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Introduction

As part of its mission, FloridaMakes is working to provide Florida’s regional manufacturers associations (RMAs) with actionable information that will help them support and increase the economic competitiveness of small- and medium-size manufacturers located in their service areas. Small and medium manufacturers are defined as companies having 500 or fewer workers at a single establishment with small manufacturers defined as those firms that have 50 or fewer employees. FloridaMakes has retained IHS to prepare an economic profile of the Northwest Florida and Capital Region economies, with a focus on the characteristics of the manufacturing sector. IHS defines the manufacturing sector as consisting of establishments assigned to North American Industry Classification System (NAICS) codes 31, 32, and 33.

The Northwest Florida and Capital Region\(^1\) comprises 16 Florida counties:

- Bay
- Calhoun
- Escambia
- Franklin
- Gadsden
- Gulf
- Holmes
- Jackson
- Jefferson
- Leon
- Liberty
- Okaloosa
- Santa Rosa
- Wakulla
- Walton
- Washington

Tallahassee is the major city in the regional economy, which is within Leon County, a part of the Tallahassee, Florida, Metropolitan Statistical Area (MSA). Gadsden, Jefferson, and Wakulla counties are also in the Tallahassee, Florida, MSA, whereas Okaloosa and Walton counties are in the Crestview-Fort Walton Beach-Destin, Florida, MSA; Bay and Gulf counties are in the Panama City, Florida, MSA; Escambia and Santa Rosa are in the Pensacola-Ferry Pass-Brent, Florida, MSA; and Calhoun, Franklin, Holmes, Jackson, Liberty, and Washington are in the Northwest Florida nonmetropolitan area.\(^2\)

In the following sections, findings of potential interest to policymakers and economic development practitioners are presented in **bold**.

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1 While data for this study are presented for the 16-county study area, they are available by county upon client request.
2 In the map, Florida A&M University is represented by the acronym FAMU.
Strategic Summary

What is the situation today?

- The 2015 population of the 16-county region was just more than 1.4 million people, or 7.0 percent of the state of Florida. With a 4.4 percent unemployment rate in April 2016, the labor market in the Northwest Florida and Capital Region has been tighter in the region than at the national and state levels, where unemployment rates have been slightly higher, on average, since 2011.

- Private, services-providing (PSP) sectors represent just more than two-thirds of employment in the region with the retail trade, accommodation and food services, and health care and social assistance sectors providing the greatest number of regional jobs. More than one-fifth of regional jobs are in government, and only ten percent of jobs are in goods-producing sectors (agriculture, mining, construction, and manufacturing).

- The manufacturing sector represents nearly 18,000 jobs, 3.1 percent of the region’s total employment, which is significantly below the US and Florida shares of 8.5 percent and 4.1 percent, respectively.

- The transportation equipment, machinery, chemical, wood product, fabricated metal products, and nonmetallic mineral manufacturing sectors each offered more than 1,000 jobs in the region in 2015 and together represent 72 percent of regional manufacturing industry employment.
• The vast majority (92 percent) of the region’s manufacturers employ fewer than 50 workers and almost three-quarters (74.5 percent) are “very small” employers (with fewer than ten employees each). Manufacturing subsectors with large numbers of very small employers include fabricated metal product, petroleum and coal, nonmetallic minerals, furniture and related products, and miscellaneous.

• For all occupations, annual wages are lower in the region than they are nationally, with wages ranging from 3.6 percent below their national levels for production workers to 14.5 percent less for transportation and material moving occupations.

**What are our advantages?**

• One-third of the region’s three-digit North American Industry Classification System (NAICS) manufacturing subsectors (of 21 total) experienced positive employment, output, and productivity growth between 2000 and 2015. These seven sectors are beverage and tobacco products, machinery, primary metal, petroleum and coal, transportation equipment, electrical equipment and appliance, and wood product manufacturing.

• Excluding the high growth witnessed in the small beverage and tobacco manufacturing subsector, primary metal, machinery, and transportation equipment manufacturing surpassed all other sectors in terms of employment growth with compound annual growth rates (CAGRs) of 4.5 percent, 3.9 percent, and 2.8 percent, respectively.

• Together, high-performing and emerging sectors represent just under two-thirds of the four-digit North American Industry Classification System (NAICS) manufacturing sectors in the Northwest Florida and Capital Region.³

• The 16-county region had eight “high-performing” four-digit NAICS manufacturing sectors that outperformed the United States in terms of their employment growth and represented an above-average share of the region’s economy. Accounting for more than 40 percent of total manufacturing employment in the Northwest Florida and Capital Region, these included:
  - Aerospace product and parts
  - Ship and boat building
  - Ventilation, heating, air-conditioning, and commercial refrigeration equipment
  - Other nonmetallic mineral product
  - Sawmills and wood preservation
  - Veneer, plywood, and engineered wood product
  - Steel products from purchased steel
  - Tobacco

³ See the "Shift-share analysis" section for sector category classifications.
• Of the region’s **25 emerging four-digit NAICS manufacturing sectors**, the largest are **motor vehicle parts and other general purpose machinery manufacturing**. Both employed more than 600 people in the region in 2015 and experienced positive employment growth between 2000 and 2015.

• With **nearly three-fifths of manufacturing industry employment in advanced manufacturing**, the Northwest Florida and Capital Region’s advanced manufacturing sector not only represents a higher share of manufacturing employment than it does in the US or Florida economies but is also more likely to provide **higher-wage jobs and contribute to regional innovation**.

• Similarly, the 73.3 percent of 2015 regional manufacturing employment found in **durable** manufacturing sectors (compared with nearly 68 percent in Florida overall) means the region’s manufacturing workforce likely has a higher-than-average share of skilled workers and correspondingly higher wages.

• In fact, the region’s **median annual wages in two of the most common manufacturing occupations (production workers and architects and engineers) are higher than those in Florida overall**. The region’s architects and engineers, who are especially important to the advanced manufacturing sectors, make 7.9 percent more than their statewide counterparts.

• Of the manufacturing sectors in the Northwest Florida and Capital Region with more than 1,000 employees in 2015 (transportation equipment, machinery, chemical, wood product, fabricated metal, and nonmetallic metal manufacturing) all but one (chemical manufacturing) had a composite risk score below the US manufacturing industry average.

**Where should we be concerned?**

• The majority of the region’s three-digit NAICS manufacturing subsectors experienced significant job losses between 2000 and 2015. A few of the most notable include:

  o Chemical manufacturing had a decline of more than 1,500 jobs.
  o Employment in paper manufacturing dropped 1,349 jobs.
  o Printing witnessed a workforce reduction of more than 61 percent to employment of fewer than 700 workers in 2015.
  o Computer and electronic product manufacturing more than halved its workforce size to employment of 975 in 2015.
  o Employment in fabricated metal products manufacturing declined by more than two-fifths.
  o Employment in textile mills declined by more than two-thirds in the 15-year period and textile product mills by more than three-quarters.
  o Apparel manufacturing went from 309 jobs in 2000 to six by 2015.
  o Food manufacturing experienced a rate of decline of 7.3 percent annually.

• The **diversity of the Northwest Florida and Capital Region’s manufacturing sector is significantly lower than the diversity of the manufacturing industry in the state of Florida**. The low diversity makes it especially important that the region understand how to **counter the above-average industry risks** facing manufacturing sectors with relatively large levels of employment in the region, such as chemical manufacturing.

• Almost full employment in the Northwest Florida and Capital Region could lead to **shortages of skilled workers**, especially for skilled manufacturing occupations. These workforce shortages likely pose a challenge to many of the region’s high-performing and emerging manufacturing sectors, such as ship and boat building, motor vehicle body

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4 See definition in “Advanced Manufacturing” section.
5 Durables, or hard goods, are defined as those that are not totally consumed during their immediate or first use.
6 See definition in “Risk rating by industry sector” section.
7 See definition of IHS industry risk scores in “Risk rating by industry sector” section.
and trailer manufacturing, and metalworking machinery manufacturing, as the local labor force’s core competences are poorly suited to meet these industries’ workforce needs.
Where should we focus our efforts?

- Given the size of the region’s manufacturers, sector development strategies should focus on adopting best practices that are relevant for small or very small manufacturing enterprises.

- Since the core competencies required by the local manufacturing industry may not be a main focus of educational or workforce training curriculum today, it may require a concerted workforce development effort over a sustained period to match education and training programs with local manufacturing employers’ needs. Workforce training organizations and educational institutions can benefit from identifying the skills required by local employers and develop programs or talent recruitment strategies to meet the industry’s current and future needs for skilled workers.

- Supporting advanced and durable manufacturing sectors in the region should result in high payoffs in terms of firm productivity, per capita incomes, worker skill levels, and regional innovation.

- By exploring what is driving the higher-than-average industry structure, profitability and pricing, and growth risks facing the chemical manufacturing sector, local policymakers and economic development practitioners can determine what role they can play in mitigating these risks.

- For targeted manufacturing industry support and workforce training, the region should decide whether to prioritize sectors that provide the greatest opportunities for employment in the region (e.g. transportation equipment, machinery, and chemical manufacturing), the eight sectors that have witnessed positive employment, output, and productivity growth in recent years, or those that have performed better than their nationwide peers in terms of employment growth and concentration (high performing sectors). If trying to focus on all three, subsectors associated with transportation equipment and machinery manufacturing may be a logical choice.

- For manufacturing industry recruitment, the region’s national competitive advantage in terms of manufacturing labor costs should not go without mention.

- By identifying gaps in manufacturing supply chains such that key inputs needed can be made in the region rather than imported and expanding the value of exports produced by local manufacturing companies (in part by taking greater advantage of their proximity to the Panama City and Pensacola ports and bordering states, Georgia and Alabama), economic development practitioners can enhance the manufacturing sector’s contribution to the regional economy.

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8 See the “Risk rating by industry sector” section for the definitions of these risk categories.
9 See the “Shift-share analysis” section for sector category classifications.
Characteristics of the regional economy

Population
IHS estimates the 2015 population in the Northwest Florida and Capital Region was 1,424,946 people, or 7.0 percent of the state of Florida. The population density was 107 persons per square mile, less than 30 percent of the population density of the state of Florida (370 people per square mile).

Labor force
In April 2016, the Northwest Florida and Capital Region’s total labor force was 641,679 people, a 0.6 percent decrease from April 2015. In the Northwest Florida and Capital Region, 11.7 percent fewer people (3,701) were unemployed in April 2016 than the year before, while the employment level also decreased by 361 workers (less than 0.1 percent). This reduction in the labor force, while relatively small, was inconsistent with the trend nationally (where the labor force grew 1.2 percent during the same period).

Unemployment rate
In April 2016, the region’s unemployment rate (not seasonally adjusted and based on workers’ place of residence rather than on workplace location), was 4.4 percent, below both the US and Florida rates of 4.7 percent and 4.5 percent, respectively, that month. The decline in the unemployment rate was consistent with that witnessed across the United States, where the unemployment rate (not seasonally adjusted) also dropped 0.4 percentage point in the same period. However, since 2011, the annual unemployment rate in the Northwest Florida and Capital Region has been 0.3 percentage point lower than the national unemployment rate and 0.6 percentage point lower than the statewide rate.

The key finding from the labor force analysis is that the labor market in the Northwest Florida and Capital Region is close to full employment and is tighter than at either the state or US level. The tight labor market will likely eventually result in rising wage rates and could potentially indicate shortages of skilled workers, especially for skilled manufacturing occupations. However, it should be noted that the region’s decreased 2016 unemployment rate does not tell the whole story about the health of the region’s labor market. The drop in the unemployment rate between April 2015 and April 2016 was due primarily to people leaving the labor force as opposed to an increase in employment.

Economic structure
Employment by major economic sector, according to two-digit NAICS codes, is presented in the table below in descending order by number of jobs. IHS estimates there were 17,863 jobs in 2015 in the Northwest Florida and Capital Region’s manufacturing sector (NAICS 31–33). The share of the Northwest Florida and Capital Region’s total 2015 employment in manufacturing is 3.1 percent, significantly below the US and Florida figures of 8.5 percent and 4.1 percent, respectively. The below-average share of 2015 manufacturing employment is reflected by the low employment location quotient (LQ) of 0.37.10

Of 22 major sectors in the Northwest Florida and Capital Region, only nine had employment LQs greater than one, and 13 had employment LQs less than one, meaning nearly 60 percent of the region’s sectors are less concentrated, based on employment, than they are in the United States. Providing nearly 75,000 jobs in the region, retail trade (NAICS 44–45) offers the greatest source of employment, whereas jobs in state government (NAICS 92) are the most highly concentrated, with a LQ of 2.87. The highest employment growth in the past 15 years has been in management of companies and enterprises (NAICS 55).

10 An LQ score greater than 1 indicates a regional economy has a higher share of its total employment in an individual economic sector than the sector’s share of total US employment.
Because of its historical role as a center of tourism, transportation, and business and health services, Florida has an above-average concentration of its total employment in the private, services-providing (PSP) sectors. However, while PSP sectors still account for more than two-thirds (66.7 percent) of jobs in the Northwest Florida and Capital Region, the PSP share of employment is less than in Florida overall, where PSP sectors represented 75.9 percent of employment in 2015, and is slightly lower than the US share of 68.9 percent. More than one-fifth (23.2 percent) of the region’s employment is in government and goods-producing sectors (e.g., agriculture, mining, construction, and manufacturing), representing just ten percent of regional employment.

**Structure diversity**

To evaluate the diversity of the Northwest Florida and Capital Region’s industrial structure, IHS calculated the Hachman Index, which compares a regional economy’s distribution of economic activity by sector (in this case, employment) to that of the US economy. With the Hachman Index, the maximum value is 1.00, or in other words, the closer the region’s Hachman Index value is to 1.00, the more similar that region’s economic structure is to the US economy.

For the Northwest Florida and Capital Region, the Hachman Index was 0.873, indicating the region’s economy is less diverse than the Florida economy overall, which has a Hachman Index of 0.941. Since regional economies, especially smaller ones, are usually less diverse than larger state economies or the United States overall, this disparity is to be expected.

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11 The private, services-providing (PSP) sector consists of the following major sectors: trade, transportation, and utilities; information; financial activities; professional and business services; education and health care; leisure and hospitality; and other services. The PSP sector excludes employment in the private, goods-producing sectors—agriculture; natural resources and mining; construction; manufacturing; and government.

12 Calculate two-digit LQs by NAICS sector weighted by employment shares, and then invert the result.
Characteristics of the manufacturing sector

To provide a more accurate picture of the Northwest Florida and Capital Region’s overall manufacturing industry, the following sections provide data on manufacturing subsectors’ growth, structure, diversity, and risk ratings. We conclude with a shift-share analysis to get a more detailed perspective on regional manufacturing sector performance in 2015.

Industry growth

As shown in the accompanying table, the Northwest Florida and Capital Region had 2015 employment in 21 manufacturing subsectors (as defined by three-digit NAICS codes), with positive employment growth rates between 2000 and 2015 in only seven of them. Excluding the small beverage and tobacco manufacturing subsector, employment rose by 2,879 jobs in four subsectors: primary metals, machinery, transportation equipment, and wood products. By contrast, employment shrank in nearly two-thirds of the region’s manufacturing subsectors, including the loss of more than 800 jobs from the chemicals, paper, printing, computers, fabricated metals, and textile mills subsectors. Overall, the Northwest Florida and Capital Region’s compound annual growth rate (CAGR) for manufacturing employment between 2000 and 2015 was a decline of 2.0 percent, less than the compound annual rates of decline of 2.4 percent and 2.3 percent for Florida and the United States during the same period. In terms of manufacturing employment, the region supported by the two RMAs outperformed the United States (i.e., had a lower rate of decline), primarily because of the large increase in the transportation equipment sector; closer analysis showed the employment increase occurred in both aerospace and ship and boat building. There are eight military installations located in the Northwest Florida and Capital Region, primarily air bases, including two major US Air Force Bases (AFB)—Eglin and Tyndall—and Naval Air Stations (NAS) in Pensacola, Whiting Field, and Panama City. The presence of these installations and their need for manufacturing goods affects the structure of the region’s manufacturing sector.

Durables and nondurables

Additional insight into a region’s manufacturing sector can be obtained by analyzing the durable and nondurable sectors. Durables, or hard goods, are defined as those that are not totally consumed during their immediate or first use (i.e., used over an extended period of time, usually with a useful life of at least three years, and thus do not have to be purchased often). By contrast, nondurables, or soft or consumable goods, are immediately and totally consumed when initially used, have a useful life of less than three years, and need to be purchased frequently. The following charts
present the employment trends in the Northwest Florida and Capital Region for the individual three-digit NAICS code manufacturing subsectors that make up the durable and nondurable sectors. Each chart presents the CAGR in employment between 2000 and 2015 on the x axis, the 2015 employment LQ on the y axis, and the size of each bubble presents that sector’s total employment in 2015. Each chart provides a visual representation of the performance of the individual subsectors and the structure of the manufacturing economy. Approximately 73.3 percent and 26.7 percent of the Northwest Florida and Capital Region’s manufacturing employment in 2015 was in the durable and nondurable sectors, respectively, with the Northwest Florida and Capital Region’s durable manufacturing sector constituting a greater share of manufacturing jobs than in Florida overall, where durable manufacturing accounted for 67.9 percent of manufacturing employment.

Because of differences in the goods made and the production processes used, the durable and nondurable manufacturing sectors also differ from each other in terms of the mix of skilled workers required, level of wages paid, and productivity, all of which will determine appropriate economic and workforce development strategies. IHS analyzed detailed occupational employment and wage data for 2015 by four-digit manufacturing subsector for the United States, identifying the following differences between the durable and nondurable sectors:

- **Durable sectors require higher shares of skilled workers.** About 19.4 percent of the jobs, by detailed occupation, required a Bachelor’s degree or higher to obtain an entry-level position, compared with only 12.4 percent in the nondurable sectors. Similarly, 26.0 percent of durable jobs required some type of postsecondary education, compared with only 18.8 percent for the nondurable sector. By contrast, 58.2 percent of durable sector jobs required a high school diploma or equivalent for an entry-level position, compared with 60.9 percent for the nondurables. Interestingly, 1.1 percent of the nondurable jobs require an advanced degree for an entry-level position, compared with only 0.5 percent in the durable sectors, because of the high share of STEM occupations required by the chemicals sector, especially in pharmaceuticals because of its high level of research and development spending.

- **Durable jobs pay higher annual wages.** The average annual US wage in the durable sectors in 2015, based on a detailed analysis of occupations required, was $49,387 compared with $44,194 in the nondurable sectors.
• **Nondurable sectors have higher shares of their employment in traditional “blue-collar” occupations and lower shares in STEM occupations.** The nondurables had 63.3 percent of their total employment in production, transportation, and material handling occupations in 2015 compared with only 57.4 percent for durables. By contrast, durable sectors had 12.2 percent of their total employment in three high-skill, high-education STEM occupations: architecture and engineering; computer and math; and life, physical, and social sciences, well above the 5.2 percent share for the nondurables.

• **Durable sectors are slightly more labor intensive,** creating 2.7 direct jobs per $1 million in output compared with 1.6 in the nondurable sectors; the latter figure is low because of the high level of output per employee in the petroleum refining and chemical manufacturing subsectors; if they are excluded, the nondurable figure rises to 2.5 jobs per $1 million in output.

The difference between the durable and nondurable sectors indicates that expanding the durable sector will require greater efforts to develop the supply of highly skilled workers in the local labor force. However, the generally lower entry-level education and training requirements for the nondurables, excluding chemicals, indicate these sectors have a greater potential to employ less-skilled workers, thus providing more opportunities for them to begin careers. The first chart, durable manufacturing sector trends, shows the composition and performance of the Northwest Florida and Capital Region’s durable sector between 2000 and 2015. Note the relatively large number of jobs and positive employment growth rate of the machinery, transportation equipment, and wood product manufacturing sectors.

The second chart presents the composition and performance of the nondurable sectors. Although it employs just 82 people and is less concentrated in the Northwest Florida and Capital Region than in the country overall, note the high annual employment growth rate the beverage and tobacco product manufacturing sector has witnessed in the past 15 years. The chart also highlights the nondurable manufacturing sectors that represent legacy industries, such as chemicals and paper. Although employment in these sectors has shrunk in recent years, they still form a large share of the region’s manufacturing employment. All the nondurable sectors had employment concentrations less than the national average for that sector in 2015.
If the primary objective of an RMA is to increase employment in the traditional, “blue-collar” manufacturing occupations, then expansion of the durable sectors (i.e., more direct jobs per $1 million of output as noted above) and some nondurables sectors (e.g., textiles, apparel, leather, wood, and printing) should be promoted. By contrast if the objective is to attract higher-paying jobs in the STEM occupations, including those that are required at nonproduction facilities such as research and development (R&D) centers, then efforts should be directed at the durable sectors, and some high-productivity nondurable sectors such as petroleum refining and chemicals. In adopting the latter strategy, complementary STEM programs to increase skills of the workforce will also have to be implemented.

Extending this report’s durable and nondurable analysis, average output per worker in the durable manufacturing sectors in the United States in 2015 was $310,099 compared with $434,078 in the nondurable sectors. The nondurable sectors’ level is greater because of the high level of productivity in the petroleum refining and chemical sectors.

Output and productivity

In addition to employment, it is helpful to consider output by sector and productivity (output per worker), to get a better sense of an individual manufacturing subsector’s contribution to a regional economy. For example, a capital-intensive (i.e., high levels and values of structures and equipment per worker) sector such as petroleum refining, chemicals, or primary metals may not employ a lot of workers (i.e., have high levels of output per worker), but could generate substantial increases in regional economic activity through either their backward linkages (i.e., they purchase large amounts of inputs from suppliers located in the region) or through their forward linkages (i.e., the products they make are in turn purchased by other firms in the region who use them as inputs in making other types of goods or services). In other words, when evaluating the manufacturing sector’s regional economic health, it is important to note that, based on changes in productivity, employment growth rates may differ significantly from output growth rates. For example, in the Northwest Florida and Capital Region, five manufacturing sectors (nonmetallic minerals, fabricated metals, leather and allied products, chemicals, and miscellaneous) experienced sufficient productivity growth in the 15-year period to increase output while decreasing the size of their workforce. As with employment, the most notable output gains were in the beverage and tobacco products, machinery, and primary metal manufacturing subsectors.

Of the 12 manufacturing sectors with positive growth in output during this period, all also demonstrated growth in productivity (inflation-adjusted output per worker), with all sectors except apparel manufacturing experiencing productivity gains. Perhaps a sector of interest to economic developers, machinery manufacturing, which ranked
third for employment and second for output growth, increased productivity annually by 5.2 percent in the 15-year period, the highest productivity growth rate in the Northwest Florida and Capital Region. Meanwhile, despite significant increases in productivity, the paper manufacturing industry, the region’s third-largest manufacturing employer in 2000, has shed a lot of jobs in recent years, thereby decreasing its relative importance in the region. Sectors in the Northwest Florida and Capital Region that experienced positive employment, output, and productivity growth rates during the 15-year period are the same seven that increased employment in that period. These include:

- Beverage and tobacco products manufacturing
- Machinery manufacturing
- Primary metal manufacturing
- Petroleum and coal manufacturing
- Transportation equipment manufacturing
- Electrical equipment and appliance manufacturing
- Wood product manufacturing

The output-per-worker figures presented in the table on productivity growth rates in the manufacturing sector also show the direct increases in manufacturing employment that an increase in output would generate. For example, whereas a sector such as petroleum and coal manufacturing with $1,341,827 of output per worker will not even produce one new job per each additional $1 million in output, the region’s strong machinery manufacturing sector will produce more than three direct jobs per $1 million of new output.

If the region’s primary focus is to maximize the number of manufacturing jobs, economic development organizations should focus on those sectors with the lowest levels of worker productivity, e.g., leather and allied product or furniture manufacturing. However, as the annual wage levels of manufacturing jobs differs widely, strategies focused on increasing per capita incomes and regional wealth creation may instead center on sectors with higher productivity such as chemical or primary metal manufacturing, as these are likely to pay much higher wages.
Establishment size

In addition to evaluating the Northwest Florida and Capital Region manufacturing sectors’ growth in the last 15 years, IHS assessed regional structure in terms of distribution of manufacturing establishments by employment size. In the 16-county Northwest Florida and Capital Region, the vast majority of manufacturers (91.9 percent, or 649 establishments) employ fewer than 50 workers, 7.1 percent (50 establishments) engage 50–499 employees, and there are only seven manufacturing firms with 500 employees or more. Of the 706 manufacturing establishments in the region, almost three-quarters (74.5 percent) are “very small” employers with fewer than ten employees each.

The significance of the distribution of manufacturing establishments by employment size is that different types of strategies and accompanying services are required for small firms than for large ones. Small and medium manufacturing enterprises (SMEs), usually defined as those with fewer than 500 employees, are more vulnerable to changes in the business cycle, fluctuations in interest and currency rates, regulatory changes, may have more difficulty in accessing capital, and be less able to provide worker training. The RMAs need to be able to offer a broader range of services and supports to SMEs than to larger manufacturing firms. We note the proportion of total establishments accounted for by SMEs varies widely by subsector based on production processes used, barriers to entry, need to achieve economies of scale, capital intensity, etc. Some subsectors, such as fabricated metals, machinery, and printing, have traditionally had higher shares of SMEs, whereas others such as petroleum refining and chemicals have low shares.
Structure diversity

To evaluate the diversity of the region’s manufacturing sector, we again used the Hachman Index\(^{13}\) based on four-digit NAICS employment, with LQs based on employment in the manufacturing sectors, not total employment. For the 16 counties included in the Northwest Florida and Capital Region, the Hachman Index of 0.265 shows the region’s manufacturing sector diversity is significantly lower than the manufacturing diversity of the state of Florida, which has a Hachman Index of 0.701.

\(^{13}\) See Footnote 12 regarding the Hachman Index calculation.
Advanced manufacturing

With 10,380 people employed in the advanced manufacturing sectors, as defined either by researchers from the US Bureau of Labor Statistics (BLS) or the Brookings Institution\(^\text{14}\) think tank, the Northwest Florida and Capital Region has more than half (58.1 percent) of its manufacturing industry employment in advanced manufacturing. This share is above the US share of 46.8 percent and the statewide share of 49.7 percent. The largest advanced manufacturing sectors, based on their 2015 employment by four-digit NAICS codes, include: aerospace (3364); ship and boat building (3369); resin, rubber, and fibers (3252); and motor vehicle parts (3363). It is in these sectors we should expect the greatest innovation to occur (i.e., have higher patent rates), and they have higher growth rates in productivity, require more highly skilled workers, and pay higher wages than other manufacturing sectors.

The criteria applied in the two studies we used to identify advanced manufacturing:

- High levels of spending for R&D, including high intensity (i.e., above-average shares of R&D spending as a percentage of sales) and high levels per worker
- The share of employment in the STEM occupations

The BLS study also considered industries that use advanced manufacturing processes and that produced high-technology goods. The Brookings and BLS studies identified advanced and high-tech NAICS sectors at the four-digit level across the entire economy; for the purposes of this profile, we considered only the individual sectors that were part of the manufacturing sector.

Similar to the discussion for the durable and nondurable sectors, there are also differences between the advanced manufacturing subsectors and the entire manufacturing sector. Our analysis of detailed occupational employment and wage data for 2015 by four-digit manufacturing subsector for the United States found the following differences:

- **Advanced sectors require higher shares of skilled workers**: About 24.9 percent of the jobs required a Bachelor’s degree or higher to obtain an entry-level position, compared with only 16.9 percent for the entire manufacturing sector. Similarly, 32.7 percent of advanced manufacturing jobs required some type of post-secondary education, compared with only 23.5 percent for all of manufacturing. In contrast, 53.9 percent of advanced sector jobs required a high school diploma or equivalent for an entry-level position, compared with 59.2 percent for total manufacturing.

- **Advanced manufacturing jobs pay higher annual wages**. The average annual US wage in advanced manufacturing sectors in 2015, based on a detailed analysis of occupations required, was $52,635 compared with $47,505 across the entire manufacturing sector.

- **Advanced manufacturing requires fewer workers in traditional blue-collar occupations and more in STEM occupations**. Advanced manufacturing had 50.8 percent of its total employment in production, transportation, and material handling occupations in 2015 compared with 59.5 percent for the entire manufacturing sector. Similarly, 16.9 percent of advanced manufacturing employment was in three high-skill, high-education occupations: architecture and engineering; computer and math; and life, physical, and social sciences versus 9.7 percent in all of manufacturing.

- **Productivity in advanced manufacturing is high**. In 2015 output per worker in the US advanced manufacturing sector was $422,751 compared with $325,000 for all of manufacturing.

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\(^\text{14}\) The definition of advanced manufacturing subsectors comes from two sources: 1) Daniel E. Hecker, “High-technology employment: A NAICS-based update,” *Monthly Labor Review*, July 2005. (Hecker is an economist in the Office of Occupational Statistics and Employment Projections, US Bureau of Labor Statistics) and 2) Muro, M., Jonathan Rothwell, et al. “America’s Advanced Industries: What They Are, Where They Are and Why They Matter,” Brookings Advanced Industries Project, February 2015. Both studies identified high-tech and advanced sectors across the entire economy at the four-digit NAICS level; we defined advanced manufacturing to consist of all the manufacturing subsectors that were identified in either study. The result was that 37 of the 86 four-digit NAICS manufacturing subsectors were defined as advanced manufacturing subsectors.
The key finding is that policies and strategies directed at the advanced manufacturing sector will have to concentrate on increasing the skill levels of the region’s manufacturing labor force. The training will have to be provided by a range of organizations, including local community colleges, universities, workforce development boards, secondary career and technical education (CTE) schools, the Northwest Florida and Capital Region RMAs, labor union apprentice programs, and manufacturing companies themselves. IHS cautions that regions cannot be competitive in all advanced manufacturing sectors, so economic development policies should be designed for and targeted at those advanced manufacturing sectors where clear competitive advantages exist. Competitive sectors are identified in this report’s shift-share analysis, but local sector development strategies might also further explore the relationship between the region’s state universities (Florida State University, Florida A&M University, and the University of West Florida) and local manufacturing companies, as universities typically have the potential to provide a breeding ground and test bed for new manufacturing products and processes, as well as yield STEM and management talent.

Risk rating by industry sector

IHS World Industry Service Sector Risk Ratings for each manufacturing sector in the United States use a proprietary methodology that calculates 40 individual risk factors for industrial sectors for most major industrialized countries including the United States. We consider the following major types of risk faced by firms in industrial sectors:

- **Composite sector risk:** A weighted average of 40 different risk components distributed among five major risk categories; 1) growth, 2) price and profitability, 3) supply, 4) industry structure, and 5) economic and commerce risk

- **Growth risk:** Evaluates, for real revenue and nominal sales, the rate and volatility of growth in the sector and detects the presence of turning points and shifts in sales patterns

- **Profitability and pricing risk:** Evaluates the sector's ability to pass on cost increases, its historical and forecast profits, and cash-flow growth and volatility, as well as operating efficiency

- **Supply risk:** Evaluates risk accruing to capital usage, depreciation, and changes in productive capacity

- **Industry-structure risk:** Evaluates the sector's exposure that results from competitive and structural characteristics (These include factors such as barriers to entry and exit.)

- **Economic and commerce risk:** Evaluates the size of the cycle in the sector and sensitivity of output demand to interest rates and incorporates the specific macroeconomic risks related to currency, legal, financial, and tax initiatives

The IHS risk ratings provide a broad perspective on the current and future risks in the industry sectors that state and local economic development organizations may consider assisting in terms of strategy development, technical assistance, workforce development, or the provision of economic development incentives such as loans, grants, and tax credits or deductions. The risk ratings are presented for International Standard Industrial Classification (ISIC) codes, which correspond closely with three-digit NAICS codes, and risk scores range between one (least risk) and ten (highest risk). In our April 2016 release, the minimum (e.g., low risk) and maximum (e.g., high risk) composite risk scores for the US manufacturing sectors were 5.0 and 8.1, compared with 6.9 for the entire manufacturing sector. The ranges of scores in the five subcategories are wider than for the composite risk, especially for the growth, profitability and pricing, and supply risk categories. The accompanying table presents the IHS industry risk ratings for the US manufacturing sector from April 2016, listed in ascending order of composite risk (i.e., low scores indicate lower levels of risk, and vice versa).

**IHS industry risk scores can assist state and local agencies in devising economic development strategies targeted at individual manufacturing subsectors. The appropriate way to use the industry risk rating is to first identify a**
specific subsector of interest in the table, then read across its row to identify the different types and levels of risks the sector is facing. Informed policies can be developed then based on the potential risks. As some of the risks faced by an individual sector, such as pricing and profitability or industry structure, may not be able to be reduced through state or regional policies, economic development practitioners need to consider the risk factors facing an industry and their ability to lessen those risks when developing strategies for, or allocating scarce resources to, individual manufacturing sectors or companies.

Of the manufacturing sectors in the Northwest Florida and Capital Region with more than 1,000 employees in 2015 (transportation equipment, machinery, chemical, wood product, fabricated metal and nonmetallic metal manufacturing) all but one (chemical manufacturing) had a composite risk score below the overall US manufacturing sector’s risk score of 6.9. In the case of chemical manufacturing, the most significant sources of risk are industry structure, profitability and pricing, and growth risk (all sources of risk that may be hard for local economic development practitioners to address).
Shift-share analysis

Finally, to examine the performance of the four-digit manufacturing subsectors based on changes in employment between 2000 and 2015, IHS conducted a shift-share analysis of the manufacturing subsectors in the regional study area.15

Shift-share analysis is an analytical technique used to decompose changes in a variable, such as employment or income, which occurred in a regional economy during a historical period. It compares the performance of an individual economic sector over time within the regional economy of interest to that same sector’s performance in a larger reference economy, usually the United States, in the same time period. Shift-share analysis is based on the theory that an individual sector’s performance in a regional economy over time is due to four effects:

- **National**: The share of growth in the larger reference economy that was captured by the region
- **Industry mix**: The shares of high-growth and low-growth sectors in the region and how they changed over time
- **Competitive**: The extent to which an individual economic sector in the region outperformed or underperformed the same sector at the level of the reference economy over the analysis period (The United States is the reference economy for the shift-share analysis presented in this profile.)
- **Allocation**: The extent to which a region has above-average shares of economic activity in those sectors where it has a competitive advantage

Stated another way, shift-share analysis enables an analyst to determine how much of the change in a variable, such as employment, in an individual economic sector over time was due to growth in the US economy and how much was attributable to characteristics of the regional economy, such as competitive advantages or disadvantages, and the distribution of economic activity into competitive and noncompetitive sectors.

Employment is the variable most often used in a shift-share analysis because it is the most widely available, the most current, and is published at the detailed NAICS level. For this study, using employment data at the four-digit NAICS code level (86 manufacturing subsectors) from the IHS Business Market Insights database, we classify each sector that has more than 50 employees into one of four types based on its performance.

- **Type A (“High Performing”)**: The sector’s 2015 employment LQ is greater than 1.0, and its employment CAGR during the analysis period was greater than the sector’s employment CAGR for the United States in the same period.
- **Type B (“Emerging”)**: The sector’s 2015 LQ is less than 1.0, but its employment CAGR was greater than the sector’s employment CAGR for the United States during the same period.
- **Type C (“Legacy”)**: The sector’s 2015 LQ is greater than 1.0, but its employment CAGR was less than the sector’s employment CAGR for the United States in the same period.

15 See Appendix A for full results of shift-share analysis.
• **Type D ("Laggard")**: The sector’s 2015 LQ is less than 1.0 and its employment CAGR during the analysis period was less than the sector’s employment CAGR for the United States during the same period.

In the Northwest Florida and Capital Region, there were eight high-performing manufacturing sectors classified as A that outperformed the United States in terms of employment growth and represented an above-average share of the region’s economy (i.e., had employment LQs above 1.0). These include:

- Aerospace product and parts manufacturing
- Ship and boat building
- Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing
- Other nonmetallic mineral product manufacturing
- Sawmills and wood preservation
- Veneer, plywood, and engineered wood product manufacturing
- Steel product manufacturing from purchased steel
- Tobacco manufacturing

The eight high-performing sectors currently account for 40.3 percent of total manufacturing employment in the Northwest Florida and Capital Region. Meanwhile, the region has 25 emerging or growth sectors, classified as B sectors, which are doing relatively well in terms of employment growth, but do not yet account for a large share of regional economic activity. **Combined, the A and B sectors represent nearly two-thirds of regional manufacturing employment, meaning state and local economic development organizations such as FloridaMakes have a significant opportunity to support sectors with existing strengths in the Northwest Florida and Capital Region by researching these companies’ competitiveness drivers and designing programs or policies that capitalize on existing strengths and minimize growth barriers.** A few of the notable B sectors providing 150 or more jobs in the region include:

- Motor vehicle parts manufacturing
- Other general purpose machinery manufacturing
- Soap, cleaning compound, and toilet preparation manufacturing
- Semiconductor and other electronic component manufacturing
- Other miscellaneous manufacturing
- Other wood product manufacturing
- Industrial machinery manufacturing
- Pharmaceutical and medicine manufacturing
• Other electrical equipment and component manufacturing
• Seafood product preparation and packaging
• Agriculture, construction, and mining machinery manufacturing

For the traditionally important legacy industries in which the region still has above-average shares of economic activity, but, for a variety of reasons, the industries are underperforming their peers at the US level in terms of employment growth (the C sectors), there are only three:

• Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing
• Pulp, paper, and paperboard mills
• Lime and gypsum product manufacturing

Finally, we find 20 D sectors that are the lowest-performing in terms of relative importance to the regional economy (as compared with the nation as a whole) and with slower growth than the sector had at the US level during the analysis period. Given that, combined, the C and D sectors represent more than one-third (35.4 percent) of the region’s employment (or 6,323 jobs), attention should be paid toward understanding why their national competitiveness has declined in recent years or what more can be done to maintain employment in these industries at levels similar or better to that which has occurred nationally.

The results of the shift-share analysis can be used for developing strategies in the following manner:

• Analyze the economic sectors classified as either A or B, as they are the highest performers, to identify the competitive advantages in the region that drive their performance. The B sectors should receive special attention because, while they currently account for below-average shares of economic activity, this is where growth opportunities are likely to be found. The economic development objective is to turn B sectors into A sectors.

• Identify the names of individual firms in each A and B sector and analyze them to determine why they are high performers. It is essential to determine the extent to which their high performances are due to:
  1) firm-level factors such as excellent management, efficient operations, competitive prices, superior product quality, etc.
  2) regional competitive advantages such as lower cost of doing business; high quality of labor; proximity to markets, suppliers, or both; lower tax rates; excellent transportation networks; favorable regulatory environment; etc.

• Analyze the C sectors and identify the factors that affect their competitiveness; they constitute traditional centers of manufacturing activity so helping them remain profitable also maintains manufacturing employment.

• Identify clusters of subsectors with similar needs that also interact with each other through buying and selling relationships.

• Identify those regional competitive advantages that apply across all the manufacturing subsectors and those that are uniquely important to a few specialized subsectors.

• Identify those regional competitive advantages where local actions can make a difference (i.e., increasing the supply of skilled workers needed by the advanced manufacturing sectors).
• Begin to **develop strategies and programs** that maintain and enhance regional competitive advantage in the targeted sectors.

Based on our experience in other studies, it is always valuable to have economic development professionals with detailed knowledge of the regional economy review the list of the subsectors assigned to each of the four shift-share types. Ideally, the distribution of subsectors by type should generally confirm their understanding of the region’s economic composition (i.e., the subsectors they expect to be classified as A or B sectors actually appear there).

## Wages in manufacturing occupations

IHS estimated total annual wage payments for an individual company in selected manufacturing sectors using the US distribution of detailed occupational employment by four-digit NAICS code. Our analysis used 2015 annual wage rates, as published by the BLS for the Pensacola-Ferry Pass-Brent, Crestview-Fort Walton Beach-Destin, Panama City, and Tallahassee, Florida, MSAs, because they are representative of labor market conditions in the Northwest Florida and Capital Region. The purpose of the analysis was to compare the total annual wage cost for a manufacturing company located in the Northwest Florida and Capital Region to the cost if it paid average annual US wages for the same occupational mix, keeping total employment the same.

A review of the major occupational categories involved in Florida’s manufacturing sector statewide shows **57.8 percent of all production workers in Florida are employed in the manufacturing sector**, followed by **23.3 percent of all architects and engineers**. As such, these are two of the most significant categories for evaluating manufacturing occupation wages in the Northwest Florida and Capital Region. **As shown by the table below on manufacturing employment and wage levels in 2015, someone in either of these two occupations in the Northwest Florida and Capital Region makes less than the average person in that occupation nationally, although average wages in both sets of occupations are higher in the Northwest Florida and Capital Region than they are statewide, with the average person in both occupations earning over 7.5 percent more in the Northwest Florida and Capital Region than their peers in the same profession across the state.**

### Employment and wage levels in manufacturing occupations, 2015

<table>
<thead>
<tr>
<th>Major occupational category</th>
<th>Employment in all sectors in region</th>
<th>Percent of occupation working in Florida’s mfg. sector</th>
<th>Median annual wage in region</th>
<th>Percent of Florida’s median annual wage</th>
<th>Percent of US median annual wage</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-0000 Management</td>
<td>15,020</td>
<td>5.7%</td>
<td>$88,266</td>
<td>88.9%</td>
<td>89.6%</td>
</tr>
<tr>
<td>17-0000 Architecture and engineering</td>
<td>8,760</td>
<td>23.3%</td>
<td>$71,926</td>
<td>107.9%</td>
<td>93.6%</td>
</tr>
<tr>
<td>41-0000 Sales and related</td>
<td>61,130</td>
<td>11%</td>
<td>$22,800</td>
<td>92.3%</td>
<td>88.9%</td>
</tr>
<tr>
<td>43-0000 Office and administrative support</td>
<td>83,470</td>
<td>2.6%</td>
<td>$28,418</td>
<td>94.0%</td>
<td>85.6%</td>
</tr>
<tr>
<td>49-0000 Installation, maintenance, and repair</td>
<td>23,000</td>
<td>4.3%</td>
<td>$17,185</td>
<td>98.7%</td>
<td>86.8%</td>
</tr>
<tr>
<td>51-0000 Production</td>
<td>16,330</td>
<td>57.8%</td>
<td>$21,093</td>
<td>107.5%</td>
<td>96.4%</td>
</tr>
<tr>
<td>53-0000 Transportation and material moving</td>
<td>21,760</td>
<td>4.9%</td>
<td>$25,716</td>
<td>97.0%</td>
<td>85.5%</td>
</tr>
</tbody>
</table>

Notes: The major occupational categories listed above accounted for 89% of total 2015 employment in Florida’s manufacturing sector. Figures in columns 2 and 4 are based on data for the Pensacola-Ferry Pass-Brent, Florida; Crestview-Fort Walton Beach-Destin, Florida; Panama City, Florida; and Tallahassee, Florida; MSAs. The median annual wage is a weighted average based on employment shares in the major occupational categories.


Additional analysis showed the total annual wage costs for all manufacturing sectors in the Northwest Florida and Capital Region range between 8.1 percent and 24.4 percent less than the national sum, with the difference in the cumulative wage bill varying by location within the region, manufacturing subsector, and occupation type. For
example, while architects and engineers in the glass and glass product manufacturing industry (NAICS 327200) in Panama City earn 0.8 percent more than their national counterparts, architects and engineers in the Northwest Florida nonmetropolitan area earn 30.8 percent less in wages annually. Meanwhile, in the basic chemical manufacturing sector (NAICS 325100), wages in production occupations range from 21.6 percent lower in the Northwest Florida nonmetropolitan area to 0.2 percent higher in the Pensacola-Ferry Pass-Brent, Florida, MSA than they are nationally.

One implication of these findings is that strategies to increase wages will need to vary significantly within the region. For example, whereas economic developers in the Northwest Florida nonmetropolitan area might tout their lower-than-average manufacturing wage costs as a competitive advantage, economic development strategies in the Pensacola-Ferry Pass-Brent, Panama City, and Crestview-Fort Walton Beach-Destin, Florida, MSAs might instead focus on supporting local workers to obtain the skills required to participate in manufacturing subsectors that pay above-average wages.

Transferability of the Northwest Florida and Capital Region labor force’s core competencies

Understanding the core competencies of a region’s labor force, and the transferability of these competencies between industries, is an important aspect of any workforce development policy that aims to fill skill gaps and guide a region to become a high-skill, high-wage economy. Measures of the knowledge, skills, and abilities (KSAs), as well as educational attainment, of a region’s labor force can be used to estimate the workforce’s core competencies, as well as to evaluate the fit of a region’s core competencies in relation to a particular industry’s skill requirements.

The chart on the following page illustrates a relative correlation index between the knowledge competencies demanded by a selected set of industries and the knowledge competencies supplied by the labor force in the Northwest Florida and Capital Region. The comparison is made between the core competencies supplied by the labor force in the 16 counties of the Northwest Florida and Capital Region and the core competencies supplied by the US labor force more generally. Industries with a positive correlation index represent sectors for which the regional labor force is better suited to meet the industry’s knowledge requirement relative to the national labor force. Industries with a negative correlation index represent sectors for which the regional labor force is less well-suited to meet the industry’s knowledge requirement relative to the national labor force. Likewise, industries with a correlation index near zero are sectors for which the regional labor force is equally well-suited to meet the industry’s knowledge requirement relative to the national labor force.

For the top set of industries given in the chart (sectors with the most positive correlation index), economic development planning may be relatively straightforward because the labor force already has the knowledge required to fill jobs in those sectors. On the other hand, for the bottom set of industries in the chart (sectors with the most negative correlation index), workforce training, relocation incentives, or targeted educational programming may be required before the region’s labor force becomes competitive. (See Appendix B for a description of the KSA methodology and more examples of practical applications of KSA analysis.)

According to the correlation indices in the top half of the chart, the Northwest Florida and Capital Region labor force is well-suited to fill jobs in a number of service industries that provide for the needs of retirees, government agencies, and military bases, such as outpatient health clinics, schools, security services, and home health care services. On the other hand, the bottom half of this chart shows that the Northwest Florida and Capital Region labor force is less well suited to fill manufacturing industry jobs, including some of those which are noted in the shift-share analysis as high-performing or growth sectors, e.g., ship and boat building, motor vehicle body and trailer manufacturing, and metalworking machinery manufacturing. Since the core competencies required by these industries may not be a main focus of educational or workforce training curriculum, it may require a concerted workforce development effort over a sustained period to match education and training programs with local manufacturing employers’ needs.
Although not shown in the chart, there may still be other industries (i.e., fitness and recreational sports centers, specialty hospitals, charter bus service, scenic and sightseeing transportation, etc.) for which the local labor force is at least as well-equipped, if not better equipped, than the national labor force to fulfill industry job requirements. These may represent feasible opportunities to nudge the region’s development path in a certain direction given an appropriate workforce development response. Thus, the Northwest Florida Manufacturers Council and the Capital Region Manufacturers Association might use the full set of industry-labor force correlation indices (available upon request) as a tool for better understanding the transferability of the region’s core competencies into manufacturing sector opportunities within the context of a larger industry or workforce development strategy.

Since the core competencies required by the region’s growth manufacturing industries may be underrepresented in the local labor force, economic and workforce developers may want to consider providing an educational pipeline to match education and training programs with local manufacturing employers’ needs.
## Appendix A: Results of the shift-share analysis

<table>
<thead>
<tr>
<th>NAICS sector</th>
<th>Description</th>
<th>Allocation code</th>
<th>Employment</th>
<th>LQ</th>
<th>% of Private Sector Employment</th>
<th>Employment CAGR 2000–15</th>
</tr>
</thead>
<tbody>
<tr>
<td>3364</td>
<td>Aerospace product and parts</td>
<td>A</td>
<td>2,489</td>
<td>1.05</td>
<td>0.43</td>
<td>2.6%</td>
</tr>
<tr>
<td>3366</td>
<td>Ship and boat building</td>
<td>A</td>
<td>1,438</td>
<td>2.15</td>
<td>0.25</td>
<td>5.5%</td>
</tr>
<tr>
<td>3334</td>
<td>Ventilation, heating, air condit., &amp; comm. refrigeration equip.</td>
<td>A</td>
<td>895</td>
<td>1.52</td>
<td>0.16</td>
<td>17.2%</td>
</tr>
<tr>
<td>3279</td>
<td>Other nonmetallic mineral product</td>
<td>A</td>
<td>682</td>
<td>1.84</td>
<td>0.12</td>
<td>4.1%</td>
</tr>
<tr>
<td>3211</td>
<td>Sawmills and wood preservation</td>
<td>A</td>
<td>657</td>
<td>1.67</td>
<td>0.11</td>
<td>1.8%</td>
</tr>
<tr>
<td>3212</td>
<td>Veneer, plywood, and engineered wood product</td>
<td>A</td>
<td>655</td>
<td>2.07</td>
<td>0.11</td>
<td>0.5%</td>
</tr>
<tr>
<td>3312</td>
<td>Steel product from purchased steel</td>
<td>A</td>
<td>292</td>
<td>1.25</td>
<td>0.05</td>
<td>4.7%</td>
</tr>
<tr>
<td>3122</td>
<td>Tobacco</td>
<td>A</td>
<td>82</td>
<td>1.13</td>
<td>0.01</td>
<td>24.7%</td>
</tr>
<tr>
<td>3363</td>
<td>Motor vehicle parts</td>
<td>B</td>
<td>740</td>
<td>0.30</td>
<td>0.13</td>
<td>0.3%</td>
</tr>
<tr>
<td>3339</td>
<td>Other general purpose machinery</td>
<td>B</td>
<td>640</td>
<td>0.50</td>
<td>0.11</td>
<td>2.8%</td>
</tr>
<tr>
<td>3256</td>
<td>Soap, cleaning compound, and toilet preparation</td>
<td>B</td>
<td>468</td>
<td>0.96</td>
<td>0.08</td>
<td>-0.5%</td>
</tr>
<tr>
<td>3344</td>
<td>Semiconductor and other electronic component</td>
<td>B</td>
<td>307</td>
<td>0.18</td>
<td>0.05</td>
<td>-1.0%</td>
</tr>
<tr>
<td>3399</td>
<td>Other miscellaneous</td>
<td>B</td>
<td>254</td>
<td>0.20</td>
<td>0.04</td>
<td>-2.8%</td>
</tr>
<tr>
<td>3219</td>
<td>Other wood product</td>
<td>B</td>
<td>208</td>
<td>0.20</td>
<td>0.04</td>
<td>-0.5%</td>
</tr>
<tr>
<td>3332</td>
<td>Industrial machinery</td>
<td>B</td>
<td>203</td>
<td>0.40</td>
<td>0.04</td>
<td>18.0%</td>
</tr>
<tr>
<td>3254</td>
<td>Pharmaceutical and medicine</td>
<td>B</td>
<td>187</td>
<td>0.14</td>
<td>0.03</td>
<td>6.6%</td>
</tr>
<tr>
<td>3359</td>
<td>Other electrical equipment and component</td>
<td>B</td>
<td>159</td>
<td>0.28</td>
<td>0.03</td>
<td>2.2%</td>
</tr>
<tr>
<td>3117</td>
<td>Seafood product preparation and packaging</td>
<td>B</td>
<td>150</td>
<td>0.98</td>
<td>0.03</td>
<td>-1.5%</td>
</tr>
<tr>
<td>3331</td>
<td>Agriculture, construction, and mining machinery</td>
<td>B</td>
<td>150</td>
<td>0.13</td>
<td>0.03</td>
<td>16.6%</td>
</tr>
<tr>
<td>3335</td>
<td>Metalworking machinery</td>
<td>B</td>
<td>113</td>
<td>0.13</td>
<td>0.02</td>
<td>-1.2%</td>
</tr>
<tr>
<td>3336</td>
<td>Engine, turbine, and power transmission equipment</td>
<td>B</td>
<td>113</td>
<td>0.23</td>
<td>0.02</td>
<td>2.5%</td>
</tr>
<tr>
<td>3362</td>
<td>Motor vehicle body and trailer</td>
<td>B</td>
<td>83</td>
<td>0.11</td>
<td>0.01</td>
<td>0.6%</td>
</tr>
<tr>
<td>3149</td>
<td>Other textile product mills</td>
<td>B</td>
<td>79</td>
<td>0.27</td>
<td>0.01</td>
<td>-3.0%</td>
</tr>
<tr>
<td>3255</td>
<td>Paint, coating, and adhesive</td>
<td>B</td>
<td>63</td>
<td>0.22</td>
<td>0.01</td>
<td>3.4%</td>
</tr>
<tr>
<td>3328</td>
<td>Coating, engraving, heat treating, and allied activities</td>
<td>B</td>
<td>62</td>
<td>0.09</td>
<td>0.01</td>
<td>9.5%</td>
</tr>
<tr>
<td>3241</td>
<td>Petroleum and coal products</td>
<td>B</td>
<td>55</td>
<td>0.11</td>
<td>0.01</td>
<td>0.4%</td>
</tr>
<tr>
<td>3372</td>
<td>Office furniture (including fixtures)</td>
<td>B</td>
<td>55</td>
<td>0.10</td>
<td>0.01</td>
<td>1.7%</td>
</tr>
<tr>
<td>3353</td>
<td>Electrical equipment</td>
<td>B</td>
<td>53</td>
<td>0.08</td>
<td>0.01</td>
<td>3.4%</td>
</tr>
<tr>
<td>3133</td>
<td>Textile and fabric finishing and fabric coating mills</td>
<td>B</td>
<td>48</td>
<td>0.30</td>
<td>0.01</td>
<td>-</td>
</tr>
<tr>
<td>3326</td>
<td>Spring and wire product</td>
<td>B</td>
<td>44</td>
<td>0.24</td>
<td>0.01</td>
<td>22.9%</td>
</tr>
<tr>
<td>3119</td>
<td>Other food</td>
<td>B</td>
<td>21</td>
<td>0.02</td>
<td>0.00</td>
<td>11.7%</td>
</tr>
<tr>
<td>3369</td>
<td>Other transportation equipment</td>
<td>B</td>
<td>20</td>
<td>0.23</td>
<td>0.00</td>
<td>2.6%</td>
</tr>
<tr>
<td>3341</td>
<td>Computer and peripheral equipment</td>
<td>B</td>
<td>14</td>
<td>0.02</td>
<td>0.00</td>
<td>-0.5%</td>
</tr>
<tr>
<td>3252</td>
<td>Resin, synthetic rubber &amp; artificial synthetic fibers and filaments</td>
<td>C</td>
<td>1,167</td>
<td>2.66</td>
<td>0.20</td>
<td>-5.3%</td>
</tr>
<tr>
<td>3221</td>
<td>Pulp, paper, and paperboard mills</td>
<td>C</td>
<td>782</td>
<td>1.64</td>
<td>0.14</td>
<td>-4.6%</td>
</tr>
<tr>
<td>3274</td>
<td>Lime and gypsum product</td>
<td>C</td>
<td>384</td>
<td>6.49</td>
<td>0.07</td>
<td>-3.6%</td>
</tr>
<tr>
<td>3231</td>
<td>Printing and related support activities</td>
<td>D</td>
<td>672</td>
<td>0.32</td>
<td>0.12</td>
<td>-6.2%</td>
</tr>
<tr>
<td>3323</td>
<td>Architectural and structural metals</td>
<td>D</td>
<td>665</td>
<td>0.60</td>
<td>0.12</td>
<td>-2.8%</td>
</tr>
<tr>
<td>3345</td>
<td>Navigational, measuring, electromedical, and control instruments</td>
<td>D</td>
<td>620</td>
<td>0.35</td>
<td>0.11</td>
<td>-3.8%</td>
</tr>
<tr>
<td>3327</td>
<td>Machine shops: turned product: and screw, nut, and bolt</td>
<td>D</td>
<td>270</td>
<td>0.15</td>
<td>0.05</td>
<td>-1.9%</td>
</tr>
<tr>
<td>3371</td>
<td>Household and institutional furniture and kitchen cabinet</td>
<td>D</td>
<td>249</td>
<td>0.24</td>
<td>0.04</td>
<td>-7.5%</td>
</tr>
<tr>
<td>3251</td>
<td>Basic chemical</td>
<td>D</td>
<td>196</td>
<td>0.28</td>
<td>0.03</td>
<td>4.5%</td>
</tr>
<tr>
<td>3391</td>
<td>Medical equipment and supplies</td>
<td>D</td>
<td>193</td>
<td>0.13</td>
<td>0.03</td>
<td>-0.3%</td>
</tr>
<tr>
<td>3341</td>
<td>Textile furnishings mills</td>
<td>D</td>
<td>184</td>
<td>0.75</td>
<td>0.03</td>
<td>-10.6%</td>
</tr>
<tr>
<td>3321</td>
<td>Forging and stamping</td>
<td>D</td>
<td>151</td>
<td>0.27</td>
<td>0.03</td>
<td>-8.1%</td>
</tr>
<tr>
<td>3222</td>
<td>Converted paper product</td>
<td>D</td>
<td>146</td>
<td>0.12</td>
<td>0.03</td>
<td>-9.9%</td>
</tr>
<tr>
<td>3132</td>
<td>Fabric mills</td>
<td>D</td>
<td>145</td>
<td>0.56</td>
<td>0.03</td>
<td>-8.9%</td>
</tr>
<tr>
<td>3261</td>
<td>Plastics product</td>
<td>D</td>
<td>140</td>
<td>0.05</td>
<td>0.02</td>
<td>-2.9%</td>
</tr>
<tr>
<td>3318</td>
<td>Bakers and tortilla</td>
<td>D</td>
<td>91</td>
<td>0.07</td>
<td>0.02</td>
<td>-5.0%</td>
</tr>
<tr>
<td>3329</td>
<td>Other fabricated metal product</td>
<td>D</td>
<td>81</td>
<td>0.07</td>
<td>0.01</td>
<td>-3.4%</td>
</tr>
<tr>
<td>3379</td>
<td>Other furniture-related product</td>
<td>D</td>
<td>67</td>
<td>0.42</td>
<td>0.01</td>
<td>-7.3%</td>
</tr>
<tr>
<td>3342</td>
<td>Communications equipment</td>
<td>D</td>
<td>30</td>
<td>0.07</td>
<td>0.01</td>
<td>-17.5%</td>
</tr>
<tr>
<td>3351</td>
<td>Electric lighting equipment</td>
<td>D</td>
<td>30</td>
<td>0.14</td>
<td>0.01</td>
<td>-6.9%</td>
</tr>
<tr>
<td>3116</td>
<td>Animal slaughtering and processing</td>
<td>D</td>
<td>26</td>
<td>0.01</td>
<td>0.00</td>
<td>-18.1%</td>
</tr>
<tr>
<td>3262</td>
<td>Rubber product</td>
<td>D</td>
<td>23</td>
<td>0.04</td>
<td>0.00</td>
<td>-13.1%</td>
</tr>
<tr>
<td>3272</td>
<td>Glass and glass product</td>
<td>D</td>
<td>11</td>
<td>0.02</td>
<td>0.00</td>
<td>-12.3%</td>
</tr>
</tbody>
</table>

Note: Only sectors with employment of 10 or more were considered; LQ = location quotient and CAGR = compound annual growth rate. CAGR of NA means 0 employment in 2000 for that sector.

Source: IHS Business MarketInsights © 2016 IHS
Appendix B: Knowledge, skills, and abilities (KSA) analysis methodology and applications

To facilitate industry-labor force matching, researchers at the Alward Institute for Collaborative Science have mapped occupations from IMPLAN’s industry employment onto BLS occupational categories and O*NET’s determined sets of knowledge, skills, and abilities KSAs. In addition, they have also linked occupations to their necessary formal education and informal on-the-job training and work experience needed to acquire these KSAs. From here, the Alward Institute has developed data models that can:

- Estimate the core competencies for the total array of occupations employed in a region

- Link these core competencies to region-specific levels of employment and wages

For example, if there are 1,000 jobs in a region, then there will be 1,000 occupational equivalents each for the KSAs with associated average wage and employment levels. The weighted average of the KSA occupational equivalents make up a region’s core competencies. These occupational equivalents and associated core competencies vary based on the region’s history and industrial mix.

An example of how KSA analysis can be applied: if a county government is looking to attract a new wind turbine manufacturing plant to the area, it might be beneficial not only to estimate the impact of that plant on the local economy, but also to understand the types of jobs and competencies that will be required to run the plant. This type of analysis can be accomplished by bridging between a sector’s occupational staffing pattern and regional measures of KSA to illuminate the set of core competencies likely to be required by a given industry.

Alternatively, a correlation analysis can be used to identify which industries best fit the existing core competencies within a regional labor market. If significant skill gaps are identified, the local government can then be proactive in establishing workforce training and education. This type of analysis is crucial not only in helping economic developers target a range of industries, but also in helping workforce developers identify training and educational programming that can help fill skill gaps in the labor force. Such informed public policy can help guide an economy from a low-skill, low-wage commodity-based economy to a high-skill, high-wage niche-based economy.