

INDICATOR INSIGHT

ECONOMICS <•> AN EXPERT'S INSIGHT ON THE ISSUE IN ARIZONA



ARIZONA
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Arizona No Longer Is a High-Technology Center

In the years following World War II, high-technology activities became a disproportionately large part of the Arizona economy, focused on the manufacturing of electronics and aerospace products. These high-tech activities were primary drivers of the Arizona economy from the 1950s into the 1980s, joined along the way by the manufacturing of instruments. Aerospace and instruments remain important components of the state's economic base, but the significance of electronics has plummeted, leaving high tech as a whole hardly any more important to the Arizona economy than to the national economy.

High technology typically has been defined by industry, but no standard definition exists. The definition used in this report is based on the work of the U.S. Bureau of Labor Statistics, the American Electronics Association, and Carnegie Mellon University, each of which defined high-technology activities using the North American Industry Classification System (NAICS).

The 17 components of the high-technology definition used in this report are shown in Table 1. The components consist of industries (five-digit and six-digit NAICS codes), industry groups (four-digit), and subsectors (three-digit). Since most economic datasets that are available by state do not provide data below the subsectoral level, employment data from the Business Patterns dataset of the U.S. Census Bureau are used to examine high-tech activities in Arizona and compare them to the nation. Employment is not an ideal economic measure since it does not distinguish between full-time and part-time workers and because wages are not considered. The latest Business Patterns data are for 2012; some of the data had to be imputed due to the federal government's disclosure restrictions.

By using industrial data to define high tech, all workers at a business that is assigned a high-tech NAICS code are considered to be high tech, though many of the workers may not be classified in a high-tech occupation. High-technology also can be defined by occupation. Using the Standard Occupational Classification (SOC), the U.S. Bureau of Labor Statistics (BLS) reports employment and wage data by occupation and by occupational group. For this report, three of the 22 occupational groups are considered to be high tech: computer and mathematical; architecture and engineering; and life, physical and social sciences. By using occupational data to define high tech, a worker in a high-tech occupation at a company that is not assigned a high-tech NAICS code is counted.

Arizona Indicators is an online information resource and analysis tool that centralizes data about the state and its communities. Arizona Indicators presents interactive visualizations, clear data descriptions, and public opinion data in a broad range of content areas.

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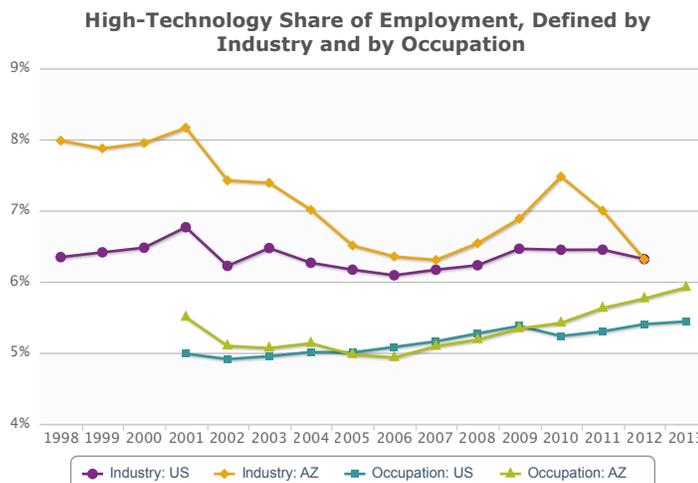


Chart 1 - High-Technology Share of Employment, Defined by Industry and by Occupation.
Sources: U.S. Department of Commerce, Census Bureau, Business Patterns (industry), and U.S. Department of Labor, Bureau of Labor Statistics (occupation).

Neither the Census Bureau nor BLS dataset provides a long time series. The NAICS was first used in the 1998 Business Patterns. While high tech had previously been defined using the Standard Industrial Classification (SIC), that definition is not comparable to the one based on the NAICS due to the lesser detail available from the SIC. Similarly, consistent occupational data are available only back to 2001. The industrial and occupational data are presented in the High-Technology Employment section of the Innovation tab of Arizona Indicators.

The high-tech shares of total employment, by occupation and by industry, are shown in Chart 1. For Arizona and the nation, the share defined by industry is higher than the occupational share in part because total employment in the Business Patterns dataset is smaller – it excludes the government sector and most of the agriculture sector. Based on occupation, the size of high tech in Arizona has not been much different from the national average since 2001, though the state's share was somewhat higher than the nation in 2001 and in recent years. In contrast, the industrial data indicate that the high-tech share in Arizona was considerably higher than the nation in the late 1990s but was no higher in 2012. An analysis of earlier data using the SIC indicates that high-tech employment in Arizona declined relative to the national average throughout the 1990s.

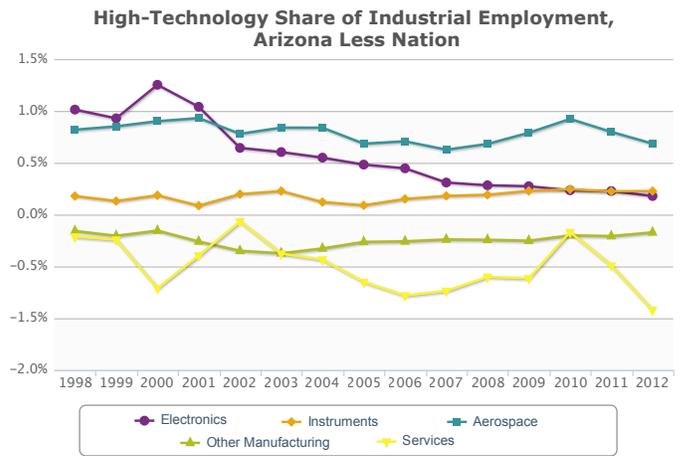


Chart 2 - High-Technology Share of Industrial Employment, Arizona Less Nation. Source: U.S. Department of Commerce, Census Bureau, Business Patterns.

High Technology as Defined by Industry

As seen in Table 1, the size of the 17 components of high technology as defined by industry varied widely in 2012 in Arizona. The percent change in employment between 1998 and 2012 also differed significantly by component.

High-Technology Activities in Arizona as Defined by Industry	Employment		Share of Total Employment, Arizona Less the Nation	
	2012	Change, 1998-2012	2012	Change, 1998-2012
Component (NAICS)				
Total High Technology	134,719	-4%	0.00%	-1.64%
<i>Manufacturing:</i>				
Pharmaceutical and Medicine (3254)	1,863	61	-0.12	0.01
Optical Instruments and Lenses (333314)	208	-32	-0.01	-0.01
Computer and Peripheral Equipment (3341)	595	-66	-0.03	0.10
Communications Equipment (3342)	1,464	-77	-0.02	-0.12
Audio and Video Equipment (3343)	83	-86	0.00	0.00
Semiconductor and Other Electronic Components (3344)	8,856	-68	0.18	-0.83
Navigational, Measuring, Electromedical, and Control Instruments (3345)	11,942	7	0.23	0.05
Aerospace Products and Parts (3364)	21,739	-5	0.68	-0.14
<i>Services:</i>				
Commercial Equipment Merchant Wholesalers (4234)	11,411	-9	-0.02	-0.06
Software Publishers (5112)	4,692	-4	-0.12	-0.14
Telecommunications (517)	15,913	-13	-0.17	-0.25
Data Processing, Hosting, and Related (5182)	8,979	158	0.04	0.09
Internet Publishing and Broadcasting and Web Search Portals (51913)	706	21	-0.10	-0.05
Engineering Services (54133)	16,103	31	-0.07	-0.03

Table 1 - High-Technology Activities in Arizona as Defined by Industry. Source: U.S. Department of Commerce, Census Bureau, Business Patterns.

High-Technology Activities in Arizona as Defined by Industry Component (NAICS)	Employment		Share of Total Employment, Arizona Less the Nation	
	2012	Change, 1998-2012	2012	Change, 1998-2012
Testing Laboratories (54138)	1,600	-23	-0.02	-0.06
Computer Systems Design and Related (5415)	23,191	84	-0.18	-0.09
Scientific Research and Development (5417)	5,374	116	-0.29	-0.14

Table 1 - High-Technology Activities in Arizona as Defined by Industry. Source: U.S. Department of Commerce, Census Bureau, Business Patterns.

Eight of the components consist of manufacturing industries. Most of Arizona’s manufacturing employment in 2012 was in three components: aerospace, instruments, and electronics. Five of the nine high-tech service components had comparable levels of employment to the three largest manufacturing components: computer systems design and related activities; engineering services; telecommunications; commercial equipment merchant wholesalers; and data processing, hosting, and related activities. Between 1998 and 2012, employment increased in only two of the eight manufacturing components and in five of the nine service components. A decrease of at least two-thirds occurred in four of the manufacturing components, including electronics.

In order to compare high-technology activities in Arizona to the nation, high-tech employment was calculated as a share of total employment and the share in Arizona was compared to the national share. As seen in Table 1, in 2012 the share was lower in Arizona than the nation in 12 of the 17 components, including eight of the nine service components. However, since Arizona’s share was much higher in aerospace manufacturing and somewhat higher in instruments and electronics manufacturing, the state’s overall high-tech share was identical to the national average.

Between 1998 and 2012, the share in Arizona decreased relative to the national average in 12 of the 17 components, including eight of nine service components. No component posted much of a gain. Thus, the overall high-tech share in Arizona fell significantly relative to the nation, with half of the overall drop resulting from the large decrease in electronics manufacturing.

Chart 2 shows the difference from the national average by year for selected components. Aerospace manufacturing remains a relatively large industry in Arizona compared to the national average, but the differential from the nation was not quite as wide in 2012 as in 1998. Instruments manufacturing is a somewhat more significant activity in Arizona than nationally, with the differential increasing slightly between 1998 and 2012. In contrast, electronics manufacturing historically was a much larger industry in Arizona than in the nation, but by 2012 the differential was small. Other high-tech manufacturing is underrepresented in Arizona, but despite the large percentage drop in employment in Arizona between 1998 and 2012, the relative share hardly changed. High-tech service activities are a smaller share of the economy in Arizona than nationally. The differential has fluctuated over time, but the Arizona figure was particularly far below the national average in 2012.

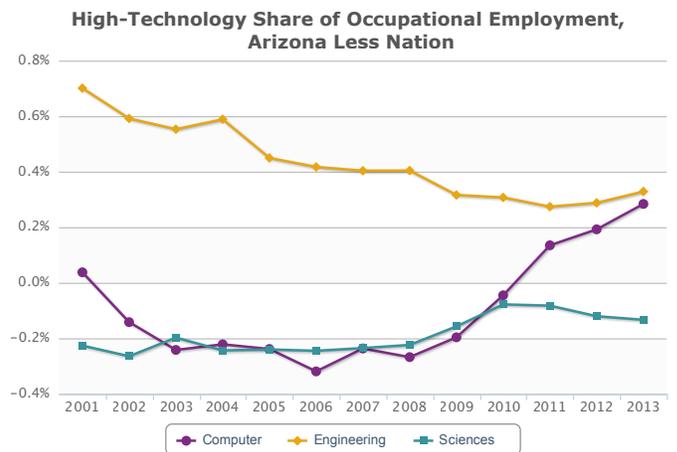


Chart 3 - High-Technology Share of Occupational Employment, Arizona Less Nation. Source: U.S. Department of Labor, Bureau of Labor Statistics.

High Technology as Defined by Occupation

In 2013, employment in Arizona was 76,040 in the computer and mathematical occupational group and 52,590 in the architecture and engineering group, but only 17,890 in the sciences group. Between 2001 and 2013, the percentage increase in employment was 52 percent in the computer and mathematical group and 32 percent in the sciences group, but employment fell 11 percent in the architecture and engineering group. High-technology employment based on occupation (the sum of the three groups) was 146,520 in 2013, up 20 percent from 2001.

Relative to total occupational employment, the high-technology share in Arizona was greater than the national share in the computer and mathematical and architecture and engineering groups. The overall high-tech share was greater than the national average.

Between 2001 and 2013, the share in Arizona decreased relative to the national average in the architecture and engineering group, but increased a little in the other two groups. Thus, the overall high-tech share in Arizona fell only marginally relative to the national average. Chart 3 shows the difference from the national average by year for each of the three groups. (Because of the way in which the occupational data are collected, caution is needed in using the data as a time series.)

The median hourly wage in each of the three high-technology occupational groups is considerably higher than the median of all jobs. In 2013 in Arizona, the overall median was \$16.43 per hour, with the high-tech figures ranging from 55 percent higher in the sciences group to 117 percent higher in the computer and mathematical group. The change in the median wage between 2001 and 2013 was not much different in the high-tech groups than the overall increase of 33 percent.

The overall median wage in Arizona in 2013 was only 3 percent less than the national average. The medians in the computer and mathematical and architecture and engineering groups were 5 percent less than the national figure for these groups; the Arizona figure was 13 percent below average in the sciences group. The comparison over time is shown in Chart 4.

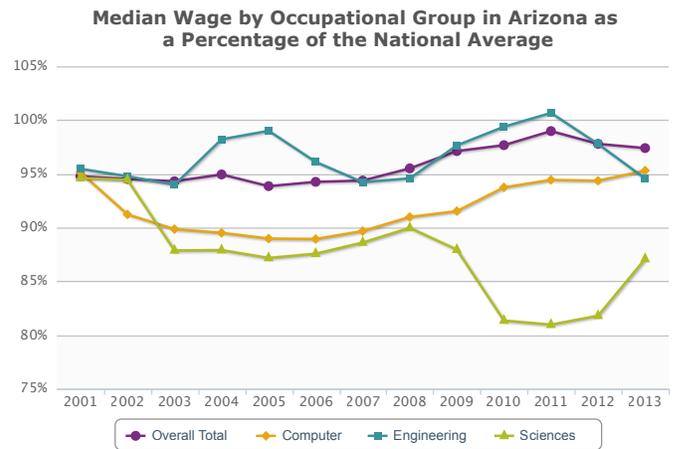


Chart 4 - Median Wage by Occupational Group in Arizona as a Percentage of the National Average. Source: U.S. Department of Labor, Bureau of Labor Statistics..