Southwest Regional Manufacturers Association

Manufacturing Sector Profile

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Southwest Regional Manufacturers Association
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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 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 Southwest Florida economy, 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 Southwest Florida region comprises eight counties: Charlotte, Collier, DeSoto, Glades, Hardee, Hendry, Highlands, and Lee.¹ The largest city in the regional economy, Cape Coral, is situated within Lee County, a part of the Cape Coral-Fort Myers, Florida, metropolitan statistical area (MSA). Meanwhile, Charlotte County is in the Punta Gorda, Florida, MSA; Collier County is in the Naples-Marco Island, Florida, MSA; Highlands County is in the Sebring, Florida, MSA; DeSoto County is in the Arcadia, Florida, micropolitan statistical area (micro); Hardee County is in the Wauchula, Florida micro; Hendry County is in the Clewiston, Florida micro; and Glades County is in the South Florida nonmetropolitan area.

In the following sections, findings of potential interest to policymakers are presented in bold.

¹ While data for this study are presented for the eight-county study area, they are available by county upon client request.
Strategic Summary

What is the situation today?

The 2015 population of the Southwest RMA service area was more than 1.4 million people, or 7.2 percent of the state of Florida. With a 4.4 percent unemployment rate in April 2016, the labor market in the Southwest region was tighter in April 2016 than at the national and state levels, despite having been slightly weaker than the state or national levels on average since 2011.

Private, services-providing (PSP) sectors constitute 70 percent of employment in the Southwest region, with the retail trade, accommodation and food services, and health care and social assistance sectors providing the greatest number of jobs. Just more than 16 percent of regional jobs are in goods-producing sectors (agriculture, mining, construction, and manufacturing), and 14 percent of jobs are in government.

The manufacturing sector consists of 10,785 jobs, 2.2 percent of the region’s total employment, which is significantly less than the US and Florida shares of 8.5 percent and 4.1 percent, respectively.

The miscellaneous, nonmetallic mineral, machinery, and transportation equipment manufacturing sectors offered more than 1,000 jobs each in 2015 and together account for almost half (49.1 percent) of regional employment.

The vast majority (94.2 percent) of the Southwest region’s manufacturers employ fewer than 50 workers, and more than three-quarters (77.6 percent) are “very small” employers (with fewer than 10 employees each). Manufacturing subsectors with large numbers of very small employers include support activities—printing, fabricated metal products, furniture and related products, and miscellaneous.

The region’s median annual wage levels in major occupations required by manufacturers (except for those in sales and related occupations) are lower than those in Florida and the country overall, with production workers
typically earning approximately 11 percent less than their national counterparts and architects and engineers earning almost 23 percent less.

What are our advantages?

- Nine of Southwest Florida’s three-digit North American Industry Classification System (NAICS) manufacturing subsectors experienced positive employment, output, and growth during the 15-year period from 2000 to 2015. The largest of these include miscellaneous, transportation equipment, and electrical equipment and appliance manufacturing.

- Although still a relatively small employer in the region (providing just more than 150 jobs), the beverage and tobacco products manufacturing sector far surpassed all other sectors in terms of employment growth with an 18.6 percent compound annual growth rate (CAGR) since 2000 (when the sector only employed 12 people). The 5.6 percent CAGR of the transportation equipment manufacturing industry (which employs more than 1,000 people in the region) is also noteworthy.

- The Southwest region had three “high-performing”² 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. These included medical equipment and supplies, electrical, and tobacco equipment manufacturing, with the first two, combined, providing more than 2,300 jobs.

- Of the region’s 35 “emerging” four-digit NAICS manufacturing sectors, which offer more regional jobs than any other category, the largest (in order of employment) are aerospace products and parts, other miscellaneous manufacturing, metalworking machinery, household and institutional furniture and kitchen cabinet, other wood products manufacturing, and other nonmetallic mineral products manufacturing. All of these sectors employ more than 300 people.

- Together, “high-performing” and “emerging” sectors constitute almost two-thirds of the four-digit North American Industry Classification System (NAICS) manufacturing sectors in the Southwest Florida region.

² See the “Shift-share analysis” section for “high-performing” and “emerging” sector category classifications.
The Southwest Florida region has more than half (53 percent) of its manufacturing industry employment in advanced manufacturing. 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.

Approximately 78.1 percent of the Southwest Florida region’s manufacturing employment in 2015 was in the durable sectors, a significantly greater share of manufacturing jobs than in Florida overall, where durable manufacturing accounted for 67.9 percent of manufacturing employment. Compared with nondurable manufacturing sectors, durable manufacturers typically require a greater share of skilled workers, have higher levels of productivity, and pay higher wages.

Aside from miscellaneous manufacturing (for which risk ratings are not available), the region’s top-three manufacturing sectors (by 2015 employment) all had an IHS World Industry Service composite risk score below the US manufacturing industry average.

Outside of sales and related occupations, the Southwest region has a competitive advantage nationally in terms of labor costs, especially for architects and engineers, who are especially important to the advanced manufacturing sectors.

Where should we be concerned?

Constituting only a small percentage of employment in Southwest Florida, the region’s manufacturing sector diversity is significantly lower than the manufacturing diversity of the state of Florida overall.

The Southwest Florida labor force is not particularly well-equipped to meet the educational requirements of the manufacturing industry, apart from apparel manufacturing. Instead, the Southwest Florida labor force is well-suited to fill jobs in industries that support the needs of retirees, government agencies, and military bases, such as occupations required by restaurants, hotels, and construction firms.

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

- Textile mills lost nearly 90 percent of their workforce; textile product mills shrank 29 percent; and apparel manufacturing was left with only 27 workers in 2015 (from 92 in 2000).
- Food manufacturing almost halved its workforce size from 1,833 to 968.
- Nonmetallic mineral and fabricated metal products manufacturers each lost more than 550 jobs.
- Plastic and rubber products manufacturing experienced a rate of decline of 9.2 percent annually.
- Paper manufacturing witnessed a workforce reduction of almost 70 percent.

Where should we focus our efforts?

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

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. Manufacturing industries 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 include kitchen cabinet and countertop manufacturing, sawmills, footwear manufacturing, food manufacturing, and furniture manufacturing, among others. The region may find feasible opportunities for workforce development to contribute to manufacturing industry development within these manufacturing sectors.

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3 See definition in “Advanced Manufacturing” section.
4 Durables, or hard goods, are defined as those that are not totally consumed during their immediate or first use.
5 See the definition in the “Risk rating by industry sector” section.
• Economic and workforce development practitioners in the Southwest Florida region might also explore how commodity demand from the region’s food service industry or commodity supply from the region’s agriculture industry might be parlayed into manufacturing sector opportunities, e.g., contribute to the growth of the food and beverage manufacturing sector.

• Explore what is driving the higher-than-average “profitability and pricing,” “growth,” and “supply” risks respectively threatening three of the region’s largest manufacturing sectors (nonmetallic minerals, machinery, and transportation equipment) to determine if there is a role local policymakers or economic development practitioners can play in mitigating these risks.

• Given the limited resources available to support regional economic development and manufacturing sector growth, the region should decide whether to prioritize sectors that currently provide the greatest opportunities for employment in the region (e.g., nonmetallic minerals, machinery, transportation equipment, and miscellaneous manufacturing), the nine sectors that have witnessed positive employment, output, and productivity growth in recent years (which exclude nonmetallic minerals and machinery manufacturing), or those that are high performing compared with their nationwide peers in terms of employment growth and industry concentration (medical equipment and supplies, electrical equipment, and tobacco manufacturing).

• For targeted manufacturing industry recruitment, the region’s national competitive advantage in terms of manufacturing labor costs (apart from sales and related occupations) should not go without mention.

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

Population
IHS estimates the 2015 population in the Southwest Florida region was 1,454,382 people, or 7.2 percent of the state of Florida. The population density was 163 persons per square mile, 44 percent of the Florida density of 369.5 persons per square mile.

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 April 2016 unemployment rate was six-tenths of a percentage point lower than in April 2015. Since 2011, the average annual unemployment rate in the Southwest Florida region has been two-fifths of a percentage point higher than the statewide rate and seven-tenths of a percentage point higher than the national unemployment rate. Despite historically higher unemployment rates, the region’s 11.8 percent year-on-year decrease in its unemployment rate far exceeded the national unemployment rate decline of 6.9 percent during the same period.

Labor force
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 April 2016 unemployment rate was six-tenths of a percentage point lower than in April 2015. Since 2011, the average annual unemployment rate in the Southwest Florida region has been two-fifths of a percentage point higher than the statewide rate and seven-tenths of a percentage point higher than the national unemployment rate. Despite historically higher unemployment rates, the region’s 11.8 percent year-on-year decrease in its unemployment rate far exceeded the national unemployment rate decline of 6.9 percent during the same period.

The key finding from the labor force analysis is the labor market in the Southwest Florida region is slightly tighter than at either the state or US level. The tighter-than-average labor market could eventually result in rising wage rates and potentially bring on shortages of skilled workers, especially for skilled manufacturing occupations.
Economic structure

Employment by major economic sector, according to two-digit NAICS codes, is presented in the accompanying table in descending order by number of jobs. **IHS estimates there were 10,785 jobs in 2015 in the Southwest Florida region’s manufacturing sector (NAICS codes 31–33).** The share of the Southwest Florida region’s total 2015 employment in manufacturing is 2.2 percent, significantly below the US and state of 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 0.26.8

Of 22 major sectors in the Southwest Florida region, only 8 had employment LQs greater than one, meaning almost two-thirds of the region’s sectors are less concentrated, based on employment, than they are in the United States. With respective location quotients of 2.22, construction (NAICS 23) and arts, entertainment, and recreation (NAICS 71) are especially highly concentrated, followed by agriculture, forestry, fishing (NAICS 11) and retail trade (NAICS 44–45), with LQs of 1.71 and 1.44, respectively.

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.9 In fact, in the Southwest Florida region, the PSP sectors account for 70.0 percent of jobs, just less than in Florida overall (where PSP sectors represented 75.9 percent of employment in 2015), and just above the US share of 68.9 percent. Goods-producing sectors (e.g., agriculture, mining, construction, and manufacturing) account for just 16.2 percent of regional employment, and government jobs constitute 13.8 percent of the region’s employment.

Structure diversity

To evaluate the diversity of the Southwest Florida 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 Index10, the maximum value is 1.00, or in other words, the closer the region’s Hachman

<table>
<thead>
<tr>
<th>Industry</th>
<th>Number of jobs</th>
<th>% share</th>
<th>LQ</th>
<th>CAGR 2000-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>44–45 Retail trade</td>
<td>76,735</td>
<td>15.5</td>
<td>1.44</td>
<td>1.3%</td>
</tr>
<tr>
<td>72 Accommodation and food service</td>
<td>61,098</td>
<td>12.4</td>
<td>1.39</td>
<td>3.2%</td>
</tr>
<tr>
<td>62 Healthcare and social assistance</td>
<td>60,782</td>
<td>12.3</td>
<td>0.96</td>
<td>2.7%</td>
</tr>
<tr>
<td>92 Local government</td>
<td>56,268</td>
<td>11.4</td>
<td>1.15</td>
<td>2.2%</td>
</tr>
<tr>
<td>23 Construction</td>
<td>47,953</td>
<td>9.7</td>
<td>2.22</td>
<td>-0.3%</td>
</tr>
<tr>
<td>56 Administrative and waste services</td>
<td>29,527</td>
<td>6.0</td>
<td>0.99</td>
<td>2.2%</td>
</tr>
<tr>
<td>81 Other services, excluding public</td>
<td>22,096</td>
<td>4.5</td>
<td>1.16</td>
<td>2.3%</td>
</tr>
<tr>
<td>54 Professional and technical services</td>
<td>20,825</td>
<td>4.2</td>
<td>0.71</td>
<td>2.4%</td>
</tr>
<tr>
<td>11 Agriculture, forestry, fishing</td>
<td>19,485</td>
<td>3.9</td>
<td>1.71</td>
<td>-1.3%</td>
</tr>
<tr>
<td>71 Arts, entertainment, and recreation</td>
<td>16,403</td>
<td>3.3</td>
<td>2.22</td>
<td>3.3%</td>
</tr>
<tr>
<td>52 Finance and insurance</td>
<td>13,125</td>
<td>2.7</td>
<td>0.65</td>
<td>2.4%</td>
</tr>
<tr>
<td>42 Wholesale trade</td>
<td>13,074</td>
<td>2.6</td>
<td>0.65</td>
<td>2.0%</td>
</tr>
<tr>
<td>31–33 Manufacturing</td>
<td>10,785</td>
<td>2.2</td>
<td>0.26</td>
<td>-1.0%</td>
</tr>
<tr>
<td>53 Real estate, rental, and leasing</td>
<td>10,054</td>
<td>2.0</td>
<td>1.41</td>
<td>0.4%</td>
</tr>
<tr>
<td>92 State government</td>
<td>8,134</td>
<td>1.6</td>
<td>0.47</td>
<td>-0.8%</td>
</tr>
<tr>
<td>48–49 Transportation and warehousing</td>
<td>6,821</td>
<td>1.4</td>
<td>0.42</td>
<td>3.1%</td>
</tr>
<tr>
<td>51 Information</td>
<td>5,218</td>
<td>1.1</td>
<td>0.56</td>
<td>-2.8%</td>
</tr>
<tr>
<td>61 Educational services</td>
<td>5,040</td>
<td>1.0</td>
<td>0.43</td>
<td>7.9%</td>
</tr>
<tr>
<td>55 Management of companies and enterprise</td>
<td>4,149</td>
<td>0.8</td>
<td>0.56</td>
<td>8.4%</td>
</tr>
<tr>
<td>92 Federal government</td>
<td>3,814</td>
<td>0.8</td>
<td>0.41</td>
<td>0.0%</td>
</tr>
<tr>
<td>21 Mining</td>
<td>1,540</td>
<td>0.3</td>
<td>0.58</td>
<td>-0.5%</td>
</tr>
<tr>
<td>22 Utilities</td>
<td>1,162</td>
<td>0.2</td>
<td>0.62</td>
<td>-0.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>493,727</strong></td>
<td><strong>1.6%</strong></td>
<td><strong>1.6%</strong></td>
<td></td>
</tr>
</tbody>
</table>

Notes: CAGR stands for compound annual growth rate; LQ stands for location quotient. Source: IHS Business Market Insights database. Shutterstock © 2016 IHS: 1683673

8 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.
9 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.
10 Calculate two-digit LQs by NAICS sector weighted by employment shares, and then invert the result.
Index value is to 1.00, the more similar that region’s economic structure is to the US economy.

For the Southwest Florida region, the Hachman Index was 0.862, indicating the region’s economy is much 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.

Characteristics of the manufacturing sector

To provide a more accurate picture of the Southwest Florida 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, the Southwest Florida region had 2015 employment in 21 three-digit manufacturing subsectors, with positive employment growth rates between 2000 and 2015 in only 9 of them. Of these, beverage and tobacco products manufacturing increased the most, with employment increasing from 12 people in 2000 to 156 in 2015. Meanwhile, the region’s largest three-digit manufacturing subsector, miscellaneous manufacturing, more than doubled to approximately 2,000 employees in 2015 and an annual growth rate of 4.8 percent. Employment in the transportation equipment manufacturing subsector also more than doubled during this period to reach a workforce of more than 1,000 people, experiencing a 5.6 percent compound annual growth rate (CAGR) between 2000 and 2015. Despite these gains in a few subsectors, employment in 11 of the region’s manufacturing subsectors declined at a rate equal to or greater than the national rate of decline of the US manufacturing industry during this period, where the CAGR in this period was -2.3 percent. Moreover, two of the region’s most significant manufacturing employers, nonmetallic minerals and machinery manufacturing, lost hundreds of jobs between 2000 and 2015. Overall, the Southwest Florida region’s CAGR for employment in manufacturing, a contraction of 1 percent, was less than the decline of the manufacturing sector in the United States in the same period.
**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 Southwest Florida 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 78.1 percent and 21.9 percent of the Southwest Florida region’s manufacturing employment in 2015 was in the durable and nondurable sectors, respectively, with the **Southwest Florida region’s durable manufacturing sector constituting a significantly 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 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 Southwest Florida’s durable sector between 2000 and 2015. The positive employment growth rates of many durable sectors that had average or below-average employment concentration in the region show that despite notable comparative advantages in these sectors, the region has made significant headway, increasing the number of potentially high-paying manufacturing jobs. The second chart presents the composition and performance of the nondurable sectors. Although the beverage and tobacco manufacturing sector is not highly concentrated and employs only 156 people, its high growth is notable, and the sector might be of interest to economic developers. At the same time, they might want to better understand the reason behind the significant job losses in recent years in the food manufacturing sector, the largest of the region’s nondurable sectors.

If an RMA wants 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 (e.g., textiles, apparel, leather, wood, printing) should be promoted. Similarly, if the economic development objective is to attract higher-paying jobs in the STEM occupations that are often associated with nonproduction facilities such as research and development (R&D) centers, then policies and programs should be directed at the durable sectors, and some nondurables 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.
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 Southwest Florida region, while only 9 manufacturing subsectors had a positive CAGR for employment between 2000 and 2015, 16 had a positive CAGR for output. The most notable output gains were in the beverage and tobacco products, petroleum and coal, leather and allied products, and transportation equipment manufacturing subsectors.

Of the 16 manufacturing sectors with positive growth in output during this period, all also demonstrated growth in productivity (inflation-adjusted output per worker), with transportation equipment manufacturing leading the pack with a CAGR in productivity of 4.7 percent. In fact, all nine Southwest Florida region manufacturing subsectors that experienced positive employment growth rates during the 15-year period also experienced positive growth in output and productivity. These include:

- Beverage and tobacco products manufacturing
- Petroleum and coal manufacturing
- Leather and allied products manufacturing
- Transportation equipment manufacturing
- Miscellaneous manufacturing
- Primary metal manufacturing
- Chemical manufacturing
- Wood products manufacturing
- Electrical equipment and appliance manufacturing
Interestingly, beverage and tobacco products manufacturing, despite ranking first for output and employment growth, only increased productivity annually 0.8 percent during 2000–15, the slowest positive productivity growth rate in the Southwest Florida region. Extending this report’s durable and nondurable analysis, output per worker in the durable manufacturing sector in the United States in 2015 was $375,043 compared with $619,325 in the nondurable sector. The nondurable sector’s level is greater because of the high level of productivity in the petroleum refining and chemical sectors.

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 leather and allied products manufacturing will produce more than six direct jobs per $1 million of new output, a sector such as chemical manufacturing with $647,933 of output per worker will not produce even two new jobs per each additional $1 million in output. Despite the relatively greater number of direct jobs that would be produced by additional investment in the leather manufacturing sector, new jobs in the chemical sector are likely to pay substantially more.

If a region’s economic development strategy is to maximize the direct increase in manufacturing employment, organizations should focus on those sectors with the lowest levels of worker productivity. However, there is an important caveat to this strategy: not all manufacturing jobs are equal; they differ widely based on their annual wage levels. Economic development agencies must consider the prevailing annual wage levels in the manufacturing subsectors they want to promote, which are a function of the types of occupations required, which in turn are determined by the types of manufacturing activities performed.
Establishment size

In addition to evaluating the Southwest Florida manufacturing sectors’ growth in the last 15 years, IHS assessed regional structure in terms of distribution of manufacturing establishments by employment size. In the Southwest Florida region, the vast majority of manufacturers (94.2 percent, or 699 establishments) employ fewer than 50 workers, 5.5 percent (41 establishments) engage 50–499 employees, and there are only two manufacturing firms with 500 employees or more. Of the 742 manufacturing establishments in the region, 77.6 percent are “very small” employers (having fewer than 10 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\(^{11}\) based on four-digit NAICS employment, with LQs based on employment in the manufacturing sectors, not total employment. For the eight counties included in the Southwest Florida region, the Hachman Index of 0.266 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.

Advanced manufacturing

With 5,718 people employed in the advanced manufacturing sectors, as defined either by researchers from the US Bureau of Labor Statistics (BLS) or the Brookings Institution\(^{12}\) think tank, the Southwest Florida region has more than half (53 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. 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:

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\(^{11}\) See Footnote 10 regarding the Hachman Index calculation.

\(^{12}\) 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.
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.

**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 universities and community colleges, workforce development boards, secondary career and technical education (CTE) schools, the Southwest RMA, 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.
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 10 (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.
Aside from miscellaneous manufacturing (for which risk ratings are not available), the manufacturing subsectors with more than 1,000 jobs in the Southwest Florida region in 2015 were nonmetallic minerals (NAICS 327 or ISIC code D26 in the accompanying industry risk ratings table), machinery (NAICS 333 or ISIC code D29), and transportation equipment (NAICS 336 or ISIC code D35), all of which had IHS World Industry Service composite risk scores below the overall US manufacturing sector’s risk score of 6.9. The most significant source of risk for the nonmetallic minerals manufacturing sector is profitability and pricing (in which this sector’s risk score exceeds the average for the manufacturing industry as a whole); the machinery, equipment, and appliances manufacturing sector’s greatest risk is in the growth category, and supply risk is of greatest concern to transportation equipment manufacturers.
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.13

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.

13 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 Southwest Florida region, there were three high-performing manufacturing sectors classified as A that outperformed the same sector in the United States and represented an above-average share of the region’s economy (i.e., had employment LQs above 1.0). All three also had positive annual employment growth rates in the past 15 years:

- Medical equipment and supplies manufacturing (5.8 percent CAGR)
- Electrical equipment manufacturing (0.7 percent CAGR)
- Tobacco manufacturing (18.6 percent CAGR)

The three high-performing sectors currently account for less than one-quarter (23.2 percent) of total manufacturing employment in the Southwest Florida region. Meanwhile, the region has 35 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. These B sectors represent 40.4 percent of regional manufacturing employment, meaning state and local economic development organizations such as FloridaMakes have a significant opportunity to support growth sectors in the Southwest Florida region by researching these companies’ competitiveness drivers and designing programs or policies that capitalize on areas of strength and/or minimize growth barriers. A few of the notable B sectors that provide 300 or more jobs in the region include:

- Aerospace products and parts manufacturing
- Other miscellaneous manufacturing
- Metalworking machinery manufacturing
- Household and institutional furniture and kitchen cabinet manufacturing
- Other wood products manufacturing
- Other nonmetallic mineral products 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, are underperforming their peers at the US level (the C sectors), we note only one: lime and gypsum products manufacturing. This sector, while an extremely large part of the region’s economy relative to the same sector’s contribution to the national economy (as shown by the LQ of 14.12), only composes 6.6 percent of the region’s employment.

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 these sectors represent 29 percent of the region’s employment—with nine of them employing more than 100 people each—to keep manufacturing jobs in the region, attention should be paid to better understanding why these sectors have experienced such challenges in recent years.

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 Cape Coral-Fort Myers, Naples-Immokalee-Marco Island, Punta Gorda, and Sebring MSAs, because they are representative of labor market conditions in the Southwest Florida region. The purpose of the analysis was to compare the total annual wage cost for a manufacturing company located in the Southwest Florida 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 Southwest Florida region. As shown by the following table on manufacturing employment and wage levels in 2015, someone in either of these two occupations in the Southwest Florida region makes less than the average person in that occupation statewide or nationally, with architects and engineers earning almost one-quarter less annually than their peers in the same profession across the United States and production workers earning more than 10 percent less. **These lower wages mean the Southwest Florida region has a competitive advantage nationally in terms of labor costs in all manufacturing occupations apart from sales, where wages in that occupation (not only in manufacturing sectors) are roughly the same.**
Additional analysis showed the total annual wage costs for all manufacturing sectors in the Southwest Florida region range between 10.4 percent and 23.0 percent lower than the annual manufacturing industry wage bill in the United States, with the difference varying by manufacturing subsector, location within the Southwest Florida region, and occupation type. For example, while architects and engineers in manufacturing occupations in the Cape Coral-Fort Myers MSA earn just more than one-quarter less than their national counterparts, production workers in manufacturing sectors in the Naples-Immokalee-Marco Island MSA earn only 8.9 percent less in wages annually than those in the same occupations nationally. Meanwhile, in just the Naples-Immokalee-Marco Island MSA, the total wage bill for transportation equipment manufacturing (NAICS 336900) is only 8.7 percent below the wage bill for that sector nationally, whereas total labor costs for basic chemical manufacturers (NAICS 325100) are more than 19.0 percent below their national levels for this sector.

If increasing per capita incomes is an objective, one implication of these findings is that the region should encourage growth in manufacturing subsectors and occupations that either pay higher wages or at least offer local salaries that are closer to the national levels. However, if the desired goal is increasing the number of manufacturing jobs in the region, attracting manufacturing employers whose national competitive advantage is derived from being a low-cost producer may be an effective strategy.

Transferability of the Southwest Florida 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 (KSA) as well as educational attainment can be used to estimate the core competencies of a region’s labor force, as well as to evaluate the fit of a region’s core competencies in relation to a particular industry’s skill requirements.

For example, the accompanying chart illustrates a relative correlation index between the education competencies demanded by a selected set of industries and the education competencies supplied by the labor force in the Southwest Florida region (defined as Charlotte, Collier, DeSoto, Glades, Hardee, Hendry, Highlands, and Lee counties). The comparison is made between the core competencies supplied by the labor force in Southwest Florida 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 education 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 education requirements 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 education requirement relative to the national labor force. Thus, the full set of industry–labor force correlation indices (available upon request) can be used as a tool within the context of a larger industry/workforce development strategy to better understand the transferability of a region’s core competencies between a variety of prospective industries.

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 education 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 more examples of practical applications of the knowledge, skills, and abilities analysis.)

According to the correlation indices in the top half of the chart on the following page, the Southwest Florida labor force is well-suited to fill jobs in industries that support the needs of retirees, government agencies, and military bases, such as those types of occupations required by restaurants, hotels, and construction firms. With respect to manufacturing occupations, the local labor force also appears well-suited to meet the educational requirements of a variety of types of apparel manufacturers. Since firms within the Southwest Florida region have tended to concentrate in these industries over time, it is not surprising the region’s labor force has also concentrated around the core competencies required by these industries. On the other hand, the bottom half of this chart shows the Southwest Florida labor force is less well-suited to fill jobs in high tech, research and development, and professional service industries, including software publishing, computer equipment manufacturing, financial investment activities, architecture, engineering, and other specialized design or research and development services. These are underrepresented industries that do not constitute a significant share of this region’s current industry mix. While not shown in the chart, there may still be other manufacturing industries 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 (e.g., kitchen cabinet and countertop manufacturing, sawmills, footwear manufacturing, food manufacturing, furniture manufacturing, etc.). It is within these manufacturing sectors the region may find feasible opportunities for workforce development to contribute to manufacturing industry development.

For example, economic and workforce development practitioners in the Southwest Florida region might explore how commodity demand from the region’s food service industry or commodity supply from the region’s agriculture industry might be parlayed into manufacturing sector opportunities, e.g., contribute to the growth of food and beverage manufacturing.
Southwest Florida region education correlation ratio—15 top and bottom industries, 2014 (Relative labor force-to-industry education correlation between the Southwest Florida region and the United States)

Limited-service eating places
Motion picture and video exhibition
Special food services
Apparel accessories and other apparel manufacturing
Full-service restaurants
Painting and wall-covering contractors
Landscaping services
Cut and sew apparel manufacturing
Logging
Gasoline stations
Animal slaughtering and processing
Apparel manufacturing
Masonry contractors
Other automotive repair and maintenance
Grocery stores
Junior colleges
Offices of mental health practitioners (except physicians)
Other information services
Other financial investment activities
Elementary and secondary schools
Specialized design services
Securities and commodity contracts intermediation and brokerage
Computer and peripheral equipment manufacturing
Architectural, engineering, and related services
Research and development in the social sciences and humanities
Engineering services
Research and development in the physical, engineering, and life sciences
Computer systems design and related services
Securities and commodity exchanges
Software publishers

Source: Alward Institute for Collaborative Science

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## Appendix A: Results of the shift-share analysis

### Appendix A: Shift-share analysis of the Southwest Florida manufacturing sector, 2015

<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>3311</td>
<td>Medical equipment and supplies manufacturing</td>
<td>A</td>
<td>1,581</td>
<td>1.25</td>
<td>0.32</td>
<td>5.8%</td>
</tr>
<tr>
<td>3332</td>
<td>Electrical equipment manufacturing</td>
<td>A</td>
<td>765</td>
<td>1.32</td>
<td>0.15</td>
<td>0.7%</td>
</tr>
<tr>
<td>3121</td>
<td>Tobacco manufacturing</td>
<td>A</td>
<td>156</td>
<td>2.50</td>
<td>0.03</td>
<td>16.6%</td>
</tr>
<tr>
<td>3364</td>
<td>Aerospace products and parts manufacturing</td>
<td>B</td>
<td>561</td>
<td>0.27</td>
<td>0.11</td>
<td>9.7%</td>
</tr>
<tr>
<td>3399</td>
<td>Other miscellaneous manufacturing</td>
<td>B</td>
<td>420</td>
<td>0.38</td>
<td>0.09</td>
<td>2.0%</td>
</tr>
<tr>
<td>3335</td>
<td>Metalworking machinery manufacturing</td>
<td>B</td>
<td>394</td>
<td>0.52</td>
<td>0.08</td>
<td>10.8%</td>
</tr>
<tr>
<td>3371</td>
<td>Household and institutional furniture and kitchen cabinet manufacturing</td>
<td>B</td>
<td>337</td>
<td>0.37</td>
<td>0.07</td>
<td>-0.7%</td>
</tr>
<tr>
<td>3219</td>
<td>Other wood products manufacturing</td>
<td>B</td>
<td>310</td>
<td>0.35</td>
<td>0.06</td>
<td>0.5%</td>
</tr>
<tr>
<td>3279</td>
<td>Other nonmetallic mineral products manufacturing</td>
<td>B</td>
<td>300</td>
<td>0.94</td>
<td>0.06</td>
<td>17.1%</td>
</tr>
<tr>
<td>3362</td>
<td>Motor vehicle body and trailer manufacturing</td>
<td>B</td>
<td>233</td>
<td>0.35</td>
<td>0.05</td>
<td>17.4%</td>
</tr>
<tr>
<td>3212</td>
<td>Veneer, plywood, and engineered wood products manufacturing</td>
<td>B</td>
<td>214</td>
<td>0.79</td>
<td>0.04</td>
<td>5.8%</td>
</tr>
<tr>
<td>3329</td>
<td>Other fabricated metal products manufacturing</td>
<td>B</td>
<td>146</td>
<td>0.14</td>
<td>0.03</td>
<td>6.6%</td>
</tr>
<tr>
<td>3254</td>
<td>Pharmaceutical and medicine manufacturing</td>
<td>B</td>
<td>140</td>
<td>0.12</td>
<td>0.03</td>
<td>12.8%</td>
</tr>
<tr>
<td>3345</td>
<td>Navigational, measuring, electro-medical, and control instruments manufacturing</td>
<td>B</td>
<td>133</td>
<td>0.09</td>
<td>0.03</td>
<td>0.5%</td>
</tr>
<tr>
<td>3363</td>
<td>Motor vehicle parts manufacturing</td>
<td>B</td>
<td>117</td>
<td>0.05</td>
<td>0.02</td>
<td>14.2%</td>
</tr>
<tr>
<td>3314</td>
<td>Nonferrous metal (except aluminum) production and processing</td>
<td>B</td>
<td>111</td>
<td>0.44</td>
<td>0.02</td>
<td>14.3%</td>
</tr>
<tr>
<td>3349</td>
<td>Other textile product mills</td>
<td>B</td>
<td>110</td>
<td>0.44</td>
<td>0.02</td>
<td>-2.0%</td>
</tr>
<tr>
<td>3211</td>
<td>Sawmills and wood preservation</td>
<td>B</td>
<td>87</td>
<td>0.26</td>
<td>0.02</td>
<td>3.4%</td>
</tr>
<tr>
<td>3253</td>
<td>Pesticide, fertilizer, and other agricultural chemical manufacturing</td>
<td>B</td>
<td>82</td>
<td>0.60</td>
<td>0.02</td>
<td>3.8%</td>
</tr>
<tr>
<td>3271</td>
<td>Clay products and refractory manufacturing</td>
<td>B</td>
<td>73</td>
<td>0.51</td>
<td>0.01</td>
<td>11.1%</td>
</tr>
<tr>
<td>3141</td>
<td>Textile furnishings</td>
<td>B</td>
<td>71</td>
<td>0.34</td>
<td>0.01</td>
<td>-2.8%</td>
</tr>
<tr>
<td>3359</td>
<td>Other electrical equipment and component manufacturing</td>
<td>B</td>
<td>67</td>
<td>0.14</td>
<td>0.01</td>
<td>-1.3%</td>
</tr>
<tr>
<td>3333</td>
<td>Commercial and service industry machinery manufacturing</td>
<td>B</td>
<td>50</td>
<td>0.14</td>
<td>0.01</td>
<td>1.7%</td>
</tr>
<tr>
<td>3262</td>
<td>Rubber products manufacturing</td>
<td>B</td>
<td>46</td>
<td>0.09</td>
<td>0.01</td>
<td>-1.2%</td>
</tr>
<tr>
<td>3241</td>
<td>Petroleum and coal products manufacturing</td>
<td>B</td>
<td>43</td>
<td>0.10</td>
<td>0.01</td>
<td>8.3%</td>
</tr>
<tr>
<td>3259</td>
<td>Other chemical products and preparation manufacturing</td>
<td>B</td>
<td>43</td>
<td>0.13</td>
<td>0.01</td>
<td>12.9%</td>
</tr>
<tr>
<td>3336</td>
<td>Engine, turbine, and power transmission equipment manufacturing</td>
<td>B</td>
<td>38</td>
<td>0.09</td>
<td>0.01</td>
<td>2.1%</td>
</tr>
<tr>
<td>3315</td>
<td>Foundries</td>
<td>B</td>
<td>36</td>
<td>0.07</td>
<td>0.01</td>
<td>1.7%</td>
</tr>
<tr>
<td>3332</td>
<td>Industrial machinery manufacturing</td>
<td>B</td>
<td>33</td>
<td>0.08</td>
<td>0.01</td>
<td>-1.7%</td>
</tr>
<tr>
<td>3115</td>
<td>Dairy product manufacturing</td>
<td>B</td>
<td>32</td>
<td>0.06</td>
<td>0.01</td>
<td>10.7%</td>
</tr>
<tr>
<td>3334</td>
<td>Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing</td>
<td>B</td>
<td>24</td>
<td>0.05</td>
<td>0.00</td>
<td>-1.0%</td>
</tr>
<tr>
<td>3328</td>
<td>Coating, engraving, heat treating, and allied activities</td>
<td>B</td>
<td>23</td>
<td>0.04</td>
<td>0.00</td>
<td>0.9%</td>
</tr>
<tr>
<td>3343</td>
<td>Audio and video equipment manufacturing</td>
<td>B</td>
<td>20</td>
<td>0.24</td>
<td>0.00</td>
<td>N/A</td>
</tr>
<tr>
<td>3312</td>
<td>Steel products manufacturing from purchased steel</td>
<td>B</td>
<td>17</td>
<td>0.09</td>
<td>0.00</td>
<td>N/A</td>
</tr>
<tr>
<td>3342</td>
<td>Communications equipment manufacturing</td>
<td>B</td>
<td>16</td>
<td>0.04</td>
<td>0.00</td>
<td>14.9%</td>
</tr>
<tr>
<td>3322</td>
<td>Cutlery and handtool manufacturing</td>
<td>B</td>
<td>15</td>
<td>0.10</td>
<td>0.00</td>
<td>-2.2%</td>
</tr>
<tr>
<td>3162</td>
<td>Footwear manufacturing</td>
<td>B</td>
<td>13</td>
<td>0.25</td>
<td>0.00</td>
<td>N/A</td>
</tr>
<tr>
<td>3351</td>
<td>Electric lighting equipment manufacturing</td>
<td>B</td>
<td>10</td>
<td>0.06</td>
<td>0.00</td>
<td>1.5%</td>
</tr>
<tr>
<td>3274</td>
<td>Lime and gypsum products manufacturing</td>
<td>C</td>
<td>716</td>
<td>14.12</td>
<td>0.15</td>
<td>-4.6%</td>
</tr>
<tr>
<td>3339</td>
<td>Other general-purpose machinery manufacturing</td>
<td>D</td>
<td>547</td>
<td>0.50</td>
<td>0.11</td>
<td>-3.2%</td>
</tr>
<tr>
<td>3314</td>
<td>Fruit and vegetable preserving and specialty food manufacturing</td>
<td>D</td>
<td>492</td>
<td>0.68</td>
<td>0.10</td>
<td>-1.5%</td>
</tr>
<tr>
<td>3231</td>
<td>Printing and related support activities</td>
<td>D</td>
<td>436</td>
<td>0.24</td>
<td>0.09</td>
<td>-5.2%</td>
</tr>
<tr>
<td>3323</td>
<td>Architectural and structural metal manufacturing</td>
<td>D</td>
<td>357</td>
<td>0.25</td>
<td>0.07</td>
<td>-4.5%</td>
</tr>
<tr>
<td>3513</td>
<td>Sugar and confectionery product manufacturing</td>
<td>D</td>
<td>305</td>
<td>0.99</td>
<td>0.06</td>
<td>-5.7%</td>
</tr>
<tr>
<td>3327</td>
<td>Machine shops; turned product; and screw, nut, and bolt manufacturing</td>
<td>D</td>
<td>185</td>
<td>0.12</td>
<td>0.04</td>
<td>-0.4%</td>
</tr>
<tr>
<td>3366</td>
<td>Ship and boat building</td>
<td>D</td>
<td>158</td>
<td>0.28</td>
<td>0.03</td>
<td>-3.9%</td>
</tr>
<tr>
<td>3344</td>
<td>Semiconductor and other electronic component manufacturing</td>
<td>D</td>
<td>130</td>
<td>0.09</td>
<td>0.03</td>
<td>-4.6%</td>
</tr>
<tr>
<td>3261</td>
<td>Plastics product manufacturing</td>
<td>D</td>
<td>101</td>
<td>0.04</td>
<td>0.02</td>
<td>-10.85%</td>
</tr>
<tr>
<td>3118</td>
<td>Bakersies and tortilla manufacturing</td>
<td>D</td>
<td>95</td>
<td>0.08</td>
<td>0.02</td>
<td>-9.43%</td>
</tr>
<tr>
<td>3324</td>
<td>Boiler, tank, and shipping container manufacturing</td>
<td>D</td>
<td>84</td>
<td>0.22</td>
<td>0.02</td>
<td>-4.04%</td>
</tr>
<tr>
<td>3255</td>
<td>Paint, coating, and adhesive manufacturing</td>
<td>D</td>
<td>63</td>
<td>0.26</td>
<td>0.01</td>
<td>-2.97%</td>
</tr>
<tr>
<td>3272</td>
<td>Glass and glass products manufacturing</td>
<td>D</td>
<td>43</td>
<td>0.11</td>
<td>0.01</td>
<td>-9.53%</td>
</tr>
<tr>
<td>3222</td>
<td>Converted paper products manufacturing</td>
<td>D</td>
<td>27</td>
<td>0.03</td>
<td>0.01</td>
<td>-7.50%</td>
</tr>
<tr>
<td>3152</td>
<td>Cut and sew apparel manufacturing</td>
<td>D</td>
<td>24</td>
<td>0.05</td>
<td>0.00</td>
<td>-8.16%</td>
</tr>
<tr>
<td>3313</td>
<td>Alumina and aluminum production and processing</td>
<td>D</td>
<td>22</td>
<td>0.09</td>
<td>0.00</td>
<td>-5.45%</td>
</tr>
<tr>
<td>3117</td>
<td>Seafood products preparation and packaging</td>
<td>D</td>
<td>16</td>
<td>0.12</td>
<td>0.00</td>
<td>-4.31%</td>
</tr>
<tr>
<td>3319</td>
<td>Other food manufacturing</td>
<td>D</td>
<td>15</td>
<td>0.02</td>
<td>0.00</td>
<td>-1.23%</td>
</tr>
<tr>
<td>3372</td>
<td>Office furniture (including fixtures) manufacturing</td>
<td>D</td>
<td>12</td>
<td>0.02</td>
<td>0.00</td>
<td>-13.78%</td>
</tr>
<tr>
<td>3331</td>
<td>Agriculture, construction, and mining machinery manufacturing</td>
<td>D</td>
<td>11</td>
<td>0.01</td>
<td>0.00</td>
<td>-15.68%</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 Market Insights © 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 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 and
- 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 knowledge, skills, and abilities 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.

As 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 knowledge, skills, and abilities 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.