita employment in Metro Phoenix was 21 percent below average and adjusted average earnings per worker was 19 percent below average, resulting in adjusted per capita aggregate earnings 36 percent below average.

Thus, Metro Phoenix's very poor performance on adjusted per capita aggregate earnings in the federal government cluster in 2019 resulted primarily from low per capita employment in each industry, particularly in the largest and highest-paying industry, but below-average adjusted average earnings per worker also contributed.

Education and knowledge creation. This cluster consists of five subclusters and 16 industries. Per capita employment in this cluster was 42 percent below the SC1 average in Metro Phoenix in 2019, but ranked 22nd. Adjusted average earnings per worker was 28 percent below average, ninth lowest. Adjusted per capita aggregate earnings was 58 percent below average, 10th lowest in the size class.

In size class 1, three industries accounted for 82 percent of the cluster's aggregate earnings in 2019. In the two very high-paying research and development industries of biotechnology; and physical, engineering, and life sciences other than biotechnology and nanotechnology, per capita employment in Metro Phoenix was approximately 77 percent below the SC1 average and adjusted average earnings per worker was more than one-fourth below average, resulting in adjusted per capita aggregate earnings being more than 80 percent below average. In the latter industry, Metro Phoenix ranked among the bottom six metro areas on each of the per capita measures. The somewhat low-paying private-sector universities industry was the largest industry in the cluster. Per capita employment in Metro Phoenix was 44 percent below average and adjusted average earnings per worker was 16 percent below average. Adjusted per capita aggregate earnings was 53 percent below the SC1 average.

Among the other 13 industries in the cluster, adjusted average earnings per worker in Metro Phoenix in 2019 was below average in eight, per capita employment was below average in eight, and adjusted per capita aggregate earnings was below average in 10.

Thus, Metro Phoenix's very poor performance on adjusted per capita aggregate earnings in the education and knowledge creation cluster in 2019 resulted primarily from very low per capita employment in each of the three largest industries. Low adjusted average earnings per worker in these industries also contributed, as did low per capita employment and low adjusted average earnings in the majority of the other industries.

Information technology and analytical instruments. This cluster consists of eight subclusters and 23 industries. Though per capita employment in this cluster was 3 percent above the SC1 average in Metro Phoenix in 2019, adjusted average earnings per worker was 13 percent below average. Adjusted per capita aggregate earnings was 11 percent below average, but ranked ninth in the size class.

The very high-paying industry of software publishers accounted for 41 percent of this cluster's aggregate earnings in 2019 in SC1. In this industry in Metro Phoenix, per capita employment was 64 percent less than the SC1 average and adjusted average earnings per worker was 22 percent less than the size-class average. Adjusted per capita aggregate earnings was 72 percent below the SC1 average.

Metro Phoenix had almost no economic activity in the extremely high-paying industry of electronic computer manufacturing, which accounted for 16 percent of this cluster's aggregate earnings in 2019 in SC1. In this industry in Metro Phoenix, per capita employment was 98 percent less than the SC1 average and adjusted average earnings per worker was 72 percent less than the size-class average, each ranking among the bottom eight metro areas. Adjusted per capita aggregate earnings was 99 percent below the SC1 average, but was only sixth lowest.

In contrast, Metro Phoenix was far above average in the very high-paying industry of semiconductor and related device manufacturing, which accounted for 17 percent of this cluster's aggregate earnings in 2019 in SC1. In this industry in Metro Phoenix, per capita employment was 4.7 times the SC1 average, fourth highest, but adjusted average earnings per worker was 13 percent less than the size-class average. Adjusted per capita aggregate earnings was 4.1 times the SC1 average.

Among the other 20 industries in the cluster, adjusted per capita aggregate earnings in Metro Phoenix in 2019 was less than the SC1 average in 17; it was less than half of the average in 13 of these industries. Per capita employment was below average in 16 of these industries and less than half of the average in 12. Adjusted average earnings per worker was below average in 15 industries. Except for the semiconductor machinery manufacturing industry, those industries in which Metro Phoenix was above average were relatively low paying.

Thus, Metro Phoenix's below-average performance on adjusted per capita aggregate earnings in the information technology and analytical instruments cluster in 2019 would have been much worse if not for semiconductor manufacturing. In most of the other industries, per capita employment was less than half the SC1 average and adjusted average earnings per worker was below average.

Marketing, design, and publishing. This cluster consists of four subclusters and 22 industries. Per capita employment in this cluster was 40 percent below the SC1 average in Metro Phoenix in 2019. Adjusted average earnings per worker was 47 percent below average, fourth lowest in the size class. Adjusted per capita aggregate earnings was 68 percent below average, eighth lowest.

The very high-paying industry of Internet publishing and broadcasting and Web search portals accounted for 38 percent of this cluster's aggregate earnings in 2019 in SC1. In this industry in Metro Phoenix, per capita employment was 55 percent less than the SC1 average and adjusted average earnings per worker was 64 percent less than the size-class average, seventh lowest. Adjusted per capita aggregate earnings were 84 percent less than the SC1 average.

Two other moderately high-paying industries each accounted for 13 percent of the cluster's aggregate earnings in SC1. In the advertising agencies industry in Metro Phoenix, per capita employment was only half of the SC1 average and adjusted average earnings per worker was 30 percent below average, sixth lowest. Adjusted per capita aggregate earnings was 65 percent below the SC1 average. In the marketing consulting industry in Metro Phoenix, per capita employment was 18 percent less than the SC1 average and adjusted average earnings per worker was 25 percent below average, fourth lowest. Adjusted per capita aggregate earnings in Metro Phoenix was 38 percent below the SC1 average.

In each of the other 19 industries in the cluster, adjusted per capita aggregate earnings in Metro Phoenix was less than the SC1 average; it was less than half of the average in 13 of these industries. Per capita employment and adjusted average earnings per worker each was below average in all but two of these industries in Metro Phoenix; average earnings per worker ranked among the bottom seven metro areas in seven industries.

Thus, Metro Phoenix's very poor performance on adjusted per capita aggregate earnings in the marketing, design, and publishing cluster in 2019 resulted both from low per capita employment and low adjusted average earnings per worker in nearly all of the industries, including the three largest.

Insurance services. This cluster consists of three subclusters and eight industries. Though per capita employment in this cluster was 7 percent above the SC1 average in Metro Phoenix in 2019, adjusted average earnings per worker was 22 percent below average, second lowest in the size class. Adjusted per capita aggregate earnings was 17 percent below average.

Three industries in this cluster — direct life insurance carriers, direct health insurance carriers, and direct property and casualty insurance carriers — accounted for 80 percent of the cluster's aggregate earnings in 2019 in SC1. Adjusted average earnings per worker in Metro Phoenix was between 23-and-26 percent below average in each of these three industries; on each Metro Phoenix ranked among the bottom six metro areas. Per capita employment in Metro Phoenix was above average in the life insurance and property/casualty insurance industries, resulting in adjusted per capita aggregate earnings being only 7-to-10 percent less than the SC1 average in these two industries. In the health insurance industry, per capita employment was 40 percent below average and adjusted per capita aggregate earnings was 55 percent below average.

In each of the other five industries in the cluster, adjusted average earnings per worker in Metro Phoenix was less than or equal to the SC1 average. Per capita employment was above average in four of these industries and adjusted per capita aggregate earnings was above average in two of these industries.

Thus, Metro Phoenix's below-average performance on adjusted per capita aggregate earnings in the insurance services cluster in 2019 resulted primarily from low adjusted average earnings per worker, particularly in each of the three largest industries.

Summary of these seven large traded clusters. Low per capita employment and low adjusted average earnings per job are roughly equally responsible for the low adjusted per capita aggregate earnings in Metro Phoenix in 2019, though the relative importance of these factors varied by cluster. In some of the clusters, Metro Phoenix compared particularly poorly in the largest and highest-paying industries. In industries with a very low adjusted average earnings per worker figure relative to the size-class average, the nature of the work performed in Metro Phoenix must be different from the norm. The typical occupation in Metro Phoenix likely is different from the norm, tilted to lower-paying occupations. For example, a manufacturing facility in Metro Phoenix may consist largely of lower-paid production workers, while a facility in the same industry in another metro area may include a broader range of functions, such as high-paid research and development.

Metropolitan Tucson, Size Class 2

Share of Activity

The traded clusters accounted for 27.7 percent of the total employment in Metro Tucson in 2019, less than the size-class average of 31.3 percent. Metro Tucson ranked 39th among the 45 metro areas in size class 2. Metro Tucson's shortfall was not as great based on aggregate earnings, with its traded cluster share of 38.9 percent below the SC2 average of 42.1 percent; Metro Tucson ranked 33rd.

The time series of the traded share of total activity in Metro Tucson expressed as the difference from the size-class average is presented in Chart 5. The total traded share in Metro Tucson was less than the SC2 average throughout the 2001-to-2020 period based on both employment and aggregate earnings. The shortfalls became smaller after 2011.

Per Capita Employment and Adjusted per capita aggregate Earnings

In 2019, total employment per 1,000 residents in Metro Tucson was 424, which was 17 percent less than the average of size class 2 and ranked second lowest of the 45 metro areas in the size class (see Table 17). Metro Tucson ranked 42nd on per capita total aggregate earnings after adjusting for the cost of living, with its figure of \$25,164 below the size-class average by 25 percent.

Metro Tucson compared less favorably in 2019 among the traded clusters, with its total traded employment of 117 per 1,000 residents 27 percent less than the average of size class 2, last in the size class. Metro Tucson ranked 43rd on adjusted per capita traded aggregate earnings, with its figure of \$9,790 below the size-class average by 31 percent.

CHART 5
TRADED CLUSTER SHARE, METROPOLITAN TUCSON LESS THE AVERAGE
OF SIZE CLASS 2, 2001 TO 2020*



* Measured as the percentage-point difference in the share.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School.

Ten traded clusters nationally each accounted for more than 3 percent of the traded total aggregate earnings in 2019. Each of these clusters ranked in the top 10 in size class 2, though the rank order was somewhat different. In Metro Tucson, the marketing, design, and publishing cluster ranked 14th and was replaced among the top 10 by the aerospace vehicles and defense cluster, which contributed 19.9 percent of the traded total, second only to the federal government cluster. The nation’s 10 largest traded clusters accounted for nearly 74 percent of the national traded total aggregate earnings in 2019; the share was 72 percent in SC2 and 68 percent in Metro Tucson. Substituting the aerospace vehicles and defense cluster for the marketing, design, and publishing cluster in Metro Tucson, its 10 largest traded clusters accounted for nearly 87 percent of the traded total aggregate earnings, indicating an unusually strong concentration in its largest traded clusters.

Among the 10 largest traded clusters nationally and in size class 2 in 2019, per capita employment in Metro Tucson exceeded the size-class average in three — federal government; information technology and analytical instruments; and hospitality and tourism. Adjusted per capita aggregate earnings was above average in the first two of these clusters. In contrast, adjusted per capita aggregate earnings in Metro Tucson was less than half the size-class average in five of the 10 largest clusters.

Adjusted per capita aggregate earnings in Metro Tucson was greater than the size-class average in 2019 in just five of the 53 traded clusters. Table 17 displays the other three traded clusters with an above-average figure; each accounted for more than 1 percent of the metro area’s total

**TABLE 17
SELECTED CLUSTERS, METROPOLITAN TUCSON, 2019**

| | Employment Per 1,000 Residents | | | Adjusted Per Capita Aggregate Earnings | | | Average Earnings Adjusted for the Cost of Living | | |
|---|--------------------------------|-------|---------|--|-------|---------|--|-------|---------|
| | Tucson | Rank* | Ratio** | Tucson | Rank* | Ratio** | Tucson | Rank* | Ratio** |
| Total | 423.88 | 44 | 0.83 | \$25,164.2 | 42 | 0.75 | \$59,366 | 43 | 0.90 |
| Total Traded | 117.39 | 45 | 0.73 | 9,790.0 | 43 | 0.69 | 83,397 | 30 | 0.94 |
| Total Nontraded | 306.49 | 43 | 0.87 | 15,374.2 | 43 | 0.79 | 50,162 | 42 | 0.90 |
| 10 Largest Traded Clusters in U.S. & SC2:^ | | | | | | | | | |
| Federal Government | 20.45 | 12 | 1.06 | 1,966.9 | 11 | 1.15 | 96,199 | 9 | 1.09 |
| Business Services | 28.73 | 19 | 1.00 | 1,808.5 | 42 | 0.61 | 62,941 | 44 | 0.61 |
| Information Tech and Analytical Instruments | 4.47 | 16 | 1.13 | 648.5 | 13 | 1.27 | 145,125 | 7 | 1.12 |
| Distribution and Electronic Commerce | 9.39 | 43 | 0.52 | 593.7 | 44 | 0.41 | 63,199 | 44 | 0.79 |
| Hospitality and Tourism | 9.58 | 14 | 1.06 | 353.3 | 18 | 0.93 | 36,866 | 18 | 0.87 |
| Financial Services | 3.08 | 37 | 0.52 | 348.0 | 40 | 0.39 | 113,115 | 32 | 0.76 |
| Transportation and Logistics | 3.78 | 32 | 0.63 | 288.0 | 33 | 0.62 | 76,237 | 18 | 0.99 |
| Education and Knowledge Creation | 3.85 | 40 | 0.36 | 264.4 | 33 | 0.35 | 68,636 | 16 | 0.96 |
| Insurance Services | 3.09 | 36 | 0.45 | 256.5 | 36 | 0.33 | 82,895 | 41 | 0.74 |
| Marketing, Design, and Publishing | 2.01 | 41 | 0.52 | 125.3 | 41 | 0.43 | 62,269 | 35 | 0.83 |
| Others Among Top 10 in Metro Tucson:^ | | | | | | | | | |
| Aerospace Vehicles and Defense | 13.40 | 2 | 6.50 | 1,952.3 | 2 | 7.23 | 145,648 | 6 | 1.10 |
| Selected Other Traded Clusters^^: | | | | | | | | | |
| Metal Mining | 1.75 | 1 | 17.04 | 187.4 | 1 | 15.74 | 107,056 | 8 | 0.92 |
| Electric Power Generation and Transmission | 1.11 | 8 | 1.90 | 166.1 | 9 | 1.66 | 149,570 | 34 | 0.88 |

* The rank is among the 45 metropolitan areas in size class 2.

** The ratio is relative to the average of size class 2.

^ Based on adjusted per capita aggregate earnings.

^^ Those with higher adjusted per capita aggregate earnings in Metro Tucson than the size-class average.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living uses the 2019 regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

traded aggregate earnings in 2019. Metro Tucson ranked first in the size class on metal mining and second on aerospace vehicles and defense. Metro Tucson’s per capita employment figure was greater than the size-class average in seven of the 53 traded clusters.

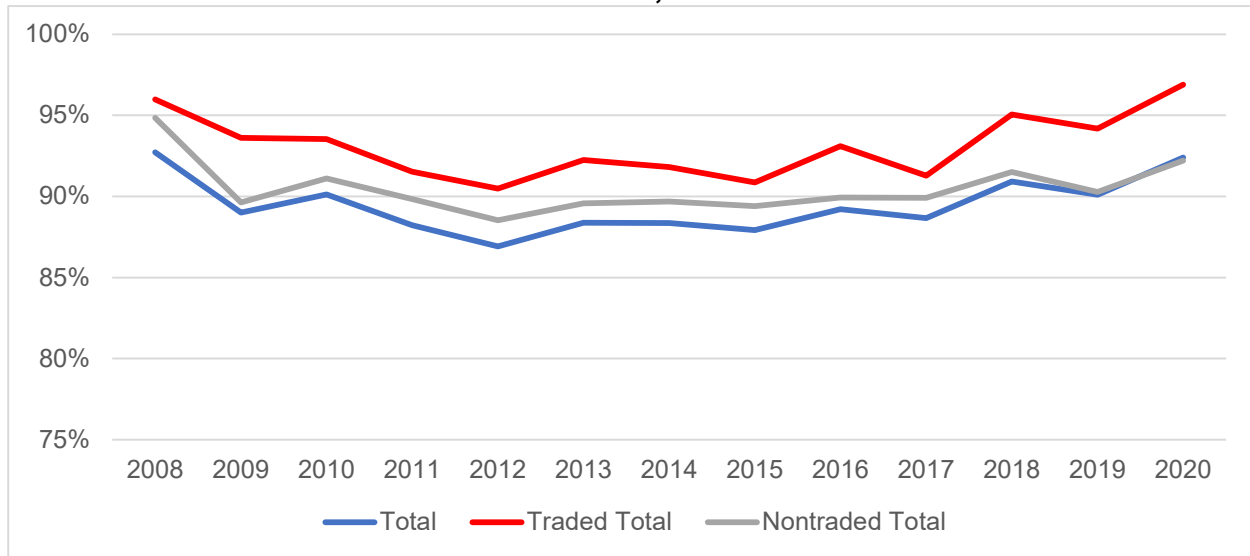
Adjusted Average Earnings Per Worker

Average earnings per worker adjusted for the cost of living was 10 percent lower in Metro Tucson in 2019 than the SC2 average overall, the third lowest in the size class. Adjusted average earnings per worker in 2019 for the traded total was 6 percent less than the adjusted size-class average in Metro Tucson and ranked 30th.

The time series of average earnings per worker adjusted for the cost of living in Metro Tucson expressed as a percentage of the adjusted size-class average is shown in Chart 6. The Metro Tucson percentage slipped between 2008 and 2012 overall and for the traded total, but rose between 2017 and 2020.

Among the 10 largest traded clusters in the size class, adjusted average earnings in Metro Tucson was higher than the size-class average in 2019 in the federal government and information technology and analytical instruments clusters. The shortfall exceeded 20 percent in five of the

**CHART 6
AVERAGE EARNINGS PER WORKER ADJUSTED FOR THE COST OF LIVING,
METROPOLITAN TUCSON AS A PERCENTAGE OF THE AVERAGE
OF SIZE CLASS 2, 2008 TO 2020**



Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living uses the regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

top 10 traded clusters and included ranks of 44th in business services, 44th in distribution and electronic commerce, and 41st in insurance services. Adjusted average earnings in Metro Tucson exceeded the SC2 average in 11 of the 53 traded clusters.

Detail for Selected Clusters

Metro Tucson in 2019 had very low per capita employment (at least 48 percent below the size-class average) and low adjusted average earnings per worker (at least 17 percent below average) in four of the 10 largest traded clusters:

- Distribution and Electronic Commerce
- Financial Services
- Insurance Services
- Marketing, Design, and Publishing

This suggests that not only is employment in these activities below the average of similarly sized metro areas, but the nature of the work also is below average in quality, resulting in subpar adjusted average earnings per worker.

Per capita employment was considerably below average in the transportation and logistics cluster and in the education and knowledge creation cluster, but adjusted average earnings per worker was near the size-class average. In the hospitality and tourism cluster, per capita employment was a little above average and adjusted average earnings was not far below average.

Business services, the largest traded cluster nationally and in SC2, is of more interest since per capita employment in Metro Tucson in 2019 was average but adjusted average earnings per worker was 39 percent below average. This cluster is examined in detail below, along with the three traded clusters in which per capita activity and average earnings were greater than the SC2 average:

- Aerospace Vehicles and Defense
- Federal Government
- Information Technology and Analytical Instruments

Business services. This cluster consists of eight subclusters and 33 industries. Though per capita employment in this cluster was equal to the SC2 average in Metro Tucson in 2019, adjusted average earnings per worker was 39 percent below average, second lowest in the size class. Adjusted per capita aggregate earnings also was 39 percent below average, fourth lowest.

In size class 2, six high-paying industries — corporate, subsidiary, and regional managing offices; engineering services; computer system design; custom computer programming services; management consulting; and data processing, hosting, and related services — accounted for 76 percent of the cluster’s aggregate earnings in 2019. Per capita employment in Metro Tucson was below the SC2 average by at least 20 percent in each of these industries, and by at least 80 percent in two industries, including corporate, subsidiary, and regional managing offices, which provided 35 percent of the cluster’s aggregate earnings in SC2 and which had the third highest adjusted average earnings per worker of the cluster’s 33 industries.

Adjusted average earnings per worker in Metro Tucson was below average in four of these industries, ranking among the bottom five of the 45 metro areas in the corporate, subsidiary, and

regional managing offices; and management consulting industries. Adjusted per capita aggregate earnings was below average in each of the six industries, by more than 50 percent in four. The greatest shortfall (91 percent below average) was in corporate, subsidiary, and regional managing offices.

Among the other 27 industries in the cluster, adjusted per capita aggregate earnings was above average in Metro Tucson in only five. Three of these industries — telemarketing bureaus and other contact centers; professional employer organizations; and translation and interpretation services — were of considerable size in Metro Tucson, ranking among the top four metro areas in the size class. However, each of these three industries was very low paying, with adjusted average earnings per worker well below the size-class average. Adjusted average earnings per worker in Metro Tucson was above average in five of the 27 industries and per capita employment was above average in eight.

Thus, Metro Tucson's poor performance in 2019 in the business services cluster on adjusted per capita aggregate earnings resulted primarily from below-average per capita employment in each of the six largest industries, along with below-average per capita employment in most of the other industries and subpar adjusted average earnings per worker in most industries.

Federal government. This cluster consists of two subclusters and three industries. In Metro Tucson in 2019, per capita employment was 6 percent more than the SC2 average, the 12th-highest figure among the 45 metro areas. Adjusted average earnings per worker was 9 percent above average, ranked ninth. Adjusted per capita aggregate earnings was 15 percent above average, ranked 11th.

In Metro Tucson in 2019, per capita employment was 30 percent above the size-class average, ranked 10th, in the highest-paying and largest industry of federal civilian workers other than the Postal Service, which accounted for 61 percent of the cluster's aggregate earnings in the size class. Combined with adjusted average earnings per worker of 3 percent above average, adjusted per capita aggregate earnings was 34 percent above average, ranked 11th

In the moderate-paying Postal Service industry, per capita employment in Metro Tucson in 2019 was 30 percent below average, and adjusted per capita aggregate earnings 34 percent below average, each ranking 40th. In the lower-paying military industry, per capita employment in Metro Tucson was 9 percent below average and adjusted per capita aggregate earnings was 7 percent below average, though Metro Tucson ranked 12th and 11th respectively.

Thus, Metro Tucson's above-average performance on adjusted per capita aggregate earnings in the federal government cluster in 2019 resulted primarily from above-average per capita employment in the largest industry.

Aerospace vehicles and defense. This cluster consists of three subclusters and seven industries. Per capita employment and adjusted average earnings per worker in this cluster was far above the SC2 average in Metro Tucson in 2019, and adjusted average earnings per worker was somewhat above average. The superior figures in Metro Tucson were predominantly due to one industry: guided missile and space vehicle manufacturing. The approximately 13,000 employees

in this industry accounted for 93 percent of the cluster total. The vast majority of the workers are employed by one company: Raytheon Technologies.

Of the other six industries, the per capita figures in Metro Tucson were above average only in search, detection, navigation, guidance, aeronautical, and nautical system and instrument manufacturing. However, employment in this industry was less than 300 in 2019. Thus, the strong performance of Metro Tucson on adjusted per capita aggregate earnings in the aerospace vehicles and defense cluster was very highly due to the activities of one company.

Information technology and analytical instruments. This cluster consists of eight subclusters and 23 industries. Per capita employment in this cluster was 13 percent above the SC2 average in Metro Tucson in 2019, ranked 16th in the size class. Adjusted average earnings per worker was 12 percent above average and ranked seventh. Adjusted per capita aggregate earnings was 27 percent above average and ranked 13th.

The high-paying industry of software publishers accounted for 31 percent of this cluster's aggregate earnings in 2019 in SC2. In this industry in Metro Tucson, per capita employment was 49 percent more than the SC2 average, ranked eighth. Adjusted average earnings per worker was 7 percent less than the size-class average but ranked 21st. Adjusted per capita aggregate earnings was 38 percent above the SC2 average, ranked seventh.

Metro Tucson also was above average in the high-paying industry of semiconductor and related device manufacturing, which accounted for 17 percent of this cluster's aggregate earnings in 2019 in SC2. In this industry in Metro Tucson, per capita employment was 29 percent higher than the SC2 average, 10th highest, and adjusted average earnings per worker was 15 percent above the size-class average, ranked ninth. Adjusted per capita aggregate earnings was 47 percent more than the SC2 average.

In the size class's next two largest industries, Metro Tucson compared less favorably, with almost no activity in the computer terminal and other computer peripheral equipment manufacturing industry. Per capita employment was a little above average in the instruments and related products manufacturing for measuring, displaying, and controlling industrial process variables industry but adjusted average earnings per worker was 40 percent below average.

Among the other 19 industries in the cluster, adjusted per capita aggregate earnings in Metro Tucson in 2019 was less than the SC2 average in 16; it was less than half of the average in 14 of these industries. Two of the three industries in which Metro Tucson was above average were modest in size, but the analytical laboratory instrument manufacturing industry provided more employment and aggregate earnings than the semiconductor manufacturing industry. Metro Tucson ranked second in the size class on all three measures in the analytical laboratory instrument manufacturing industry, with the per capita figures far above average and adjusted average earnings per worker 34 percent above average.

Thus, Metro Tucson's strong performance on adjusted per capita aggregate earnings in the information technology and analytical instruments cluster in 2019 was due to three disparate

high-paying industries: software publishing, analytical laboratory instrument manufacturing, and semiconductor and related device manufacturing.

Metropolitan Prescott, Size Class 5

Share of Activity

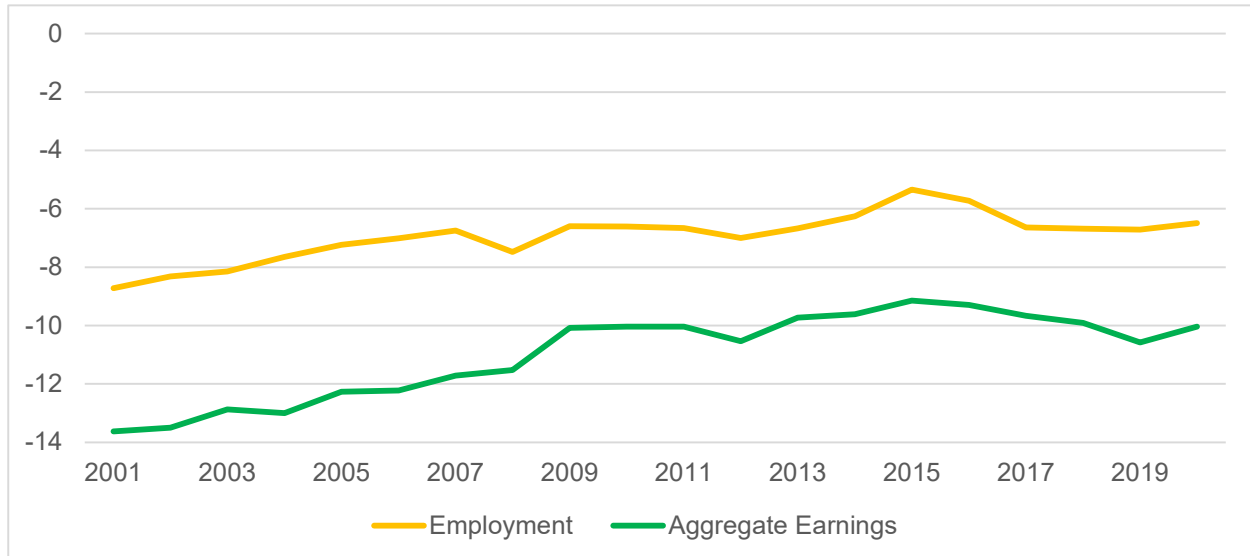
The traded clusters accounted for 21.9 percent of the total employment in Metro Prescott in 2019, less than the size-class average of 28.7 percent. Metro Prescott ranked 56th among the 71 metro areas in size class 5. Metro Prescott’s shortfall was somewhat greater based on aggregate earnings, with its traded cluster share of 26.8 percent less than the SC5 average of 37.4 percent; Metro Prescott ranked 58th.

The time series of the traded share of total activity in Metro Prescott expressed as the difference from the size-class average is presented in Chart 7. In each year throughout the 2001-to-2020 period, based on both employment and aggregate earnings, the total traded share was lower in Metro Prescott than the SC5 average. An upward trend was present through 2015.

Per Capita Employment and Adjusted Per Capita Aggregate Earnings

In 2019, total employment per 1,000 residents in Metro Prescott was 330, which was 31 percent less than the average of size class 5 and ranked third lowest of the 71 metro areas in the size class (see Table 18). Metro Prescott ranked second lowest on per capita total aggregate earnings after

**CHART 7
TRADED CLUSTER SHARE, METROPOLITAN PRESCOTT LESS THE AVERAGE
OF SIZE CLASS 5, 2001 TO 2020***



* Measured as the percentage-point difference in the share.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School.

**TABLE 18
SELECTED CLUSTERS, METROPOLITAN PRESCOTT, 2019**

| | Employment Per 1,000 Residents | | | Adjusted Per Capita Aggregate Earnings | | | Average Earnings Adjusted for the Cost of Living | | |
|--|--------------------------------|-------|---------|--|-------|---------|--|-------|---------|
| | Prescott | Rank* | Ratio** | Prescott | Rank* | Ratio** | Prescott | Rank* | Ratio** |
| Total | 330.43 | 69 | 0.69 | \$16,533.2 | 70 | 0.58 | \$50,035 | 69 | 0.84 |
| Total Traded | 72.46 | 70 | 0.53 | 4,431.7 | 70 | 0.42 | 61,160 | 64 | 0.79 |
| Total Nontraded | 257.97 | 65 | 0.76 | 12,101.5 | 66 | 0.68 | 46,910 | 63 | 0.90 |
| Large Traded Clusters in U.S. & SC5^: | | | | | | | | | |
| Federal Government | 8.72 | 33 | 0.48 | 797.4 | 28 | 0.53 | 91,468 | 13 | 1.11 |
| Hospitality and Tourism | 14.88 | 15 | 1.44 | 565.0 | 14 | 1.41 | 37,978 | 12 | 0.98 |
| Business Services | 6.59 | 68 | 0.40 | 481.0 | 68 | 0.34 | 72,996 | 55 | 0.85 |
| Distribution and Electronic Commerce | 4.66 | 65 | 0.38 | 298.9 | 66 | 0.35 | 64,081 | 50 | 0.91 |
| Financial Services | 1.30 | 66 | 0.39 | 125.7 | 68 | 0.35 | 96,453 | 50 | 0.90 |
| Transportation and Logistics | 1.88 | 63 | 0.30 | 120.5 | 63 | 0.27 | 64,097 | 61 | 0.88 |
| Insurance Services | 0.27 | 66 | 0.07 | 22.3 | 63 | 0.06 | 82,407 | 41 | 0.88 |
| Large Traded Clusters in U.S.^ | | | | | | | | | |
| Education and Knowledge Creation | 7.07 | 18 | 1.27 | 272.7 | 24 | 0.85 | 38,553 | 61 | 0.67 |
| Information Tech and Analytical Instruments | 0.98 | 28 | 0.60 | 80.9 | 33 | 0.51 | 82,447 | 53 | 0.86 |
| Marketing, Design, and Publishing | 1.66 | 38 | 0.78 | 79.1 | 45 | 0.62 | 47,562 | 63 | 0.80 |
| Large Traded Clusters in SC5^^ | | | | | | | | | |
| Construction Products and Services | 1.93 | 44 | 0.44 | 139.6 | 46 | 0.34 | 72,155 | 53 | 0.77 |
| Food Processing and Manufacturing | 1.19 | 56 | 0.23 | 51.6 | 58 | 0.14 | 43,375 | 64 | 0.61 |
| Oil and Gas Production and Transportation | 0.07 | 44 | 0.01 | 6.4 | 47 | 0.01 | 95,138 | 41 | 0.70 |
| Others Among Top 10 in Metro Prescott:# | | | | | | | | | |
| Automotive | 1.92 | 26 | 0.54 | 120.2 | 27 | 0.40 | 62,693 | 39 | 0.75 |
| Selected Other Traded Clusters##: | | | | | | | | | |
| Metal Mining | 4.35 | 2 | 25.91 | 459.2 | 2 | 21.93 | 105,547 | 6 | 0.85 |
| Aerospace Vehicles and Defense | 1.24 | 14 | 1.63 | 104.9 | 16 | 1.36 | 84,436 | 30 | 0.83 |
| Recreational and Small Electric Goods | 0.99 | 14 | 1.70 | 51.8 | 18 | 1.30 | 52,368 | 38 | 0.76 |
| Performing Arts | 1.47 | 17 | 1.23 | 39.0 | 22 | 1.02 | 26,562 | 46 | 0.83 |
| Video Production and Distribution | 0.19 | 19 | 1.34 | 8.9 | 23 | 1.17 | 47,503 | 44 | 0.87 |
| Jewelry and Precious Metals | 0.16 | 8 | 2.37 | 7.3 | 11 | 2.02 | 45,535 | 24 | 0.85 |

(continued)

TABLE 18 (continued)
SELECTED CLUSTERS, METROPOLITAN PRESCOTT, 2019

* The rank is among the 71 metropolitan areas in size class 5.

** The ratio is relative to the average of size class 5.

^ Ranked in the top 10 in each geography based on adjusted per capita aggregate earnings.

^^ Ranked in the top 10 in the nation but not in SC5 based on adjusted per capita aggregate earnings.

^^^ Ranked in the top 10 in SC5 but not in the nation based on adjusted per capita aggregate earnings.

Based on adjusted per capita aggregate earnings.

Those with higher adjusted per capita aggregate earnings in Metro Prescott than the size-class average.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living uses the 2019 regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

adjusting for the cost of living, with its figure of \$16,533 below the size-class average by 42 percent.

Metro Prescott compared less favorably in 2019 among the traded clusters, with its total traded employment of 72 per 1,000 residents 47 percent less than the average of size class 5, second lowest in the size class. Metro Prescott also ranked second lowest on adjusted per capita traded aggregate earnings, with its figure of \$4,432 less than the size-class average by 58 percent.

Ten traded clusters nationally each accounted for more than 3 percent of the traded total aggregate earnings in 2019. Only seven of these clusters ranked in the top 10 in size class 5. Education and knowledge creation; information technology and analytical instruments; and marketing, design, and publishing ranked lower, replaced by oil and gas production and transportation; construction products and services; and food processing and manufacturing. The top 10 in Metro Prescott differed from both the national top 10 and the SC5 top 10. It included seven of the nation's top 10 (rank in parentheses) — federal government (first); hospitality and tourism (second); business services (third); distribution and electronic commerce (fifth); education and knowledge creation (sixth); financial services (eighth); and transportation and logistics (ninth). Just one of the three additional clusters in the top 10 of SC5 — construction products and services (seventh) — was in Metro Prescott's top 10. Also in the top 10 in Metro Prescott were metal mining (fourth) and automotive (10th).

The nation's 10 largest traded clusters accounted for nearly 74 percent of the national traded total aggregate earnings in 2019; the share was only 56 percent in SC5 and 64 percent in Metro Prescott. The share was 65 percent in SC5 based on its top 10 and 76 percent in Metro Prescott based on its top 10.

Among the 13 traded clusters ranked among the top 10 nationally and/or in size class 5 in 2019, per capita employment in Metro Prescott exceeded the size-class average in only two — education and knowledge creation, and hospitality and tourism. Adjusted per capita aggregate earnings was above average only in hospitality and tourism. In contrast, adjusted per capita aggregate earnings in Metro Prescott was less than half the size-class average in eight of these 13 clusters.

Adjusted per capita aggregate earnings in Metro Prescott was greater than the size-class average in 2019 in just seven of the 53 traded clusters. Table 18 displays these clusters; Metro Prescott ranked second in the size class on metal mining; it accounted for 10 percent of all traded cluster aggregate earnings. Hospitality and tourism, which ranked 14th in Metro Prescott among the 71 metro areas in the size class, accounted for 13 percent of all traded cluster aggregate earnings. Per capita employment was greater than the size-class average in 11 of the 53 traded clusters.

Adjusted Average Earnings Per Worker

Average earnings per worker adjusted for the cost of living was 16 percent lower in Metro Prescott in 2019 than the SC5 average overall, the third lowest in the size class. The shortfall was larger for the traded total at 21 percent, eighth lowest in the size class. A slight uptrend was present between 2008 and 2019 in total traded adjusted average earnings in Metro Prescott relative to the size-class average.

Among the 13 traded clusters ranked among the top 10 nationally and/or in size class 5 in 2019, adjusted average earnings in Metro Prescott was higher than the size-class average only in the federal government cluster. The shortfall exceeded 20 percent in four of these 13 traded clusters; the rank was 50th or worse in nine. Adjusted average earnings in Metro Prescott was higher than the size-class average only in two of the 53 traded clusters.

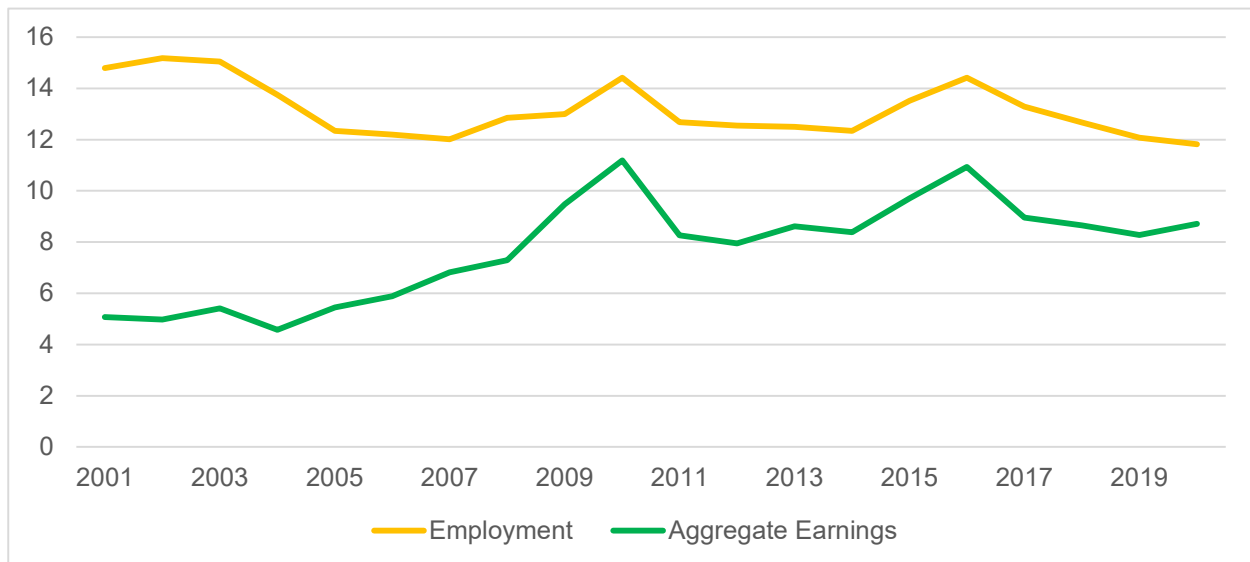
Metropolitan Yuma, Size Class 5

Share of Activity

The traded clusters accounted for a high 40.7 percent of the total employment in Metro Yuma in 2019, greater than the size-class average of 28.7 percent. Metro Yuma ranked fourth among the 71 metro areas in size class 5. Metro Yuma was not as far above average based on aggregate earnings, with its traded cluster share of 45.7 percent greater than the SC5 average of 37.4 percent; Metro Yuma ranked 11th.

The time series of the traded share of total activity in Metro Yuma expressed as the difference from the size-class average is presented in Chart 8. In each year throughout the 2001-to-2020 period, based on both employment and aggregate earnings, the total traded share was higher in Metro Yuma than the SC5 average. Based on employment, Metro Yuma relative to the size-class

CHART 8
TRADED CLUSTER SHARE, METROPOLITAN YUMA LESS THE AVERAGE
OF SIZE CLASS 5, 2001 TO 2020*



* Measured as the percentage-point difference in the share.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School.

average fell between 2003 and 2006 and has fluctuated without trend since. Based on aggregate earnings, Metro Yuma relative to the size-class average rose between 2001 and 2010 and has fluctuated without trend since.

Per Capita Employment and Adjusted Per Capita Aggregate Earnings

In 2019, total employment per 1,000 residents in Metro Yuma was 394, which was 17 percent less than the average of size class 5 and ranked eighth lowest of the 71 metro areas in the size class (see Table 19). Metro Yuma also ranked eighth lowest on per capita total aggregate earnings after adjusting for the cost of living, with its figure of \$22,014 below the size-class average by 22 percent.

Metro Yuma compared much more favorably in 2019 among the traded clusters, with its total traded employment of 161 per 1,000 residents 18 percent more than the average of size class 5, ranking 18th in the size class. Metro Yuma's adjusted per capita traded aggregate earnings was below average by 5 percent.

Ten traded clusters nationally each accounted for more than 3 percent of the traded total aggregate earnings in 2019. Only seven of these clusters ranked in the top 10 in size class 5. Education and knowledge creation; information technology and analytical instruments; and marketing, design, and publishing ranked lower, replaced by oil and gas production and transportation; construction products and services; and food processing and manufacturing. The top 10 in Metro Yuma differed from both the national top 10 and the SC5 top 10. It included six of the nation's top 10 (rank in parentheses) — federal government (first); business services (fourth); distribution and electronic commerce (fifth); transportation and logistics (sixth); hospitality and tourism (ninth); and insurance services (10th). Two of the three additional clusters in the top 10 of SC5 — construction products and services (seventh) and food processing and manufacturing (eighth) — were in Metro Yuma's top 10. Also in the top 10 in Metro Yuma were agricultural inputs and services (second) and farming and ranching (third).

The nation's 10 largest traded clusters accounted for nearly 74 percent of the national traded total aggregate earnings in 2019; the share was only 56 percent in SC5 and 59 percent in Metro Yuma. The share was 65 percent in SC5 based on its top 10 and a high 91 percent in Metro Yuma based on its top 10.

Among the 13 traded clusters ranked among the top 10 nationally and/or in size class 5 in 2019, per capita employment in Metro Yuma exceeded the size-class average in only two — federal government by a wide margin and transportation and logistics by a small amount. Adjusted per capita aggregate earnings was above average only in the federal government cluster. In contrast, adjusted per capita aggregate earnings in Metro Yuma was less than half the size-class average in nine of these 13 clusters.

Adjusted per capita aggregate earnings in Metro Yuma was greater than the size-class average in 2019 in just five of the 53 traded clusters. Table 18 displays these clusters; Metro Yuma ranked first in the size class in agricultural inputs and services and second on farming and ranching. Combined, these two agricultural clusters were one of two dominant economic activities in Metro Yuma, accounting for 31 percent of all traded aggregate earnings. The other dominant

**TABLE 19
SELECTED CLUSTERS, METROPOLITAN YUMA, 2019**

| | Employment Per 1,000 Residents | | | Adjusted Per Capita Aggregate Earnings | | | Average Earnings Adjusted for the Cost of Living | | |
|--|--------------------------------|-------|---------|--|-------|---------|--|-------|---------|
| | Yuma | Rank* | Ratio** | Yuma | Rank* | Ratio** | Yuma | Rank* | Ratio** |
| Total | 394.37 | 64 | 0.83 | \$22,014.1 | 64 | 0.78 | \$55,821 | 49 | 0.94 |
| Total Traded | 160.59 | 18 | 1.18 | 10,050.3 | 36 | 0.95 | 62,582 | 63 | 0.81 |
| Total Nontraded | 233.78 | 69 | 0.69 | 11,963.8 | 68 | 0.68 | 51,176 | 40 | 0.98 |
| Large Traded Clusters in U.S. & SC5^: | | | | | | | | | |
| Federal Government | 40.57 | 6 | 2.23 | 3,738.3 | 6 | 2.48 | 92,138 | 12 | 1.11 |
| Business Services | 15.56 | 37 | 0.95 | 870.9 | 59 | 0.62 | 55,977 | 69 | 0.65 |
| Distribution and Electronic Commerce | 6.06 | 58 | 0.50 | 459.5 | 57 | 0.53 | 75,864 | 19 | 1.08 |
| Transportation and Logistics | 6.69 | 23 | 1.07 | 298.4 | 44 | 0.66 | 44,595 | 70 | 0.61 |
| Hospitality and Tourism | 5.49 | 50 | 0.53 | 169.9 | 45 | 0.42 | 30,932 | 29 | 0.80 |
| Insurance Services | 2.26 | 20 | 0.61 | 165.0 | 22 | 0.48 | 73,102 | 57 | 0.78 |
| Financial Services | 0.71 | 71 | 0.21 | 60.9 | 71 | 0.17 | 85,529 | 57 | 0.80 |
| Large Traded Clusters in U.S. ^^ | | | | | | | | | |
| Education and Knowledge Creation | 1.01 | 66 | 0.18 | 81.8 | 57 | 0.26 | 81,000 | 10 | 1.41 |
| Marketing, Design, and Publishing | 0.64 | 67 | 0.30 | 38.3 | 64 | 0.30 | 60,294 | 23 | 1.01 |
| Information Tech and Analytical Instruments | 0.01 | 70 | 0.01 | 1.4 | 70 | 0.01 | 125,752 | 11 | 1.31 |
| Large Traded Clusters in SC5^ | | | | | | | | | |
| Construction Products and Services | 2.45 | 35 | 0.56 | 179.5 | 38 | 0.44 | 73,153 | 49 | 0.78 |
| Food Processing and Manufacturing | 2.80 | 34 | 0.53 | 177.6 | 34 | 0.48 | 63,376 | 33 | 0.90 |
| Oil and Gas Production and Transportation | 0.11 | 36 | 0.02 | 12.7 | 35 | 0.02 | 115,413 | 27 | 0.84 |
| Others Among Top 10 in Metro Yuma: # | | | | | | | | | |
| Agricultural Inputs and Services | 44.14 | 1 | 18.58 | 1,859.7 | 1 | 17.28 | 42,136 | 33 | 0.93 |
| Farming and Ranching | 20.98 | 2 | 4.60 | 1,264.9 | 2 | 5.47 | 60,289 | 8 | 1.19 |
| Selected Other Traded Clusters##: | | | | | | | | | |
| Upstream Chemical Products | 1.45 | 4 | 2.25 | 113.8 | 8 | 1.21 | 78,437 | 39 | 0.54 |
| Textile Manufacturing | 1.49 | 8 | 3.63 | 71.9 | 10 | 2.77 | 48,165 | 27 | 0.76 |

(continued)

TABLE 19 (continued)
SELECTED CLUSTERS, METROPOLITAN YUMA, 2019

* The rank is among the 71 metropolitan areas in size class 5.

** The ratio is relative to the average of size class 5.

^ Ranked in the top 10 in each geography based on adjusted per capita aggregate earnings.

^^ Ranked in the top 10 in the nation but not in SC5 based on adjusted per capita aggregate earnings.

^^^ Ranked in the top 10 in SC5 but not in the nation based on adjusted per capita aggregate earnings.

Based on adjusted per capita aggregate earnings.

Those with higher adjusted per capita aggregate earnings in Metro Yuma than the size-class average.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living uses the 2019 regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

activity was the federal government, accounting for 37 percent of all traded aggregate earnings. Much of the federal government activity is tied to the international border or the military. Per capita employment was greater than the size-class average in eight of the 53 traded clusters.

Adjusted Average Earnings Per Worker

Average earnings per worker adjusted for the cost of living was only 6 percent lower in Metro Yuma in 2019 than the SC5 average overall, ranking 49th among the 71 metro areas in the size class. The shortfall for the traded total was greater at 19 percent, ninth lowest in the size class. A slight uptrend was present between 2008 and 2019 in adjusted average earnings in Metro Yuma relative to the size-class average.

Among the 13 traded clusters ranked among the top 10 nationally and/or in size class 5 in 2019, adjusted average earnings in Metro Yuma was higher than the size-class average in five, though adjusted per capita aggregate earnings was quite low in three of these. The shortfall exceeded 20 percent in four of these 13 traded clusters; the rank was 50th or worse in four. Adjusted average earnings in Metro Yuma was higher than the size-class average only in 10 of the 53 traded clusters.

Metropolitan Flagstaff, Size Class 6

Share of Activity

The traded clusters accounted for 25.5 percent of the total employment in Metro Flagstaff in 2019, less than the size-class average of 30.0 percent. Metro Flagstaff ranked 86th among the 123 metro areas in size class 6. Metro Flagstaff was further below average based on aggregate earnings, with its traded cluster share of 29.8 percent less than the SC6 average of 38.1 percent; Metro Flagstaff ranked 100th.

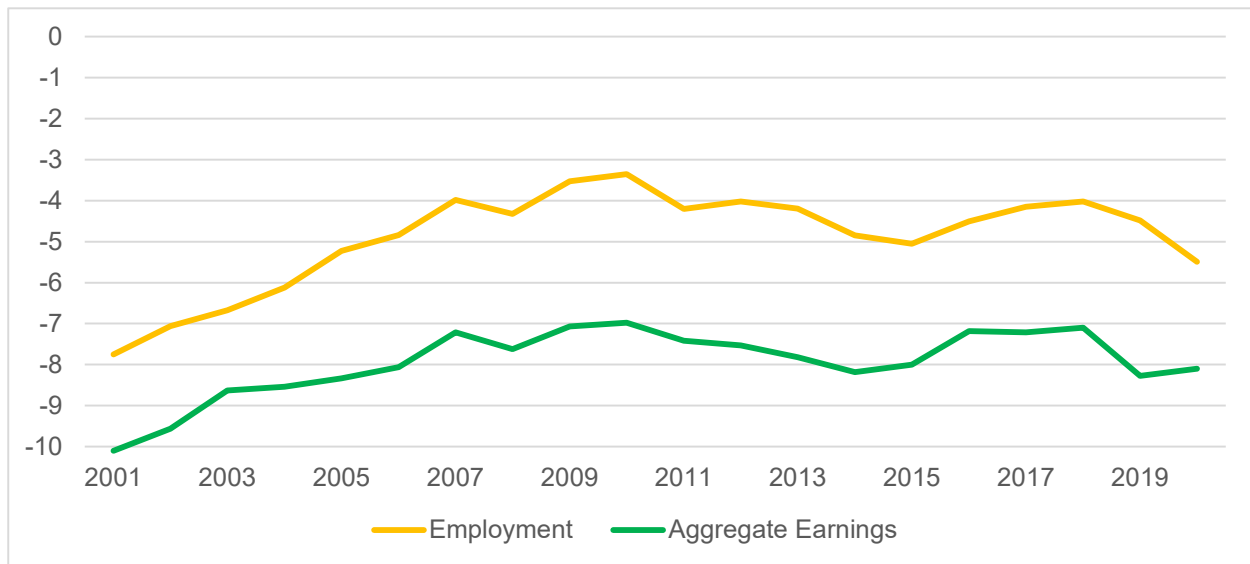
The time series of the traded share of total activity in Metro Flagstaff expressed as the difference from the size-class average is presented in Chart 9. In each year throughout the 2001-to-2020 period, based on both employment and aggregate earnings, the total traded share was considerably lower in Metro Flagstaff than the SC6 average. Based on employment, Metro Flagstaff's gap relative to the size-class average narrowed between 2001 and 2010 but lost some of this gain thereafter. Based on aggregate earnings, Metro Flagstaff relative to the size-class average rose between 2001 and 2007 and fluctuated without trend thereafter.

Per Capita Employment and Adjusted Per Capita Aggregate Earnings

In 2019, total employment per 1,000 residents in Metro Flagstaff was 482, which was 9 percent higher than the average of size class 6 and ranked 42nd among the 123 metro areas in the size class (see Table 20). Metro Flagstaff ranked 63rd on per capita total aggregate earnings after adjusting for the cost of living, with its figure of \$25,548 below the size-class average by 1 percent.

Metro Flagstaff compared less favorably in 2019 among the traded clusters, with its total traded employment of 123 per 1,000 residents 7 percent less than the average of size class 6, ranking 71st in the size class. Metro Flagstaff's adjusted per capita traded aggregate earnings was below average by 23 percent and ranked 96th.

CHART 9
TRADED CLUSTER SHARE, METROPOLITAN FLAGSTAFF LESS THE AVERAGE
OF SIZE CLASS 6, 2001 TO 2020*



* Measured as the percentage-point difference in the share.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School.

Ten traded clusters nationally each accounted for more than 3 percent of the traded total aggregate earnings in 2019. Only five of these clusters ranked in the top 10 in size class 6. Financial services; hospitality and tourism; information technology and analytical instruments; insurance services; and marketing, design, and publishing ranked lower, replaced by the automotive; farming and ranching; food processing and manufacturing; plastics; and production technology and heavy machinery clusters. The top 10 in Metro Flagstaff differed from both the national top 10 and the SC6 top 10. It included seven of the nation’s top 10 (rank in parentheses) — federal government (first); hospitality and tourism (third); business services (fourth); distribution and electronic commerce (sixth); transportation and logistics (seventh); financial services (eighth); and marketing, design, and publishing (ninth). Only one of the five additional clusters in the top 10 of SC6 — food processing and manufacturing (fifth) — was in Metro Flagstaff’s top 10. Also in the top 10 in Metro Flagstaff were medical devices (second) and construction products and services (10th).

The nation’s 10 largest traded clusters accounted for nearly 74 percent of the national traded total aggregate earnings in 2019; the share was only 52 percent in SC6 and 65 percent in Metro Flagstaff. The share was 62 percent in SC6 based on its top 10 and a high 92 percent in Metro Flagstaff based on its top 10.

Among the 15 traded clusters ranked among the top 10 nationally and/or in size class 6 in 2019, per capita employment in Metro Flagstaff exceeded the size-class average in only two — hospitality and tourism by a wide margin and marketing, design, and publishing. Adjusted per

TABLE 20
SELECTED CLUSTERS, METROPOLITAN FLAGSTAFF, 2019

| | Employment Per 1,000 Residents | | | Adjusted Per Capita Aggregate Earnings | | | Average Earnings Adjusted for the Cost of Living | | |
|--|--------------------------------|-------|---------|--|-------|---------|--|-------|---------|
| | Flag | Rank* | Ratio** | Flag | Rank* | Ratio** | Flag | Rank* | Ratio** |
| Total | 482.28 | 42 | 1.09 | \$25,547.5 | 63 | 0.99 | \$52,973 | 108 | 0.91 |
| Total Traded | 122.95 | 71 | 0.93 | 7,612.9 | 96 | 0.77 | 61,918 | 111 | 0.83 |
| Total Nontraded | 359.33 | 22 | 1.16 | 17,934.6 | 35 | 1.12 | 49,912 | 71 | 0.97 |
| Large Traded Clusters in U.S. & SC6^: | | | | | | | | | |
| Federal Government | 20.51 | 33 | 0.99 | 1,880.6 | 37 | 1.10 | 91,686 | 28 | 1.10 |
| Business Services | 7.41 | 91 | 0.57 | 452.2 | 104 | 0.43 | 61,025 | 110 | 0.74 |
| Distribution and Electronic Commerce | 3.86 | 117 | 0.33 | 269.0 | 112 | 0.34 | 69,731 | 51 | 1.03 |
| Transportation and Logistics | 3.25 | 77 | 0.67 | 266.4 | 74 | 0.70 | 81,847 | 42 | 1.03 |
| Education and Knowledge Creation | 1.39 | 74 | 0.23 | 69.4 | 79 | 0.21 | 50,025 | 44 | 0.94 |
| Large Traded Clusters in U.S.^ | | | | | | | | | |
| Hospitality and Tourism | 49.16 | 1 | 5.99 | 1,621.7 | 2 | 6.36 | 32,987 | 21 | 1.06 |
| Financial Services | 1.86 | 65 | 0.87 | 226.9 | 46 | 1.02 | 122,230 | 25 | 1.17 |
| Marketing, Design, and Publishing | 3.71 | 10 | 2.33 | 149.0 | 20 | 1.47 | 40,125 | 111 | 0.63 |
| Information Tech and Analytical Instruments | 0.15 | 89 | 0.11 | 16.9 | 85 | 0.12 | 112,167 | 27 | 1.13 |
| Insurance Services | 0.19 | 110 | 0.12 | 13.7 | 112 | 0.11 | 72,187 | 92 | 0.91 |
| Large Traded Clusters in SC6^^ | | | | | | | | | |
| Food Processing and Manufacturing | 4.40 | 50 | 0.80 | 302.1 | 49 | 0.73 | 68,626 | 47 | 0.90 |
| Production Tech and Heavy Machinery | 0.62 | 96 | 0.14 | 54.3 | 93 | 0.13 | 87,947 | 36 | 0.94 |
| Plastics | 0.66 | 87 | 0.21 | 45.9 | 85 | 0.17 | 69,449 | 57 | 0.82 |
| Farming and Ranching | 0.47 | 114 | 0.07 | 20.8 | 113 | 0.06 | 43,913 | 72 | 0.92 |
| Automotive | 0.12 | 90 | 0.02 | 5.3 | 89 | 0.01 | 44,159 | 99 | 0.54 |
| Others Among Top 10 in Metro Flagstaff# | | | | | | | | | |
| Medical Devices | 15.14 | 1 | 21.80 | 1,695.7 | 1 | 26.10 | 111,999 | 10 | 1.20 |
| Construction Products and Services | 1.54 | 85 | 0.54 | 131.5 | 78 | 0.52 | 85,455 | 52 | 0.97 |
| Selected Other Traded Clusters##: | | | | | | | | | |
| Recreational and Small Electric Goods | 1.39 | 10 | 2.57 | 62.7 | 20 | 1.74 | 45,058 | 81 | 0.68 |
| Performing Arts | 2.29 | 13 | 2.29 | 58.6 | 15 | 1.93 | 25,618 | 79 | 0.84 |
| Jewelry and Precious Metals | 0.06 | 21 | 1.64 | 2.2 | 23 | 1.14 | 38,326 | 50 | 0.70 |
| Music and Sound Recording | 0.05 | 16 | 2.26 | 1.8 | 15 | 1.92 | 36,376 | 47 | 0.85 |

(continued)

TABLE 20 (continued)
SELECTED CLUSTERS, METROPOLITAN FLAGSTAFF, 2019

* The rank is among the 123 metropolitan areas in size class 6.

** The ratio is relative to the average of size class 6.

^ Ranked in the top 10 in each geography based on adjusted per capita aggregate earnings.

^^ Ranked in the top 10 in the nation but not in SC6 based on adjusted per capita aggregate earnings.

^^^ Ranked in the top 10 in SC6 but not in the nation based on adjusted per capita aggregate earnings.

Based on adjusted per capita aggregate earnings.

Those with higher adjusted per capita aggregate earnings in Metro Flagstaff than the size-class average.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living uses the 2019 regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

capita aggregate earnings was above average in four of these 15 clusters: hospitality and tourism by a wide margin and marketing, design, and publishing; the federal government; and financial services. In contrast, adjusted per capita aggregate earnings in Metro Flagstaff was less than half the size-class average in nine of these 15 clusters.

Adjusted per capita aggregate earnings in Metro Flagstaff was greater than the size-class average in 2019 in just nine of the 53 traded clusters. Table 19 displays these clusters; Metro Flagstaff ranked first in the size class in medical devices and second on hospitality and tourism. The latter cluster accounted for 21 percent of all traded aggregate earnings. The other dominant activity was the federal government, accounting for 25 percent of all traded aggregate earnings. Per capita employment was greater than the size-class average in eight of the 53 traded clusters.

Adjusted Average Earnings Per Worker

Average earnings per worker adjusted for the cost of living was 9 percent lower in Metro Flagstaff in 2019 than the SC6 average overall, ranking 108th among the 123 metro areas in the size class. The shortfall was greater for the traded total at 17 percent, ranking 111th. No trend was present between 2008 and 2019 in adjusted average earnings in Metro Flagstaff relative to the size-class average.

Among the 15 traded clusters ranked among the top 10 nationally and/or in size class 6 in 2019, adjusted average earnings in Metro Flagstaff was higher than the size-class average in six. The shortfall exceeded 20 percent in three of these 15 traded clusters; the rank was 90th or worse in four. Adjusted average earnings in Metro Flagstaff was higher than the size-class average in only 11 of the 53 traded clusters.

Metropolitan Lake Havasu City, Size Class 6

Share of Activity

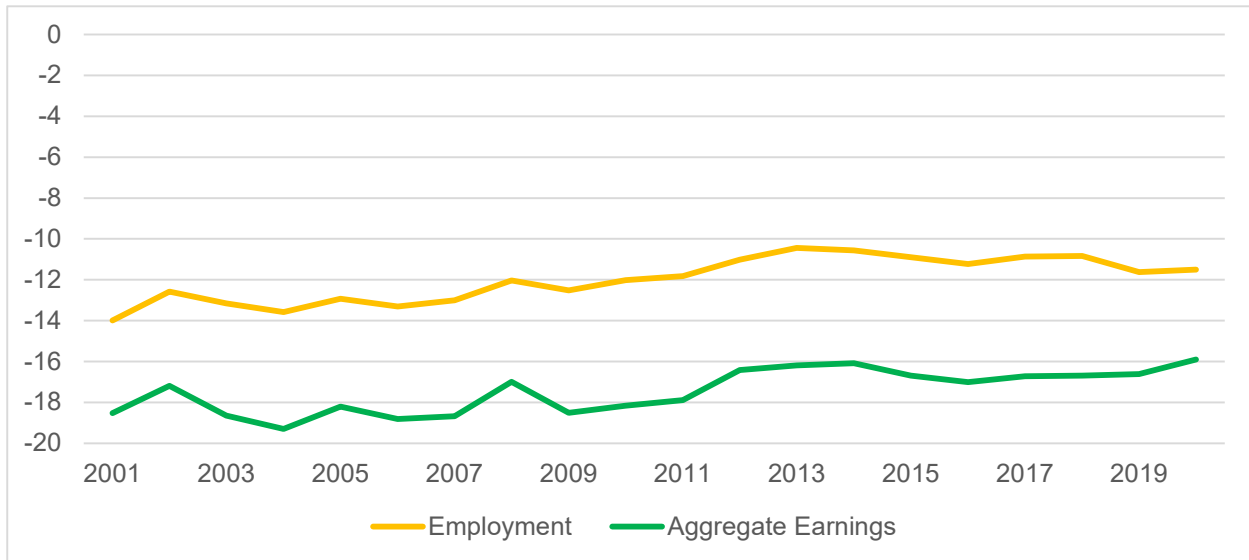
The traded clusters accounted for only 18.4 percent of the total employment in Metro Lake Havasu City in 2019, less than the size-class average of 30.0 percent. Metro Lake Havasu City ranked fourth lowest among the 123 metro areas in size class 6. Metro Lake Havasu City was further below average based on aggregate earnings, with its traded cluster share of 21.5 percent much less than the SC6 average of 38.1 percent; Metro Lake Havasu City ranked sixth lowest.

The time series of the traded share of total activity in Metro Lake Havasu City expressed as the difference from the size-class average is presented in Chart 10. In each year throughout the 2001-to-2020 period, based on both employment and aggregate earnings, the total traded share was considerably lower in Metro Lake Havasu City than the SC6 average. Metro Lake Havasu City's gap relative to the size-class average narrowed slightly between 2001 and 2020 on each measure.

Per Capita Employment and Adjusted Per Capita Aggregate Earnings

In 2019, total employment per 1,000 residents in Metro Lake Havasu City was 276, which was 38 percent less than the average of size class 6 and ranked fourth lowest among the 123 metro areas in the size class (see Table 21). Metro Lake Havasu City ranked fifth lowest on per capita total aggregate earnings after adjusting for the cost of living, with its figure of \$14,612 below the size-class average by a large 44 percent.

CHART 10
TRADED CLUSTER SHARE, METROPOLITAN LAKE HAVASU CITY
LESS THE AVERAGE OF SIZE CLASS 6, 2001 TO 2020*



* Measured as the percentage-point difference in the share.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School.

Metro Lake Havasu City compared less favorably in 2019 among the traded clusters, with its total traded employment of 51 per 1,000 residents 62 percent less than the average of size class 6, ranking third lowest. Metro Lake Havasu City’s adjusted per capita traded aggregate earnings was below average by 68 percent and ranked fourth lowest in the size class.

Ten traded clusters nationally each accounted for more than 3 percent of the traded total aggregate earnings in 2019. Only five of these clusters ranked in the top 10 in size class 6. Financial services; hospitality and tourism; information technology and analytical instruments; insurance services; and marketing, design, and publishing ranked lower, replaced by the automotive; farming and ranching; food processing and manufacturing; plastics; and production technology and heavy machinery clusters. The top 10 in Metro Lake Havasu City differed from both the national top 10 and the SC6 top 10. It included six of the nation’s top 10 (rank in parentheses) — transportation and logistics (first); business services (second); federal government (third); distribution and electronic commerce (fourth); hospitality and tourism (fifth); and financial services (eighth). Two of the five additional clusters in the top 10 of SC6 — plastics (seventh) and farming and ranching (10th) — were in Metro Lake Havasu City’s top 10. Also in the top 10 in Metro Lake Havasu City were furniture (sixth) and construction products and services (ninth).

The nation’s 10 largest traded clusters accounted for nearly 74 percent of the national traded total aggregate earnings in 2019; the share was only 52 percent in SC6 and 64 percent in Metro Lake

TABLE 21
SELECTED CLUSTERS, METROPOLITAN LAKE HAVASU CITY, 2019

| | Employment Per 1,000 Residents | | | Adjusted Per Capita Aggregate Earnings | | | Average Earnings Adjusted for the Cost of Living | | |
|--|--------------------------------|-------|---------|--|-------|---------|--|-------|---------|
| | LHC | Rank* | Ratio** | LHC | Rank* | Ratio** | LHC | Rank* | Ratio** |
| Total | 275.96 | 120 | 0.62 | \$14,611.5 | 119 | 0.56 | \$52,947 | 109 | 0.91 |
| Total Traded | 50.64 | 121 | 0.38 | 3,136.0 | 120 | 0.32 | 61,929 | 110 | 0.83 |
| Total Nontraded | 225.32 | 117 | 0.73 | 11,475.5 | 116 | 0.72 | 50,929 | 56 | 0.99 |
| Large Traded Clusters in U.S. and SC6^: | | | | | | | | | |
| Transportation and Logistics | 5.68 | 44 | 1.18 | 521.5 | 37 | 1.37 | 91,861 | 14 | 1.16 |
| Business Services | 7.62 | 89 | 0.59 | 485.9 | 101 | 0.46 | 63,797 | 98 | 0.78 |
| Federal Government | 4.33 | 107 | 0.21 | 273.0 | 96 | 0.16 | 63,112 | 73 | 0.76 |
| Distribution and Electronic Commerce | 4.35 | 110 | 0.37 | 248.0 | 114 | 0.32 | 57,011 | 110 | 0.85 |
| Education and Knowledge Creation | 0.32 | 121 | 0.05 | 10.9 | 121 | 0.03 | 34,539 | 96 | 0.65 |
| Large Traded Clusters in U.S.^: | | | | | | | | | |
| Hospitality and Tourism | 7.64 | 35 | 0.93 | 244.3 | 30 | 0.96 | 31,991 | 24 | 1.03 |
| Financial Services | 1.57 | 78 | 0.74 | 124.9 | 92 | 0.56 | 79,379 | 104 | 0.76 |
| Marketing, Design, and Publishing | 0.94 | 78 | 0.59 | 51.6 | 79 | 0.51 | 54,573 | 70 | 0.86 |
| Insurance Services | 0.32 | 100 | 0.20 | 28.2 | 91 | 0.22 | 86,982 | 35 | 1.09 |
| Information Tech & Analytical Instruments | 0.40 | 61 | 0.28 | 27.6 | 73 | 0.20 | 69,569 | 103 | 0.70 |
| Large Traded Clusters in SC6^: | | | | | | | | | |
| Plastics | 2.41 | 50 | 0.76 | 162.8 | 49 | 0.61 | 67,636 | 62 | 0.80 |
| Farming and Ranching | 1.54 | 95 | 0.22 | 88.0 | 90 | 0.27 | 57,311 | 17 | 1.20 |
| Production Tech and Heavy Machinery | 0.42 | 103 | 0.10 | 24.1 | 104 | 0.06 | 58,021 | 117 | 0.62 |
| Food Processing and Manufacturing | 0.31 | 114 | 0.06 | 16.7 | 110 | 0.04 | 54,199 | 85 | 0.71 |
| Automotive | 0.13 | 86 | 0.02 | 9.4 | 86 | 0.02 | 72,673 | 52 | 0.88 |
| Others Among Top 10 in Metro LHC# | | | | | | | | | |
| Furniture | 3.49 | 8 | 3.07 | 168.2 | 10 | 2.70 | 48,174 | 71 | 0.88 |
| Construction Products and Services | 1.42 | 91 | 0.49 | 112.9 | 89 | 0.45 | 79,570 | 71 | 0.91 |
| Selected Other Traded Clusters##: | | | | | | | | | |
| Metal Mining | 0.53 | 6 | 4.30 | 57.3 | 6 | 3.96 | 107,689 | 6 | 0.92 |
| Jewelry and Precious Metals | 0.10 | 14 | 2.77 | 5.2 | 14 | 2.64 | 52,258 | 34 | 0.95 |

(continued)

TABLE 21 (continued)
SELECTED CLUSTERS, METROPOLITAN LAKE HAVASU CITY, 2019

* The rank is among the 123 metropolitan areas in size class 6.

** The ratio is relative to the average of size class 6.

^ Ranked in the top 10 in each geography based on adjusted per capita aggregate earnings.

^^ Ranked in the top 10 in the nation but not in SC6 based on adjusted per capita aggregate earnings.

^^^ Ranked in the top 10 in SC6 but not in the nation based on adjusted per capita aggregate earnings.

Based on adjusted per capita aggregate earnings.

Those with higher adjusted per capita aggregate earnings in Metro Lake Havasu City than the size-class average.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living uses the 2019 regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

Havasu City. The share was 62 percent in SC6 based on its top 10 and 78 percent in Metro Lake Havasu City based on its top 10.

Among the 15 traded clusters ranked among the top 10 nationally and/or in size class 6 in 2019, transportation and logistics was the only one to exceed the size-class average on per capita employment and adjusted per capita aggregate earnings in Metro Lake Havasu City. In contrast, adjusted per capita aggregate earnings in Metro Lake Havasu City was less than half the size-class average in nine of these 15 clusters.

Adjusted per capita aggregate earnings in Metro Lake Havasu City was greater than the size-class average in 2019 in just four of the 53 traded clusters. Table 19 displays these clusters; Metro Lake Havasu City ranked sixth in the size class in metal mining and 10th in furniture. Per capita employment was greater than the size-class average in five of the 53 traded clusters.

Adjusted Average Earnings Per Worker

Average earnings per worker adjusted for the cost of living was 9 percent lower in Metro Lake Havasu City in 2019 than the SC6 average overall, ranking 109th among the 123 metro areas in the size class. The shortfall was greater for the traded total at 17 percent, ranking 110th. An uptrend was present between 2008 and 2019 in adjusted average earnings in Metro Lake Havasu City relative to the size-class average.

Among the 15 traded clusters ranked among the top 10 nationally and/or in size class 6 in 2019, adjusted average earnings in Metro Lake Havasu City was higher than the size-class average in four. The shortfall exceeded 20 percent in seven of these 15 traded clusters; the rank was 90th or worse in four. Adjusted average earnings in Metro Lake Havasu City was higher than the size-class average in only eight of the 53 traded clusters.

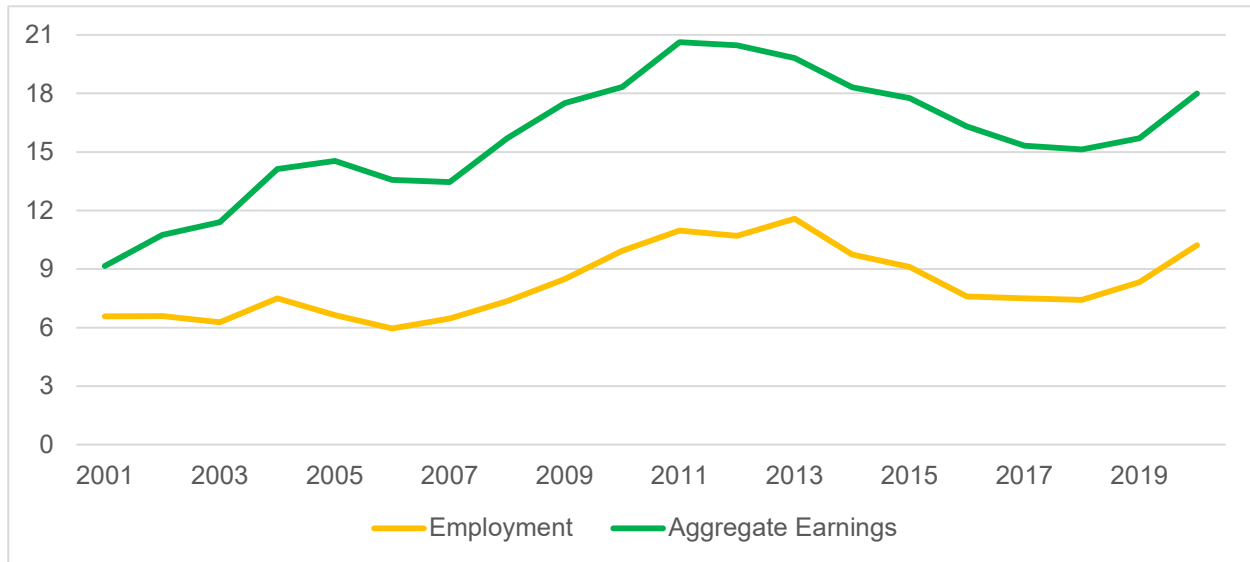
Metropolitan Sierra Vista, Size Class 6

Share of Activity

The traded clusters accounted for 38.3 percent of the total employment in Metro Sierra Vista in 2019, more than the size-class average of 30.0 percent. Metro Sierra Vista ranked 14th among the 123 metro areas in size class 6. Metro Sierra Vista was further above average based on aggregate earnings, with its traded cluster share of 53.8 percent much more than the SC6 average of 38.1 percent; Metro Sierra Vista ranked 10th.

The time series of the traded share of total activity in Metro Sierra Vista expressed as the difference from the size-class average is presented in Chart 11. In each year throughout the 2001-to-2020 period, based on both employment and aggregate earnings, the total traded share was considerably higher in Metro Sierra Vista than the SC6 average. Metro Sierra Vista's share relative to the size-class average based on employment improved between 2001 and 2013 but then lost some of its gains. Similarly, Metro Sierra Vista's share relative to the size-class average based on aggregate earnings improved between 2001 and 2011 but then lost some of its advances.

**CHART 11
TRADED CLUSTER SHARE, METROPOLITAN SIERRA VISTA
LESS THE AVERAGE OF SIZE CLASS 6, 2001 TO 2020***



* Measured as the percentage-point difference in the share.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School.

Per Capita Employment and Adjusted Per Capita Aggregate Earnings

In 2019, total employment per 1,000 residents in Metro Sierra Vista was 322, which was 27 percent less than the average of size class 6 and ranked seventh lowest among the 123 metro areas in the size class (see Table 22). Metro Sierra Vista ranked 12th lowest on per capita total aggregate earnings after adjusting for the cost of living, with its figure of \$11,062 below the size-class average by 21 percent.

Metro Sierra Vista compared much more favorably in 2019 among the traded clusters, with its total traded employment of 123 per 1,000 residents 7 percent less than the average of size class 6, ranking 70th in the size class. Metro Sierra Vista’s adjusted per capita traded aggregate earnings was above average by 12 percent and ranked 36th.

Ten traded clusters nationally each accounted for more than 3 percent of the traded total aggregate earnings in 2019. Only five of these clusters ranked in the top 10 in size class 6. Financial services; hospitality and tourism; information technology and analytical instruments; insurance services; and marketing, design, and publishing ranked lower, replaced by the automotive; farming and ranching; food processing and manufacturing; plastics; and production technology and heavy machinery clusters. The top 10 in Metro Sierra Vista differed from both the national top 10 and the SC6 top 10. It included seven of the nation’s top 10 (rank in parentheses) — federal government (first); business services (second); education and knowledge creation (third); transportation and logistics (sixth); hospitality and tourism (eighth); distribution and electronic commerce (ninth); and financial services (10th). Only one of the five additional

TABLE 22
SELECTED CLUSTERS, METROPOLITAN SIERRA VISTA, 2019

| | Employment Per 1,000 Residents | | | Adjusted Per Capita Aggregate Earnings | | | Average Earnings Adjusted for the Cost of Living | | |
|--|--------------------------------|-------|---------|--|-------|---------|--|-------|---------|
| | SV | Rank* | Ratio** | SV | Rank* | Ratio** | SV | Rank* | Ratio** |
| Total | 321.51 | 117 | 0.73 | \$20,570.8 | 112 | 0.79 | \$63,981 | 20 | 1.10 |
| Total Traded | 123.16 | 70 | 0.93 | 11,061.5 | 36 | 1.12 | 89,812 | 14 | 1.21 |
| Total Nontraded | 198.35 | 121 | 0.64 | 9,509.3 | 120 | 0.59 | 47,942 | 100 | 0.93 |
| Large Traded Clusters in U.S. and SC6^: | | | | | | | | | |
| Federal Government | 67.74 | 8 | 3.28 | 7,202.8 | 8 | 4.20 | 106,326 | 12 | 1.28 |
| Business Services | 22.67 | 15 | 1.75 | 1,883.9 | 15 | 1.77 | 83,105 | 44 | 1.01 |
| Education and Knowledge Creation | 2.84 | 54 | 0.47 | 272.5 | 34 | 0.84 | 96,006 | 6 | 1.80 |
| Transportation and Logistics | 2.45 | 93 | 0.51 | 189.8 | 94 | 0.50 | 77,469 | 63 | 0.98 |
| Distribution and Electronic Commerce | 2.31 | 121 | 0.20 | 159.3 | 121 | 0.20 | 68,906 | 54 | 1.02 |
| Large Traded Clusters in U.S.^ | | | | | | | | | |
| Hospitality and Tourism | 5.84 | 66 | 0.71 | 166.3 | 57 | 0.65 | 28,456 | 56 | 0.92 |
| Financial Services | 1.39 | 86 | 0.65 | 136.8 | 90 | 0.62 | 98,457 | 68 | 0.94 |
| Information Tech & Analytical Instruments | 0.32 | 68 | 0.23 | 34.9 | 65 | 0.25 | 107,650 | 31 | 1.09 |
| Marketing, Design, and Publishing | 0.46 | 115 | 0.29 | 20.2 | 119 | 0.20 | 43,531 | 105 | 0.69 |
| Insurance Services | 0.02 | 123 | 0.01 | 1.0 | 123 | 0.01 | 46,985 | 123 | 0.59 |
| Large Traded Clusters in SC6^^ | | | | | | | | | |
| Farming and Ranching | 4.16 | 56 | 0.61 | 258.2 | 42 | 0.79 | 62,095 | 8 | 1.30 |
| Food Processing and Manufacturing | 1.81 | 76 | 0.33 | 86.9 | 81 | 0.21 | 47,902 | 92 | 0.63 |
| Production Tech and Heavy Machinery | 0.52 | 100 | 0.12 | 30.7 | 102 | 0.08 | 59,410 | 113 | 0.63 |
| Automotive | 0.01 | 99 | 0.00 | 0.5 | 100 | 0.00 | 55,556 | 84 | 0.67 |
| Plastics | 0.00 | 116 | 0.00 | 0.0 | 116 | 0.00 | | | |
| Others Among Top 10 in Metro Sierra V# | | | | | | | | | |
| Construction Products and Services | 2.20 | 53 | 0.77 | 191.5 | 54 | 0.76 | 87,035 | 46 | 0.99 |
| Agricultural Inputs and Services | 4.44 | 11 | 1.42 | 179.9 | 16 | 1.27 | 40,541 | 72 | 0.90 |
| Selected Other Traded Clusters##: | | | | | | | | | |
| Metal Mining | 0.71 | 4 | 5.71 | 73.6 | 5 | 5.10 | 104,202 | 7 | 0.89 |
| Communication Equipment and Services | 0.52 | 26 | 1.48 | 40.5 | 27 | 1.48 | 77,838 | 40 | 1.00 |
| Video Production and Distribution | 0.25 | 11 | 2.10 | 10.2 | 23 | 1.47 | 40,957 | 87 | 0.70 |
| Jewelry and Precious Metals | 0.06 | 19 | 1.78 | 2.4 | 22 | 1.23 | 38,023 | 51 | 0.69 |

(continued)

TABLE 22 (continued)
SELECTED CLUSTERS, METROPOLITAN SIERRA VISTA, 2019

* The rank is among the 123 metropolitan areas in size class 6.

** The ratio is relative to the average of size class 6.

^ Ranked in the top 10 in each geography based on adjusted per capita aggregate earnings.

^^ Ranked in the top 10 in the nation but not in SC6 based on adjusted per capita aggregate earnings.

^^^ Ranked in the top 10 in SC6 but not in the nation based on adjusted per capita aggregate earnings.

Based on adjusted per capita aggregate earnings.

Those with higher adjusted per capita aggregate earnings in Metro Sierra Vista than the size-class average.

Source: Calculated from data from Lightcast — <https://www.economicmodeling.com/>. Cluster definitions largely are from the Institute for Strategy and Competitiveness at the Harvard Business School. The cost of living uses the 2019 regional price parity figures of the U.S. Department of Commerce, Bureau of Economic Analysis (<https://www.bea.gov/data/prices-inflation/regional-price-parities-state-and-metro-area>).

clusters in the top 10 of SC6 — farming and ranching (fourth) — was in Metro Sierra Vista’s top 10. Also in the top 10 in Metro Sierra Vista were construction products and services (fifth) and agricultural inputs and services (seventh).

The nation’s 10 largest traded clusters accounted for nearly 74 percent of the national traded total aggregate earnings in 2019; the share was only 52 percent in SC6 but was a high 91 percent in Metro Sierra Vista. The share was 62 percent in SC6 based on its top 10 and 96 percent in Metro Sierra Vista based on its top 10.

Among the 15 traded clusters ranked among the top 10 nationally and/or in size class 6 in 2019, only two in Metro Sierra Vista exceeded the size-class average on per capita employment: the federal government and business services. These two clusters also were the only ones above average on adjusted per capita aggregate earnings. In contrast, adjusted per capita aggregate earnings in Metro Sierra Vista was less than half the size-class average in eight of these 15 clusters.

Adjusted per capita aggregate earnings in Metro Sierra Vista was greater than the size-class average in 2019 in just seven of the 53 traded clusters. Table 22 displays these clusters. Metro Sierra Vista ranked fifth in the size class in metal mining and eighth in the federal government cluster, which accounted for 65 percent of all aggregate earnings in Metro Sierra Vista, largely related to Fort Huachuca and to federal activities related to the international border. Per capita employment also was greater than the size-class average in seven of the 53 traded clusters.

Adjusted Average Earnings Per Worker

Average earnings per worker adjusted for the cost of living was 10 percent higher in Metro Sierra Vista in 2019 than the SC6 average overall, ranking 20th among the 123 metro areas in the size class. The traded total was 21 percent above average, ranking 14th. Some downtrend was present between 2008 and 2019 in adjusted average earnings in Metro Sierra Vista relative to the size-class average.

Among the 15 traded clusters ranked among the top 10 nationally and/or in size class 6 in 2019, adjusted average earnings in Metro Sierra Vista was higher than the size-class average in six. The shortfall exceeded 20 percent in five of these 15 traded clusters; the rank was 90th or worse in three. Adjusted average earnings in Metro Sierra Vista was higher than the size-class average in only 12 of the 53 traded clusters.

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.

THE CENTER FOR COMPETITIVENESS AND PROSPERITY RESEARCH

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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