The Economic Contribution of North Carolina's Supply Chain An Analysis of Sectors and Emerging Industries

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Institute for Transportation Research & Education North Carolina State University





RESEARCH & DEVELOPMENT

The Economic Contribution of North Carolina's Supply Chain

An Analysis of Sectors and Emerging Industries

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16. Abstract As North Carolina continues to carve out its competitive advantage among states, there are several strategic decisions and investments that can be made to strengthen its status as an international leader in business. This report aims to spotlight North Carolina's competitive advantages as well as document opportunities for targeted business growth within the state.				
The report opens with a focus on 14 of North Carolina's highest-producing sectors within its supply chain. An economic contribution analysis is completed for each sector, demonstrating how North Carolina's supply chain impacts the state's economy. Additionally, an analysis of the essential factors of production for the industries that comprise each sector is undertaken. In-state and out-of-state industry inputs are delineated to demonstrate existing supply chain success as well as opportunities for strategic business attraction. Employment hotspots are also discussed to show areas of concentrated economic activity within each sector.				
The report then transitions into emerging industries, sector growth, and the value of the existing transportation network. Coinciding with evolving technologies, growth areas, and strategic opportunities, this section of the report highlights the industries or sectors within North Carolina that have the potential to capitalize on anticipated domestic and global growth, including a review of offshore wind, semiconductors, aerospace manufacturing, and transportation-related industries. The report concludes with a discussion on the role of North Carolina's transportation network on the state's supply chain.				
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FOREWORD

There may not be another report released this year, or even over the past few years, more valuable to understanding the true position of our state's supply chain and industrial ecosystem than this. The Economic Contribution of North Carolina's Supply Chain: An Analysis of Sectors and Emerging Industries harnesses the robust research talents and resources of NC State University's Institute of Transportation Research and Education to provide a powerful snapshot of North Carolina's supply chain sectors. The dynamic industrial, commercial, and service sectors captured in this study are not only key drivers for North Carolina's economic health, but they also serve to bring the talents and output of North Carolinians to the global marketplace.

From advanced manufacturing sectors producing pharmaceuticals, chemicals, industrial machinery, electronics, and more, to legacy sectors such as furniture and tobacco production, it is clear from the results of this study that North Carolina's supply chain is thriving. The first such supply chain economic impact statement was completed at NC State University in 2016 and provided a baseline to understand the industrial landscape in our state. In this new report, the team at ITRE has expanded the scope and content of this important investigation to provide deeper insight into the production factors for each industry. They have also introduced an analysis of geographic concentration and adjacent manufacturing influences for each sector.

The research team has also discussed the potential future impact of emerging industries. Another supply chain success factor the research team articulates is the strategic investment and development of resilient transportation infrastructure. Including more than eighty-thousand roadway miles, more than three thousand miles of railways, more than eighty intermodal and transload facilities, two deep water ports, and more than seventy public airports, the state's multimodal transportation network facilitates efficient trade and commerce within and beyond the state borders. From infrastructure to our nationally recognized, first-for-business policy and tax climate, this report establishes that North Carolina's supply chain represents a meaningful advantage in the competition for business investment. This research will be an important resource for many across the state including manufacturers, economic development professionals, market analysts, transportation and infrastructure planners, investors, and policy makers at every level of government. By better understanding each of our state's supply chain sectors, in the broader context of the state, national, and global economy, we are in a better position—and now collectively better informed—to protect, sustain, and grow prosperity in North Carolina.



North Carolina continues to strengthen its role as a leader in economic activity, commerce, and international trade. Ranked 11th in gross domestic product (Bureau of Economic Analysis, 2024) and 9th in population (World Population Review) in 2023, North Carolina has established itself as a place where people come to work and live. Local, state, and corporate tax structures place North Carolina in the top 10 of all states for business tax climate (Tax Foundation, 2024). In 2022 and 2023, CNBC named North Carolina America's top state for business, and since 2017, the state has secured a top 5 position four times (Chan, 2024). At the core of the state's business success lies a multimodal transportation network supporting an ecosystem of firms that produce, sell, and buy the essential ingredients for business growth. Known collectively as the North Carolina Supply Chain, these firms and the underlying transportation system help the state's economy thrive.

The strength of its supply chain positions North Carolina as a world leader in international trade, supporting a diverse economy with exports ranging from machinery to chemicals. In 2023, North Carolina exported a total of \$42.2 billion making it the 15th largest out of the 53 exporters in the United States – a 23 percent increase from its pre-pandemic level in 2019 (US Census, 2024).¹

As North Carolina continues to carve out its competitive advantage among states, there are several strategic decisions and investments that can be made to strengthen its status as an international leader in business. This report aims to spotlight North Carolina's competitive advantages as well as document opportunities for targeted business growth within the state.

The report opens with a focus on 14 of North Carolina's highest-producing sectors within its supply chain. An economic contribution analysis is completed for each sector, demonstrating how North Carolina's supply chain impacts the state's economy. Additionally, an analysis of the essential factors of production for the industries that comprise each sector is undertaken. In-state and out-of-state industry inputs are delineated to demonstrate existing supply chain success as well as opportunities for strategic business attraction. Employment hotspots are also discussed to show areas of concentrated economic activity within each sector.

The report then transitions into emerging industries, sector growth, and the value of the existing transportation network. Coinciding with evolving technologies, growth areas, and strategic opportunities, this section of the report highlights the industries or sectors within North Carolina that have the potential to capitalize on anticipated domestic and global growth, including a review of offshore wind, semiconductors, aerospace manufacturing, and transportation-related industries. The report concludes with a discussion on the role of North Carolina's transportation network on the state's supply chain.





Total Exported by North Carolina in 2023¹

In Total Exported by North Carolina in 2023¹

¹ Includes all 50 states, Washington D.C., Puerto Rico, and the U.S. Virgin Islands.



Figure 1: Total Output By Supply Chain Sector (in billions of 2023 USD)

From the initial sourcing of raw materials to the final delivery of products to consumers, North Carolina's supply chain functions as an engine of economic activity. This chart shows 14 of North Carolina's highest grossing supply chain sectors. Altogether these sectors contribute to more than \$619.2 billion in annual economic activity.

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PHARMACEUTICAL, BIOLOGICS, & MEDICAL PRODUCTS

NORTH CAROLINA SUPPLY CHAIN STUDY

Overview

The pharmaceutical, biologics, & medical products sector contains a multitude of industries that adapt to new healthcare policies, low-cost, low-wage manufacturing pressures, and dynamic regulatory environments, among other macroeconomic conditions such as the global pandemic. Despite these constraints, the promise of American innovation and continued research assists in keeping companies investing in the pharmaceutical, biologics, & medical products sector in the United States.

North Carolina's innovative research and development infrastructure positions it to be a leader in both domestic and international markets within the sector. North Carolina ranks This sector is supported by North Carolina's innovative research and development infrastructure. North Carolina ranks 4th in brand name pharmaceutical manufacturing in the United States, bringing in over 16.7 billion in revenue and employing 26,698 individuals across the state.

4th in brand name pharmaceutical manufacturing in the United States, bringing in over \$16.7 billion in revenue and employing 26,700 individuals (Zambrano, 2023). This is just one glimpse of how this wide collection of industries is impacting economic growth across the state.

Pharmaceutical, Biologics, & Medical Products Sector in North Carolina

In the 1980's North Carolina's three largest industries, tobacco, textiles, and furniture were on the decline due to cheaper labor costs overseas. The state needed a new industry to replace those jobs and bolster the economy. Building on the presence of leading research universities, medical schools, agriculture, and a growing business climate the state turned its attention to biotechnology. Recently, North Carolina has become a global center for life science manufacturing (History of Biotechnology in North Carolina). The state's research and development infrastructure has enabled North Carolina to exist on the leading edge of pharmaceutical, biologics, & medical products manufacturing.

North Carolina has witnessed continued growth within the pharmaceuticals, biologics, and medical products sector. The state is now home to more than 810 life science companies, as compared to 600 in 2019, and directly employs 75,000 people (NCBIOTECH Transforms Life Sciences in North Carolina). Workforce capabilities, educational programs, research & development resources, and low business costs are cited as predominant reasons for why North Carolina has been able to sustain meaningful growth (NCBIOTECH Transforms Life Sciences in North Carolina). North Carolina was named the 2023 Top State for Business by CNBC (CNBC, 2023).

The pharmaceuticals, biologics, & medical products sector has experienced notable growth in the Research Triangle Park area. This has led to significant requirements for technical talent, which is being offered through community colleges, the region's universities, and the North Carolina Biotechnology Center.

Sector Composition

For the purposes of this analysis, the Pharmaceutical, Biologics, & Medical Products sector has been defined to include the following industries and their associated IMPLAN codes: Medicinal and botanical manufacturing (171); Pharmaceutical preparation manufacturing (172); In-vitro diagnostic substance manufacturing (173); Biological product (except diagnostic) manufacturing (174); Optical instrument and lens manufacturing (270); Surgical and medical instrument manufacturing (376); Surgical appliance and supplies manufacturing (377); Dental equipment and supplies manufacturing (378); Ophthalmic goods manufacturing (379).

Economic Contribution Analysis



Total Output



Total Labor Income

89,700 Total Employment

\$19.7 billion

Total Value Added

Industry Agglomeration Heat Map



Figure 2: Pharmaceutical, Biologics, & Medical Products Sector Agglomeration Heat Map

Durham, Pitt and Wilson Counties all have more than five times the national average concentration of jobs in the Pharmaceutical, Biologics, & Medical Products sector.

Pharmaceuticals

More than 230 intermediate goods and services are used as factors of production for the pharmaceuticals sector in North Carolina.² Approximately \$6.4 billion of these inputs are sourced from industries within the state and \$8.9 billion are sourced from those outside of NC. This equates to 42.9 percent of the pharmaceuticals sector's factors of production being sourced locally.³ The top 10 inputs used within the sector's supply chain are shown in Figure 3. The share sourced in-state is shown in **blue** and the share sourced out-of-state is shown in **gray**. With out-of-state inputs grossing \$2.9 billion for biological products and \$1.4 billion for medicines and botanicals, North Carolina may stand to benefit by bringing more businesses that produce these inputs into the state. In addition to attracting new producers, transportation investments could help improve supply chain efficiency while lowering production costs. The primary modes of transportation that support the pharmaceuticals sector can be found on page 76.



Out-of-State

In-State

Figure 3: Top Ten Factors of Production for the Pharmaceutical, Biologics, & Medical Products Sector

Source: ITRE IMPLAN Analysis.

² Analysis of IMPLAN's Commodity Industry Demand within North Carolina. ³ Ibid. Value of Gross Inputs (in 2023 USD)

CHEMICAL MANUFACTURING

NORTH CAROLINA SUPPLY CHAIN STUDY

Overview

The chemical manufacturing sector's products support a multitude of industries. Chemical manufacturing's raw materials and outputs enable the production of everything from medicines and fertilizers to plastics and electronics. The chemical manufacturing sector was greatly impacted by COVID-19 and the supply chain disruption it caused. Many companies had to test and utilize different ingredients to continue producing their products. This has caused a shift across the country impacting where and how companies are receiving materials used in this sector (*Covid-19 impact on the chemicals industry*, 2020). Despite recent challenges chemical manufacturing is the second largest manufacturing industry in North Carolina bringing in \$20 billion dollars per year (*2022 North Carolina Manufacturing Facts*, 2022).

Chemical manufacturing is the second largest manufacturing industry in North Carolina, bringing in \$20 billion per year. With above average productivity, output, and wages, the sector accounts for more than 15% of the state's manufacturing workforce.

North Carolina's chemical manufacturing sector operates with above average productivity, output, and wages (2022 North Carolina Manufacturing Facts, 2022). As a notable employer, the sector accounts for more than 15 percent of the state's manufacturing workforce (2022 North Carolina Manufacturing Facts, 2022).

Chemical manufacturing is not immune to natural events. During the Texas polar vortex in 2021, the chemical manufacturing sector was heavily impacted. Shortages of critical chemicals such as ethylene were felt throughout the nation. Fortunately, this disruption was largely abated by the end of 2022.

Chemical Manufacturing Sector in North Carolina

The chemical manufacturing sector in North Carolina is extremely important, producing a broad range of products that are utilized to serve other industries and consumers. From soaps to plastics to perfumes, pesticides to paint, the sector's downstream audience is diverse. North Carolina makes up the largest chemical and plastics manufacturing workforce in the Southeast with over 75,000 jobs (*Advanced Manufacturing Industry in North Carolina: EDPNC*, 2023). The state is home to over 2,500 plastics and chemical establishments, which is a concentration of 1.5 times the national average (*Advanced Manufacturing Industry in North Carolina: EDPNC*, 2023). With access to a robust education system and lower cost for U.S. based manufacturers, North Carolina is a prime location for new investment, and the chemical manufacturing Sector has recognized that. High levels of regulation challenge chemical manufacturing within the United States and North Carolina. Regulations typically focus on environmental considerations which are intricately connected to the sector's processes and products.

North Carolina native brands such as Pine Glo manufacture all cleaning and disinfectant products at the company's plant in Rolesville (*Manufactured in North Carolina*, 2023). Other global companies such as Bona, a producer of floor cleaning products, expanded operations to a new manufacturing facility in Monroe (*New bona distribution facility in Monroe, North Carolina*, 2023). Pfizer became a household name during the COVID-19 pandemic and has two operational chemical manufacturing plants in the state (*Manufactured in North Carolina*, 2023). These are just a sample of the numerous firms that support the chemical manufacturing sector in North Carolina.

Sector Composition

For the purposes of this analysis, the chemical manufacturing sector has been defined to include the following industries and their associated IMPLAN codes: Petroleum lubricating oil and grease manufacturing (157); Petrochemical manufacturing (159); Industrial gas manufacturing (160); Synthetic dye and pigment manufacturing (161); Other basic inorganic chemical manufacturing (162); Other basic organic chemical manufacturing (163); Plastics material and resin manufacturing (164); Synthetic rubber manufacturing (165); Artificial and synthetic fibers and filaments manufacturing (166); Nitrogenous fertilizer manufacturing (167); Phosphatic fertilizer manufacturing (168); Pesticide and other agricultural chemical manufacturing (170); Paint and coating manufacturing (175);

Adhesive manufacturing (176); Soap and other detergent manufacturing (177); Polish and other sanitation good manufacturing (178); Surface active agent manufacturing (179); Toilet preparation manufacturing (180); Printing ink manufacturing (181); Photographic film and chemical manufacturing (184); Other miscellaneous chemical product manufacturing (185); Plastics packaging materials and unlaminated film and sheet manufacturing (186); Unlaminated plastics profile shape manufacturing (187); Plastics pipe and pipe fitting manufacturing (188); Laminated plastics plate, sheet (except packaging), and shape manufacturing (189); Polystyrene foam product manufacturing (190); Urethane and other foam product (except polystyrene) manufacturing (191); Plastics bottle manufacturing (192); Other plastics product manufacturing (193).

Economic Contribution Analysis



Total Output



Total Labor Income

137,000

Total Employment



Total Value Added

Industry Agglomeration Heat Map

Figure 4: Chemical Manufacturing Sector Agglomeration Heat Map



Randolph County has nearly six times the job concentration in the sector as the US as a whole, while Catawba and Lee Counties each have more than two times the national average.

Factors of Production

More than 270 intermediate goods and services are used as factors of production for the chemical manufacturing sector in North Carolina.⁴ Approximately \$7.5 billion of these inputs are sourced from industries within the state and \$14.7 billion are sourced from those outside of NC. This equates to 33.8 percent of the chemical manufacturing sector's factors of production being sourced locally.⁵ The top 10 inputs used within the sector's supply chain are shown in Figure 5. The share sourced in-state is shown in **red** and the share sourced out-of-state is shown in **gray**. With out-of-state inputs grossing \$2.8 billion for plastics, materials, and resins, \$2.1 billion for petrochemicals, and \$1.9 billion for other basic organic chemicals, North Carolina may stand to benefit by bringing more businesses that produce these inputs into the state. In addition to attracting new producers, transportation investments could help improve supply chain efficiency while lowering production costs. The primary modes of transportation that support the chemical manufacturing sector can be found on page 76.



Figure 5: Top Ten Factors of Production for the Chemical Manufacturing Sector

Source: ITRE IMPLAN Analysis.

⁴ Analysis of IMPLAN's Commodity Industry Demand within North Carolina.

⁵ Ibid.

INDUSTRIAL MACHINERY & TRANSPORTATION EQUIPMENT

NORTH CAROLINA SUPPLY CHAIN STUDY

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Overview

After rebounding from the COVID-19 pandemic, industrial machinery & transportation equipment has experienced a period of low growth stemming from high interest rates, trade disputes, energy price volatility, and economic concerns. The costs of borrowing money to finance operations have increased due to high interest rates and energy costs have increased due to the war in Ukraine. These pressures have resulted in curtailed investment for industrial equipment and machinery. With inflation rates and gas prices returning to normal levels, investment in the sector is expected to rebound marginally in 2024 and return to moderate growth thereafter.

From the roadway to the assembly line, this sector manufactures a plethora of items including tires, transmissions, and other automotive parts, as well as heavy trucks, buses, and construction machinery. The sector supports hundreds of precision manufacturers with highly active supply chains.

Industrial Machinery & Transportation Equipment Sector in North Carolina

North Carolina's industrial machinery and transportation equipment sector faces similar challenges as the broader U.S., especially with respect to inflationary pressures and commodity price fluctuations, which impact the ability of North Carolina's businesses to invest in new machinery. Additionally, global conditions increased the price of iron and steel, resulting in higher operating costs (Jankowski, 2023). Despite these challenges, North Carolina is home to hundreds of precision manufacturers with highly active supply chains (Carolina Core, 2024) and is showing signs of continued growth. With more than 230 companies in the automotive and heavy truck industries statewide, Caterpillar, GKN, Mack Trucks, Thomas Built Buses, Volvo Trucks, Deere Hitachi Construction Machinery, and Beta Fueling Systems are among transportation companies with ongoing operations in North Carolina (Carolina Core, 2024). In August 2023, Siemens Mobility broke ground on its \$220 million facility in Lexington, North Carolina. This facility will enable Siemens to fulfill its contract to build 73 trains for Amtrak, which is the largest North American train manufacturing contract of all time (Hill, 2023). The Lexington plant is anticipated to create more than 500 jobs by 2028, and grow the state's economy by \$1.6 billion over 12 years (Siemens, 2023).

Looking toward the future, VinFast announced the establishment of its first North American auto-manufacturing plant in North Carolina with operations expected to start in July 2024 (Vinfast, 2023). Since its original announcement, VinFast has experienced setbacks in meeting electric vehicle sales targets, and has downsized its plans for the Chatham County facility as well as delaying operations in Chatham County (Tobin, 2024). However, even with these setbacks the Chatham County Economic Development Corporation is still optimistic about a near-term start date for operations and the facility is still anticipated to be quite substantial at an estimated 782,000 square feet (Tobin, 2024). A big component of Vinfast's plans includes expansion of the company's supply networks in a nearby industrial park, as well as expansion of inbound and outbound shipping through the Port of Wilmington.

North Carolina's colleges and universities have benefited industry within the state, enabling access to a skilled workforce and advances in research and development. North Carolina enrolls more than 570,000 students each year at the 58-campus community college system state-wide, offering some of the most comprehensive and advanced vocational and technical programs in the U.S (EDPNC, 2023).

Sector Composition

For the purposes of this analysis, the industrial machinery & transportation equipment sector has been defined to include the following industries and their associated IMPLAN codes: Tire manufacturing (194); Rubber and plastics hoses and belting manufacturing (195); Farm machinery and equipment manufacturing (260); Lawn and garden equipment manufacturing (261); Construction machinery manufacturing (262); Mining machinery and equipment manufacturing (263); Food product machinery manufacturing (266); Semiconductor machinery manufacturing (265); Printing machinery and equipment manufacturing (268); All other industrial machinery manufacturing (269); Industrial mold manufacturing (276); Special tool, die, jig, and fixture manufacturing (277); Cutting tool and machine tool accessory manufacturing (278); Machine tool manufacturing (279); Rolling mill and other metalworking machinery manufacturing (280); Turbine and turbine generator set units manufacturing (281); Speed changer, industrial high-

speed drive, and gear manufacturing (282); Mechanical power transmission equipment manufacturing (283); Other engine equipment manufacturing (284); Pump and pumping equipment manufacturing (285); Air and gas compressor manufacturing (286); Measuring and dispensing pump manufacturing (285); Conveyor and conveying equipment manufacturing (288); Overhead cranes, hoists, and monorail systems manufacturing (289); Industrial truck, trailer, and stacker manufacturing (290); Power-driven handtool manufacturing (291); Welding and soldering equipment manufacturing (292); Packaging machinery manufacturing (293); Industrial process furnace and oven manufacturing (294); Fluid power cylinder and actuator manufacturing (295); Fluid power pump and motor manufacturing (296); Power, distribution, and specialty transformer manufacturing (329); Motor and generator manufacturing (330); Switchgear and switchboard apparatus manufacturing (331); Relay and industrial control manufacturing (332); Storage battery manufacturing (333); Primary battery manufacturing (334); Automobile manufacturing (340); Heavy duty truck manufacturing (342); Motor vehicle body manufacturing (343); Truck trailer manufacturing (344); Travel trailer and camper manufacturing (346); Motor vehicle gasoline engine and engine parts manufacturing (347); Motor vehicle electrical and electronic equipment manufacturing (348); Motor vehicle transmission and power train parts manufacturing (349); Motor vehicle seating and interior trim manufacturing (350); Other motor vehicle parts manufacturing (352); Aircraft manufacturing (354); Aircraft engine and engine parts manufacturing (355); Other aircraft parts and auxiliary equipment manufacturing (356); Railroad rolling stock manufacturing (359); Ship building and repairing (360); Boat building (361); Motorcycle, bicycle, and parts manufacturing (362); Military armored vehicle, tank, and tank component manufacturing (363); All other transportation equipment manufacturing (364); Commercial and industrial machinery and equipment rental and leasing (453).

Economic Contribution Analysis





Total Output

Total Employment

Total Labor Income

Total Value Added

Industry Agglomeration Heat Map

Figure 6: Industrial Machinery & Transportation Equipment Sector Agglomeration Heat Map



Gaston County has two-and-a-half times the national average concentration of jobs in this sector.

Factors of Production

More than 330 intermediate goods and services are used as factors of production for the industrial machinery and transportation sector in North Carolina.⁶ Approximately \$7.5 billion of these inputs are sourced from industries within the state and \$9.8 billion are sourced from those outside of NC. This equates to 38.6 percent of the industrial machinery and transportation sector's factors of production being sourced locally.⁷ The top 10 inputs used within the sector's supply chain are shown in Figure 7. The share sourced in-state is shown in **orange** and the share sourced out-of-state is shown in **gray**. With out-of-state inputs grossing \$2.8 billion for plastics, materials, and resins, \$2.1 billion for petrochemicals, and \$1.9 billion for other basic organic chemicals, North Carolina may stand to benefit by bringing more businesses that produce these inputs into the state. In addition to attracting new producers, transportation investments could help improve supply chain efficiency while lowering production costs. The primary modes of transportation that support the industrial machinery & transportation equipment sector can be found on page 76.



Figure 7: Top Ten Factors of Production for the Industrial Machinery & Transportation Equipment Sector

Source: ITRE IMPLAN Analysis.

⁶ Analysis of IMPLAN's Commodity Industry Demand within North Carolina.
⁷ Ibid.

TOBACCO & FOODSTUFFS

NORTH CAROLINA SUPPLY CHAIN STUDY

Overview

After the pandemic, crop prices increased substantially allowing farms to generate greater revenue. Additionally, healthy eating trends have helped boost revenue and lead to profit growth for cultivated crops and livestock (Curran, 2024).

The high-stress environment of the pandemic granted a reprieve to cigarette and tobacco manufacturers, which have experienced a significant drop in consumer demand over the last four decades. The U.S. decreased from approximately 180,000 tobacco producing North Carolina ranks first in the nation in agricultural production of tobacco, sweet potatoes, poultry and egg receipts, and is a leading producer of many other crops and livestock products.

farms in the 1980s to about 10,000 farms as of 2012 (Centers for Disease Control and Prevention, 2022). Though international markets are attractive, U.S. products face fierce competition within markets containing less stringent regulatory environments. (*IBIS World*, 2023). Despite the competitive marketplace, North Carolina remains the number one producer of tobacco in the country.

Tobacco & Foodstuffs Sector in North Carolina

The annual Cheerwine Festival commemorating the "nectar of the tarheels" (Visit NC, n.d.) is just one example of the many products within the tobacco and foodstuffs sector that are internationally renowned and have origins in North Carolina. From Mt. Olive pickles to Texas Pete hot sauce, to Krispy Kreme, Pepsi Cola, or BoJangles', the state has a multitude of world-famous foods, beverages, and establishments that support the sector. These recognizable retail brands represent just a segment of the tobacco and foodstuffs sector. North Carolina ranks first in the nation in agricultural production of tobacco, sweet potatoes, poultry and egg receipts, and is a leading producer of many other crops and livestock products. Table 1 demonstrates North Carolina's rank in agricultural production and Table 2 shows the top farming commodities by cash receipts. Agriculture and agribusiness remains top industries in North Carolina, employing 1 in 5 people across the state (Hart, 2023)

Rank	Item	Production		NC % of US
1	Sweet Potatoes	18,322.5	(000 Cwt)	63.5%
1	All Tobacco	252.4	(Mil Lbs)	52.8%
1	All Poultry & Egg Cash Receipts	5,762.3	(Mil \$)	16.2%
2	Turkeys	30	(Mil Hd)	13.9%
2	Annual Pig Crop Dec 20 - Nov 21	17.9	(Mil Hd)	13.5%
2	Trout Sold (foodsize)	3.5	(Mil Lbs)	7.7%
3	Cucumbers	1,565.5	(000 Cwt)	10.9%
3	Hogs & Pigs (12-1-21)	8	(Mil Hd)	10.8%
4	Broilers	971.4	(Mil Hd)	10.6%
5	Peanuts	495.9	(Mil Lbs)	7.8%
5	Watermelon	2,557.5	(000 Cwt)	7.5%
5	Bell Peppers	506	(000 Cwt)	5%
5	Burley Tobacco	0.4	(Mil Lbs)	0.5%

Table 1: North Carolina's Rank in U.S. Agriculture

Source: USDA, 2022

NC Rank	Commodities	2021 (Thousand Dollars)	2021% of Total Sales
1	Broilers	4,289,303	32.3%
2	Hogs	2,919,398	22%
3	Turkeys	958,107	7.2%
4	Soybeans	762,461	5.7%
5	Corn	732,911	5.5%
6	Miscellaneous Crops	719,190	5.4%
7	Chicken eggs	512,783	3.9%
8	Tobacco	441,172	3.3%
9	Sweet potatoes	391,950	3%
10	Cotton lint, Upland	261,390	2%

Table 2: Farm Income: Cash Receipts from Farming by Commodity

Source: USDA, 2022

With origins from the colonial period, tobacco was once the most valuable export commodity of North Carolina, Virginia, and Maryland (NC Division of Historic Sites and Properties, n.d.). Today, North Carolina is the United States' leading producer of tobacco with more than 260 million pounds produced across the state in 2023 (Shahbandeh, 2024). However, over the last two decades demand for tobacco has dropped by over half (Quillin, 2022). This shift was caused by several factors, from tobacco's addictive nature, negative health effects, and outsourcing globally to more inexpensive regions.

Sector Composition

For the purposes of this analysis, the tobacco & foodstuffs sector has been defined to include the following industries and their associated IMPLAN codes: Dog and cat food manufacturing (63); Other animal food manufacturing (64); Breakfast cereal manufacturing (71); Nonchocolate confectionery manufacturing (74); Chocolate and confectionery manufacturing from cacao beans (75); Confectionery manufacturing from purchased chocolate (76); Frozen fruits, juices and vegetables manufacturing (77); Frozen specialties manufacturing (78); Canned fruits and vegetables manufacturing (79); Canned specialties (80); Dehydrated food products manufacturing (81); Fluid milk manufacturing (84); Cheese manufacturing (82); Ice cream and frozen dessert manufacturing (86); Bread and bakery product, except frozen, manufacturing (93); Frozen cakes and other pastries manufacturing (87); Cookie and cracker manufacturing (946); Dry pasta, mixes, and dough manufacturing (95); Tortilla manufacturing (96); Roasted nuts and peanut butter manufacturing (97); Other snack food manufacturing (98); Coffee and tea manufacturing (99); Flavoring syrup and concentrate manufacturing (100); Mayonnaise, dressing, and sauce manufacturing (101); Spice and extract manufacturing (102); All other food manufacturing (103); Tobacco product manufacturing (109). **Economic Contribution Analysis**



Total Output



Total Labor Income

105,600

Total Employment



Total Value Added

Industry Agglomeration Heat Map

KEY US Interstates US and NC Highways NC Railroad System Industry Location Employment Employment

Wilson County has more than three times the national average concentration of jobs in this sector.

Figure 8: Tobacco & Foodstuffs Industry Agglomeration Heat Map

Factors of Production

Nearly 230 intermediate goods and services are used as factors of production for the tobacco & foodstuffs sector in North Carolina.⁸ Approximately \$6.2 billion of these inputs are sourced from industries within the state and \$7.5 billion are sourced from those outside of NC. This equates to 45.3 percent of the tobacco & foodstuffs sector's factors of production being sourced locally.⁹ The top 10 inputs used within the sector's supply chain are shown in Figure 9. The share sourced in-state is shown in **green** and the share sourced out-of-state is shown in **gray**. With out-of-state inputs grossing \$1.1 billion for artificial and synthetic fibers and filaments and \$0.8 billion for paperboard containers, North Carolina may stand to benefit by bringing more businesses that produce these inputs into the state. In addition to attracting new producers, transportation investments could help improve supply chain efficiency while lowering production costs. The primary modes of transportation that support the tobacco & foodstuffs sector can be found on page 76.

Figure 9: Top Ten Factors of Production for the Tobacco & Foodstuffs Sector



Source: ITRE IMPLAN Analysis.

⁸ Analysis of IMPLAN's Commodity Industry Demand within North Carolina.

⁹ Ibid.



NORTH CAROLINA SUPPLY CHAIN STUDY

Overview

North Carolina's transportation, distribution, & logistics sector supports two of the country's fastest growing metropolitan areas, 10th busiest passenger airport, and over 80,000 miles of state supported roads, the second most in the country. In recent years this sector has undergone immense changes, increased demand, and pressure. The COVID-19 pandemic accelerated the shift from instore to online shopping, putting a greater demand on the transportation, distribution, & logistics sector. E-commerce and last mile delivery was predicted to increase 64% between 2019 and 2024 (NCDOT, 2020). This represents a huge shift for an industry to undergo in a matter of five years.

This sector is a key enabler for almost every industry within the state's economy. Home delivery, in particular, relies on transportation, distribution, & logistics to fulfill an increased demand, fueled by the

North Carolina's transportation, distribution, & logistics sector supports two of the country's fastest growing metropolitan areas, the 7th busiest airport by operations, and over 80,000 miles of state supported roads, the second most in the country.

pandemic. Coinciding with the increase in demand, the sector has contributed to employing a growing workforce. Altogether, sector employment rose by 5% across the US from 2021 to 2022 (Transportation Economic Trends: Transportation Employment - Industry, 2022).

Transportation, Distribution & Logistics Sector in North Carolina

In North Carolina, the rapid growth of metropolitan cities and global airports add to the demand of this sector. With North Carolina's airports providing access to more than 180 global destinations (NCDOA, 2023), inbound and outbound travelers and cargo support the sector and the state's economy. Additionally, both Raleigh and Charlotte are in the top 10 fastest growing large US metropolitan cities between 2016-2021 (Lee, 2022). This amount of population growth and travel rely on a strong Transportation, Distribution, and Logistics sector.

North Carolina's transportation, distribution, & logistics sector is highly supported by new investments and the ongoing maintenance of air, ground, water, pipeline, rail, and distribution infrastructure. The state's transportation network is essential for the vast majority of North Carolina businesses. North Carolina has more state supported roads than any other state besides Texas with over 80,000 miles of road (Bragg, 2023). These roads help the almost 9 million vehicles registered in the state get to their destinations across the state quickly and safely (Vehicle registration counts by State, 2021). Railroads are also an important economic driver carrying millions of tons of cargo per year across the state and moving NC products across the country. In particular, the Triad area has grown with the addition of large Third-Party Logistics provider investments in warehouse and distribution center hubs, as well as the growth of the Foreign Trade zone regions in RDU and the Triad. The port of Wilmington has also emerged as one of the more efficient ports on the East Coast and is seeing an increase in inbound carrier shipments, and on-going digital transformation.

Sector Composition

For the purposes of this analysis, the transportation, distribution & logistics sector has been defined to include the following industries and their associated IMPLAN codes: Air transportation (414); Rail transportation (415); Water transportation (416); Truck transportation (417); Transit and ground passenger transportation (418); Pipeline transportation (419); Warehousing and storage (422).

Economic Contribution Analysis



Total Output



Total Labor Income

494,500

Total Employment



Total Value Added

Industry Agglomeration Heat Map



Figure 10: Transportation, Distribution, & Logistics Sector Agglomeration Heat Map

Both Davie and Edgecombe County have more than twice the US average job concentration in this sector.

Factors of Production

More than 240 intermediate goods and services are used as factors of production for the transportation, distribution, & logistics sector in North Carolina.¹⁰ Approximately \$9.8 billion of these inputs are sourced from industries within the state and \$5.6 billion are sourced from those outside of NC. This equates to 63.6 percent of the transportation distribution and logistics sector's factors of production being sourced locally.¹¹ The top 10 inputs used within the sector's supply chain are shown in Figure 11. The share sourced in-state is shown in **green** and the share sourced out-of-state is shown in **gray**. With out-of-state inputs grossing \$2.7 billion for refined petroleum products, North Carolina may stand to benefit by bringing more businesses that produce these inputs into the state. In addition to attracting new producers, transportation investments could help improve supply chain efficiency while lowering production costs. The primary modes of transportation that support the transportation, distribution, & logistics sector can be found on page 76.

Figure 11: Top Ten Factors of Production for the Transportation, Distribution, & Logistics Sector



Source: ITRE IMPLAN Analysis.

¹⁰ Analysis of IMPLAN's Commodity Industry Demand within North Carolina.
¹¹ Ibid.

METAL PRODUCTS

NORTH CAROLINA SUPPLY CHAIN STUDY

Overview

The metal products sector produces everything from computers and electronics, metal furniture, pipe fittings, hand tools, and machinery for other industries (U.S. Bureau of Labor Statistics, 2023). These products are often created through the process of welding or brazing, techniques for joining metals (Hazard Overview, 2023). The metal products sector's growth is driven by construction and manufacturing demand, which are on the rise post-pandemic (Pigott, 2023; Jozkowski, 2023b). The United States faces low-cost import pressure, which continues to drive the need for innovation in manufacturing processes and final products

Community colleges across North Carolina offer highly respected programs for welding and metal fabrication, leading to a knowledgeable and growing workforce for the Metal Products Sector.

(Jozkowski, 2023). Meeting this challenge head-on, community colleges across North Carolina offer highly respected programs for welding and metal fabrication, leading to a knowledgeable and growing workforce for the metal products sector.

Metal Products Sector in North Carolina

North Carolina leads the Southeast in manufacturing and ranks 6th in the nation for its manufacturing contribution to U.S. Gross Domestic Product (GDP) (*Manufacturing Matters*, 2024). The metal products sector is also an economic anchor with over 550 companies across the state (*Manufactured in North Carolina*, 2024). One of these companies, Charlotte Pipe, is one of the biggest makers of iron pipe and fittings. Established in Charlotte, they have been manufacturing high quality pipe and fittings for over 100 years (Ward, 2024). The sector in North Carolina produces metal wiring, pipes, valves and fittings, sheet metal, hardware, steel milling, and aluminum production (Sellers, 2023).

Positive trends in residential construction directly affect the metal product manufacturing sector. North Carolina welcomed over 130,000 new residents in 2022, bouncing back from the COVID-19 pandemic, which created a need for new construction and a boom in residential building (Cline, 2022). Industrial and commercial markets also support the sector with recent growth within the fabricated structural metal manufacturing industry.

North Carolina's education system provides an essential pipeline to the metal products sector's workforce. Community colleges across North Carolina offer highly respected programs for welding and metal fabrication. Machining technology is also offered at most community colleges in the state creating a knowledgeable and growing workforce (Sellers, 2023). This is an important component with access to skilled tradesman that is a big draw for companies coming to the state.

Sector Composition

For the purposes of this analysis, the metal products sector has been defined to include the following industries and their associated IMPLAN codes: Iron and steel mills and ferroalloy manufacturing (215); Iron, steel pipe and tube manufacturing from purchased steel (216); Rolled steel shape manufacturing (217); Aluminum sheet, plate, and foil manufacturing (221); Crown and closure manufacturing and metal stamping (230); Cutlery, utensil, pot, and pan manufacturing (233); Handtool manufacturing (234); Prefabricated metal buildings and components manufacturing (235); Fabricated structural metal manufacturing (236); Plate work manufacturing (237); Metal window and door manufacturing (238); Sheet metal work manufacturing (239); Ornamental and architectural metal work manufacturing (240); Power boiler and heat exchanger manufacturing (241); Metal tank (heavy gauge) manufacturing (242); Metal cans manufacturing (243); Metal barrels, drums and pails manufacturing (244); Hardware manufacturing (245); Spring and wire product manufacturing (246); Turned product and screw, nut, and bolt manufacturing (248); Valve and fittings, other than plumbing, manufacturing (252); Ball and roller bearing manufacturing (254); Fabricated pipe and pipe fitting manufacturing (258); Other fabricated metal manufacturing (259); Other communication and energy wire manufacturing (336); Wiring device manufacturing (337).

Economic Contribution Analysis

Total Output

Total Labor Income

Industry Agglomeration Heat Map

76,700

Total Employment

\$9.2 billion

Total Value Added



Figure 12: Metal Products Sector Agglomeration Heat Map

Surry County has more than two-and-a-half times the U.S. average job concentration in the Metal Products sector.

METAL PRODUCTS

Factors of Production

An estimated 245 intermediate goods and services are used as factors of production for the metal products sector in North Carolina.¹² Approximately \$2.7 billion of these inputs are sourced from industries within the state and \$4.4 billion are sourced from those outside of NC. This equates to 38.6 percent of the metal products sector's factors of production being sourced locally.¹³ The top 10 inputs used within the sector's supply chain are shown in Figure 13. The share sourced in-state is shown in **dark gray** and the share sourced out-of-state is shown in **light gray**. With out-of-state inputs grossing \$1.3 billion for iron and steel and ferroalloy products, North Carolina may stand to benefit by bringing more businesses that produce these inputs into the state. In addition to attracting new producers, transportation investments could help improve supply chain efficiency while lowering production costs. The primary modes of transportation that support the metal products sector can be found on page 76.





Source: ITRE IMPLAN Analysis.

¹² Analysis of IMPLAN's Commodity Industry Demand within North Carolina.
¹³ Ibid.

ELECTRONICS

NORTH CAROLINA SUPPLY CHAIN STUDY
The COVID-19 pandemic had a profound impact on the global supply chain for electronics, particularly those connecting US and Asian Markets. Decreases in production during the pandemic created order backlogs and a shortage of semiconductors and electronic components, which has led to a pent-up demand for products within the electronics sector (IBIS World, 2023). In addition to COVID-19 shocks, which impacted demand in the short-run, the integration of AI chips is anticipated to generate sustained growth in the sector (IBIS World, 2023). Success within the sector is dependent on quick adaptations to technological advancements and leveraging innovation.

North Carolina's electronics sector utilizes the power of the state's university and research infrastructure to push the envelope on cutting edge technology. The sector is competitive with high paying jobs and industry growth.

Its prominence in research and development has enabled North Carolina to be a national leader in electronics. The state's electronics sector draws from colleges, universities, and the business community to push the envelop on cutting edge technology. Overall, the sector is competitive with high paying jobs and industry growth. With federally-initiated grants and investments in electronics and computer-related manufacturing, the North Carolina electronics sector has also benefited.

Electronics Sector in North Carolina

The electronics sector is a major employer in North Carolina. Many employees come from highly respected universities training the next generations in electronics engineering, computer science, and electronics drafters. North Carolina universities have the highest amount of industry-funded research in the nation. Giving the state an edge on other markets and bolstering the technology industry with up and coming cutting-edge technology and young talent (*Information Technology Industry in North Carolina: EDPNC, 2023*). The number of companies moving to NC State's Centennial Campus is creating a hub of activity, combined with recent large federal grants for semiconductor and advanced manufacturing technology centers of excellence.

Research & development, defense, and a skilled workforce have helped North Carolina emerge as "the tech hub of the south" (White, 2023). The state is home to a multitude of large tech companies, such as Wolfspeed, Qorvo, Global Skyware, Northrop Gunman, among many others spreading from the Research Triangle to the Piedmont Triad to the Charlotte metro region (Data Axel, 2024). The state ranks number two in the country for women in tech, making up over 36 percent of the electronics workforce. This is credited to the resources and STEM programs among North Carolina universities and the state providing desirable places to live (Information Technology Industry in North Carolina: EDPNC, 2023).

Sector Composition

For the purposes of this analysis, the electronics sector has been defined to include the following industries and their associated IMPLAN codes: Bare printed circuit board manufacturing (306); Semiconductor and related device manufacturing (307); Capacitor, resistor, coil, transformer, and other inductor manufacturing (308); Electronic connector manufacturing (309); Printed circuit assembly (electronic assembly) manufacturing (305); Other electronic component manufacturing (310); Electromedical and electrotherapeutic apparatus manufacturing (311); Search, detection, and navigation instruments manufacturing (312); Automatic environmental control manufacturing (313); Industrial process variable instruments manufacturing (314); Totalizing fluid meter and counting device manufacturing (315); Electricity and signal testing instruments manufacturing (316); Analytical laboratory instrument manufacturing (317); Irradiation apparatus manufacturing (318); Watch, clock, and other measuring and controlling device manufacturing (319); Blank magnetic and optical recording media manufacturing (320); Electric lamp bulb and part manufacturing (322); Lighting fixture manufacturing (323).



Total Output



Total Labor Income

49,500

Total Employment



Total Value Added

Industry Agglomeration Heat Map



Figure 14: Electronics Sector Agglomeration Heat Map

Guilford County has above-average job concentration in this sector compared to the nation as a whole—and nearly twice the statewide average.

Factors of Production

Nearly 220 intermediate goods and services are used as factors of production for the electronics sector in North Carolina.¹⁴ Approximately \$2.64 billion of these inputs are sourced from industries within the state and \$2.59 billion are sourced from those outside of NC. This equates to 50.5 percent of the electronics sector's factors of production being sourced locally.¹⁵ The top 10 inputs used within the sector's supply chain are shown in Figure 15. The share sourced in-state is shown in **aqua** and the share sourced out-of-state is shown in **gray**. With out-of-state inputs grossing \$0.5 billion for semiconductors and related devices and \$0.3 billion for printed circuit assemblies (electronic assemblies), North Carolina may stand to benefit by bringing more businesses that produce these inputs into the state. In addition to attracting new producers, transportation investments could help improve supply chain efficiency while lowering production costs. The primary modes of transportation that support the electronics sector can be found on page 76.



Figure 15: Top Ten Factors of Production for the Electronics Sector

Source: ITRE IMPLAN Analysis.

¹⁴ Analysis of IMPLAN's Commodity Industry Demand within North Carolina.
¹⁵ Ibid.

COMMUNICATIONS & COMPUTER

The communications & computer manufacturing sector is marked by high demand and constant innovation. The sector has connected communities around the world and has a great impact on both U.S. and international markets. Industries within the sector depend on fast and reliable internet access for both their processes and merchandise. Products created in this sector include smart phones, laptops, and cable which have become ubiquitous in daily life. Research and innovation are necessary for companies to keep up with high customer expectations. North Carolina is home to a skilled workforce and is a suitable host for companies in this sector looking for strong talent and budding professionals (Information Technology Industry in North Carolina: EDPNC, 2023). North Carolina's communications & computer sector is marked by high demand and constant innovation. Home to numerous universities, the state provides a consistent stream of up and coming professionals in this sector. Over a third of North Carolina's communications & computer companies are located in the Triangle area.

Communications & Computer Sector in North Carolina

North Carolina is home to more than 2,300 companies involved in the manufacturing, development, sales, and servicing of computers and related products. Over a third of these companies are located in the Research Triangle (Moore, 2006). The computer industry alone is a major employer across the state (Sundu, 2023). Companies in the sector benefit from North Carolina's skilled labor pool, which can be largely attributed to its community college and university systems (Information Technology Industry in North Carolina: EDPNC, 2023).

CommScope, a global telecommunications company, founded in Hickory, North Carolina recently expanded operations and opened a fiber-optic cable manufacturing plant. The plant expansion in Catawba County added over 250 jobs to the local economy. This \$60 million dollar investment will not only boost the economy but also maintain North Carolina as the fiber cable hub in the U.S. CommScope will continue advancing technology and high-speed internet for underserved communities (According to the North Carolina Department of Commerce, 2023). Lenovo, a technology and computer giant, recently celebrated two decades of working in North Carolina. Their U.S. headquarters is strategically in the Triangle region, the hub of research and innovation in the state (*Lenovo in North Carolina, 2023*).

Large regional ports, making it desirable for manufacturers to be located in the southeast for the convenience of international trade (Computer Manufacturing in the US, 2023). North Carolina's Ports of Wilmington and Morehead City as well as nearby access to the Port of Savannah help contribute to the site selection of firms within the sector.

Sector Composition

For the purposes of this analysis, the communications & computer sector has been defined to include the following industries and their associated IMPLAN codes: Electronic computer manufacturing (298); Computer storage device manufacturing (299); Computer terminals and other computer peripheral equipment manufacturing (300); Telephone apparatus manufacturing (301); Broadcast and wireless communications equipment manufacturing (302); Other communications equipment manufacturing (302); Other other prerecorded and record reproducing (321).



Total Output



Total Labor Income

35,400 Total Employment



Total Value Added

Industry Agglomeration Heat Map



Figure 16: Communications & Computer Sector Agglomeration Heat Map

Wake County has more than twice the US average job concentration in this sector.

Factors of Production

More than 170 intermediate goods and services are used as factors of production for the communications and computers sector in North Carolina.¹⁶ Approximately \$1.5 billion of these inputs are sourced from industries within the state and \$2.1 billion are sourced from those outside of NC. This equates to 42.0 percent of the communications and computers sector's factors of production being sourced locally.¹⁷ The top 10 inputs used within the sector's supply chain are shown in Figure 17. The share sourced in-state is shown in **blue** and the share sourced out-of-state is shown in **gray**. With out-of-state inputs grossing \$0.4 billion for semiconductors and related devices and \$0.2 billion for printed circuit assemblies (electronic assemblies), North Carolina may stand to benefit by bringing more businesses that produce these inputs into the state. In addition to attracting new producers, transportation investments could help improve supply chain efficiency while lowering production costs. The primary modes of transportation that support the communications & computer sector can be found on page 76.



Figure 17: Top Ten Factors of Production for the Communications & Computer Sector

Source: ITRE IMPLAN Analysis.

¹⁶ Analysis of IMPLAN's Commodity Industry Demand within North Carolina.
¹⁷ Ibid.



TEXTILES

During the pandemic, textile manufacturers temporarily pivoted to the production of cloth masks. This helped the textiles in the U.S. remain steady through an economic downturn caused by shelterin-place policies. Since the pandemic, many textile manufacturers have moved offshore to reduce labor and manufacturing costs (IBIS World, 2023). Despite trends in offshoring, textiles remains a strong sector in North Carolina. The state employs the second largest textiles workforce in the country and has more than 1,000 textile and textile product mills (EDPNC, 2024). The state is an integral driver in the industry's research, development, and production of innovative fabrics and polymer. (U.S. Textile Industry, 2022; Textiles industry in North Carolina 2022). Textiles across the state contribute to over \$1.2 billion in state, local, and federal taxes. North Carolina is also a national leader in talent and labor pool

North Carolina is a national leader in talent and labor pool development for the sector. It contains the nation's highest number of graduates in textile sciences and engineering.

development for the sector. It boasts the nation's highest number of graduates in textile sciences and engineering (EDPNC, 2024).

Textiles Sector in North Carolina

The textile sector has an established history in North Carolina. Since the early 1800s a multitude of textile products have reached large-scale production while other related activities have helped advance the sector. From cotton farming to textile mills, and leading education in textile production, North Carolina has helped to shape the U.S. textile sector.

Across the United States, growth in American textiles took off during World War I and continued to grow in the years that followed. By 1923 North Carolina had surpassed Massachusetts as the leading textile-producing state in the nation (Glass & Krass, 2006). Since that time, international advancements in textiles and gains market share have negatively impacted the textiles domestically resulting in notable job losses. Despite those setbacks, the southeast continues to have a tremendous amount of infrastructure to support the textile sector. North Carolina is rich with textile skill and knowledge continuing to mold and push the sector in new directions (Connecting brands to American manufacturers).

North Carolina leads the nation in the number of operational textile mills (Textiles industry in North Carolina, 2023). The state's productive capacity has enabled North Carolina to export roughly 20 percent of all U.S. textile goods globally per year (Textiles industry in North Carolina, 2023). Within the state, textiles are supported by higher education and innovation centers, including the Textile Technology Center at Gaston Community College, the fiber program at Haywood Community College, the Wilson College of Textiles at NC State University, and the North Carolina Textile Innovation and Sustainability Engine (a consortium of academic and private sector partners to advance research, commercialization, and workforce development within the sector), among many others.

Sector Composition

For the purposes of this analysis, the textiles sector has been defined to include the following industries and their associated IMPLAN codes: Fiber, yarn, and thread mills (110); Broadwoven fabric mills (111); Narrow fabric mills and schiffli machine embroidery (112); Nonwoven fabric mills (113); Knit fabric mills (114); Textile and fabric finishing mills (115); Fabric coating mills (116); Carpet and rug mills (117); Curtain and linen mills (118); Textile bag and canvas mills (119); Rope, cordage, twine, tire cord and tire fabric mills (120); Other textile product mills (121); Hosiery and sock mills (122); Other apparel knitting mills (123); Cut and sew apparel contractors (124); Men's and boys' cut and sew apparel manufacturing (125); Women's and girls' cut and sew apparel manufacturing (126); Other cut and sew apparel manufacturing (127); Apparel accessories and other apparel manufacturing (128); Footwear manufacturing (130); Other leather and allied product manufacturing (131).



Total Output



Total Labor Income

69,000 Total Employment



Total Value Added

Industry Agglomeration Heat Map



Figure 18: Textile Sector Agglomeration Heat Map

Rockingham County has more than 20 times the national average concentration of jobs in the Textiles sector, while Alamance and Gaston Counties each have more than 10 times the US average. Textiles Factors of Production (Inputs)

Factors of Production

More than 170 intermediate goods and services are used as factors of production for the textiles sector in North Carolina.¹⁸ Approximately \$2.8 billion of these inputs are sourced from industries within the state and \$5.2 billion are sourced from those outside of NC. This equates to 32.7 percent of the textiles sector's factors of production being sourced locally.¹⁹ The top 10 inputs used within the sector's supply chain are shown in Figure 19. The share sourced instate is shown in **orange** and the share sourced out-of-state is shown in **gray**. With out-of-state inputs grossing \$2.3 billion for artificial synthetic fibers and filaments, North Carolina may stand to benefit by bringing more businesses that produce these inputs into the state. In addition to attracting new producers, transportation investments could help improve supply chain efficiency while lowering production costs. The primary modes of transportation that support the textiles sector can be found on page 76.



Figure 19: Top Ten Factors of Production for the Textiles Sector

Source: ITRE IMPLAN Analysis.

¹⁸ Analysis of IMPLAN's Commodity Industry Demand within North Carolina.
¹⁹ Ibid.

HOUSEHOLD GOODS & FURNITURE

The household goods & furniture sector has deep roots in North Carolina. Two globally renowned centers for the furniture industry are Hickory and High Point. North Carolina has remained the epicenter of the market in the U.S. Meanwhile, targeting niche markets and integrating technology into products and processes has helped the sector remain relevant.

Although North Carolina continues to be a national leader within the sector, low-cost imports present challenges. Domestic producers directly compete with lower production costs overseas, enabling foreign producers to capture a large portion of domestic demand (Zambrano, 2023). Despite these pressures, innovation and craftsmanship have helped the sector remain resilient in North Carolina. North Carolina is widely known as the "Furniture Capital of the World" and is home to more than 800 furniture manufacturers.

Household Goods & Furniture Sector in North Carolina

North Carolina is a national leader in the sector with the largest furniture manufacturing workforce in the U.S. at an estimated 35,000 employees (Furniture. NC Commerce). Widely known as "the Furniture Capital of the World," North Carolina leads the nation in furniture manufacturing jobs (EDPNC, 2024). With its pull in furniture and household goods, North Carolina attracts industry leaders, international buyers, artists, and other interested individuals to High Point Market, a world-renowned trade show and furnishings market. The market attracts more than 75,000 attendees annually and generates an estimated \$140 million in revenue for the city from accommodations, food, and transportation alone (HPMKT, 2024; Keller, 2019). High Point is also home to many well-known manufacturers such as Ashley Furniture (Furniture Industry in North Carolina: EDPNC, 2023). Looking across the state, there are more than 800 furniture manufacturers who call North Carolina home (EDPNC, 2024).

Sector Composition

For the purposes of this analysis, the household goods & furniture sector has been defined to include the following industries and their associated IMPLAN codes: Small electrical appliance manufacturing (324); Household cooking appliance manufacturing (325); Other major household appliance manufacturing (328); Pottery, ceramics, and plumbing fixture manufacturing (197); Plumbing fixture fitting and trim manufacturing (253); Wood kitchen cabinet and countertop manufacturing (365); Upholstered household furniture manufacturing (366); Non-upholstered wood household furniture manufacturing (367); Other household non-upholstered furniture manufacturing (368); Institutional furniture manufacturing (369); Wood office furniture manufacturing (370); Office furniture, except wood, manufacturing (372); Showcase, partition, shelving, and locker manufacturing (373); Mattress manufacturing (374); Blind and shade manufacturing (375).



Total Output



Total Labor Income

74,500 Total Employment



Total Value Added

Industry Agglomeration Heat Map



Figure 20: Household Goods & Furniture Sector Agglomeration Heat Map

Alexander County has more than 80 times the national average concentration of jobs in the sector, while both Catawba and Randolph Counties each have more than 25 times and Burke and Caldwell Counties each have more than 10 times the US average.

Factors of Production

Nearly 240 intermediate goods and services are used as factors of production for the household goods & furniture sector in North Carolina.²⁰ Approximately \$2.8 billion of these inputs are sourced from industries within the state and \$3.0 billion are sourced from those outside of NC. This equates to 48.5 percent of the household goods & furniture sector's factors of production being sourced locally.²¹ The top 10 inputs used within the sector's supply chain are shown in Figure 21. The share sourced in-state is shown in **green** and the share sourced out-of-state is shown in **gray**. With out-of-state inputs grossing \$0.2 billion for urethane and other foam products (except polystryrene), \$0.2 billion for iron and steel ferroralloy products, and more than \$0.15 billion for rolled, drawn, extruded, and allowed copper, North Carolina may stand to benefit by bringing more businesses that produce these inputs into the state. In addition to attracting new producers, transportation investments could help improve supply chain efficiency while lowering production costs. The primary modes of transportation that support the household goods and furniture sector can be found on page 76.



Figure 21: Top Ten Factors of Production for the Household Goods & Furniture Sector

Source: ITRE IMPLAN Analysis.

Household Goods & Furniture Factors of Production (Inputs)

²⁰ Analysis of IMPLAN's Commodity Industry Demand within North Carolina.
²¹ Ibid.



The building materials sector is vital in the expansion of communities and infrastructure. Materials produced in this sector include concrete, metal, wood, clay, and brick (U.S. Bureau of Labor Statistics, 2024). Each material has different applications and costs that impact their usability for different projects. Strong construction growth means

demand for the building materials sector. In 2022, a record 1.65 million residential units were built, the highest number of new builds since 1969 in the U.S. (Henderson, 2023). The Building Materials sector not only serves the residential, non-residential, and commercial construction sector but the federal and state government as well. New infrastructure projects from the federal and state government boost this sector with projects across North Carolina. To maintain a competitive edge the Building Materials sector needs to continue to be resilient and lean into sustainability practices (*Building your business in the building materials industry*, 2018).

The building materials sector is vital in the expansion of communities and roadways. Materials produced in this sector include concrete, metal, wood, clay, and brick. Natural resources found in North Carolina such as wood, clay, and stone opened great opportunities for this sector.

The Building Materials Sector in North Carolina

Natural resources found in North Carolina such as wood, clay, and stone opened great opportunities for the Building Materials sector. Wilkes County is an example of ample natural resources that have created local building materials companies with rich knowledge of building materials and the industry (Industries: Wilkes EDC). The county is home to the largest home improvement retailer in the world. The Lowe's company began in 1921 as the North Wilkesboro Hardware store (Our History, 2024). Since that time, it has grown into a multibillion-dollar industry with headquarters in Mooresville, North Carolina (2022 Annual Report - Lowe's corporate, 2023). State investment in roads and bridges has positively impacted the sector, establishing a need for aggregates, cement, and other building materials across the state (Devooght, 2024). Lowes' has also made significant investments in green chemicals and products that encourage domestic production within the state.

Sector Composition

For the purposes of this analysis, the building materials sector has been defined to include the following industries and their associated IMPLAN codes: Asphalt paving mixture and block manufacturing (155); Asphalt shingle and coating materials manufacturing (156); Brick, tile, and other structural clay product manufacturing (198); Ready-mix concrete manufacturing (204); Concrete block and brick manufacturing (205); Concrete pipe manufacturing (206); Other concrete product manufacturing (207); Gypsum product manufacturing (209); Abrasive product manufacturing (210); Cut stone and stone product manufacturing (211); Ground or treated mineral and earth manufacturing (212); Mineral wool manufacturing (213); Miscellaneous nonmetallic mineral products manufacturing (214); Air purification and ventilation equipment manufacturing (273); Heating equipment (except warm air furnaces) manufacturing (274); Air conditioning, refrigeration, and warm air heating equipment manufacturing (273).



Total Output



Total Labor Income



Total Employment



Total Value Added

Industry Agglomeration Heat Map



Figure 22: Building Materials Sector Agglomeration Heat Map

Factors of Production

An estimated 270 intermediate goods and services are used as factors of production for the building materials sector in North Carolina.²² Approximately \$1.7 billion of these inputs are sourced from industries within the state and \$2.0 billion are sourced from those outside of NC. This equates to 45.5 percent of the building materials sector's factors of production being sourced locally.²³ The top 10 inputs used within the sector's supply chain are shown in Figure 23. The share sourced in-state is shown in **blue** and the share sourced out-of-state is shown in **gray**. With out-of-state inputs grossing more than \$0.25 billion for cement, \$0.17 billion for refined petroleum products, and nearly \$0.15 billion for sand and gravel, North Carolina may stand to benefit by bringing more businesses that produce these inputs into the state. In addition to attracting new producers, transportation investments could help improve supply chain efficiency while lowering production costs. The primary modes of transportation that support the building materials sector can be found on page 76.



Figure 23: Top Ten Factors of Production for the Building Materials Sector

Source: ITRE IMPLAN Analysis.

²² Analysis of IMPLAN's Commodity Industry Demand within North Carolina.
 ²³ Ibid.

PAPER PRODUCTS

The paper products sector is largely impacted by the ebb and flow of consumer demand and industrial output (O'Malley, 2023). A vast number of industries rely on the sector for product packaging. Paper products manufacturers convert paper into wrapping paper, playing cards, egg cartons, paper plates, and many other products (Berdousis, 2024). The paper manufacturing industry is responsible for breaking down trees into pulp and then converting them into paper (U.S. Bureau of Labor Statistics, 2024). The Southeast is the hub of the Paper Products sector in the U.S. Major companies are strategically positioned in this part of the country to be located near the raw materials to keep transportation costs low (O'Malley, 2023).

Environmental regulation and environmental awareness have greatly impacted the sector. Businesses that can effectively market sustainable products are anticipated to outperform their competitors.

Paper Products Sector in North Carolina

Paper products have played a significant role in North Carolina's history. The first paper mill in the state was opened in 1777 in Orange County (Stevenson, 2006). Today, North Carolina produces 40 percent of nonwoven products in the U.S. (Pulp and Paper Technical Services, 2024). North Carolina's colleges and universities help advance the sector. For example, North Carolina State University's Biomaterials department, helps spur innovation in the sector through its research and development, product testing, and technical services (Pulp and Paper Technical Services, 2024).

Demand for paper has been on the decline over the last decade and dropped significantly during the pandemic (Berdousis, 2024). Profit decreased significantly in 2020 but as pandemic-related restrictions eased in 2021, the sector was able to increase production again (Berdousis, 2024). The sector has also been impacted by the push towards eco-friendly products. Businesses within the sector that can effectively market these sustainable products are anticipated to out-perform their competitors (Berdousis, 2024). Additionally, environmental regulation has caused pressure on this sector by limiting the supply of materials and creating an increase in operating costs associated with regulatory compliance (Berdousis, 2024).

Sector Composition

For the purposes of this analysis, the paper products sector has been defined to include the following industries and their associated IMPLAN codes: Paperboard container manufacturing (147); Paper bag and coated and treated paper manufacturing (148); Stationery product manufacturing (149); Sanitary paper product manufacturing (150); All other converted paper product manufacturing (151).



Total Output



Total Labor Income

Industry Agglomeration Heat Map

36,100 Total Employment

\$4.2 billion

Total Value Added



Burke, Rowan and Davidson Counties all have more than three times the national average concentration of jobs in the Paper Products sector.

Factors of Production

More than 160 intermediate goods and services are used as factors of production for the paper products sector in North Carolina.²⁴ Approximately \$1.8 billion of these inputs are sourced from industries within the state and \$3.1 billion are sourced from those outside of NC. This equates to 37.0 percent of the paper products sector's factors of production being sourced locally.²⁵ The top 10 inputs used within the sector's supply chain are shown in Figure 25. The share sourced in-state is shown in **green** and the share sourced out-of-state is shown in **grey**. With out-of-state inputs grossing \$0.8 billion for paperboard from pulp and \$0.7 billion for paper from pulp, North Carolina may stand to benefit by bringing more businesses that produce these inputs into the state. In addition to attracting new producers, transportation investments could help improve supply chain efficiency while lowering production costs. The primary modes of transportation that support the paper products sector can be found on page 76.



Figure 25: Top Ten Factors of Production for the Paper Products Sector

Source: ITRE IMPLAN Analysis.

²⁴ Analysis of IMPLAN's Commodity Industry Demand within North Carolina.
²⁵ Ibid.

WOOD PRODUCTS

The wood products sector is responsible for manufacturing lumber, wood containers, wood flooring, manufactured homes, prefabricated wood buildings, and more. The process of wood product manufacturing includes sawing, planing, shaping, laminating, and assembling wood products (U.S. Bureau of Labor Statistics, 2024). Over the last several years the expansion of construction activity and consumer spending led to unprecedented growth of this sector. The COVID-19 pandemic led to higher demand for wood flooring and fencing products for use in residential projects, as people worked from home and sheltered in place (Wood Product Manufacturing in the US, 2024). However, the wood products sector experienced a dip in revenue in later 2022.

More than one quarter of the wood products in the U.S come from the Southeast, and North Carolina is a dominant leader in the region. Over 60% of North Carolina's forests are commercial forest land producing vast amounts of timber (North Carolina Forest Service, 2017).

Wood Products Sector in North Carolina

The COVID-19 pandemic led to a substantial increase in demand for wood products. However, the pandemic also led to challenges for the sector, experienced through higher transportation costs and difficulties maintaining ongoing operations (Wood Product Manufacturing in the US, 2024). Although many professional remodeling projects came to a halt when the pandemic hit, DIY renovations surged (Baker, 2021). Additionally, the sudden flexibility of remote work increased demand for larger homes and yards in lower-cost and less dense areas of the country (Baker, 2021). These circumstances led to an initial decrease in the wood products sector in 2020 and then a quick turnaround in profit and production. North Carolina's forest sector demonstrated this trend growing by more than \$2.5 billion from 2020 to 2021 (Parajuli, & Bardon, 2023). Today, more than one quarter of the wood products in the US, 2024).

North Carolina's forests account for a total of 800 thousand cubic feet (USDA Forest Service, 2021). Over 60% of North Carolina's forests are commercial forest land producing vast amounts of timber (North Carolina Forest Service, 2017). Harvested timber is then processed in mills and distributed to manufacturing plants to be processed and used to create wood products.

Sector Composition

For the purposes of this analysis, the wood products sector has been defined to include the following industries and their associated IMPLAN codes: Sawmills (132); Wood preservation (133); Veneer and plywood manufacturing (134); Engineered wood member and truss manufacturing (135); Reconstituted wood product manufacturing (136); Wood windows and door manufacturing (137); Cut stock, resawing lumber, and planing (138); Other millwork, including flooring (139); Wood container and pallet manufacturing (140); Manufactured home (mobile home) manufacturing (141); Prefabricated wood building manufacturing (142); All other miscellaneous wood product manufacturing (143).



Total Output



Total Labor Income

Industry Agglomeration Heat Map

54,700 Total Employment

\$6.7 billion

Total Value Added



Figure 26: Wood Products Sector Agglomeration Heat Map

Alexander County has more than five times the national average concentration of jobs in the Wood Products sector, while Caldwell, Montgomery and Rutherford Counties each have more than two-and-half-times the US average.

Factors of Production

Nearly 220 intermediate goods and services are used as factors of production for the wood products sector in North Carolina.²⁶ Approximately \$2.4 billion of these inputs are sourced from industries within the state and \$1.8 billion are sourced from those outside of NC. This equates to 57.3 percent of the wood products sector's factors of production being sourced locally.²⁷ The top 10 inputs used within the sector's supply chain are shown in Figure 27. The share sourced in-state is shown in green and the share sourced out-of-state is shown in gray. With out-of-state inputs grossing \$0.4 billion for dimension lumber and \$0.15 billion plastics materials and resins, North Carolina may stand to benefit by bringing more businesses that produce these inputs into the state. In addition to attracting new producers, transportation investments could help improve supply chain efficiency while lowering production costs. The primary modes of transportation that support the wood products sector can be found on page 76.



Figure 27: Top Ten Factors of Production for the Wood Products Sector

Source: ITRE IMPLAN Analysis.

²⁶ Analysis of IMPLAN's Commodity Industry Demand within North Carolina. 27 Ibid.

MANUFACTURING NOT ELSEWHERE SPECIFIED (N.E.S.)

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Manufacturing is healthy in North Carolina with the state containing more than 10,500 manufacturing companies and nearly one-fifth of the state's total output (*MNI*, 2023; National Association of Manufacturers, 2021). Many of the manufacturing activities occurring within are supported by supply chains discussed within other sectors in this report. Manufacturing not elsewhere specified (N.E.S.) underpins a broad and diverse range of industries without a definitive link to one of the major supply chain sectors. This "catch-all" sector includes products ranging from sporting goods to fiber optic cable, from glassware to musical instruments, and from small arms and explosives to buttons and needles. Each faces unique challenges in the broader economy. Clear connections to other industries upstream and downstream make the firms of this sector invaluable to the supply chain of both the domestic and state economy.

The industries that make up the manufacturing N.E.S. sector in North Carolina represent a wide range of products from sporting goods to fiber optic cable, from glassware to musical instruments, and from small arms and explosives to buttons and needles.

Manufacturing N.E.S. Sector in North Carolina

The manufacturing N.E.S. sector consists of a collection of industries that produce manufactured goods. Though the sector's composition is varied, there are common trends confronting each of the manufacturing industries within the sector. Manufacturing production in the state has rebounded strongly from the pandemic recession, which pushed output well below pre-COVID-19 levels (Walden, 2023). However, compared to 2019, production has decreased overall, stemming from fears of recession and monetary policies aimed to combat inflation (Walden, 2023).

Beyond recessionary pressures, there are a number of factors that can influence manufacturing. Economic activity, exchange rates and commodity prices can all affect demand and profitability of goods produced in the manufacturing sector, and fluctuations in these factors can contribute to volatility in the sector (Jozkowski, 2023). Additionally, manufacturing businesses are subject to regulations from various federal agencies, including the Environmental Protection Agency, Food and Drug Administration, Occupational Safety and Health Administration, Consumer Product Safety Commission, and other agencies involved in trade regulation. Changes in regulation can impact the sector's ability to produce relative to specified requirements (Jozkowski, 2023).

Manufacturers in North Carolina and throughout the U.S. have combated increasing wage demands with automation. Many companies have supplemented skilled design and R&D workforces with automated workforces and AI to improve efficiency (*Team Stage*, 2023). This has led to a nationwide increase in profit-margins of approximately 9.9 percent in manufacturing (Jozkowski, 2023).

Sector Composition

For the purposes of this analysis, the manufacturing not elsewhere specified (N.E.S.) sector has been defined to include the following industries and their associated IMPLAN codes: Explosives manufacturing (182); Other rubber product manufacturing (196); Flat glass manufacturing (199); Other pressed and blown glass and glassware manufacturing (200); Glass container manufacturing (201); Glass product manufacturing made of purchased glass (202); Small arms ammunition manufacturing (255); Ammunition, except for small arms, manufacturing (256); Small arms, ordnance, and accessories manufacturing (257); Photographic and photocopying equipment manufacturing (271); Other commercial service industry machinery manufacturing (272); Scales, balances, and miscellaneous general purpose machinery manufacturing (297); Fiber optic cable manufacturing (335); Carbon and graphite product manufacturing (338); All other miscellaneous electrical equipment and component manufacturing (339); Jewelry and silverware manufacturing (381); Sporting and athletic goods manufacturing (382); Doll, toy, and game manufacturing (383); Office supplies (except paper) manufacturing (384); Sign manufacturing (385); Gasket, packing, and sealing device manufacturing (386); Musical instrument manufacturing (387); Fasteners, buttons, needles, and pins manufacturing (388); Broom, brush, and mop manufacturing (389); Burial casket manufacturing (390); All other miscellaneous manufacturing (381).



Total Output



Total Labor Income

58,800

Total Employment



Total Value Added

Industry Agglomeration Heat Map





Factors of Production

An estimated 285 intermediate goods and services are used as factors of production for the manufacturing N.E.S. sector in North Carolina.²⁸ Approximately \$2.4 billion of these inputs are sourced from industries within the state and \$3.1 billion are sourced from those outside of NC. This equates to 43.3 percent of the manufacturing N.E.S. sector's factors of production being sourced locally.²⁹ The top 10 inputs used within the sector's supply chain are shown in Figure 29. The share sourced in-state is shown in **blue** and the share sourced out-of-state is shown in **gray**. With out-of-state inputs grossing \$0.4 billion for rolled, drawn, extruded, and alloyed copper, North Carolina may stand to benefit by bringing more businesses that produce these inputs into the state. In addition to attracting new producers, transportation investments could help improve supply chain efficiency while lowering production costs. The primary modes of transportation that support the manufacturing N.E.S. sector can be found on page 76.



Figure 29: Top Ten Factors of Production for the Manufacturing N.E.S. Sector

Source: ITRE IMPLAN Analysis.

²⁸ Analysis of IMPLAN's Commodity Industry Demand within North Carolina.
²⁹ Ibid.

EMERGING INDUSTRIES & GROWING SECTORS

Offshore Wind

Government incentives, policies, and grant funding have accelerated the growth of wind power across the United States. As of February 2024, 36 states have established renewable portfolio standards, including North Carolina. Renewable portfolio standards are regulatory mandates that require utilities to generate a specific portion of their energy from renewable sources (Bari, 2024). These mandates create a favorable climate for the offshore wind industry with new companies entering the industry to advance the goals detailed within the renewable portfolio standards of each participating state. As of February 2024, 36 states have established renewable portfolio standards, including North Carolina. Renewable portfolio standards are regulatory mandates that require utilities to generate a specific portion of their energy from renewable sources (Bari, 2024).

In addition to renewable portfolio standards, the recently passed Bipartisan Infrastructure Law (BIL) specifically targets the offshore wind industry. BIL allocated \$27.0 million to fund 15 projects supporting offshore and land-based wind energy research and development and another \$45.0 million for 14 projects that will accelerate and reduce the cost of wind technology manufacturing (Bari, 2024).

Despite heavy regulation within the industry, offshore wind is anticipated to sustain favorable growth in the near term. By 2030, approximately 77,000 jobs are projected to be supported by offshore wind across the United States (WETO, N.D.1) with offshore wind fulfilling approximately 30 gigawatts or 2.5 percent of U.S. domestic energy capacity (Shields et al., 2023; Statista, 2024). By 2035, that number is projected to reach 85,000 residents on the Atlantic Coast alone (NC Department of Commerce, 2023).

Since February 2022, the North Carolina Taskforce for Offshore Wind Economic Resource Strategies (NC TOWERS) has met quarterly to identify economic and workforce opportunities and challenges presented by the offshore wind industry and to develop policy recommendations that will advance offshore wind projects along North Carolina's coastline (NC Department of Commerce, 2023). The primary recommendation within the committee's 2022-2023 annual report seeks strategic decision-making with immediacy. The recommendation states:

The next 10 years of offshore wind project development on the U.S. East Coast has the potential to attract to North Carolina up to \$100 billion in offshore wind supply chain investments and tens of thousands of good-paying, family-sustaining wage jobs. However, without legislative, regulatory, or clear market signals, the window of opportunity for our state to capture these investments and jobs for North Carolinians diminishes every day.

As North Carolina continues to develop the offshore wind industry, supply chain considerations should remain a key focus. Offshore wind projects require a complex and well-coordinated supply chain to ensure their successful design, construction, installation, and maintenance. This includes meaningful collaboration among turbine manufacturers, wind tower foundation suppliers, cable manufacturers, component suppliers, installation vessels and equipment, port operators for logistics and assembly, government agencies for certification and regulatory approvals, operations and maintenance service providers, among a vast array of companies required to support indirect and induced expenditures. The state currently has more than 120 companies contributing to the emerging Offshore Wind industry and more than 30 additional businesses are considering entry (North Carolina Department of Commerce, 2021).

Semiconductors

Semiconductors have applications in nearly every industry. Their tremendous impact on computing, smart technology, artificial intelligence, and other applications makes these chips an invaluable commodity for both intermediate and final products. Though varied in application, their primary use includes electronic devices such as smartphones, tablets, and PCs (Alsop, 2024). Since the start of 2021, there have been substantial investments made in the semiconductors sector across the United States with nearly \$80 billion of expenditures forecast through the end of 2025 (The White House, 2022).

To remain globally competitive, several domestic incentives have been recently established to promote the semiconductor industry. In July 2022, the US Innovation and Competition Act (USICA) was passed to support U.S. semiconductor manufacturing, research and development, and supply chain security with a key offshoot of the bill, the CHIPS Act, appropriating \$52 billion to spur the domestic production of semiconductors.

Wolfspeed, in Chatham County, North Carolina submitted one of nearly 400 statements of interest for CHIPS grant funding by companies looking to build semiconductor projects across 37 states (Ohnesorge, 2023). The firm was In July 2022, the US Innovation and Competition Act (USICA) was passed to support U.S. semiconductor manufacturing, research and development, and supply chain security with a key offshoot of the bill, the CHIPS Act, appropriating \$52 billion to spur the domestic production of semiconductors.

the recipient of approximately \$1 billion in a joint-incentive package from state, county, and local governments within North Carolina (Loder, 2023). Wolfspeed plans to construct the world's largest Silicon Carbide Materials Facility by 2030 (Walker, 2022). When completed, the \$5 billion manufacturing plant will support 1,800 jobs (Ohnesorge, 2023) and produce silicon carbide wafers, which have emerged as a favored component for renewable energy products (Jones, 2023).

Across the state, western North Carolina is home to the purest natural quartz found on planet earth, which happens to be an essential input for computer chips, fiber-optic cables, and other high-tech hardware (Beiser, 2018). As the digital age continues to evolve, this fine-grained natural quartz is likely to increase in importance. Currently, as a key economic anchor to the western region, this high-purity sand supports a billion-dollar industry (Beiser, 2018).

North Carolina is home to several notable semiconductor businesses, ranging from manufacturing to research and development. With more than 110 semiconductor and other electronic component manufacturing establishments employing more than 7,600 individuals, the industry produces approximately \$1.2 billion annually in exported products (NC Department of Commerce, N.D.).

Aerospace Manufacturing

Across the United States, air travel has strongly rebounded following the COVID-19 pandemic. High passenger travel demand has led to increased production for aircraft manufacturers, while newer, fuel-efficient models have helped mitigate volatile fuel prices and keep costs down (Jozkowski, 2023). Within the US, highly advanced manufacturers have increased exports to countries seeking to expand their aviation capabilities (Jozkowski, 2023).

North Carolina has opened its doors to more than 200 aerospace companies and more than 400 companies that are integral to the aerospace supply chain (NCDoA, 2023).

North Carolina continues to make gains as a national leader in aerospace manufacturing. According to a 2023 PwC industry report, North Carolina ranks third in the nation in aerospace manufacturing attractiveness. This is an improvement from the state's 2019 ranking (the year PwC began its annual ranking system), up from the seventh spot (PwC, 2019 & 2023). North Carolina's aerospace manufacturing capabilities are supported by a highly skilled technical workforce, as well as a steady pipeline of military aviation talent entering the civilian workforce (NCDOC, N.D.). North Carolina features major military bases, such as Camp Lejeune, Seymour Johnson, and Fort Liberty, which is one of the largest military installations in the world.

Altogether, the state's aerospace manufacturing sector employs more than 5,600 workers (NCDoA, 2023). North Carolina has opened its doors to more than 200 aerospace companies and more than 400 companies that are integral to the aerospace supply chain (NCDoA, 2023). Among the 200-plus aerospace and aviation companies in North Carolina is Honda Aircraft Company, which manufactures a highly technically advanced ultralight jet made in Greensboro. The Honda Aircraft company established its Greensboro headquarters in 2006 and operates R&D, manufacturing, and customer service facilities that together employ 1,500 associates in the region (Carolina Core, N.D.). Additionally, the engines produced by the Honda Aircraft Company are manufactured by GE Honda Aero Engines, a joint-venture in nearby Burlington.

In the near future, Greensboro, North Carolina will also be home to the Boom Superfactory, which will begin production on the world's fastest and most sustainable aircraft. The Overture aircraft will be capable of flying on 100 percent sustainable aviation fuel (SAF) at twice the speed of today's fastest passenger jets (Boom, 2022). Boom will bring more than 1,750 jobs to North Carolina by 2030, with plans to expand to a total of more than 2,400 jobs by 2032 (Boom, 2022). The Overture Superfactory is estimated to grow the state's economy by at least \$32.3 billion over 20 years (Boom, 2022).

Other major aerospace operations in Greensboro include HAECO Americas, which has 600,000 square feet of facilities including a new hangar that is one of the largest in the HAECO family, and Textron Aviation, operating one of only 15 service centers for Cessna business jets worldwide (Carolina Core, N.D.).

North Carolina is also home to Collins Aerospace, which has its interior unit based in Winston Salem. Collins produces cutting edge, compact designs for premier passenger seating, including seats that fold into beds and ultralight doors that create enclosed cabin spaces. In Kinston, North Carolina, Spirit AeroSystems manufactures central fuselage components within its Composite Fabrication Manufacturing Facility. Spirit is one of the world's largest manufacturers of aerostructures for commercial airplanes, defense platforms, and business/regional jets (Spirit AeroSystems, N.D.).

Transportation-Related Industries

Transportation-related industries have recovered far faster than expected from the COVID-19 pandemic. E-commerce continues to generate demand for transportation and warehousing, while international supply chain disruptions have caused businesses to onshore pieces of their supply chain, creating a greater reliance on domestic transportation and warehousing industries (ITF, 2023; Burns, 2024). In North Carolina, job growth in transportation and warehousing is up 20 percent from pre-pandemic levels (this demonstrates a change from the pre-COVID highpoint to today; Walden, 2024).

In North Carolina, job growth in transportation and warehousing is up 20 percent from pre-pandemic levels (this demonstrates a change from the pre-COVID highpoint to today; Walden, 2024).

North Carolina has the 10th largest automotive sector in the nation (NC Department of Commerce, n.d) and it continues to attract key investments that support the state's economy. In October of 2023, Toyota announced an investment of nearly \$8 billion that will add approximately 3,000 jobs in Liberty, North Carolina (Holland, 2023). This investment solidifies North Carolina's position as the company's primary location for lithium-ion battery production in North America. Toyota's campus will total more than 160 acres (Holland, 2023) and is anticipated to begin production in 2025 (Toyota, 2022).

Formidable investments have also been made by Vinfast and Siemens to manufacture EV batteries, automobiles, and passenger rail rolling stock. More information about these investments can be found in the transportation, distribution, & logistics sector section of the report.

Toyota, Vinfast, and Siemens are only a sample of the numerous transportation related industries that do business within the state. North Carolina is ranked 11th in the nation for concentration of transportation related industries with 2.6 percent of the nation's total establishments (Burns, 2024). In addition to the economic contribution of the Transportation, Distribution, and Logistics Sector discussed previously within this report, other transportation related industries industries support an additional \$177.8 billion in economic output and more than 965,700 jobs within the state.
THE IMPORTANCE OF NORTH CAROLINA'S TRANSPORTATION NETWORK

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NORTH CAROLINA SUPPLY CHAIN STUDY

North Carolina's transportation network is the cornerstone of the state's economy, enabling interstate commerce through the movement of goods and people. Without transportation, the state's 10 million residents would not have access to employment, recreation, health services, and a variety of other needs and quality of life amenities served by mobility. Moreover, North Carolina's businesses would lack critical access to the local, domestic, and international markets that ensure their financial stability and growth.

Highways

The North Carolina Department of Transportation maintains approximately 80,286 miles of roadway (HNTB, 2023). Highway transportation stands as the dominant method for moving goods in North Carolina, making up almost 83 percent of the total freight tonnage handled across all transportation modes, including inbound, outbound, internal, and transit shipments within the state (HNTB, 2023). The road network plays a vital role in the state's comprehensive freight system, with the majority of goods relying on highways for at least part of their journey.

North Carolina's highway network consists of over 80,000 lane miles and is one of the largest state-maintained highway systems in the nation. It plays a crucial role in the movement of freight, transporting over 605 million tons of cargo worth \$794 billion in 2017 (HNTB, 2023). The state's highways enable the movement of people and freight within North Carolina and across to neighboring states. As North Carolina continues to grow, its highway infrastructure will play an important role in sustaining the state's economy.

Railroads

North Carolina's railroads span approximately 3,200 miles, serving 86 of its 100 counties. These railways are significant contributors to the state's economy, supporting two Class I railroads, Norfolk Southern Railway (NS) and CSX Transportation (CSX) and 24 short-line railroads. North Carolina's railroads transport a variety of commodities, supporting key industries within the state's supply chain. Additionally, the rail network can help alleviate highway congestion, promote sustainable transportation, and offer a cost-effective solution for moving large quantities of goods over long distances.

Airports

Air cargo supports virtually every industry sector, from agriculture to automotive. It is ideally suited for high-value, time-sensitive, and perishable items and pays average wages of \$51,324 (NCDoA, 2023). North Carolina's system of 10 commercial service and 62 general aviation airports transported nearly 60 million business and leisure travelers in 2021 and moved 1.3 million tons of high-value, time-sensitive cargo, from medical supplies to advanced manufacturing components (NCDoA, 2023). Driven by a major increase in durable goods and online purchases by home-based consumers, North Carolina's air cargo tonnage increased by 22 percent from 2019 (NCDoA 2023).

Many of North Carolina's industries are part of global supply chains that rely on just-in-time manufacturing. Airports provide essential transportation for these industries, transporting high-value, time-sensitive goods. Within North Carolina, three airports are responsible for the vast majority of air cargo activity. Altogether, Charlotte Douglas, Piedmont Triad, and Raleigh-Durham international airports handle 99 percent of the state's air cargo activity (HNTB, 2023). These airports provide connectivity to domestic and international markets and integrate with North Carolina's surface transportation system.

Seaports

Ports and waterways in North Carolina are crucial for the transportation of goods and serve as significant catalysts for the state's economic growth. Unlocking access to maritime trade lanes, North Carolina's ports enable exporters to reach global markets. Additionally, North Carolina's ports allow imports to reach businesses and consumers, supporting supply chain production and commerce (NCSPA, 2021). In 2021, North Carolina's ports contributed to more than 88,200 jobs and \$16.1 billion in economic output (NCSPA, 2021).

Ferry

The North Carolina Department of Transportation's Ferry Division provides transportation services across the state's coastal waterways. The state's ferry services provide visitors access to tourism destinations and enable residents to reach work, school, medical, shopping, recreation, and other key locations. The Ferry Division offers both vehicle and passenger ferry services. Some routes are critical for daily commutes, while others are popular with tourists visiting North Carolina's coastal regions. For example, the Hatteras-Ocracoke Ferry transports residents and workers who commute between the island and mainland. This connection is particularly important for North Carolinians working in tourism and service industries. Meanwhile, the Cherry Branch-Minnesott Beach Ferry and the Aurora-Bayview ferry provide access to major employers including the Marin Corps Air Station at Cherry point, the PCS Phosphate / Nutrien plant in Aurora, among other regional employers. North Carolina's ferry services not only provide meaningful transportation for daily commuters, but also serve as key supply routes for transporting goods. For example, Ocracoke business owners and residents depend on North Carolina's ferry services to transport goods to their storefronts and homes.

The NCDOT Ferry Division operates 21 vessels on seven routes along the eastern coast of North Carolina, transporting over 800,000 vehicles, or approximately two million passengers, a year (ITRE, 2020). This makes the NCDOT-operated ferry system the second-largest state-run ferry system in the United States (ITRE, 2020).

The Ferry System is an essential facilitator of economic impact in North Carolina's coastal communities. Altogether, the North Carolina Ferry System supports a total of 5,860 jobs, including 3,295 direct, 1,385 indirect, and 1,180 induced jobs (ITRE, 2020). Furthermore, the NC Ferry System supports a total of \$217.3 million in labor income and \$735.2 million in total economic output (ITRE, 2020).

The Importance of a Multimodal Transportation Network

A multimodal transportation network is vital for supporting North Carolina's supply chain. By integrating different transportation modes—such as road, rail, air, and sea—this network ensures seamless connectivity and optimized freight movement throughout the state and across its borders. Economically, a robust multimodal transportation network reduces transportation costs and transit times for businesses, boosting their competitiveness in the global market. It also supports the state's key industries, by facilitating the swift and efficient movement of raw materials and finished goods. This, in turn, attracts investments, fosters job creation, and stimulates economic growth.

North Carolina's supply chain relies on the movement of key factors of production via truck, rail, air, water, and pipeline transportation. Through an evaluation of network linkages within IMPLAN, the extent to which a specific industry relies on a mode of transportation for the transportation of key inputs can be assessed. Each of the 14 supply chain sectors evaluated in this study and the transportation modes that are likely to transport their key factors of production are shown in Figure 30. Industrial Machinery & Transportation Equipment has the largest reliance on North Carolina's multimodal transportation network, supporting nearly \$42.2 billion in economic output annually. Of this total output, approximately \$33.8 billion supports truck transportation (82 percent), \$5.2 billion supports air transportation (13 percent), \$1.8 billion supports rail transportation (4 percent), \$0.16 billion supports water transportation (less than 1 percent), and \$0.25 billion supports pipeline transportation (1 percent).

Each supply chain sector depends on transportation and specific modes within North Carolina's multimodal transportation network differently. Truck transportation is often essential for the effective and flexible movement of commodities, providing accessibility, speed, and adaptability within the supply chain. For bulk commodities such as coal, grain, minerals, and chemicals, among others, rail can be an ideal mode of transportation, allowing for the movement of large quantities over long distances at a lower cost compared to road transport. Meanwhile, air cargo transport is invaluable for moving high-cost goods, offering speed, reliability, and security. Additionally, water transport can be an essential mode for transporting heavy items. It is particularly well-suited for transporting bulky and heavy commodities such as machinery, vehicles, raw materials, and large industrial components. Meanwhile, pipelines can be vital for transporting large volumes of liquids and gases over long distances.



Figure 30: Transportation Industry Output Facilitated from Sector Production (Billions of 2023 USD)

	Wood Products	Building Materials	Paper Products	Communications & Computer	Household Goods & Furniture	Manufacturing Not Elsewhere Specified (NES)	Textiles	Electronics	Metal Products	Pharmaceuticals	Chemical Manufacturing	Transportation Distribution & Logistics	Tobacco & Foodstuffs	Industrial Machinery & Transportation
Air Transportation	\$0.49	\$0.59	\$0.39	\$0.63	\$0.69	\$0.81	\$0.67	\$1.48	\$1.21	\$2.11	\$2.32	\$4.25	\$2.08	\$5.16
Rail Transportation	\$0.64	\$0.79	\$0.92	\$0.18	\$0.45	\$1.08	\$0.59	\$0.43	\$1.02	\$1.26	\$4.50	\$2.88	\$2.37	\$1.84
Water Transportation	\$0.01	\$0.05	\$0.01	\$0.02	\$0.02	\$0.08	\$0.07	\$0.07	\$0.06	\$0.04	\$0.34	\$0.05	\$0.23	\$0.16
Pipeline Transportation	\$0.05	\$0.07	\$0.04	\$0.04	\$0.04	\$0.09	\$0.13	\$0.09	\$0.08	\$0.20	\$0.46	\$1.40	\$0.21	\$0.25
Truck Transportation	\$4.95	\$4.94	\$5.17	\$6.58	\$7.33	\$6.56	\$8.59	\$8.53	\$8.93	\$21.59	\$19.97	\$19.20	\$25.93	\$33.77

FINDINGS

Findings

North Carolina's supply chain is a tremendous driver of economic activity. It serves as the cornerstone of the state's economic prosperity, playing a crucial role in the success of North Carolina's industries. Fourteen of the state's most productive supply chain sectors were evaluated in this study and their impacts on the state's economy are shown below.

- The pharmaceutical, biologics, & medical products sector generates \$40.4 billion in economic output, supports 89,700 jobs, facilitates \$8 billion in labor income, and provides \$19.7 billion in value added.
- The **chemical manufacturing** sector generates **\$56.1 billion in economic output**, supports **137,000 jobs**, facilitates \$10.6 billion in labor income, and provides \$20.7 billion in value added.
- The industrial machinery & transportation equipment sector generates \$74.1 billion in economic output, supports 213,000 jobs, facilitates \$16.6 billion in labor income, and provides \$31.3 billion in value added.
- The tobacco & foodstuffs sector generates \$47.5 billion in economic output, supports 105,000 jobs, facilitates \$6.7 billion in labor income, and provides \$24.2 billion in valued added.
- The transportation, distribution, & logistics sector generates \$77.3 billion in economic output, supports 494,500 jobs, facilitates \$26.4 billion in labor income, and provides \$41.2 billion in value added.
- The metal products sector generates \$24.3 billion in economic output, supports 76,700 jobs, facilitates \$5.4 billion in labor income, and provides \$9.2 billion in value added.
- The electronics sector generates \$16 billion in economic output, supports 49,500 jobs, facilitates \$4.3 billion in labor income, and provides \$7.2 billion in value added.
- The communications & computer sector generates \$13 billion in economic output, supports 35,400 jobs, facilitates \$3.8 billion in labor income, and provides \$6.2 billion in value added.
- The textiles sector generates \$17.1 billion in economic output, supports 69,000 jobs, facilitates \$3.9 billion in labor income, and provides \$5.9 billion in value added.
- The household goods & furniture sector generates \$17.8 billion in economic output, supports 74,500 jobs, facilitates \$4.6 billion in labor income, and provides \$7 billion in value added.
- The building materials sector generates \$12.9 billion in economic output, supports 42,200 jobs, facilitates \$3.2 billion in labor income, and provides \$5.7 billion in value added.
- The paper products sector generates \$12.5 billion in economic output, supports 36,100 jobs, facilitates \$2.6 billion in labor income, and provides \$4.2 billion in value added.

- The wood products sector generates \$15.8 billion in economic output, supports 54,700 jobs, facilitates \$3.6 billion in labor income, and provides \$6.7 billion in value added.
- The manufacturing not elsewhere specified sector generates \$16.7 billion in economic output, supports 58,800 jobs, facilitates \$4.3 billion in labor income, and provides \$7 billion in value added.

Conclusions

Economic productivity is often dependent on a diverse web of industries and infrastructure that move products and services to market. In North Carolina, key assets such as the Port of Wilmington, major interstate highways like I-95 and I-40, and significant rail connections provide vital links that support commerce and trade. These are just a few examples within North Carolina's vast transportation system of highways, railroads, airports, seaports, and ferry routes that enable businesses to transport raw materials and finished products efficiently and reliably.

Working in tandem, the state's transportation infrastructure and diverse set of businesses form North Carolina's supply chain. The state's supply chain not only ensures the steady flow of goods and services within the state and beyond but also supports thousands of jobs, attracts significant investment, and enhances North Carolina's competitiveness in the global market. By maintaining and strengthening its supply chain, North Carolina secures its economic stability and fosters sustainable growth for future generations.

Recommendations

As part of this study, the essential factors of production of the industries comprising key sectors within North Carolina's supply chain are analyzed. In-state and out-of-state industry inputs are delineated to demonstrate existing supply chain successes as well as opportunities for **strategic business attraction**. The research team recommends that these analysis findings be shared with economic development agencies to help promote strategic investments that will support high-value business attraction to North Carolina. The research team specifically recommends two steps:

- 1. Reviewing the "Top Ten Factors of Production" for each supply chain sector and identifying the commodities that have the highest value for gross inputs.
- 2. Evaluating the factors of production that are primarily sourced from businesses out-of-state and determining if there are opportunities to bring those businesses in-state.

This study also evaluated the modes of transportation that North Carolina's key supply chain sectors rely on (see Figure 30: Transportation Industry Output Facilitated from Sector Production). The research team recommends reviewing the composition of transportation modes used to support the sector and then determining if **strategic transportation investments** could be made to improve North Carolina's supply chain and overall economic activity.

The research team also recommends **ongoing supply chain research**. Ongoing research is essential for evaluating and ensuring the health of North Carolina's supply chain. Continuous analysis and assessment, through annual or biannual study, allows for the identification of strengths and weaknesses within industries, infrastructure, and other considerations. Ultimately, a commitment to ongoing research fosters innovation and adaptation, ensuring that North Carolina's supply chain remains robust, competitive, and capable of meeting the demands of a dynamic global market.

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