

IHS ECONOMICS

# First Coast Regional Manufacturers Association

Manufacturing Sector Profile

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## IHS CONSULTING REPORT

Economic Strategy Solutions

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# First Coast Regional Manufacturers Association Manufacturing Sector Profile

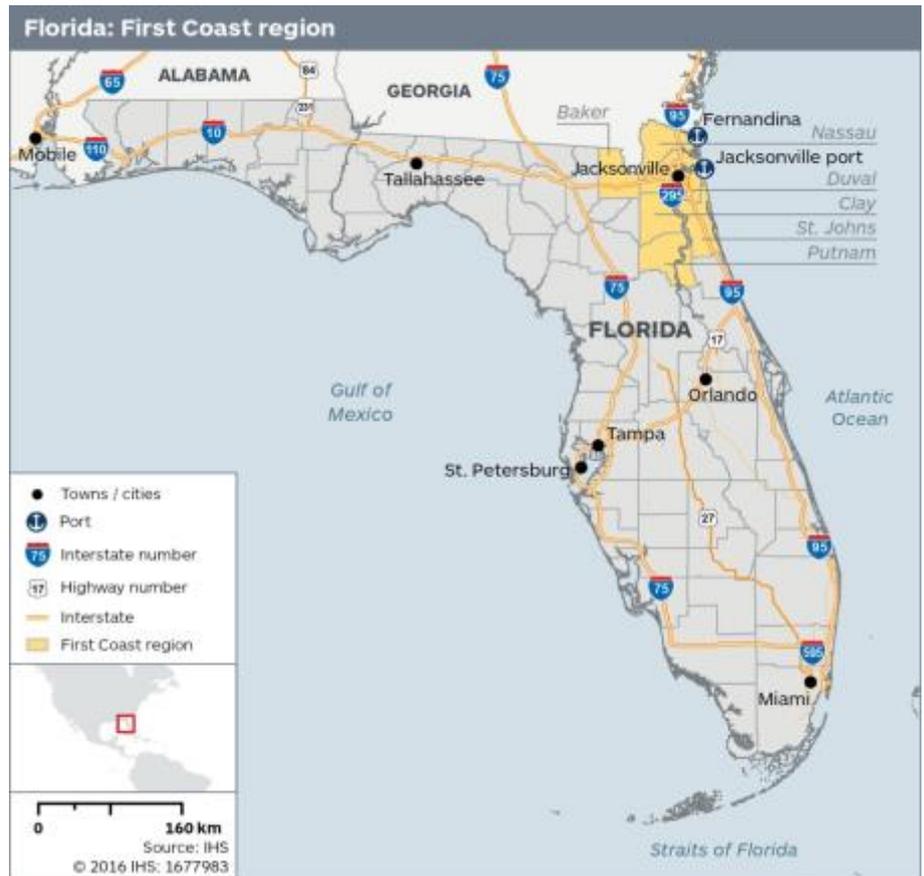
## Introduction

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 First Coast regional 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 First Coast region comprises six Florida counties: Baker, Clay, Duval, Nassau, Putman, and St. Johns.<sup>1</sup>

Jacksonville is the major city in the regional economy, situated within Duval County, a part of the Jacksonville, Florida, metropolitan statistical area (MSA). Baker, Clay, Nassau, and St. Johns counties are also part of the Jacksonville, Florida, MSA, while Putnam County is in the Palatka micropolitan statistical area.

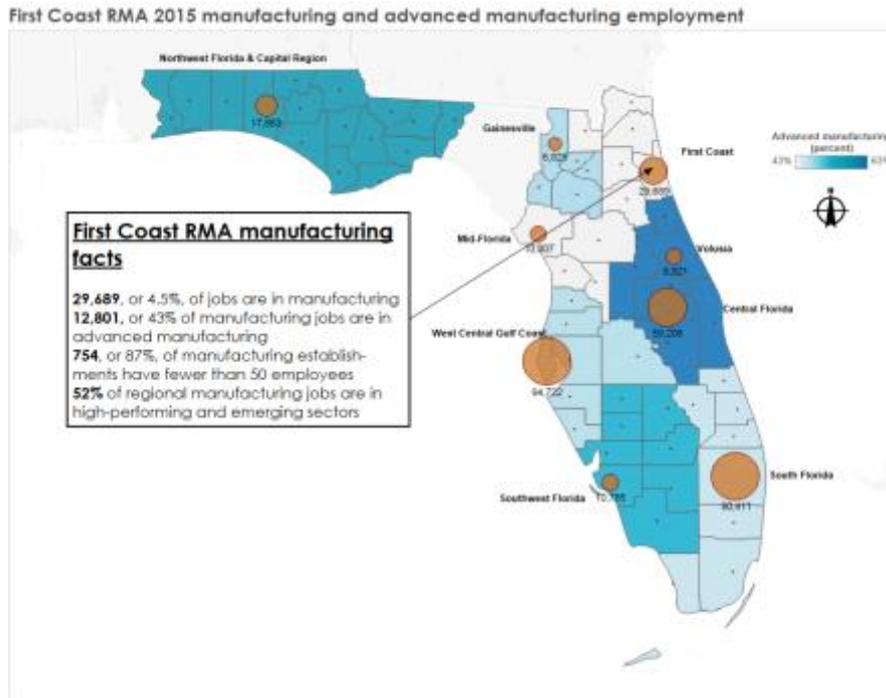
In the following sections, findings of potential interest to policymakers are presented in **bold**.



<sup>1</sup> While data for this study are presented for the six-county study area, they are available by county upon client request.

# Strategic summary

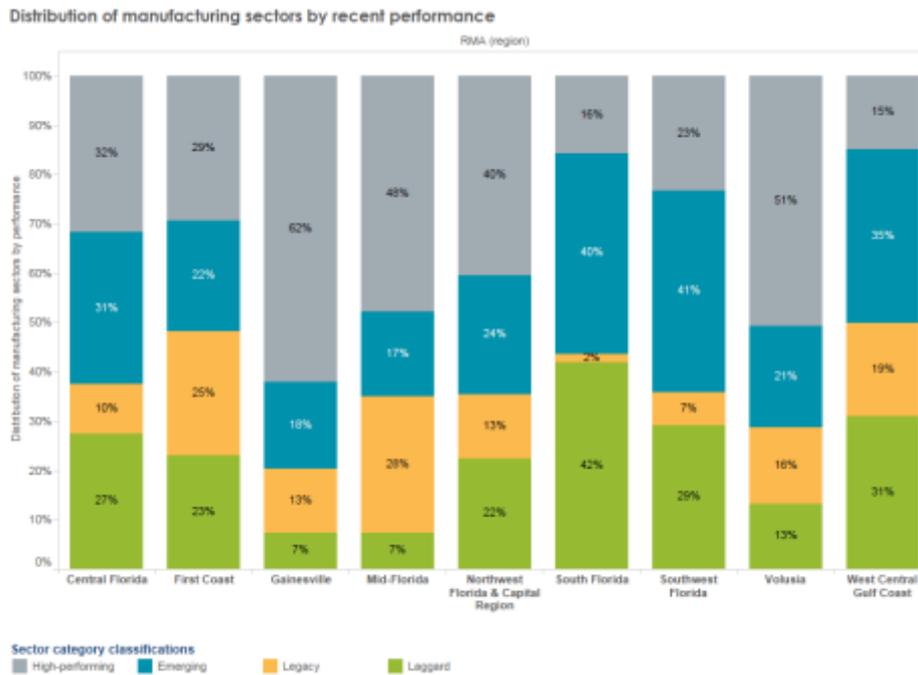
## What is the situation today?



- The 2015 population of the First Coast RMA service area was more than 1.5 million people, or 7.5 percent of the state of Florida.
- With a **4.3 percent unemployment rate, the labor market in the First Coast RMA was tighter in April 2016 than at the national and state levels**, where the unemployment rate was 4.7 percent and 4.5 percent, respectively.
- **Private, services-providing (PSP) sectors represent 77.8 percent of employment** in the First Coast region with more than 50 percent of jobs in health care and social assistance, retail trade, accommodation and food services, administrative and waste services, and finance and insurance sectors.
- The **manufacturing sector comprises 29,689 jobs, 4.5 percent of the region’s total employment**, which is less than the manufacturing sector’s share of employment in the country overall but above the figure for the state of Florida, where 4.1 percent of total 2015 employment was in the manufacturing sector.
- The **transportation equipment, fabricated metal products, paper, beverage and tobacco product, and miscellaneous manufacturing sectors offered more than 2,700 jobs each** in the First Coast region in 2015 and together comprise more than half (56.5 percent) of regional employment.
- **Eighty-seven percent of the First Coast region’s manufacturers employ fewer than 50 workers** and almost two-thirds (64.3 percent) are “very small” employers (with fewer than 10 employees each). Manufacturing subsectors with large numbers of very small employers include food, textile mill products, support activities—printing, chemicals, plastics and rubber, fabricated metal products, machinery, transportation equipment, furniture and related products, and miscellaneous.

## What are our advantages?

- Two three-digit North American Industry Classification System (NAICS) manufacturing sectors (of 21 total) **experienced positive employment, output, and productivity growth** between 2000 and 2015. These are **electrical equipment and appliance manufacturing and transportation equipment manufacturing**.
- **Electrical equipment and appliance manufacturing far surpassed all other sectors in terms of employment growth** with a 5.3 percent compound annual growth rate (CAGR). The second-fastest growing sector in the area in terms of employment was the transportation equipment manufacturing industry with a CAGR of 1.3 percent between 2000 and 2015.
- Together, “high-performing” and “emerging” sectors<sup>2</sup> represent just over half of the four-digit NAICS manufacturing sectors in the First Coast region.



<sup>2</sup> See the “Shift-share analysis” section for sector category classifications.

- The First Coast 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. These included:
  - Aerospace product and parts
  - Pulp, paper, and paperboard mills
  - Ship and boat building
  - Other electrical equipment and component
  - Tobacco
  - Sawmills and wood preservation
  - Lime and gypsum product
  - Other furniture-related product
- Of the **emerging sectors**, the largest are **other miscellaneous and plastics product manufacturing**, both employing more than 800 people in the First Coast region.
- Outside of management occupations, **the First Coast has a competitive advantage nationally in terms of labor costs**, especially for architects and engineers, who are especially important to the advanced manufacturing sectors. However, the **region’s median annual wage levels in major occupations utilized by manufacturers** (except for those in sales and related occupations) **are higher in the First Coast region than in Florida overall**, with regional production workers typically earning 5.7 percent more than their statewide counterparts.
- The region’s top-three manufacturing sectors (by 2015 employment) all had an IHS World Industry Service composite risk score<sup>3</sup> 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:
  - Transportation and equipment manufacturing went from 10,923 jobs to 6,387, a decline of more than 4,500 jobs.
  - Employment in machinery manufacturing dropped almost 2,800 jobs.
  - Plastics and rubber product manufacturing witnessed a workforce reduction of more than 41 percent to employment of just more than 1,800 workers in 2015.
  - The nonmetallic mineral and wood product manufacturing sectors experienced annual rates of decline of 4.1 percent, leaving them with 2015 employment of 2,275 and 861, respectively.
  - Employment in petroleum and coal manufacturing, employing more than 400 people in 2000, declined nearly 87 percent.
  - Although only employing just more than 100 people each in 2000, the leather and allied product manufacturing and textile mills both shrank by approximately half.
- **None of the region’s growth sectors are more concentrated in the First Coast region than in the United States as a whole**, meaning they do not play a particularly significant role in the regional manufacturing economy.
- **The region’s manufacturing sector is almost 50 percent less diverse than the manufacturing industry in the state of Florida overall**, making it especially important that the region focus on the few sectors that create significant numbers of manufacturing jobs or perform well compared with national peers.
- **The region’s largest manufacturing sector by 2015 employment, computer and electronic product manufacturing, has the highest IHS composite risk score among all US manufacturing subsectors.**<sup>4</sup>

<sup>3</sup> See definition in “Risk rating by industry sector” section.

## 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**.
- By **identifying gaps in manufacturing supply chains** such that necessary key inputs 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 Fernandina and Jacksonville ports), economic development practitioners can enhance the manufacturing sector's contribution to the regional economy.
- **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.
- 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 advanced and durable manufacturing industry's larger-than-average needs for skilled workers**.
- By exploring the drivers of the **particularly high Profitability and pricing, Industry structure, and Growth category risks<sup>5</sup> facing the region's large computer and electronic product manufacturing sector**, local policymakers and economic development practitioners can determine what role they can play in mitigating these risks.
- To allocate scarce resources toward manufacturing industry support and workforce training, the region should **decide whether to prioritize sectors that currently provide the greatest opportunities for employment in the region (e.g., computer and electronic product manufacturing), the three sectors that have witnessed positive employment, output, and productivity growth in recent years (paper, chemical, and food manufacturing), or those that have performed better than their nationwide peers in terms of employment growth and concentration (sectors categorized as high performing).**<sup>6</sup>
- For targeted manufacturing industry recruitment, the region's **national competitive advantage in terms of manufacturing labor costs** should not go without mention.

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<sup>4</sup> Ibid.

<sup>5</sup> See definition in "Risk rating by industry sector" section.

<sup>6</sup> See the "Shift-share analysis" section for sector category classifications.

# Characteristics of the regional economy

## Population

IHS estimates the 2015 population in the First Coast region was 1,515,447 people, or 7.5 percent of the state of Florida. The population density was 145.0 persons per square mile, approximately two-fifths 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 4.3 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 0.8 percentage point lower than in April 2015. **Since 2011, the average annual unemployment rate in the First Coast region has been one-tenth of a percentage point lower than the statewide rate and one-fifth of a percentage point higher than the national unemployment rate.**

## Labor force

In April 2016, First Coast's total labor force was 725,679 people, a 1.2 percent increase from April 2015. In the First Coast region, 6,005 fewer people were unemployed in April 2016 than the year before, while the employment level increased by 14,929 workers (2.1 percent). The net effect was the labor force increased as workers, attracted by rising employment levels, reentered the labor force; since employment grew faster than the labor force, the unemployment rate fell.

A similar story played out statewide as the number of unemployed persons in April 2016 was down 64,000 on a year-on-year basis. The positive growth of the labor force in the First Coast region and the state of Florida is consistent with that of the United States where the labor force grew 1.2 percent and the unemployment rate (not seasonally adjusted) dropped 6.9 percent in the same period.

**The key finding from the labor force analysis is the labor market in the First Coast region has recently become tighter than at the state or the US levels. The April 2016 unemployment rate of 4.3 percent was well below the 5.0 percent rate generally considered to represent full employment. The tight labor market could eventually result in rising wage rates and potentially indicate 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 29,689 jobs in 2015 in the First Coast region's manufacturing sector (NAICS codes 31–33). The share of the First Coast region's total 2015 employment in manufacturing is 4.5 percent, significantly below the US figure of 8.5 percent, but above the figure for the state of Florida, where 4.1 percent of total 2015 employment was in the manufacturing sector.** The overall below-average share of 2015 manufacturing employment is reflected by the low employment location quotient (LQ) of 0.53.<sup>7</sup>

Of 22 major sectors in the First Coast region, 11 had employment LQs greater than one, and 11 had employment LQs less than one, meaning half of the region's sectors are less concentrated, based on employment, than they are in the United States, while the other half are more concentrated. With a location quotient of 1.92, the finance and insurance sector is a particularly notable part of the First Coast economy.

<sup>7</sup> 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.<sup>8</sup>** The PSP share of employment in Florida in 2015 was 75.9 percent, compared with the US share of 68.9 percent. The PSP share for the First Coast region is even higher at 77.8 percent, confirming that its economic activity is even more concentrated in provision of services than in production of goods, which reduces the relative importance of the manufacturing sector.

Employment by major economic sector (by two-digit NAICS code) is ranked in the accompanying table in descending order by number of jobs.

**Structure diversity**

To evaluate the diversity of the First Coast 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<sup>9</sup>, 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 First Coast, the Hachman Index was 0.903, slightly less diverse than the Florida economy,** 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, the First Coast region’s Hachman score indicates it has a fairly diverse metro economy.

**The First Coast region’s low manufacturing share and moderately high level of structural diversity indicate there is room to grow its manufacturing sector without creating a regional overdependence on it.** Ways to enhance the manufacturing sector’s contribution to the First Coast economy include:

**Employment by major economic sector (2015)**

Industry	Number of jobs	% share	LQ	CAGR 2000-15
62 Health care and social assist.	87,061	13.2%	1.03	2.9% ▲
44-45 Retail trade	80,147	12.2%	1.13	0.7% ▲
72 Accommodation and food serv.	69,373	10.5%	1.18	2.6% ▲
56 Administrative and waste services	53,503	8.1%	1.34	0.7% ▲
52 Finance and insurance	51,833	7.9%	1.92	0.6% ▲
900L Local government	48,790	7.4%	0.75	0.6% ▲
54 Professional and technical ser.	39,860	6.1%	1.01	1.5% ▲
23 Construction	34,181	5.2%	1.18	-0.5% ▼
48-49 Transportation and warehousing	32,770	5.0%	1.52	-0.1% ▼
31-33 Manufacturing	29,689	4.5%	0.53	-2.4% ▼
42 Wholesale trade	24,210	3.7%	0.90	-0.9% ▼
81 Other services, excl. public	23,334	3.5%	0.92	0.0%
900F Federal government	16,927	2.6%	1.37	-0.4% ▼
61 Educational services	11,683	1.8%	0.75	5.3% ▲
900S State government	11,622	1.8%	0.50	-0.3% ▼
71 Arts, entert., and recreation	11,010	1.7%	1.13	1.9% ▲
53 Real estate, rental, and leasing	10,337	1.6%	1.09	0.2% ▲
51 Information	9,036	1.4%	0.72	-3.6% ▼
55 Mgt. of companies and enterp.	6,850	1.0%	0.69	-0.2% ▼
11 Agriculture, forestry, fishing	4,621	0.7%	0.30	-3.3% ▼
22 Utilities	888	0.1%	0.35	-1.3% ▼
21 Mining	59	0.0%	0.02	-9.9% ▼
<b>Total</b>	<b>657,784</b>			<b>0.6% ▲</b>

Notes: CAGR stands for compound annual growth rate; LQ stands for location quotient.  
 Source: IHS Business Market Insights database, Shutterstock. © 2016 IHS: 1683765

8 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.

9 Calculate two-digit LQs by NAICS sector weighted by employment shares, and then invert the result.

- Identifying gaps in manufacturing supply chains such that key inputs needed can be made in the region rather than imported (also known as import substitution)
- Expanding the value of exports produced by its manufacturing subsectors (Note there are two types of exports: 1) domestic, i.e., manufactured goods made in the region that are sold to other Florida counties or to other US states; and 2) foreign, i.e., manufactured goods sold to foreign countries.)

**Regional manufacturers seeking to expand their exports should take maximum advantage of their proximity to the state of Georgia and the Jacksonville and Fernandina ports.** As manufacturing companies increase the volume and value of their domestic and foreign exports, they will bring income back into the region, benefitting workers and households. At the same time, as production rises, they will increase their demand for inputs made by local suppliers, some of which will come from other local manufacturing firms. As the round-by-round increases in demand are transmitted through the backward linkages, they will generate further increases in regional economic activity in all sectors through the indirect multiplier effect.

## Characteristics of the manufacturing sector

To provide a more accurate picture of the First Coast 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 First Coast region had 2015 employment in 21 three-digit manufacturing subsectors, with positive employment growth rates between 2000 and 2015 in only 2 of them:** electrical equipment and appliance manufacturing; and transportation equipment manufacturing. Electrical equipment and appliance manufacturing far surpassed all other sectors in terms of growth with a 5.3 percent compound annual growth rate (CAGR), which was nearly four times that of the transportation equipment manufacturing industry, the second-fastest-growing sector in the area in terms of employment. Employment in all other manufacturing sectors, even those that were more concentrated in the First Coast region than in the United States as a whole (as shown by an LQ greater than 1) declined between 2000 and 2015. In addition to being less concentrated in manufacturing employment than the United States as a whole, the First Coast experienced a 2.4 percent



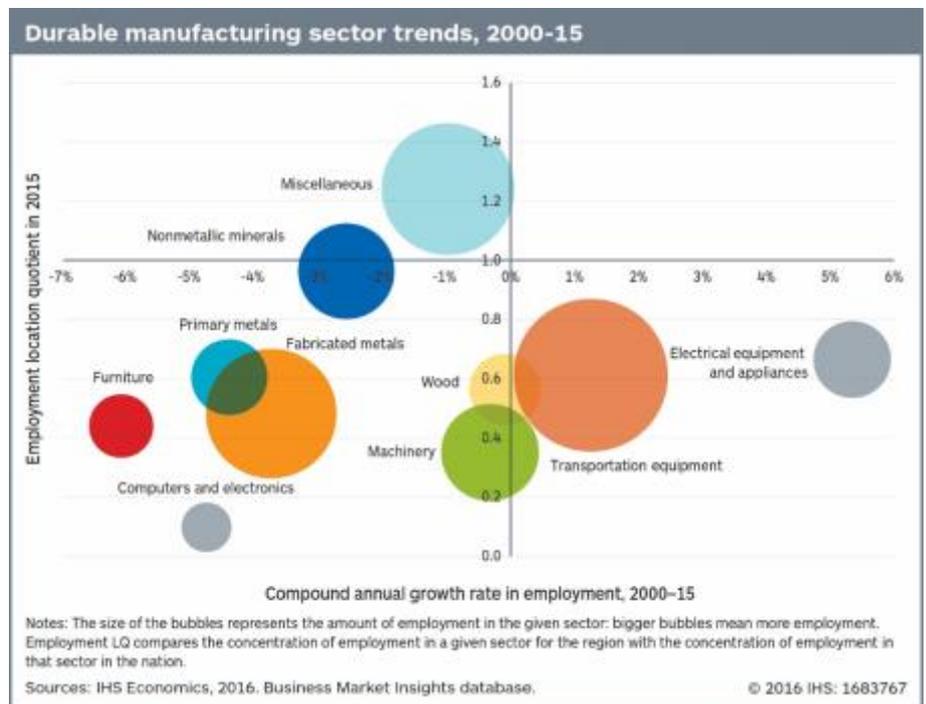
compound annual decline in manufacturing employment during the last 15 years. The state of Florida declined at an identical CAGR of -2.4 percent, on a par with the US CAGR of -2.3 percent in the same period.

### 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 First Coast 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 63.5 percent and 36.5 percent of the First Coast region’s manufacturing employment in 2015 was in the durable and nondurable sectors, respectively, with the First Coast region’s durable manufacturing sector constituting a lower share of manufacturing jobs than in Florida overall, where durable manufacturing accounted for 67.9 percent of manufacturing employment.

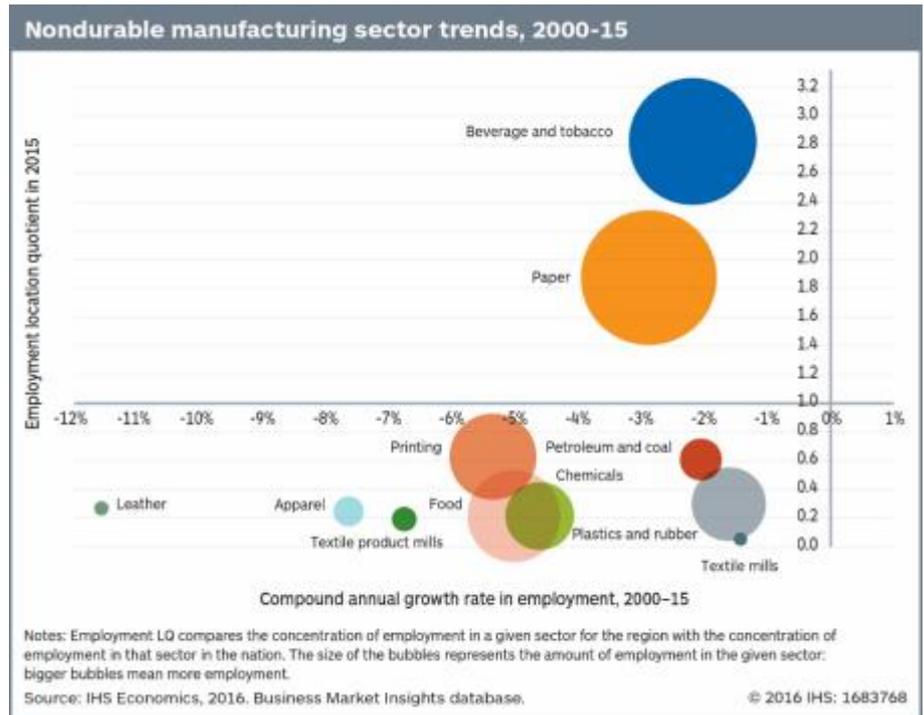
**Due to the differences in the goods made and the production processes used, the durable and nondurable manufacturing sectors also differ from each other in terms of the mix of skilled workers required, level of wages paid, and productivity, all of which will determine appropriate economic and workforce 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.

- **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.
- **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.



**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 First Coast’s durable sector between 2000 and 2015. Note the relatively large number of jobs and positive employment growth rate of the transportation equipment and electrical equipment and appliances sectors as well as the above-average employment concentration of the miscellaneous manufacturing sector. The second chart presents the composition and performance of the nondurable sectors. Although employment has declined in the beverage and tobacco and paper manufacturing sectors, these industries are still notable for their large numbers of jobs and above-average concentration in the regional economy.

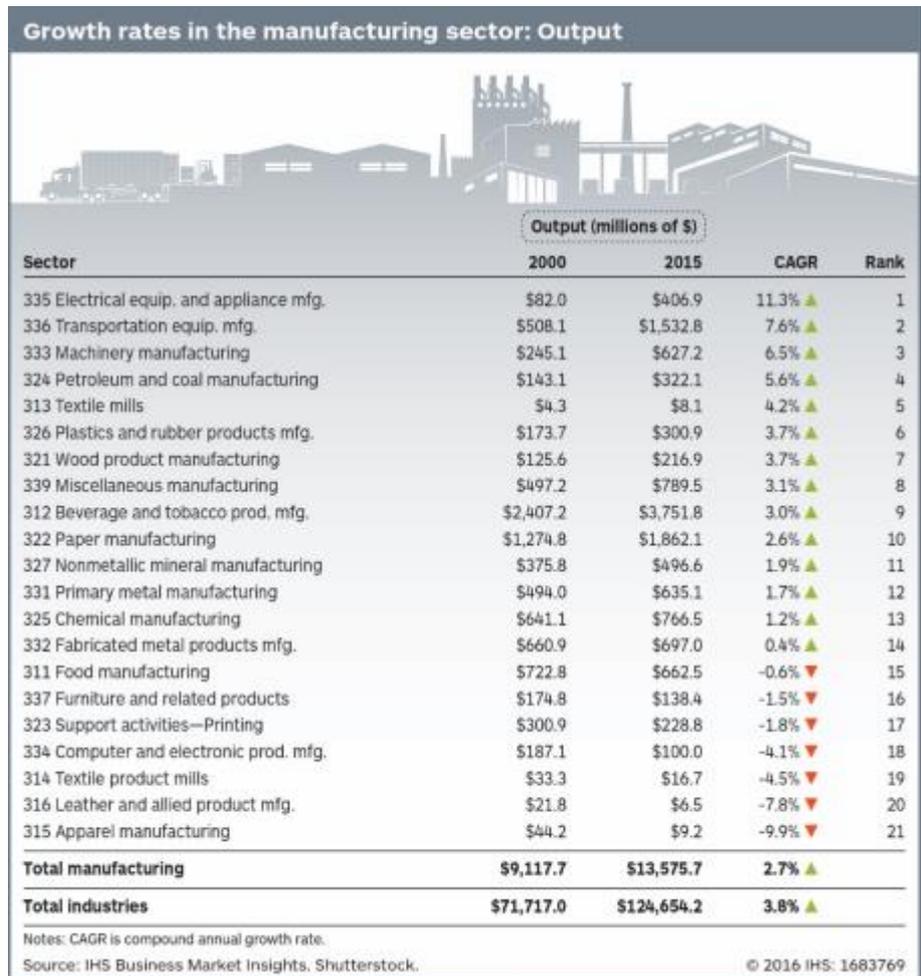
**If one of the objectives of a region’s economic development plan is to increase employment in the traditional, “blue-collar” manufacturing occupations, then expansion of the durable sectors (i.e., more direct jobs per \$1 million of output as noted above), and some nondurable sectors (e.g., textiles, apparel, leather, wood, and 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 First Coast region, whereas only 2 manufacturing subsectors had a positive CAGR for employment between 2000 and 2015, 14 had a positive CAGR for output. As with employment growth, the most notable output gains were in the electrical equipment and appliance and transportation equipment manufacturing subsectors.

Of the 14 manufacturing sectors with positive growth in output from 2000 to 2015, all also demonstrated growth in productivity (output per worker), with petroleum and coal manufacturing, machinery manufacturing, primary metal manufacturing, transportation equipment manufacturing, and chemical manufacturing leading the pack with productivity growth rates exceeding six percent annually. **Of the manufacturing sectors composing the First Coast manufacturing economy, only electrical equipment and appliance manufacturing and transportation manufacturing had positive growth between 2000 and 2015 across all three areas: employment, productivity, and output.** 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 textile product mills will produce approximately six direct jobs per \$1 million of new output, a sector such as petroleum and coal manufacturing with \$1,091,900 of output per worker will not produce even one new job per each additional \$1 million in output. Despite the relatively greater number of direct jobs that would be produced by additional investment in textile mills, new jobs in the petroleum and coal manufacturing 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.**

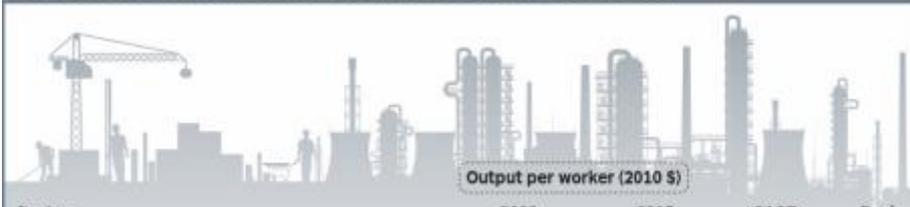
**However, there is an important caveat to this strategy: not all manufacturing jobs are equal; they differ widely based on their annual wage levels. Economic development agencies must consider the prevailing annual wage levels in the manufacturing subsectors they want to promote, which are a function 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 First Coast manufacturing sectors’ growth in the last 15 years, IHS assessed regional structure in terms of distribution of manufacturing establishments by employment size. **In the six-county First Coast region, the vast majority of manufacturers (87 percent, or 754 establishments) employ fewer than 50 workers, 12 percent (107 establishments) engage 50–499 employees, and there are only eight manufacturing firms with 500 employees or more. Of the 869 manufacturing establishments in the region, almost two-thirds (64.3 percent) are “very small” employers (having fewer than ten employees each).** Manufacturing subsectors with large numbers of very small employers include food, textile mill products, support activities—printing, chemicals, plastics and rubber, fabricated metal products, machinery, transportation equipment, furniture and related products, and miscellaneous.

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, and regulatory changes; may have more difficulty 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

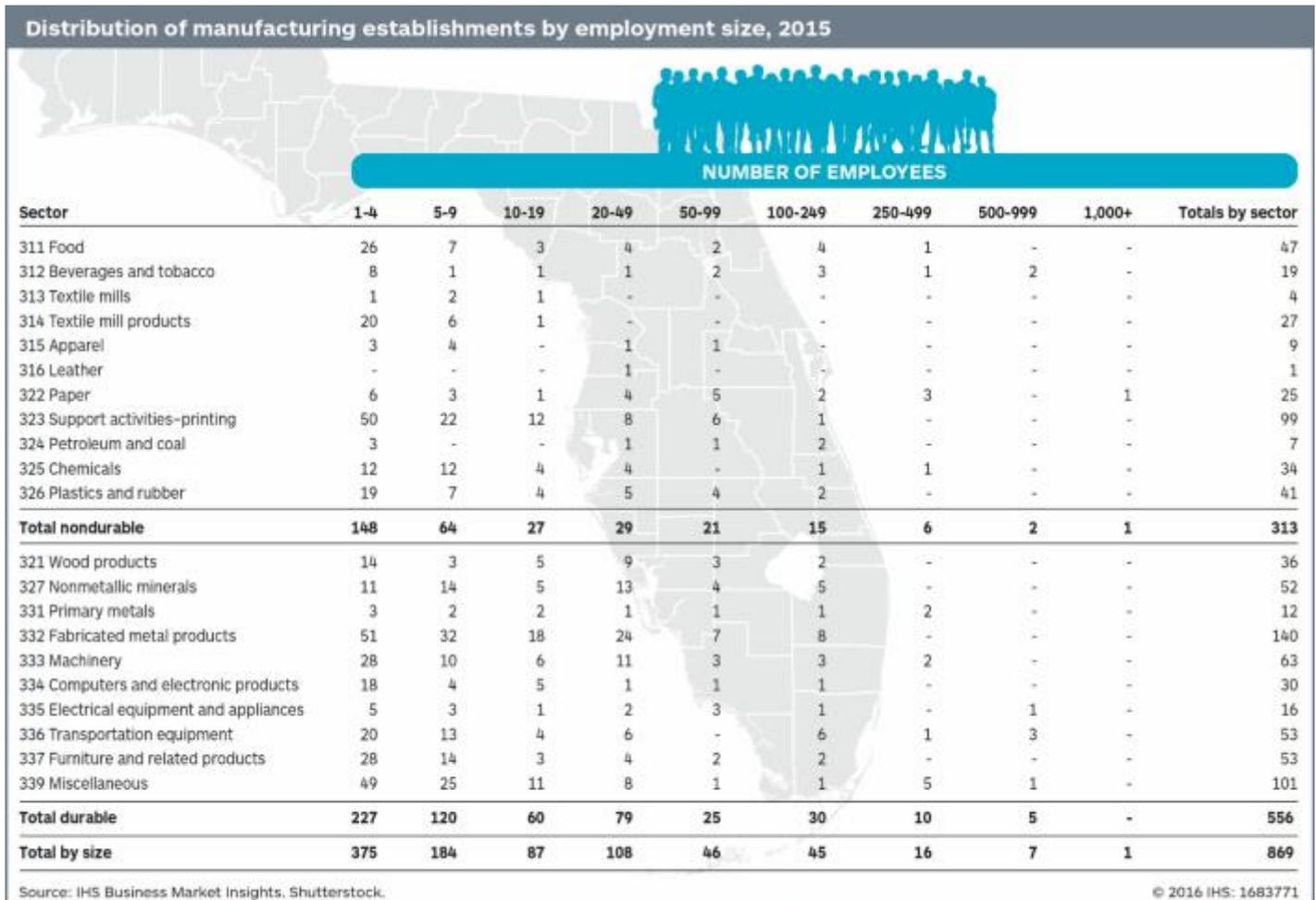
**Growth rates in the manufacturing sector: Productivity**



Sector	Output per worker (2010 \$)		CAGR	Rank
	2000	2015		
324 Petroleum and coal manufacturing	\$354,966	\$1,091,900	7.8% ▲	1
333 Machinery manufacturing	\$131,124	\$352,138	6.8% ▲	2
331 Primary metal manufacturing	\$231,174	\$583,730	6.4% ▲	3
336 Transportation equip. mfg.	\$137,846	\$344,763	6.3% ▲	4
325 Chemical manufacturing	\$401,956	\$976,435	6.1% ▲	5
313 Textile mills	\$120,553	\$278,673	5.7% ▲	6
335 Electrical equip. and appliance mfg.	\$160,820	\$365,240	5.6% ▲	7
322 Paper manufacturing	\$265,908	\$602,631	5.6% ▲	8
326 Plastics and rubber products mfg.	\$147,682	\$326,752	5.4% ▲	9
312 Beverage and tobacco prod. mfg.	\$631,136	\$1,370,777	5.3% ▲	10
337 Furniture and related products	\$88,774	\$180,396	4.8% ▲	11
311 Food manufacturing	\$231,803	\$460,382	4.7% ▲	12
327 Nonmetallic mineral manufacturing	\$146,554	\$286,248	4.6% ▲	13
316 Leather and allied product mfg.	\$101,345	\$191,077	4.3% ▲	14
332 Fabricated metal products mfg.	\$116,890	\$218,493	4.3% ▲	15
339 Miscellaneous manufacturing	\$129,896	\$239,027	4.1% ▲	16
321 Wood product manufacturing	\$129,206	\$225,970	3.8% ▲	17
323 Support activities—Printing	\$104,341	\$181,141	3.7% ▲	18
314 Textile product mills	\$116,325	\$167,149	2.4% ▲	19
334 Computer & electronic prod. mfg.	\$195,348	\$216,917	0.7% ▲	20
315 Apparel manufacturing	\$88,772	\$61,019	-2.5% ▼	21
<b>Total manufacturing</b>	<b>\$212,207</b>	<b>\$457,262</b>	<b>5.3% ▲</b>	
<b>Total industries</b>	<b>\$119,795</b>	<b>\$189,506</b>	<b>3.1% ▲</b>	

Notes: CAGR is compound annual growth rate.  
Source: IHS Business Market Insights, Shutterstock. © 2016 IHS: 1683770

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<sup>10</sup> based on four-digit NAICS employment, with LQs based on employment in the manufacturing sectors, not total employment. **For the six counties included in the First Coast region, the Hachman Index of 0.332 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 12,801 people employed in the advanced manufacturing sectors**, as defined either by researchers from the US Bureau of Labor Statistics (BLS) or the Brookings Institution<sup>11</sup> think tank, **the First Coast region has just above 43**

10 See Footnote 9 regarding the Hachman Index calculation.

11 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)

**percent of its manufacturing industry employment in advanced manufacturing. This share is just below the US and Florida shares of 46.8 percent and 49.7 percent, respectively. 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 are:

- 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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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 universities and community colleges, workforce development boards, secondary career and technical education (CTE) schools, the First Coast 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. Competitive sectors are identified in this report's shift-share analysis.

## 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.

**Industry risk ratings for the US manufacturing sector, April 2016**



ISIC code	RISK RATING					
	Composite sector	Growth	Profitability and pricing	Supply	Industry structure	Economic and commerce
(D15) Food and beverages	5.0	6.2	6.4	5.6	2.7	2.0
(D19) Leather footwear	5.8	8.0	7.5	7.1	1.7	2.0
(D31) Electrical machinery	5.8	8.2	5.8	6.7	3.3	3.5
(D20) Wood products (exclude furniture)	6.1	7.5	8.3	5.8	3.0	3.7
(D23) Refined petroleum, coke, and nuclear	6.1	8.2	6.8	5.6	4.7	2.0
(D34) Motor vehicles, trailers, and parts	6.1	8.0	6.7	6.6	4.0	3.5
(D35) Transport equipment (excluding motor vehicles)	6.1	6.8	7.0	7.4	4.7	3.5
(D16) Tobacco products	6.2	9.5	7.7	5.1	2.7	2.0
(D18) Wearing apparel	6.2	8.5	7.7	6.6	2.0	4.2
(D33) Medical, precision, and optical	6.2	5.3	7.7	6.4	8.0	2.5
(D29) Machinery, equipment, appliances	6.3	7.6	6.9	6.7	5.0	3.5
(D25) Rubber and plastics products	6.5	8.0	8.8	6.9	3.7	2.5
(D26) Mineral-based products (nonmetallic)	6.6	7.7	8.3	6.4	5.0	3.5
(D27) Basic metals	6.6	8.2	8.1	6.9	5.0	2.0
(D28) Fabricated metal products	6.6	8.6	8.9	5.1	3.7	3.5
<b>Manufacturing</b>	<b>6.9</b>	<b>8.2</b>	<b>7.6</b>	<b>6.7</b>	<b>6.3</b>	<b>3.5</b>
(D21) Paper and pulp	6.9	8.7	8.6	6.7	4.7	2.7
(D24) Chemicals	6.9	7.6	7.1	6.8	8.3	2.8
(D17) Textiles	7.0	9.4	8.6	6.9	3.3	4.2
(D32) Communications equip., semiconductors, and TVs	7.5	7.5	8.9	7.2	8.7	2.7
(D36) Furniture, jewelry, toys, musical, other goods	7.7	8.5	9.1	7.6	7.3	4.0
(D22) Printing and publishing	8.0	10.0	9.4	5.0	8.3	3.2
(D30) Computers and office machinery	8.1	8.8	9.6	7.2	9.3	2.5

Note: The sectors are ranked from lowest risk to highest based on the composite sector risk rating.

Source: IHS, April 2016, World Industry Service, Industry Risk Ratings. Shutterstock. © 2016 IHS: 1683773

From the above table, we note that machinery, equipment, and appliances manufacturing and transport equipment manufacturing, which align with the two NAICS sectors noted earlier for their high employment and output growth, have composite sector risk ratings of 6.3 and 6.1, respectively, both below the overall US manufacturing sector’s composite risk score of 6.9. The most significant source of risk for the machinery, equipment, and appliances manufacturing sector is growth risk, and the transport equipment manufacturing sector’s greatest risk is in the supply category.

# 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.<sup>12</sup>

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



<sup>12</sup> See Appendix A for full results of shift-share analysis.

sector's employment CAGR for the United States in the same period.

- **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 First Coast region, there were **eight high-performing manufacturing sectors** classified as A that outperformed the United States and represented an above-average share of the region's economy (i.e., had employment LQs above 1.0), which cumulatively **accounted for 29.3 percent of total 2015 manufacturing employment in the First Coast region**. These included:

- Aerospace product and parts
- Pulp, paper, and paperboard mills
- Ship and boat building
- Other electrical equipment and component
- Tobacco
- Sawmills and wood preservation
- Lime and gypsum product
- Other furniture-related product

However, perhaps even more interesting than the A sectors were the large number (24) of B sectors that are high performers compared with national employment growth in those sectors. While these emerging or growth sectors are doing relatively well in terms of employment growth, they do not yet account for a large share of regional economic activity. A few of the notable B sectors providing more than 200 jobs in the region include:

- Other miscellaneous
- Plastics product
- Machine shops; turned product; and screw, nut, and bolt
- Ventilation, heating, air-conditioning, and commercial refrigeration equipment
- Iron and steel mills and ferroalloy
- Other wood product
- Other general purpose machinery
- Semiconductor and other electronic component
- Engine, turbine, and power transmission equipment
- Office furniture (including fixtures)
- Motor vehicle parts
- Other fabricated metal product
- Coating, engraving, heat treating, and allied activities.

**Combined, the A and B sectors represent just over half (51.7 percent) of regional manufacturing employment, meaning state and local economic development organizations such as FloridaMakes have an opportunity to support sectors with existing strengths in the First Coast region by researching these companies' competitiveness drivers and designing programs or policies that capitalize on existing strengths and minimize growth barriers.**

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 five:

- Medical equipment and supplies
- Beverage
- Architectural and structural metals
- Cement and concrete product
- Alumina and aluminum production and processing.

These five sectors make up just over a quarter (25.3 percent) of the region's manufacturing employment.

Finally, we find more D sectors than any other category (25), which 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 in the analysis period. These sectors represent 23.1 percent of employment in the region and 6,802 jobs.

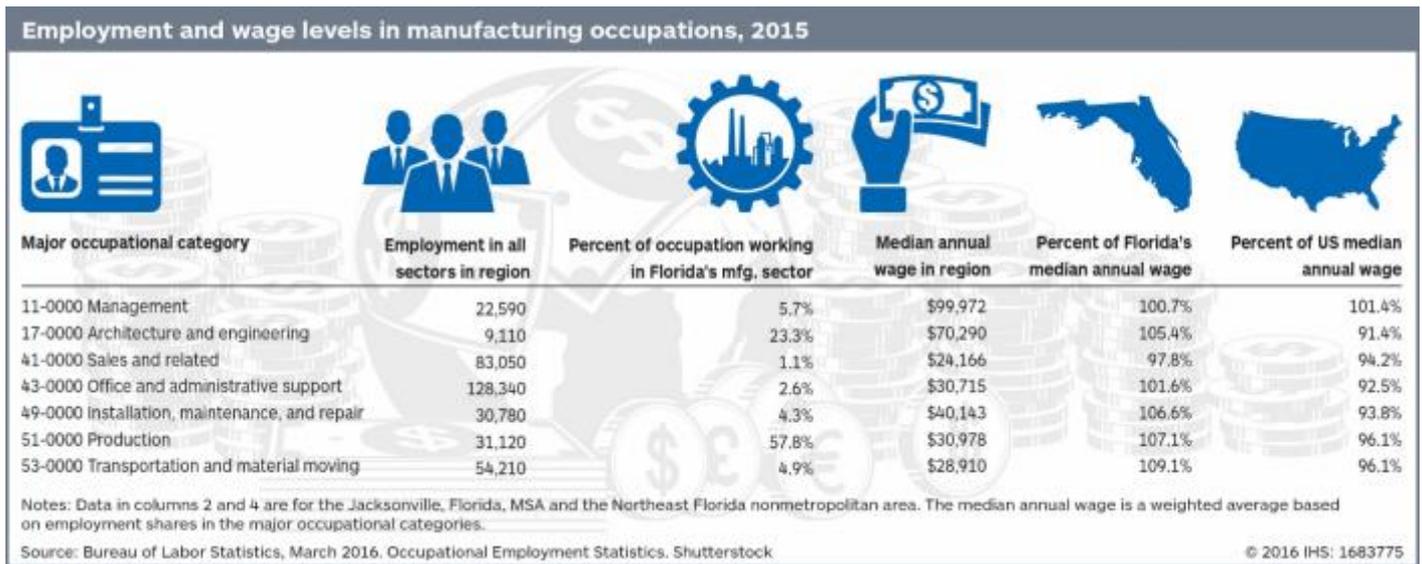
The results of the shift-share analysis can be used for developing strategies in the following manner:

- 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

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 First Coast region. From the table on manufacturing employment and wage levels in 2015, we can infer that someone in a production occupation in the First Coast region makes more than a production worker statewide, but less than a production worker nationally. The same is true for an architect or engineer. We also note that, **outside of management occupations, the First Coast has a competitive advantage nationally in terms of labor costs, especially for architects and engineers who are especially important to the advanced manufacturing sectors.**



**One implication of these findings is the First Coast RMA should encourage growth in manufacturing subsectors that pay above-average wages such as advanced and durable manufacturing (i.e., basic chemicals or metalworking machinery). However, if increasing the number of manufacturing jobs in the region, rather than increasing per capita incomes, is the desired goal, attracting manufacturing employers whose national competitive advantage is derived from being a low-cost producer may be an effective strategy.**

# Appendix A: Results of the shift-share analysis

Appendix A: Shift-share analysis of the First Coast manufacturing sector, 2015							
NAICS sector	Description	Allocation code	Employment	LQ	% of Private Sector Employment	Employment CAGR 2000-15	
3364	Aerospace product and parts	A	2,547	1.11	0.47%	2.44%	
3221	Pulp, paper, and paperboard mills	A	1,936	4.34	0.36%	-2.24%	
3366	Ship and boat building	A	1,589	2.54	0.29%	-0.55%	
3359	Other electrical equipment and component	A	830	1.54	0.15%	9.06%	
3122	Tobacco	A	807	12.99	0.15%	-1.16%	
3211	Sawmills and wood preservation	A	390	1.03	0.07%	-2.28%	
3274	Lime and gypsum product	A	337	5.96	0.06%	-3.06%	
3379	Other furniture-related product	A	206	1.36	0.04%	-1.12%	
3399	Other miscellaneous	B	877	0.72	0.16%	3.49%	
3261	Plastics product	B	846	0.34	0.16%	-1.32%	
3327	Machine shops; turned product; and screw, nut, and bolt	B	634	0.36	0.12%	1.99%	
3334	Ventilation, heating, air-conditioning, and commercial refrigeration equipment	B	440	0.78	0.08%	2.21%	
3311	Iron and steel mills and ferroalloy	B	390	0.94	0.07%	1.12%	
3219	Other wood product	B	383	0.39	0.07%	3.58%	
3339	Other general purpose machinery	B	343	0.29	0.06%	1.46%	
3344	Semiconductor and other electronic component	B	289	0.18	0.05%	-2.14%	
3336	Engine, turbine, and power transmission equipment	B	288	0.62	0.05%	8.56%	
3372	Office furniture (including fixtures)	B	277	0.51	0.05%	1.80%	
3363	Motor vehicle parts	B	259	0.11	0.05%	8.33%	
3329	Other fabricated metal product	B	248	0.22	0.05%	0.16%	
3328	Coating, engraving, heat treating, and allied activities	B	210	0.34	0.04%	0.19%	
3279	Other nonmetallic mineral product	B	198	0.57	0.04%	4.39%	
3353	Electrical equipment	B	192	0.30	0.04%	-0.75%	
3212	Veneer, plywood, and engineered wood product	B	187	0.62	0.03%	-0.28%	
3345	Navigational, measuring, electromedical, and control instruments	B	103	0.06	0.02%	9.07%	
3351	Electric lighting equipment	B	92	0.46	0.02%	1.94%	
3113	Sugar and confectionery product	B	82	0.24	0.02%	-1.18%	
3326	Spring and wire product	B	81	0.46	0.01%	22.21%	
3252	Resin, synthetic rubber, and artificial synthetic fibers and filaments	B	80	0.19	0.01%	1.61%	
3141	Textile furnishings mills	B	44	0.19	0.01%	-1.94%	
3315	Foundries	B	35	0.06	0.01%	6.30%	
3162	Footwear	B	34	0.60	0.01%	5.61%	
3391	Medical equipment and supplies	C	2,426	1.76	0.45%	-2.04%	
3121	Beverage	C	1,930	2.19	0.36%	-2.57%	
3323	Architectural and structural metals	C	1,672	1.08	0.31%	-3.65%	
3273	Cement and concrete product	C	965	1.24	0.18%	-2.02%	
3313	Alumina and aluminum production and processing	C	458	1.71	0.08%	-6.06%	
3231	Printing and related support activities	D	1,263	0.65	0.23%	-5.36%	
3222	Converted paper product	D	1,154	1.00	0.21%	-3.84%	
3119	Other food	D	608	0.72	0.11%	-1.74%	
3118	Bakeries and tortilla	D	366	0.28	0.07%	-4.59%	
3241	Petroleum and coal products	D	295	0.62	0.05%	-2.06%	
3256	Soap, cleaning compound, and toilet preparation	D	290	0.63	0.05%	-4.90%	
3371	Household and institutional furniture and kitchen cabinet	D	284	0.28	0.05%	-10.55%	
3333	Commercial and service industry machinery	D	264	0.68	0.05%	-4.69%	
3115	Dairy product	D	251	0.44	0.05%	-0.29%	
3251	Basic chemical	D	249	0.38	0.05%	-4.81%	
3331	Agriculture, construction, and mining machinery	D	237	0.23	0.04%	-0.17%	
3272	Glass and glass product	D	229	0.55	0.04%	-6.11%	
3312	Steel product from purchased steel	D	202	0.94	0.04%	-7.23%	
3332	Industrial machinery	D	178	0.37	0.03%	-4.07%	
3324	Boiler, tank, and shipping container	D	174	0.42	0.03%	-7.82%	
3321	Forging and stamping	D	154	0.29	0.03%	-9.05%	
3152	Cut and sew apparel	D	146	0.29	0.03%	-7.72%	
3117	Seafood product preparation and packaging	D	107	0.74	0.02%	-5.30%	
3262	Rubber product	D	75	0.13	0.01%	-4.26%	
3259	Other chemical product and preparation	D	74	0.20	0.01%	-6.29%	
3149	Other textile product mills	D	56	0.20	0.01%	-8.91%	
3255	Paint, coating, and adhesive	D	52	0.19	0.01%	-6.12%	
3342	Communications equipment	D	37	0.09	0.01%	-14.56%	
3335	Metalworking machinery	D	31	0.04	0.01%	-5.64%	
3253	Pesticide, fertilizer, and other agricultural chemical	D	26	0.17	0.00%	-5.53%	

Note: Only sectors with employment of 10 or more were considered; LQ = location quotient and CAGR = compound annual growth rate.

Source: IHS Business Market Insights © 2016 IHS

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