



The Economic Impact of Manufacturing in South Carolina



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EXECUTIVE SUMMARY

- South Carolina currently enjoys a thriving and globally competitive, export-oriented manufacturing base that is a principal driver for the Palmetto State's economic growth. In addition to having maintained consistently high growth rates over the past decade that are well in excess of the state average, manufacturing is also relatively unique among all industry sectors in that it is one of the highest contributors to both GDP and employment in the Palmetto State.

- Transportation equipment manufacturing is an especially strong component of South Carolina's manufacturing base, with employment growth having averaged more than three times that of the state's economy as a whole during the previous economic expansion. Specifically, transportation equipment manufacturing experienced an average annual employment growth rate of 8.0 percent between 2010 and 2019 compared to just 2.4 percent for South Carolina.

- The economic impact of manufacturing on the state of South Carolina is estimated to total between \$194 billion and \$206 billion annually. This figure reflects the dollar value representing all final goods and services produced statewide that can be attributed (directly or indirectly) to manufacturing. This level of economic activity corresponds to between 662,391 and 703,081 jobs and to between \$34 billion and \$37 billion in labor income for South Carolinians.

- Although manufacturing's direct employment base alone represents 12.6 percent of all jobs in South Carolina, after accounting for the additional impacts resulting from all secondary economic multiplier effects, this percentage jumps to 30.2 percent. This means that manufacturing ultimately supports over 30 percent of all jobs in South Carolina, making it among the state's largest industry sectors.

- With such a sizable contribution to the state's economy, the speed of manufacturing's recovery from the COVID-19 pandemic will fundamentally shape the nature of South Carolina's economic future and set the tone for growth in the 2020's.

- South Carolina's manufacturing cluster continues to evolve in the face of rapid technological development. This study's examination of the requirements associated with manufacturing occupations projected to be in the highest demand over the next decade suggests a significant shift towards a more high-skilled, experienced workforce.

- Although only ten percent of all manufacturing-related occupations in South Carolina represent high-tech, non-production fields, nearly half of the high demand manufacturing occupations fall within these two categories. Such a major shift towards higher-skilled labor would provide significant positive spillover effects for South Carolina's economy, including increased productivity that leads to higher wages for workers.

Section I Introduction

Over the past 30 years, South Carolina has experienced a significant transition period in which the state has proactively established a globally competitive, export-oriented manufacturing base that is now a principal driver of the state's economic growth. For example, over 15 percent of the approximately 350,000 private-sector jobs created between 2010 and 2019 have been in manufacturing.¹ Throughout the last decade, South Carolina has consistently outpaced the United States in its rate of economic growth and has seen its total dollar volume of exports grow at about twice the rate as that of imports. Both trends are largely the result of the state's rapidly expanding manufacturing base.

These positive growth trends in the Palmetto State were interrupted in the spring of 2020 as a result of the emergence of the global COVID-19 pandemic that led to a recession in the United States. Nevertheless, this pandemic has not undermined the role of manufacturing as an essential component of South Carolina's long-run economic growth. In many ways, the manufacturing industry may play an even greater role in the state's economic future to the extent that the pandemic incentivizes U.S. manufacturers to make changes to existing supply chains by utilizing more domestic suppliers. Regardless of any long-term supply chain changes, however, South Carolina's economic recovery from the pandemic will depend heavily on the success of the manufacturing industry. For example, manufacturing is relatively unique among all industry sectors in that it is among the highest contributors to both GDP and employment in the state. Given the vital role that manufacturing will continue to play in the post-pandemic economy towards shaping South Carolina, it is important to accurately define and measure this sector in order to help ensure its long-run success.

The specific purpose of this study is to conduct a comprehensive assessment of the manufacturing industry in South Carolina. This assessment will include two main elements. First, the total economic footprint that manufacturing maintains in South Carolina will be quantified. Although manufacturing is well-established as one of the largest sectors of the state and national economy, its significance is often underreported because of the nature of the manufacturing workforce. Manufacturers hire many of their employees through staffing agencies, and as such, the use of standard manufacturing industry classification codes typically does not capture these workers. To minimize such a limitation and to more accurately capture the breadth of the industry, this study will establish manufacturing's economic footprint in South Carolina in a new way by defining it as a set of occupations.

¹ U.S. Bureau of Labor Statistics, Current Employment Statistics, NSA



The second element of this study will consist of the development of a manufacturing workforce profile. This profile will generate a summary of the education, training, and skillset requirements associated with the most in-demand manufacturing jobs in South Carolina – along with a review of other sectors in South Carolina competing for these workers. Such a profile will aid workforce training efforts and help to better align the curriculum of training facilities with known industry needs. It will also help manufacturers to more effectively tap into the expanded pool of workers that are now available due to the higher levels of unemployment resulting from the pandemic. This section will also review the major manufacturing-related workforce programs currently in operation through the South Carolina Technical College System.

Section II Manufacturing Trends in South Carolina: 2010-2020

The 2020 global recession brought about by the COVID-19 pandemic ended a nearly 11-year economic expansion for the United States that began in July 2009 – an expansion that became the longest on record. South Carolina greatly benefitted from this expansion, consistently outpacing national growth rates across many economic metrics. For example, between 2010 and 2019, employment and wage growth for South Carolina totaled 24.9 percent and 27.5 percent compared to 19.1 percent and 26.9 percent for the United States, respectively.² In addition, South Carolina's unemployment rate decreased much faster than that of the United States over the past decade. Between January 2010 and January 2020, South Carolina's unemployment rate dropped 9.3 percentage points from 11.7 percent to 2.4 percent. Over the same period U.S. unemployment dropped 6.3 percentage points, from 9.8 percent to 3.5 percent.³

While there were multiple reasons for South Carolina's economic performance during this decade-long expansion, one of the primary factors was strong economic growth in the state's manufacturing industry. In addition to the overall growth itself, manufacturing is relatively unique among all industry sectors in that it is among the highest contributors to both GDP and employment in South Carolina. As such, a given level of growth in manufacturing translates into a much higher economic contribution to the state's economy than that same level of growth would in a smaller industry. Consider two industry sectors, one containing 50,000 employees and one containing 100,000 employees. A two percent annual employment growth rate in both sectors would generate twice as many new jobs in the larger industry. **Figure 1** specifically illustrates the industry sectors in South Carolina that contribute most to the state's economy, ranked by percentage contribution to GDP. Notice that manufacturing is the only industry with relatively high contributions to both GDP and employment.

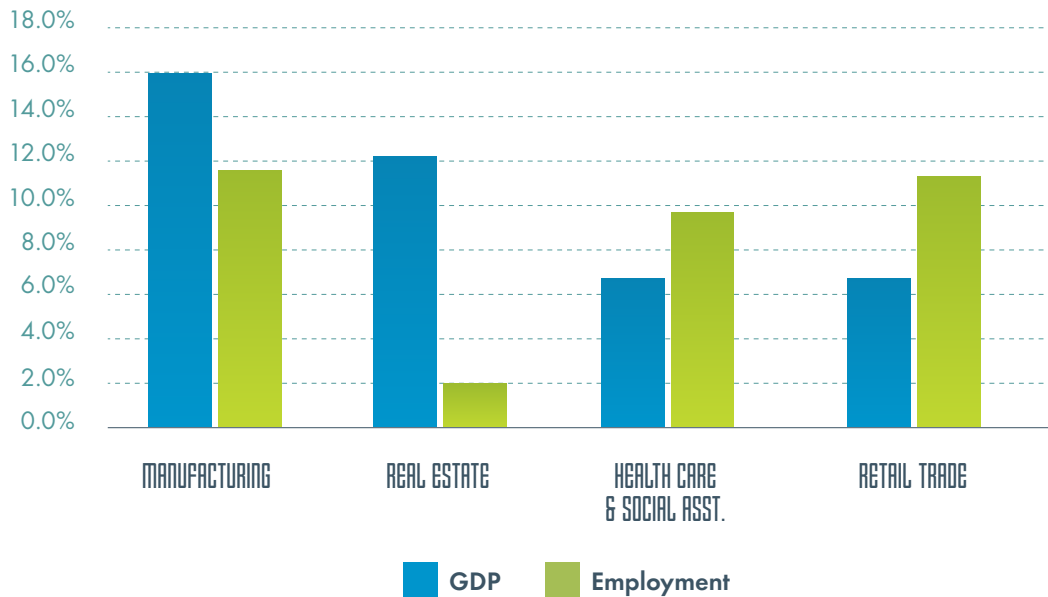
Manufacturing is relatively unique among all industry sectors in that it is among the highest contributors to both GDP and employment in South Carolina.

² U.S. Bureau of Labor Statistics, Current Employment Statistics, NSA

³ U.S. Bureau of Labor Statistics, LAUS, SA

Figure 1 – Percentage Contributions to GDP & Employment by Industry: South Carolina
Industry Sectors Ranked by GDP Contribution

Source: U.S. Bureau of Labor Statistics & U.S. Bureau of Economic Analysis, 2019



The bulk of manufacturing’s growth in South Carolina over the past decade has primarily come from the industry subsector of transportation equipment manufacturing – more commonly referred to as advanced manufacturing. Transportation equipment manufacturing encompasses the aerospace and automotive sectors (along with their major suppliers), and includes many well-known international companies located throughout the state’s major metropolitan regions. Between 2010 and 2019, employment growth in transportation equipment manufacturing significantly exceeded the average growth rate of the manufacturing industry as a whole as well as for the broader South Carolina economy. **Figure 2** highlights these trends. While employment growth for both manufacturing and the state of South Carolina averaged approximately 2.4 percent annually between 2010 and 2019, transportation equipment manufacturing averaged 8.0 percent. In other words, **advanced manufacturing in South Carolina consistently grew at over 3 times the rate of the state’s economy during the previous economic expansion.**





Figure 2 – South Carolina Employment Growth Rates

Source: U.S. Bureau of Labor Statistics

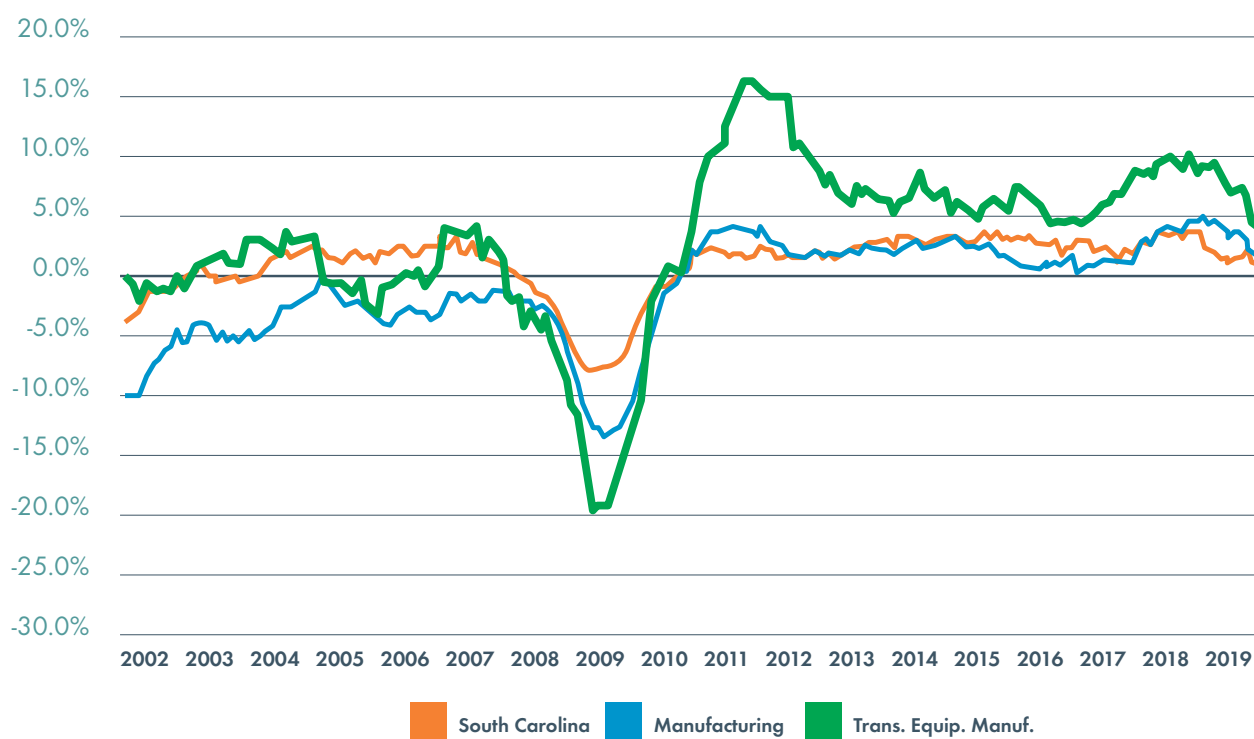


Figure 2 also summarizes employment growth trends between 2002 and 2008. The sizable uptick in growth in transportation equipment manufacturing that occurred following the Great Recession of 2008 can be directly observed. This dramatic increase in growth was not generally observed at the national level, as **Figure 3** denotes.

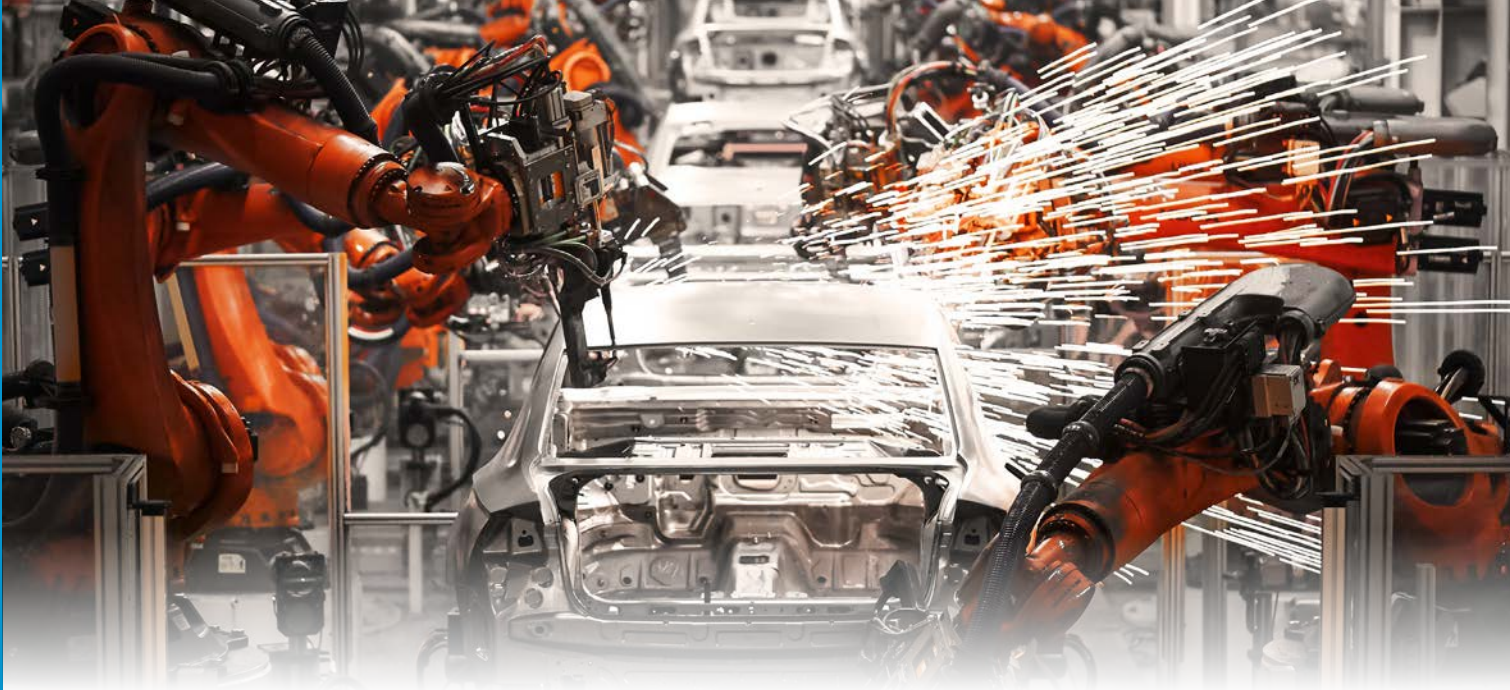
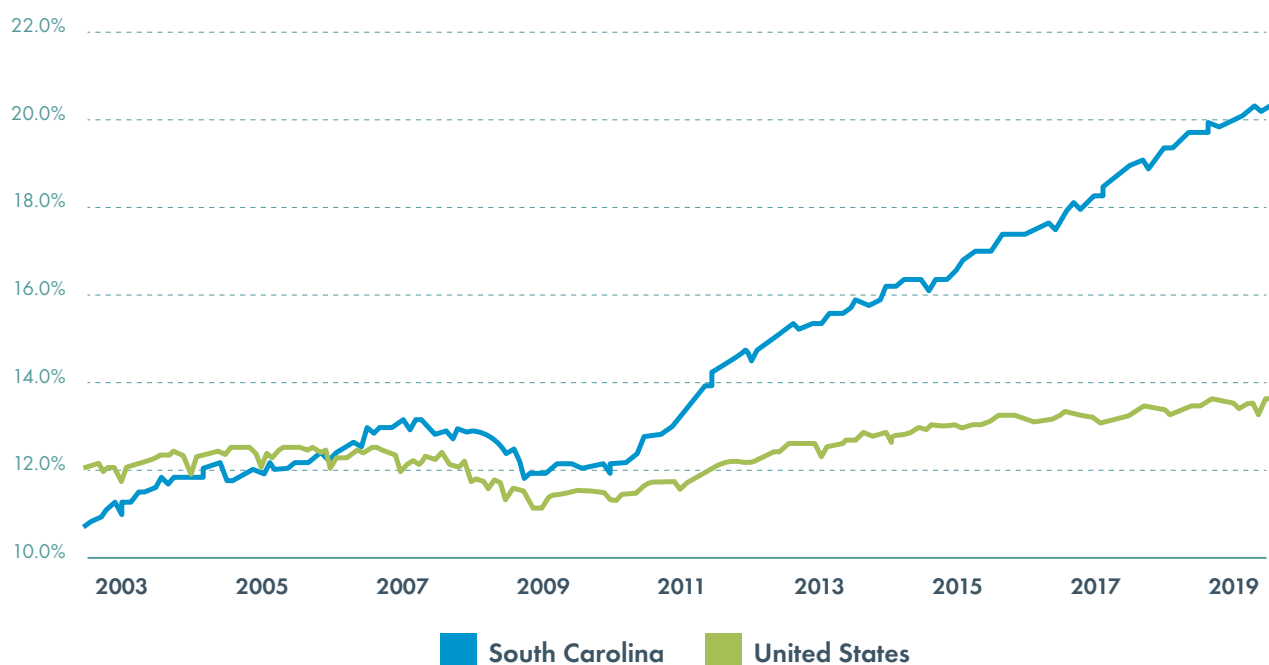


Figure 3 – Transportation Equipment Manufacturing as Pct. of Total Manufacturing Industry

Source: U.S. Bureau of Labor Statistics



South Carolina has generated among the highest rates of growth in manufacturing throughout the Southeastern United States. **Figures 4 and 5** highlight the cumulative growth rate in employment for both transportation equipment manufacturing and the manufacturing industry as a whole for each state in the Southeast over the course of the previous economic expansion. Notice that South Carolina has outperformed virtually every other state since 2011, and as of 2018 has taken over top position in both categories.

Figure 4 – Cumulative Employment Growth in Transportation Equipment Manufacturing since 2011 by State

Source: U.S. Bureau of Labor Statistics

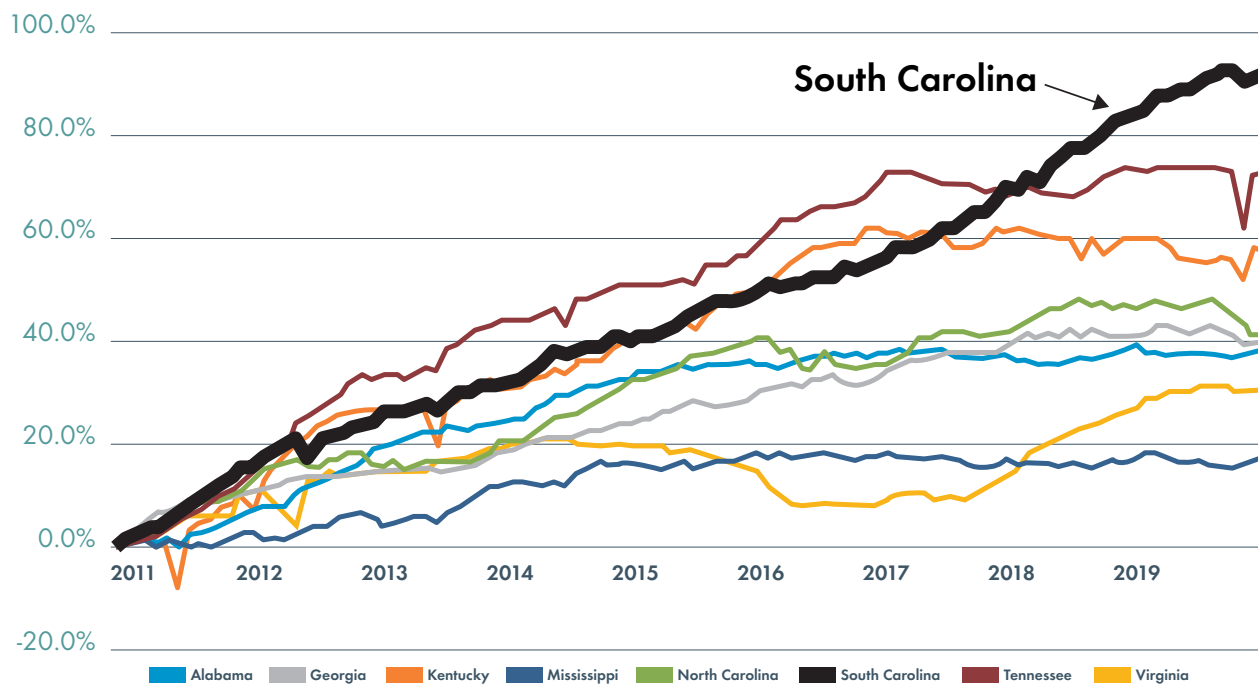
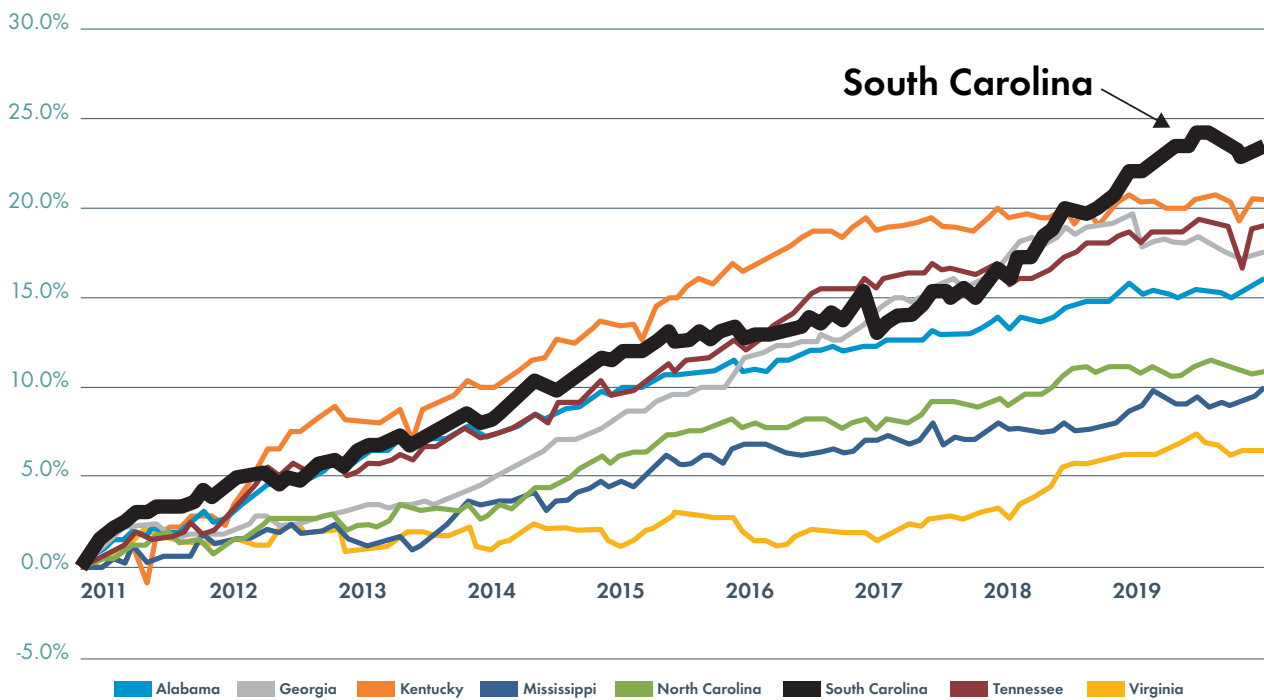
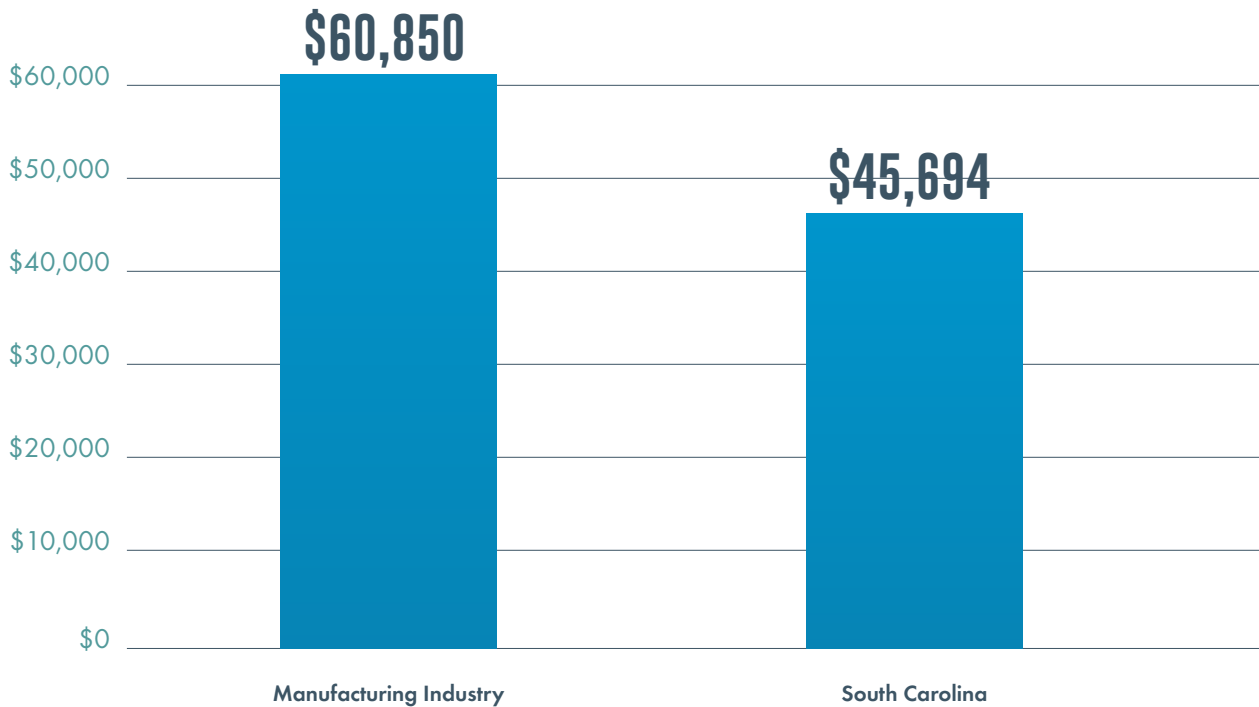


Figure 5 – Cumulative Employment Growth in the Manufacturing Industry since 2011 by State
Source: U.S. Bureau of Labor Statistics



One of the most important and positive consequences of this growth in transportation equipment manufacturing in South Carolina has been the fact that this subsector generates jobs that are typically skilled, high-wage positions. This increase has meant that the wage premium offered by manufacturing jobs in South Carolina has risen far faster than the wage premium for manufacturing jobs across the United States. For example, since 2002, the wage premium that South Carolina manufacturing jobs offer over the average job in the Palmetto State has more than doubled. For the United States as a whole, during this same time period, the manufacturing wage premium has not changed. Moreover, South Carolina manufacturing jobs offer a wage premium of approximately 33 percent over the average South Carolina job, as **Figure 6** denotes. The annual wage of the average manufacturing job in South Carolina is \$60,850, compared to \$45,694 for all jobs across South Carolina.

Figure 6 – South Carolina Annual Wage Comparisons
Source: U.S. Bureau of Labor Statistics

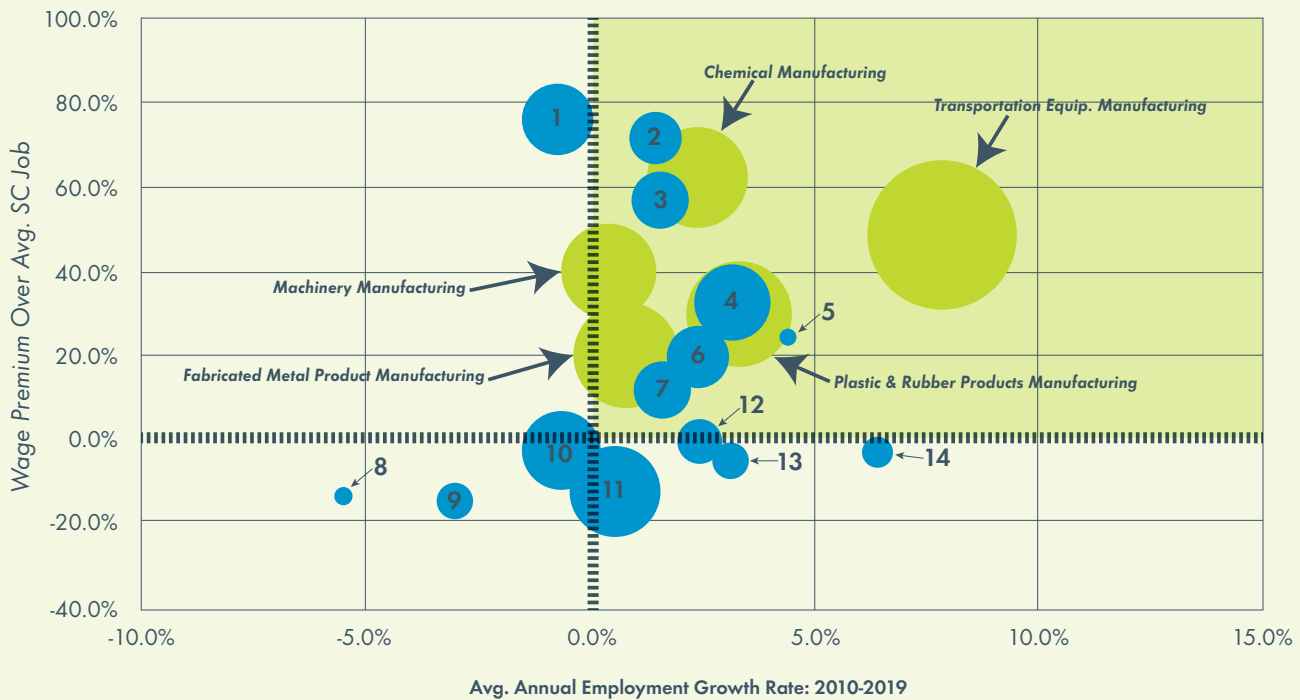


Despite transportation equipment manufacturing’s disproportionate contribution to recent growth trends in South Carolina as the industry’s largest subsector, it is also important to recognize that approximately 80 percent of the state’s manufacturing base falls outside of this subsector – including many companies that depend on this subsector as part of their supply chains. Perhaps the most well-known example of such a supplier base is the tire industry, which comprises the majority of the plastic and rubber products manufacturing subsector in South Carolina. **Figure 7** summarizes the 19 subsectors of manufacturing in South Carolina by displaying their varying rates of employment growth, wage premiums, and relative sizes. Each of these three factors helps determine a subsector’s contribution to the state’s economy. In general, subsectors with larger bubble sizes that are in the upper right quadrant are the largest contributors.

In **Figure 7**, the five subsectors highlighted in green reflect those ranking highest across all three aforementioned factors. Chemical manufacturing has one of the highest overall wage premiums, while transportation equipment manufacturing has experienced the highest employment growth rate over the past decade and is the single largest manufacturing subsector. Plastic and rubber parts manufacturing, machinery manufacturing, and fabricated metal product manufacturing – all of which contain companies that serve as suppliers to firms within transportation equipment manufacturing – have also generated relatively high employment growth rates and maintain wage premiums over the average South Carolina job.

Figure 7 – Employment and Wage Trends of Manufacturing Subsectors in South Carolina

Source: U.S. Bureau of Labor Statistics
Note: Bubble size represents number of employees



Subsector Legend

No.	Name	No.	Name
1	Paper Manuf.	8	Apparel Manuf.
2	Primary Metal Manuf.	9	Textile Product Mills
3	Computer and Electronic Prod. Manuf.	10	Textile Mills
4	Electrical Equip. & Appliance Manuf.	11	Food Manuf.
5	Petroleum and Coal Products Manuf.	12	Printing and Related Support Manuf.
6	Misc. Manuf.	13	Furniture and Related Prod. Manuf.
7	Wood Product Manuf.	14	Bev.&Tobacco Prod Manuf.

In sum, the manufacturing industry represents one of the largest sectors of the South Carolina economy that has also made an unusually large contribution to economic growth over the past decade. Despite these contributions, however, manufacturing is often underreported as an industry sector in South Carolina primarily due to the nature of the manufacturing workforce. As such, this study now turns towards developing a more comprehensive profile of manufacturing in South Carolina in order to accurately quantify its total statewide economic footprint.

Section III The Current Economic Impact of Manufacturing in South Carolina

A New Definition of Manufacturing

Manufacturing has long been recognized as one of the largest industry sectors in South Carolina. Having established a globally competitive, export-oriented manufacturing base, South Carolina now consistently ranks near the top among all states in various measures of overall economic activity. This is especially true with respect to foreign direct investment where, as of 2019, South Carolina has a higher percentage of its employment base tied to foreign-headquartered companies than any other state.⁴ Nevertheless, manufacturing's impact on the South Carolina economy tends to be systematically underreported due to the way in which many manufacturers hire workers.

Specifically, in recent years manufacturers have relied more heavily on staffing agencies to help them to identify and recruit qualified workers. In this new hiring model, staffing agencies are the employers of record who then "place" workers with the manufacturing firms. This provides a number of benefits to the manufacturers, including the flexibility to more easily adjust the size of their workforce as needed to accommodate regular changes in market demand. Thus, the workforce of many manufacturing firms includes direct hires as well as a contingent labor force. Because the staffing agencies are the employers of record for the contingent labor force, these workers do not show up as manufacturing employees in the standard manufacturing industry classification codes as compiled by the U.S. Bureau of Labor Statistics (BLS). Rather, they are classified under the "employment services" category as a subset of the broader "professional and business services" employment category. In order to address this limitation, this study will define manufacturing in a new way – as a set of occupations using standard occupational code (SOC) listings as maintained by the BLS.



⁴Source: Organization for International Investment



For example, consider the fact that all manufacturing employees fall into one of the following three categories:

- (1) Manufacturing occupations in the manufacturing industry
- (2) Non-manufacturing occupations in the manufacturing industry (e.g., accountants employed in manufacturing)
- (3) Manufacturing occupations in non-manufacturing industries (e.g., employment services/staffing agencies)

Standard manufacturing industry codes will generally capture categories (1) and (2) while leaving out category (3). In some cases, this can be a significant omission. For instance, in the case of the occupation category “assemblers and fabricators,” approximately 76.7 percent of these employees are estimated to be working within the manufacturing industry. However, another 14.7 percent are estimated to work in the employment services industry – that is – likely working in manufacturing through staffing firms. Estimating the full impact of the manufacturing industry begins by quantifying each of these three categories.

As a first step, data from the U.S. Bureau of Labor Statistics’ Industry/Occupation Matrix is used to identify all 867 occupation categories in the United States and to determine – for each occupation category – (a) what percentage of the manufacturing workforce is comprised of that occupation category and (b) what percentage of total employees in that occupation (across all industries) is employed in manufacturing. These data can then be used to quantify components (1)-(3) listed above. The Division of Research (DOR), in conjunction with the South Carolina Future Makers (SCFM), evaluated the full list of these 867 occupation categories as maintained by the BLS and identified 127 to be considered as “manufacturing occupations” for the purposes of this study. These categories were then combined with South Carolina employment data in order to arrive at the estimates of components (1)-(3). These are summarized in **Table 1**. Note that all manufacturing data reflect employment totals from February 2020 and thus reflect the employment count immediately preceding the onset of the COVID-19 pandemic.

Table 1 – Total Direct Employment of the Manufacturing Industry in South Carolina

Category	Employment Total
Manufacturing Occupations in the Manufacturing Industry	165,634
Non-Manufacturing Occupations in the Manufacturing Industry	92,766
Manufacturing Occupations in Non-Manufacturing Industries (Lower Bound)	19,190
Manufacturing Occupations in Non-Manufacturing Industries (Upper Bound)	36,242

Total (Lower Bound)	277,590
Total (Upper Bound)	294,642

The total number of employees in South Carolina working directly for manufacturing companies is estimated to be 258,400. Of this total, 165,634 (64%) are in manufacturing occupations, while the remaining 92,766 (36%) are not. Manufacturing occupations include categories such as “first-line supervisors of production and operating workers,” “machinists,” and “welders, cutters, solderers, and brazers.” Non-manufacturing occupations include categories such as “operations specialties managers” “buyers and purchasing agents,” and “financial analysts.”

In addition to the employees working directly for manufacturing firms, there are also individuals working in manufacturing occupations for non-manufacturing firms. As previously noted, many staffing firms hire workers in manufacturing occupations who are then placed with manufacturing or manufacturing-related firms. As such, even though these workers are not employed by manufacturers directly, they nevertheless are part of the economic footprint of manufacturing in South Carolina.

This additional manufacturing employment base was specifically quantified by using the 127 aforementioned manufacturing occupations as a starting point. For each occupation, if the BLS Industry/Occupation Matrix reported that the total number of employees in that occupation (across all industries) employed in manufacturing was greater than 70 percent, it was assumed that **all of the remaining employees in South Carolina working in that occupation were also employed in manufacturing-related firms**. This assumption is based on the premise that manufacturing-related occupations that are most heavily employed in the manufacturing industry as defined by BLS are likely to be employed in manufacturing-related firms even if they are not explicitly identified as such. An additional, broader scenario was also modeled using the assumption of 50 percent instead of 70 percent. Table 1 illustrates the estimated number of employees working in manufacturing occupations for non-manufacturing firms to be between 19,190 (lower bound) and 36,242 (upper bound). This implies that the true direct impact of manufacturing in South Carolina is between 277,590 and 294,642. **Appendix I** provides a list of all occupations included in these employment estimates.

Methodology

As shown above, manufacturing in South Carolina directly supports thousands of workers across the state and generates billions of dollars in economic activity every year. This includes all economic activity at manufacturing firms as well as additional manufacturing-related production generated by workers in manufacturing occupations who are employed in non-manufacturing firms. For example, if a temporary staffing firm were to hire and place 1,000 workers with manufacturing firms in South Carolina, the economic activity generated by these 1,000 workers would be considered to be part of manufacturing's direct impact.

Yet these activities do not provide a complete picture of the impact of manufacturing on South Carolina's economy. The expenditures that occur within the manufacturing industry and within non-manufacturing firms that involve manufacturing production lead to additional job creation and economic activity throughout South Carolina by way of the economic multiplier effect (or economic ripple effect).

Economic multiplier effects can be divided into direct, indirect, and induced impacts. The direct impact reflects all in-state purchases made by firms conducting manufacturing-related activities. These include, for example, employee wages and benefits, equipment, building construction and remodeling, technology services, vendors, and other overhead or administrative costs. This spending activity increases demand and leads to the creation of new jobs and more income for employees and suppliers of these firms.

The indirect impact reflects additional economic activity that results from inter-industry linkages between local firms in South Carolina. For example, if an automotive manufacturer were to purchase computer equipment from an in-state supplier, then this computer equipment supplier would experience an increase in demand. To satisfy this demand, the computer equipment supplier would purchase additional inputs from its own vendors, and so on. These indirect effects ripple through the economy and affect many industrial sectors of South Carolina.

The induced impact reflects additional economic activity that results from increases in the spending of household income. For example, when the aforementioned computer equipment supplier purchases raw materials from one of its vendors and the overall demand for this vendor rises, some of the staff working for this vendor will see a rise in their income levels (or the vendor may hire new staff). Part of this income will then be spent locally on, for example, food, entertainment, or health care. These industries will then also see an increase in demand for their goods and services, which will lead to higher incomes for some of their employees, part of which will also be spent locally.

These successive rounds of indirect and induced spending do not go on forever, which is why it is possible to calculate a value for each of them. In each round, money is “leaked out” for a variety of reasons. For example, firms will purchase some of their supplies from vendors located outside of the local region. In order to determine the total economic impact that will result from an initial direct impact, economic multipliers are used. An economic multiplier can be used to determine the total impact (direct, indirect, and induced) that results from an initial change in economic activity (the direct impact). Multipliers are different in each sector of the economy and are largely determined by the size of the local supplier network as well the particular region being examined. Economic multipliers are available to calculate not just the total economic impact of a cluster, but also the total employment and income levels associated with the total impact.

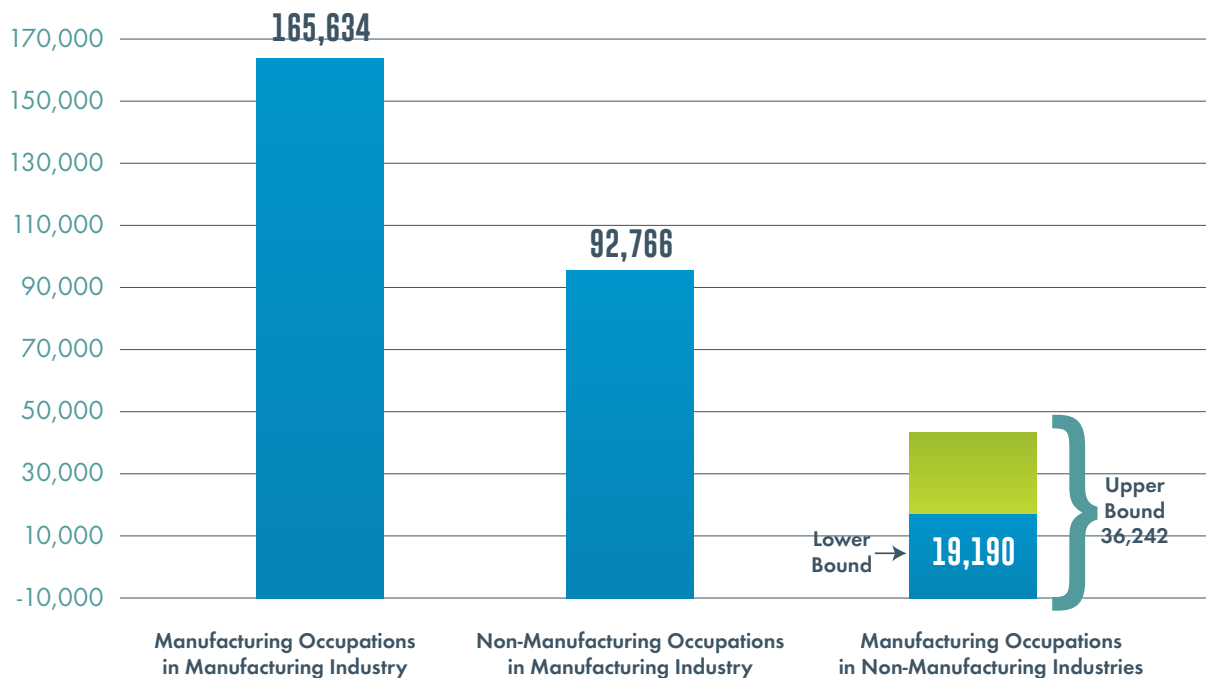
In this analysis, all multiplier effects are calculated using input-output analysis, which is the industry-standard method for estimation that is widely implemented across the United States. This analysis uses customized input-output models of the state of South Carolina and its local regions, which contain specific information on economic linkages of over 500 different industries for each region. The IMPLAN software package was combined with these models to generate all estimates in this report.



Primary Results

As described above, the direct impact of manufacturing in South Carolina as estimated earlier in this study is between 277,590 and 294,642 workers, which supports between \$139 billion and \$147 billion in annual direct economic activity for South Carolina's economy. This direct employment impact is divided into three components that are illustrated in **Figure 8**.

Figure 8 – Components of Direct Manufacturing Employment Base in South Carolina



The largest part of the direct manufacturing employment base is represented by the 165,634 workers in manufacturing occupations working for manufacturing firms (or firms in the manufacturing industry). The second largest component is represented by the 92,766 workers in non-manufacturing occupations working for manufacturing firms (or firms in the manufacturing industry). Thus, collectively these two components represent all employees working for manufacturing firms in South Carolina, of which there are approximately 6,414. The righthand bar in **Figure 8**, by contrast, represents employees working in manufacturing occupations for non-manufacturing firms. This study estimates that between 19,190 and 36,242 employees in South Carolina are working in manufacturing occupations doing manufacturing-related production for non-manufacturing firms.⁵

⁵ Note that a firm is considered to be a "non-manufacturing firm" if it is not contained within the standard North American Industry Classification Code (NAICS) industry definitions of 31-33.

These direct impacts also generate significant multiplier effects that make the total impact of manufacturing in South Carolina far larger. The structural input-output models used in this analysis estimate impacts in terms of three specific measures: economic output, employment, and labor income. Economic output reflects the dollar value of all final goods and services that can be attributed (directly or indirectly) to manufacturing in South Carolina. It can also be thought of as an aggregate measure of total spending activity that results from an initial direct expenditure. Because it includes all spending by consumers and businesses on both goods and services, it is an all-inclusive measure of the impact on total economic activity. Employment measures the total number of full-time equivalent positions associated with total economic output. Labor income reflects all employee compensation associated with total employment estimates, including wages, salaries, and benefits. **Tables 2 and 3** below highlight these estimates.

Table 2 – Economic Impact of Manufacturing on South Carolina: Lower Bound

	Economic Output	Employment	Labor Income
Direct Impact	\$138.8 Billion	277,590	\$15.8 Billion
Indirect Impact	\$30.9 Billion	196,369	\$10.7 Billion
Induced Impact	\$24.2 Billion	188,432	\$7.6 Billion
Total Impact	\$193.9 Billion	662,391	\$34.1 Billion

Table 3 – Economic Impact of Manufacturing on South Carolina: Upper Bound

	Economic Output	Employment	Labor Income
Direct Impact	\$147.4 Billion	294,642	\$16.8 Billion
Indirect Impact	\$32.8 Billion	208,432	\$11.4 Billion
Induced Impact	\$25.7 Billion	200,007	\$8.0 Billion
Total Impact	\$205.9 Billion	703,081	\$36.2 Billion



The 277,590 workers that represent the lower bound estimate of the direct employment base of manufacturing in South Carolina generate a total of \$138.8 billion in total economic output annually. This level of direct economic activity leads to indirect effects totaling approximately \$30.9 billion in economic output and 196,369 jobs. These estimates reflect increased demand for goods and services of in-state suppliers resulting from in-state expenditures on the part of manufacturing firms and manufacturing-related production. The direct economic activity also leads to induced effects totaling \$24.2 billion in economic output and 188,432 jobs. This is a reflection of economic activity in South Carolina generated across all industries that is the result of increased household spending. The combination of the direct, indirect, and induced effects leads to a total economic impact of approximately \$193.9 billion, which is associated with 662,391 jobs across South Carolina. The upper bound estimate of the direct employment base of manufacturing in South Carolina increases the total impact estimates further to \$205.9 billion in annual economic output along with 703,081 jobs.

One important takeaway from these estimates is to simply note the sheer size of manufacturing's economic presence in South Carolina. Although manufacturing's direct employment base alone represents 12.6% of all jobs in South Carolina, after accounting for the additional impacts resulting from all economic multiplier effects, this percentage jumps to 30.2 percent. Or put more succinctly, manufacturing supports, either directly or indirectly, over 30 percent of all jobs in South Carolina, making it among the state's largest industry sectors. This means that future gains (or losses) in the manufacturing industry will have disproportionately large effects on South Carolina employment.

Manufacturing supports, either directly or indirectly, over 30 percent of all jobs in South Carolina, making it among the state's largest industry sectors.

South Carolina's manufacturing cluster also exhibits some of the state's highest employment multiplier effects. **Tables 2 and 3** reveal that the aggregate employment multiplier effect across the entire statewide manufacturing base is approximately 2.4. This implies that for every 10 jobs that are supported directly by South Carolina manufacturing, an additional 14 jobs are created elsewhere in South Carolina. This multiplier effect is higher than that of the average industry in South Carolina, which is estimated to be approximately 1.6. Moreover, many of the state's largest manufacturing subsectors have multipliers well in excess of this state average. **Table 4** specifically highlights the state's 20 largest manufacturing subsectors, which together comprise nearly 40 percent of the manufacturing employment base in South Carolina. Notice that the employment multipliers are all at or above 1.6, with many being significantly higher.

Table 4 – South Carolina Manufacturing Employment Multipliers
South Carolina's 20 Largest Manufacturing Subsectors

Manufacturing Industry Subsector	Employment Multiplier
Automobile manufacturing	3.54
Tire manufacturing	2.39
Artificial and synthetic fibers and filaments manufacturing	2.87
Ball and roller bearing manufacturing	2.18
Other plastics product manufacturing	1.93
Bread and bakery product, except frozen, manufacturing	1.65
Other motor vehicle parts manufacturing	2.54
Motor vehicle transmission and power train parts manufacturing	2.55
Motor vehicle steering, suspension component (except spring), and brake systems manufacturing	2.52
Paperboard container manufacturing	2.57
Plastics packaging materials and unlaminated film and sheet manufacturing	2.19
Pharmaceutical preparation manufacturing	3.92
Aircraft engine and engine parts manufacturing	2.08
Turbine and turbine generator set units manufacturing	2.63
Aircraft manufacturing	2.37
Motor vehicle gasoline engine and engine parts manufacturing	2.65
Motor vehicle seating and interior trim manufacturing	2.52
Plastics material and resin manufacturing	3.39
Iron and steel mills and ferroalloy manufacturing	4.25
Valve and fittings, other than plumbing, manufacturing	2.10
Average South Carolina Employment Multiplier: 1.61	

Another major impact that the manufacturing industry generates for the state of South Carolina comes from the state tax revenue that results from the economic activity it supports. As shown in **Table 2** above, the total economic impact of manufacturing on the state of South Carolina conservatively approximates \$193.9 billion annually.





Historically, every additional dollar that is generated in economic activity (i.e., nominal gross state product) within South Carolina also generates 4.7 cents in new state tax revenue for the General Fund.⁶ By applying this figure to the economic activity generated by South Carolina manufacturing, the tax revenue from this total volume of activity can be estimated.⁷ **Table 5** displays these results, which show that the annual total estimated tax revenue that arises from manufacturing in South Carolina is approximately \$3.3 billion. This implies that approximately 38 percent of the state’s General Fund revenue can be attributed, directly or indirectly, to the manufacturing industry. Note that this percentage contribution to state tax revenue is greater than the manufacturing industry’s contribution to statewide employment (at 30.2 percent). This difference is primarily attributable to the fact that manufacturing-related jobs offer a sizable wage premium relative to the average South Carolina job, and nearly half of the General Fund revenue derives from individual income taxes.

Table 5 – Annual State Tax Revenue Derived from South Carolina Manufacturing (2019)

Category	Dollar Value
Estimated Economic Output for South Carolina	\$193,944,614,264
Estimated Tax Revenue Generated for South Carolina	\$3,347,489,068

⁶The historical relationship between South Carolina nominal gross state product and the South Carolina general funds revenue (as measured and tracked by the South Carolina Board of Economic Advisors) was estimated by the Division of Research using industry-standard time-series regression techniques.

⁷Economic output represents the value of industry production and is therefore not synonymous with gross state product. As such, the dollar value of all intermediate inputs was subtracted from economic output before the 4.7-cent estimate was applied to estimate total tax revenue.

Section IV A Workforce Profile of South Carolina Manufacturing

South Carolina offers many competitive advantages for the manufacturing industry, which is one reason why the industry has experienced such strong economic growth over the past decade. Two of the most important competitive advantages that South Carolina offers are (1) the availability of infrastructure and (2) workforce development initiatives. As a coastal state with easy access to the Port of Charleston and the domestic rail and highway system, South Carolina is well-positioned geographically to provide manufacturers with connectivity to both domestic and international markets. This includes access to upstream suppliers as well as downstream buyers. South Carolina also offers workforce development programs - largely administered through the state's Technical College System - that serves as a link between current and potential South Carolina employers and the South Carolina workforce. By constantly communicating with employers to assess the current and future workforce skills that will be needed and then adjusting workforce programs to offer the relevant skills training, the Technical College System helps to ensure that South Carolina can provide the workforce talent that employers require.

More generally, the competitive advantages that South Carolina currently offers - including the availability of infrastructure and workforce development initiatives - will both persist in the post-pandemic era. As such, South Carolina will likely continue to experience strong economic growth if it continues to meet employer demand in the face of market evolution both in manufacturing and across the broader economy. One way to assess market evolution in manufacturing is to examine the workforce profile of the cluster as a whole, which is an effort to which this study now turns.



Preparing for the 2020s: Manufacturing Occupations Projected to be in Highest Demand

Perhaps the most direct way to determine how manufacturing will evolve over the next decade is to examine the extent to which the demand for manufacturing-related occupations will change. As previously noted, this study has identified 127 specific manufacturing occupations that currently exist in South Carolina. Employment data on these manufacturing occupations can be combined with specific occupation projections made by the South Carolina Department of Employment and Workforce (DEW) through the year 2028 in order to determine which areas of manufacturing will likely experience the most increase in demand. **Table 6** shows the top 20 “in-demand” manufacturing occupations that are expected to see the most new jobs created through the year 2028 based on these projections. For example, the total number of manufacturing assemblers and fabricator positions in South Carolina is expected to grow by 4,950 through 2028, which reflects a total growth rate of 10.3 percent over this eight-year period. More generally, as a group the top 20 in-demand manufacturing occupations are expected to grow by a total of 13.2 percent through the year 2028 versus 10.0 percent for all manufacturing occupations.

As a group, the top 20 in-demand manufacturing occupations are expected to grow by a total of 13.2 percent through the year 2028 versus 10.0 percent for all manufacturing occupations.

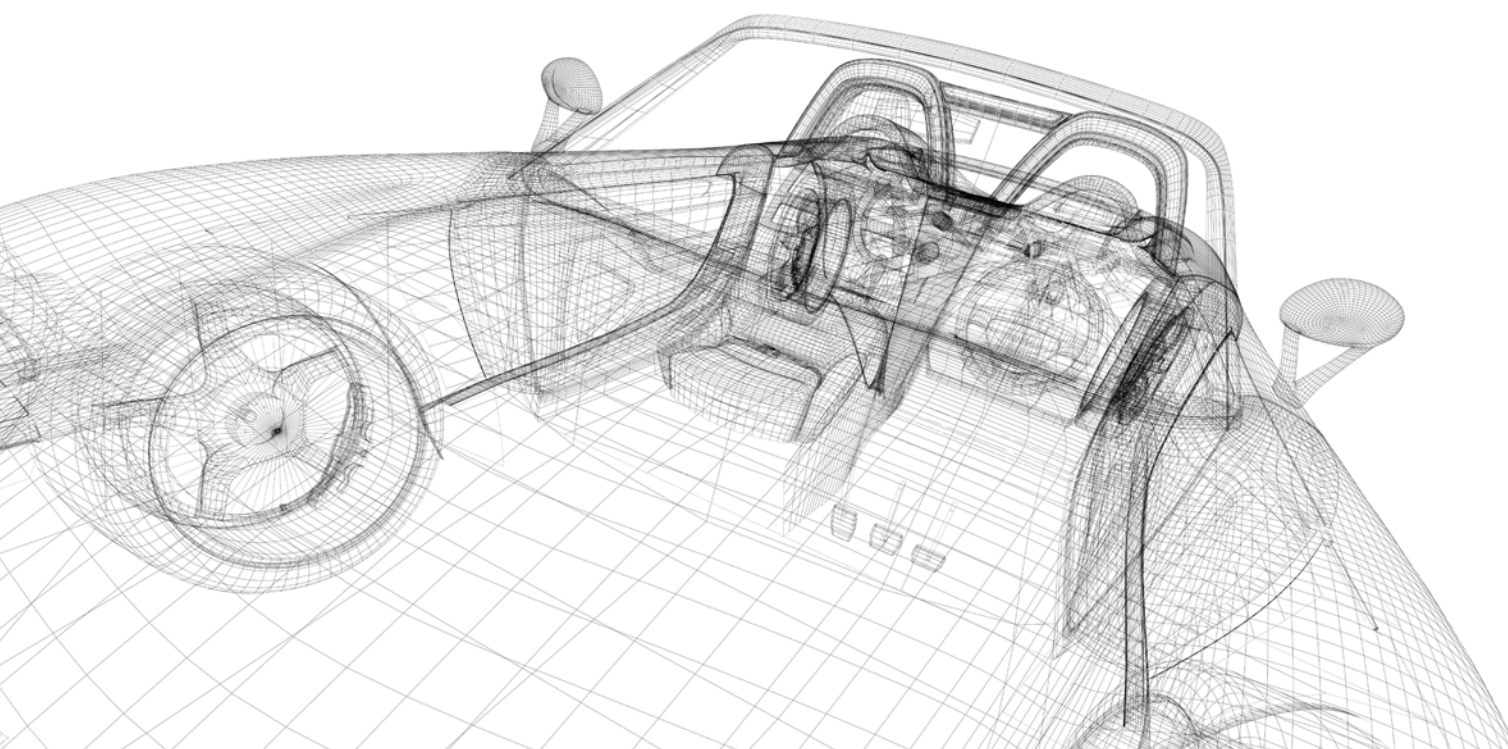


Table 6 – South Carolina Manufacturing Occupation Projections through 2028

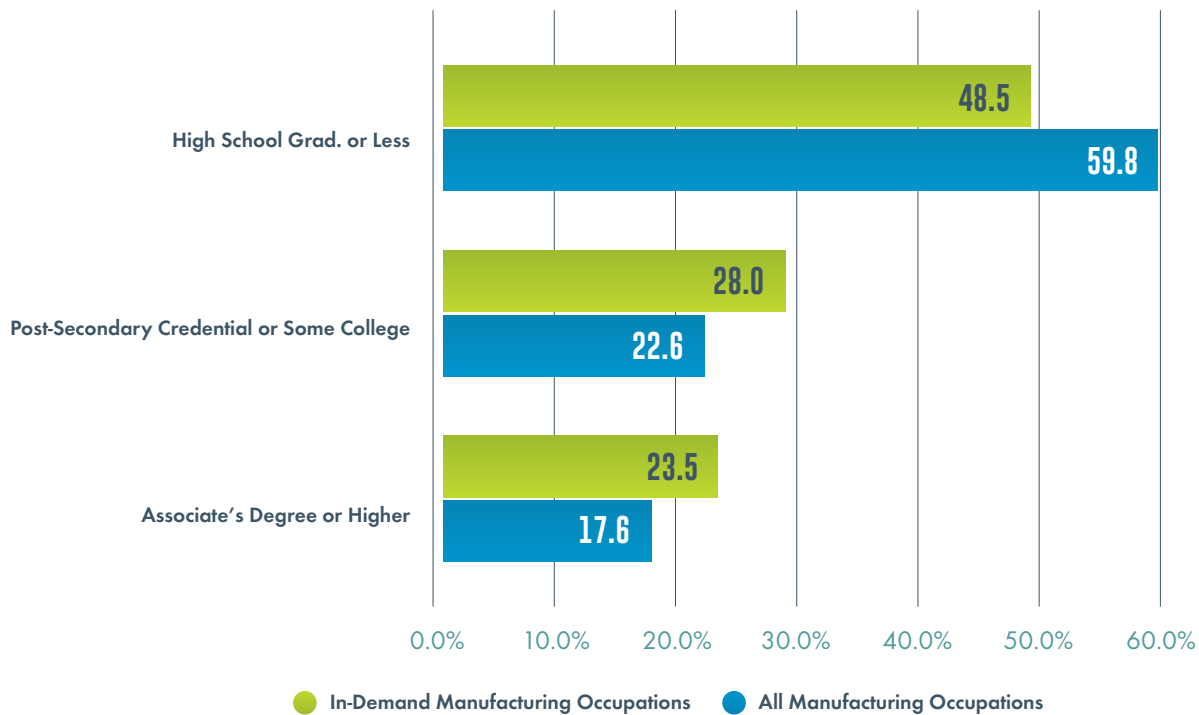
Note: Top 20 Occupations Ranked by Number of New Jobs Expected

Occupation Title	Number of New Jobs by 2028	Average Annual Wage (2019)	Pct. Growth
Assemblers and fabricators, all other, including team assemblers	4,950	\$34,890	+10.3%
Maintenance and repair workers, general	3,561	\$37,630	+11.8%
Industrial engineers	2,201	\$89,090	+30.2%
Machinists	1,855	\$39,860	+14.7%
Industrial machinery mechanics	1,758	\$53,400	+19.3%
First-line supervisors of production and operating workers	1,672	\$67,960	+12.4%
Helpers-production workers	1,035	\$29,640	+18.1%
Welders, cutters, solderers, and brazers	977	\$43,260	+13.1%
First-line supervisors of mechanics, installers, and repairers	966	\$62,800	+11.3%
Mechanical engineers	946	\$88,540	+15.4%
Packaging and filling machine operators and tenders	871	\$35,240	+13.3%
Meat, poultry, and fish cutters and trimmers	819	\$24,460	+13.9%
Production, planning, and expediting clerks	799	\$46,550	+15.0%
Electrical, electronic, and electromechanical assemblers, except coil winders, tapers, and finishers	587	\$37,950	+20.6%
Industrial production managers	491	\$115,550	+16.0%
Multiple machine tool setters, operators, and tenders, metal and plastic	438	\$49,400	+22.7%
Electrical engineers	364	\$89,200	+14.5%
Computer-controlled machine tool operators, metal and plastic	349	\$44,470	+11.9%
Rolling machine setters, operators, and tenders, metal and plastic	287	\$58,250	+17.9%
Fiberglass laminators and fabricators	278	\$35,590	+31.8%
Average Annual Wage Across all South Carolina Jobs (2019): \$45,694			

An explicit comparison between the education, experience, and on-the-job requirements associated with in-demand manufacturing occupations versus that of all manufacturing occupations reveal some striking differences. First, a comparison of education requirements shows that the most in-demand manufacturing occupations over the next decade will require significantly more education relative to the total manufacturing occupation base. As **Figure 9** reveals, approximately 51.5 of in-demand manufacturing occupations will require some form of post-secondary education compared to just 40.2 of across all manufacturing occupation categories.

Figure 9 – Education Requirements for S.C. Manufacturing Occupations

Source: U.S. Bureau of Labor Statistics and O*Net

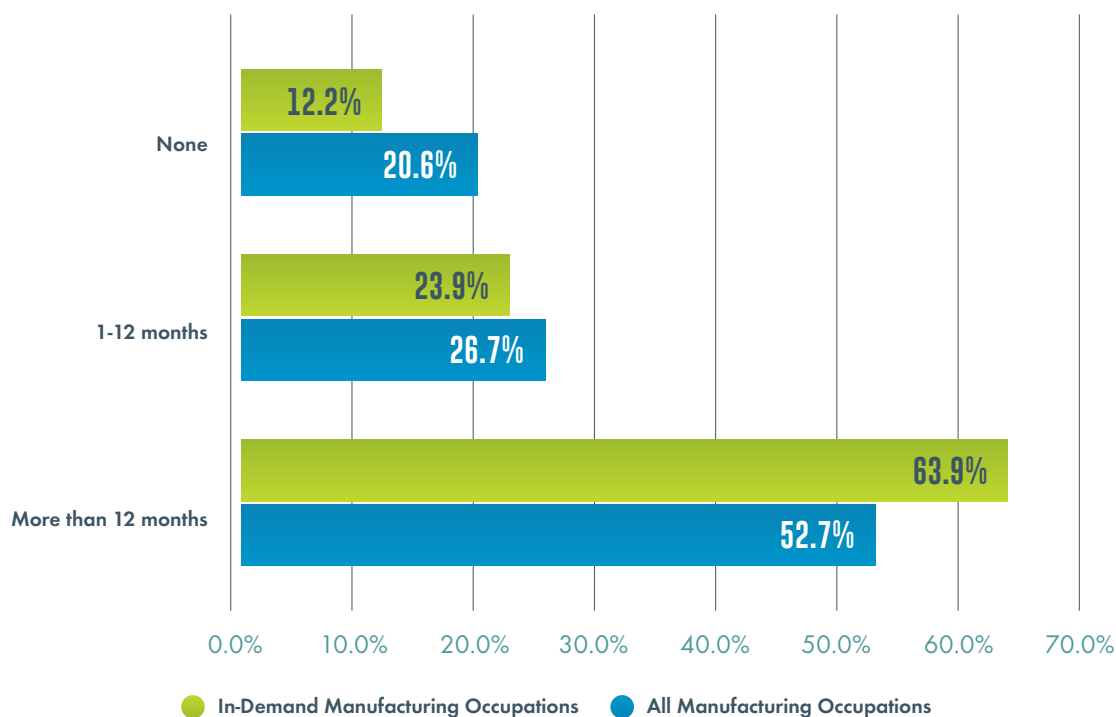


Accompanying these higher education requirements are greater experience requirements for in-demand manufacturing occupations. **Figure 10** reveals that 63.9 percent of the most in-demand manufacturing occupations over the next decade are likely to require at least one year of experience, compared to just 52.7 percent across all manufacturing occupations. Similarly, 20.6 percent of jobs across all manufacturing occupations will require no experience versus just 12.2 percent of in-demand manufacturing occupations.



Figure 10 – Experience Requirements for S.C. Manufacturing Occupations

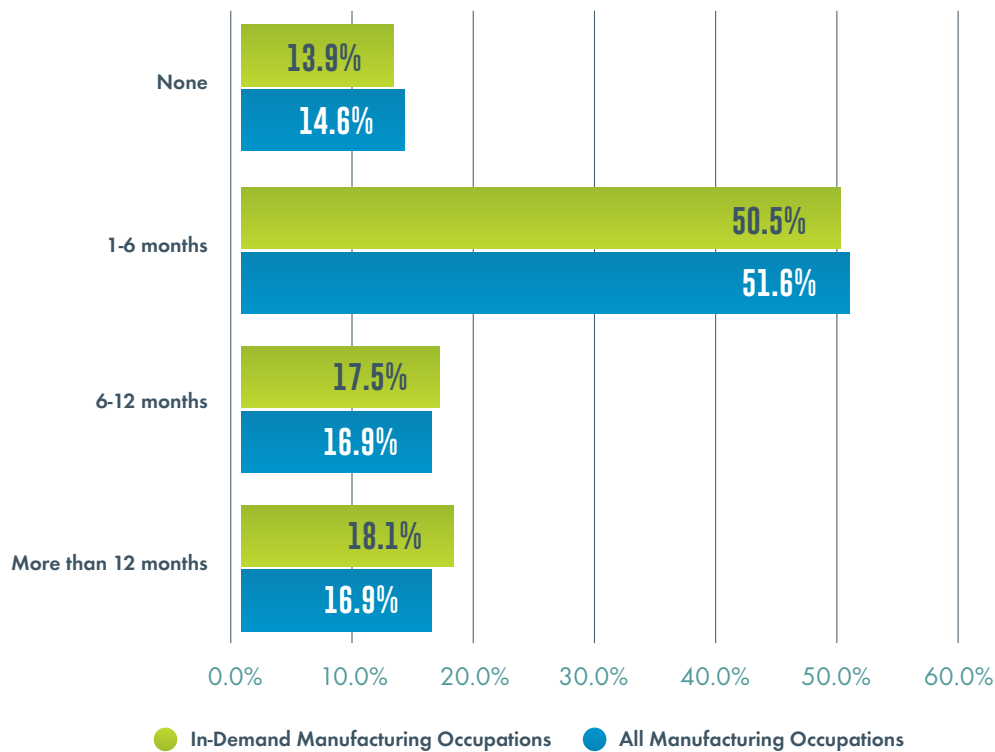
Source: U.S. Bureau of Labor Statistics and O*Net



Examining differences in the on-the-job training requirements reveals more uniformity across all manufacturing occupations. As **Figure 11** denotes, the required training for both the most in-demand manufacturing occupations and manufacturing occupations as a whole are comparable across all training timeframes.

Figure 11 – On-the-Job Training Time for S.C. Manufacturing Occupations

Source: U.S. Bureau of Labor Statistics and O*Net



Shifts Towards High-Skilled, High-Tech Manufacturing and the Competitive Landscape

One of the key takeaways already observed from examining the education, experience, and job training requirements associated with manufacturing occupations expected to be in the highest demand over the next decade is the continued shift in manufacturing towards high-skilled labor. This shift is a direct result of technological advancements in many areas of production, including automation. Examining once again the 127 manufacturing occupations in South Carolina, just 13 are considered to be high-tech, non-production occupation categories.⁸ Yet almost half of these occupation categories (six) are projected to have among the largest employment gains over the next decade, as seen in **Table 6** above. Such a shift would provide significant positive spillover effects for South Carolina's economy, including increased productivity that leads to higher wages for workers.

⁸ High-tech, non-production occupations are those characterized as being primarily engineering, supervisory, or management positions.

This shift also implies that manufacturing may face greater competition for workers over time, as high-tech, non-production occupations tend to also be in high demand in other industry sectors. For example, nearly 30 percent of mechanical engineers work in professional service firms that may or may not be directly tied to the manufacturing industry. An examination of the top 20 manufacturing occupations projected to be in highest demand over the next decade shows that the largest industry competitors for workers will be wholesale trade, professional service firms, and construction firms.

Furthermore, in addition to increased external competition, manufacturing will also face an increase in demand due to the fact that it maintains a relatively older workforce when compared to that of the average South Carolina industrial sector. For example, the median age of a manufacturing worker in the Palmetto State is 44.1 years, compared to 42.3 years for all workers in South Carolina. Approximately 48.3 percent of the manufacturing workforce is currently over the age of 45, compared to 44.0 percent of workers across all sectors. An older workforce implies that manufacturing will face a relatively higher incidence of retirement among its workers and will thus have to aggressively recruit new workers to replace them.

Training South Carolina's Workforce in the 2020s

The South Carolina Technical College System serves as one of the Palmetto State's primary institutions for workforce training. Comprised of 16 colleges located across the state, the South Carolina Technical College System serves as the largest higher education system in the state, serving more than 250,000 students each year and educating more undergraduates than all other public higher education institutions in South Carolina combined. In addition, two of the Technical College System's nationally recognized programs – Apprenticeship Carolina and readySC – actively work towards recruiting companies and providing workforce partnerships to help ensure that these companies remain in South Carolina and grow over time.

The Technical College System actively supports the manufacturing cluster in South Carolina in many ways and has played a central role in this sector's growth over the past decade. Further, the Technical College System continues to meet the evolving workforce needs of manufacturing that this study has outlined. This can be most easily observed through the Technical College System's traditional programs as well as through Apprenticeship Carolina and readySC.

In recent years, the Technical College System's traditional programs have served approximately 5,000 students per year across most areas of manufacturing-related occupation training. The largest concentration of students has been in mechatronics technology and welding. **Figure 12** summarizes the primary manufacturing-related curriculum focus areas over the last three fiscal years. Although students enrolled in these traditional programs come from across the state, students studying manufacturing primarily come from Greenville, Spartanburg, and Anderson counties as **Figure 13** denotes. This is a natural result of the fact that the highest concentration of manufacturing in South Carolina is in the Upstate region.

Figure 12 – Distribution of Manufacturing-Related Curriculum Areas at S.C. Tech. College System

Note: Based on data from fiscal years 2016-2018

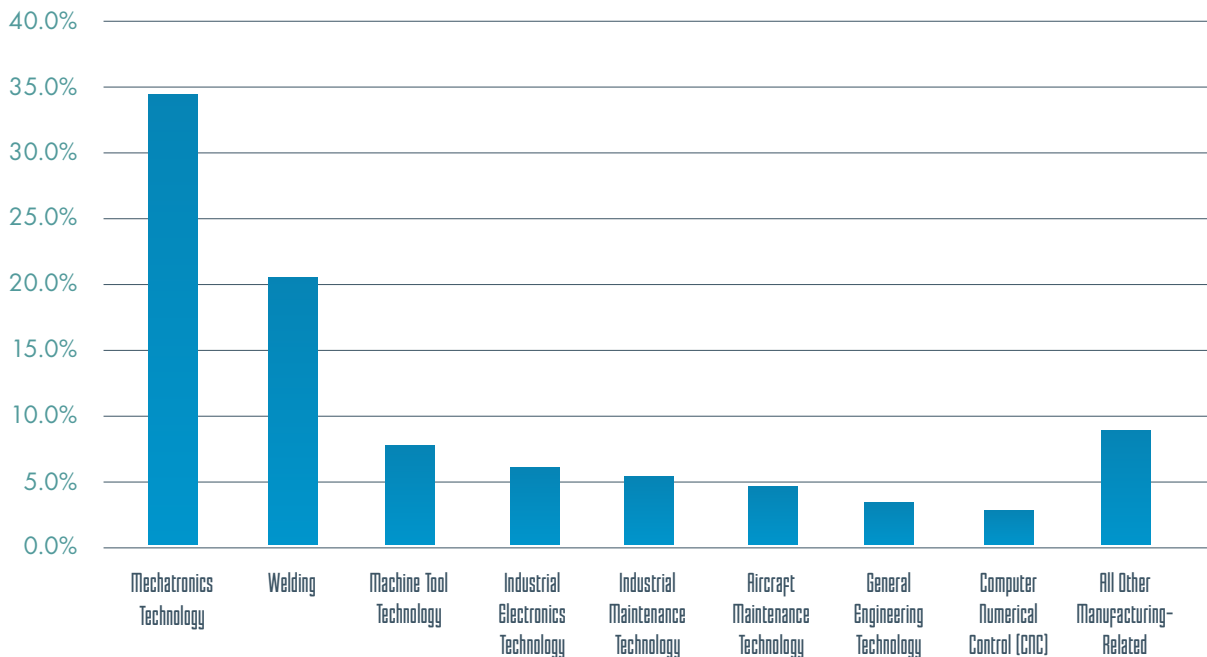
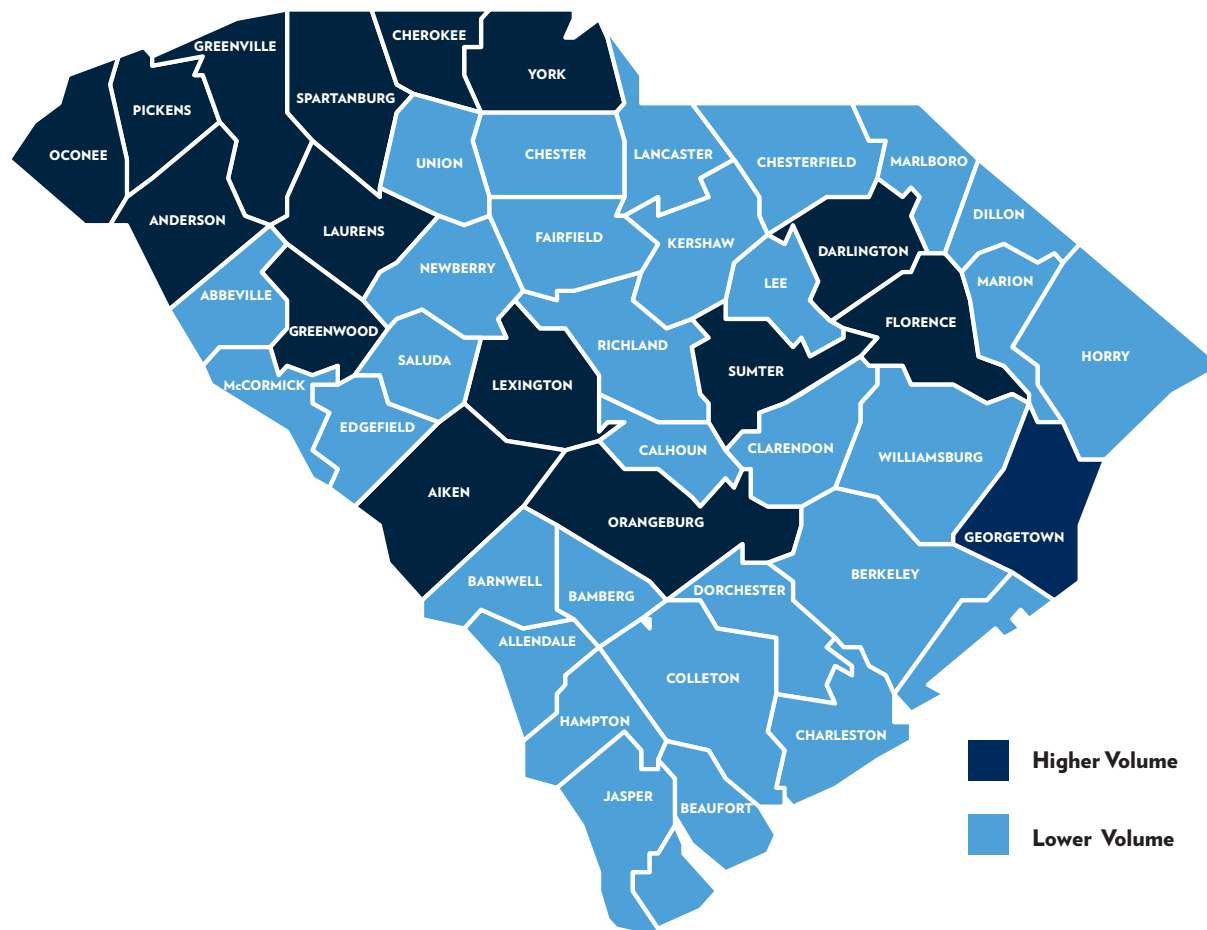


Figure 13 – County of Residence of S.C. Tech. College System Students Graduating from Traditional Manufacturing Programs: FY2016-FY2018

Source: S.C. Technical College System



Apprenticeship Carolina works directly with many of South Carolina's leading manufacturers and provides significant benefits to both employers and employees. For example, a 2019 study completed by the University of South Carolina on the Apprenticeship Carolina program shows that the average employer participating in apprenticeship programs with Apprenticeship Carolina is estimated to receive a net positive return-on-investment (ROI) beginning approximately five years after apprentices are initially hired.⁹ At the five-year point, the cumulative productivity gains of an apprentice begin to outweigh total employer cost associated with the training of that apprentice. The study also finds that the manufacturing industry category has the highest overall net benefit. The cumulative employer ROI by year seven of an apprentice's employment is \$2.82, compared to \$2.15 across all industrial sectors. Since 2016, over 1,400 apprenticeships have been completed through Apprenticeship Carolina in manufacturing-related occupations.

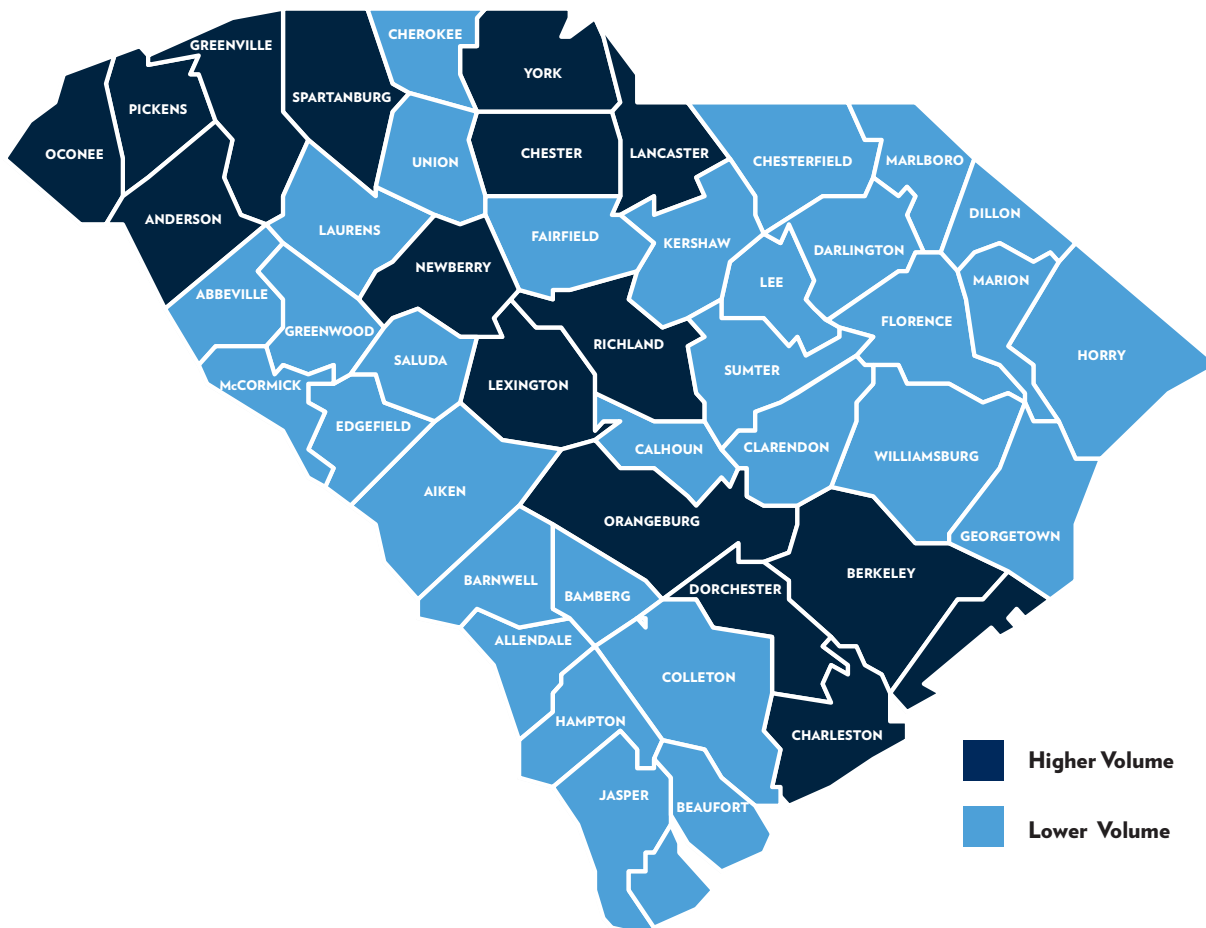
⁹ Source: "South Carolina Apprenticeship Initiative: Return-on-Investment Analysis," Division of Research, Moore School of Business, University of South Carolina; December 2019

The readySC program, also managed by the Technical College System, promotes economic development in South Carolina through providing customized recruiting and training solutions that bring new jobs to the state through relocation or expansion. readySC is perhaps the most “manufacturing centered” workforce program administered by the Technical College System. In the most recent three fiscal years, over 90 percent of readySC participants engaged in manufacturing-related workforce training.

Figure 14 highlights the breakdown of which counties the program participants are primarily drawn from. Note that unlike the traditional programs which draw largely from the Upstate, readySC draws participants more evenly from the Upstate, the Midlands, and the Lowcountry. This is because readySC is providing workforce training designed for specific employers that may be located throughout the state. The traditional programs, by contrast, provide manufacturing training to students that is not necessarily tied to any specific employer and typically draws students who are more likely to study manufacturing in areas of the state where manufacturing jobs are generally more concentrated.

Figure 14 – County of Residence of S.C. Tech. College System Participants Completing readySC Manufacturing Programs: FY18-FY20

Source: S.C. Technical College System



Section V Conclusion

Manufacturing has long been one of the primary industry drivers for South Carolina's economy. Over the past thirty years, the state's manufacturing base has transformed into a globally competitive, export-oriented industry cluster that has consistently outpaced virtually all other sectors in economic growth. In addition, manufacturing is also relatively unique among all industry sectors in that it is one of the highest contributors to both GDP and employment in the Palmetto State.

This study has found that the manufacturing cluster in South Carolina has a total annual economic impact between \$194 billion and \$206 billion. This level of economic activity corresponds to between 662,391 and 703,081 jobs and to between \$34 billion and \$37 billion in labor income for South Carolinians. Further, this statewide economic impact is associated with an employment multiplier of 2.4, meaning that for every 10 jobs created by the manufacturing industry, an additional 14 jobs are created elsewhere in the state. These impact estimates reveal that manufacturing ultimately supports over 30 percent of all jobs in South Carolina, making it among the state's largest industry sectors.

Moreover, this study also documents the ongoing evolution of manufacturing workforce demands in the face of rapid technological innovation. The results of an analysis examining the occupations in South Carolina likely to be in highest demand over the next decade show a marked shift towards a more high-skilled, experienced workforce. It also illustrates that while only ten percent of all manufacturing-related occupations in South Carolina represent high-tech, non-production fields, these two categories represent roughly half of the high demand manufacturing occupations. Such a major shift towards higher-skilled labor has the potential to provide significant positive spillover effects for South Carolina's economy, including increased productivity that leads to higher wages for workers.

Because manufacturing is relatively unique among all industry sectors in its large contribution to both GDP and employment in South Carolina, any meaningful economic expansion in South Carolina must include manufacturing. Thus, South Carolina's manufacturing industry will be a crucial part of both the speed of economic recovery from the COVID-19 pandemic as well as the broader long-run pace of economic growth that South Carolina works to establish for the 2020's in a post-pandemic world.

Appendix I – Occupations in the South Carolina Manufacturing Industry

**Denotes non-manufacturing occupations contained within the manufacturing industry*

Occupation Title
Adhesive bonding machine operators and tenders
Aerospace engineering and operations technicians
Aerospace engineers
Aircraft structure, surfaces, rigging, and systems assemblers
Assemblers and fabricators, all other, including team assemblers
Bakers
Biomedical engineers
Butchers and meat cutters
Cabinetmakers and bench carpenters
Camera and photographic equipment repairers
Chemical engineers
Chemical equipment operators and tenders
Chemical plant and system operators
Chemical technicians
Cleaning, washing, and metal pickling equipment operators and tenders
Coating, painting, and spraying machine setters, operators, and tenders
Coil winders, tapers, and finishers
Coin, vending, and amusement machine servicers and repairers
Computer numerically controlled machine tool programmers, metal and plastic
Computer-controlled machine tool operators, metal and plastic
Computer, automated teller, and office machine repairers
Cooling and freezing equipment operators and tenders
Crushing, grinding, and polishing machine setters, operators, and tenders
Cutters and trimmers, hand
Cutting and slicing machine setters, operators, and tenders
Cutting, punching, and press machine setters, operators, and tenders, metal and plastic
Dental laboratory technicians
Drafters, all other
Drilling and boring machine tool setters, operators, and tenders, metal and plastic
Electric motor, power tool, and related repairers
Electrical and electronics drafters
Electrical and electronics engineering technicians
Electrical and electronics repairers, commercial and industrial equipment
Electrical and electronics repairers, powerhouse, substation, and relay
Electrical engineers
Electrical, electronic, and electromechanical assemblers, except coil winders, tapers, and finishers
Electro-mechanical technicians
Electronic home entertainment equipment installers and repairers
Electronics engineers, except computer
Engine and other machine assemblers

Appendix I – Occupations in the South Carolina Manufacturing Industry

**Denotes non-manufacturing occupations contained within the manufacturing industry*

Occupation Title
Engineering technicians, except drafters, all other
Engineers, all other
Extruding and drawing machine setters, operators, and tenders, metal and plastic
Extruding, forming, pressing, and compacting machine setters, operators, and tenders
Fabric menders, except garment
Fiberglass laminators and fabricators
First-line supervisors of mechanics, installers, and repairers
First-line supervisors of production and operating workers
Food and tobacco roasting, baking, and drying machine operators and tenders
Food batchmakers
Food cooking machine operators and tenders
Food processing workers, all other
Forging machine setters, operators, and tenders, metal and plastic
Foundry mold and coremakers
Furnace, kiln, oven, drier, and kettle operators and tenders
Furniture finishers
Grinding and polishing workers, hand
Grinding, lapping, polishing, and buffing machine tool setters, operators, and tenders, metal and plastic
Heat treating equipment setters, operators, and tenders, metal and plastic
Helpers-production workers
Industrial engineering technicians
Industrial engineers
Industrial machinery mechanics
Industrial production managers
Inspectors, testers, sorters, samplers, and weighers
Installation, maintenance, and repair workers, all other
Jewelers and precious stone and metal workers
Layout workers, metal and plastic
Locksmiths and safe repairers
Machine feeders and off bearers
Machinists
Maintenance and repair workers, general
Maintenance workers, machinery
Materials engineers
Meat, poultry, and fish cutters and trimmers
Mechanical drafters
Mechanical engineering technicians
Mechanical engineers
Medical appliance technicians
Metal workers and plastic workers, all other

Appendix I – Occupations in the South Carolina Manufacturing Industry

**Denotes non-manufacturing occupations contained within the manufacturing industry*

Occupation Title
Metal-refining furnace operators and tenders
Milling and planing machine setters, operators, and tenders, metal and plastic
Millwrights
Mixing and blending machine setters, operators, and tenders
Model makers, metal and plastic
Molders, shapers, and casters, except metal and plastic
Molding, coremaking, and casting machine setters, operators, and tenders, metal and plastic
Multiple machine tool setters, operators, and tenders, metal and plastic
Nuclear technicians
Ophthalmic laboratory technicians
Packaging and filling machine operators and tenders
Patternmakers, metal and plastic
Plant and system operators, all other
Painting, coating, and decorating workers
Plating and coating machine setters, operators, and tenders, metal and plastic
Pourers and casters, metal
Power distributors and dispatchers
Power plant operators
Prepress technicians and workers
Print binding and finishing workers
Printing press operators
Production workers, all other
Production, planning, and expediting clerks
Refractory materials repairers, except brickmasons
Rolling machine setters, operators, and tenders, metal and plastic
Sawing machine setters, operators, and tenders, wood
Semiconductor processors
Separating, filtering, clarifying, precipitating, and still machine setters, operators, and tenders
Sewing machine operators
Slaughterers and meat packers
Stationary engineers and boiler operators
Structural metal fabricators and fitters
Textile, apparel, and furnishings workers, all other
Timing device assemblers and adjusters
Tire builders
Tool and die makers
Tool grinders, filers, and sharpeners
Weighers, measurers, checkers, and samplers, recordkeeping
Welders, cutters, solderers, and brazers
Welding, soldering, and brazing machine setters, operators, and tenders

Appendix I – Occupations in the South Carolina Manufacturing Industry

**Denotes non-manufacturing occupations contained within the manufacturing industry*

Occupation Title
Wind turbine service technicians
Woodworkers, all other
Woodworking machine setters, operators, and tenders, except sawing
Laborers and freight, stock, and material movers, hand*
Operations specialties managers*
Sales representatives, wholesale and manufacturing, except technical and scientific products*
General and operations managers*
Shipping, receiving, and traffic clerks*
Customer service representatives*
Office clerks, general*
Industrial truck and tractor operators*
Heavy and tractor-trailer truck drivers*
Other management occupations*
Bookkeeping, accounting, and auditing clerks*
Buyers and purchasing agents*
Secretaries and administrative assistants, except legal, medical, and executive*
Accountants and auditors*
Stock clerks and order fillers*
Advertising, marketing, promotions, public relations, and sales managers*
Software developers, systems software*
Marketing and sales managers*
Architectural and engineering managers*
Business operations specialists, all other*
Software developers, applications*
Janitors and cleaners, except maids and housekeeping cleaners*
First-line supervisors of office and administrative support workers*
Human resources specialists*
Market research analysts and marketing specialists*
Sales representatives, wholesale and manufacturing, technical and scientific products*
Electricians*
Light truck or delivery services drivers*
Managers, all other*
Logisticians*
Computer user support specialists*
Chemists*
Sales managers*
Financial managers*
Computer systems analysts*
Graphic designers*
Retail salespersons*

Appendix I – Occupations in the South Carolina Manufacturing Industry

**Denotes non-manufacturing occupations contained within the manufacturing industry*

Occupation Title
First-Line supervisors of transportation and material moving workers, except aircraft cargo handling supervisors*
Purchasing managers*
Training and development specialists*
Marketing managers*
Administrative services managers*
Computer and information systems managers*
Cost estimators*
Management analysts*
Financial analysts*
Network and computer systems administrators*
Cashiers*
Executive secretaries and executive administrative assistants*
Carpenters*
Sheet metal workers*
Aircraft mechanics and service technicians*
Textile knitting and weaving machine setters, operators, and tenders*
Textile winding, twisting, and drawing out machine setters, operators, and tenders*
Upholsterers*
Petroleum pump system operators, refinery operators, and gaugers*
Cleaners of vehicles and equipment*
Human resources managers*
Chief executives*
Computer network architects*
Computer network support specialists*
Computer occupations, all other*
Health and safety engineers, except mining safety engineers and inspectors*
Food scientists and technologists*
Occupational health and safety specialists*
Payroll and timekeeping clerks*
Human resources assistants, except payroll and timekeeping*
Transportation, storage, and distribution managers*
Natural sciences managers*
Compliance officers*
Computer programmers*
Operations research analysts*
Computer hardware engineers*
Medical scientists, except epidemiologists*
Agricultural and food science technicians*
Commercial and industrial designers*
Merchandise displayers and window trimmers*

Appendix I – Occupations in the South Carolina Manufacturing Industry

**Denotes non-manufacturing occupations contained within the manufacturing industry*

Occupation Title
Technical writers*
Security guards*
Food preparation workers*
Bartenders*
Combined food preparation and serving workers, including fast food*
Counter attendants, cafeteria, food concession, and coffee shop*
Waiters and waitresses*
First-line supervisors of non-retail sales workers*
Sales representatives, services, all other*
Demonstrators and product promoters*
Sales engineers*
Billing and posting clerks*
Procurement clerks*
Order clerks*
Receptionists and information clerks*
Dispatchers, except police, fire, and ambulance*
Graders and sorters, agricultural products*
Farmworkers and laborers, crop, nursery, and greenhouse*
First-line supervisors of construction trades and extraction workers*
Construction laborers*
Operating engineers and other construction equipment operators*
Plumbers, pipefitters, and steamfitters*
Avionics technicians*
Bus and truck mechanics and diesel engine specialists*
Heating, air conditioning, and refrigeration mechanics and installers*
Textile bleaching and dyeing machine operators and tenders*
Textile cutting machine setters, operators, and tenders*
Extruding and forming machine setters, operators, and tenders, synthetic and glass fibers*
Driver/sales workers*
Conveyor operators and tenders*
Crane and tower operators*



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