



The North Carolina Rural Economic Development Center

Our Manufacturing Future

PART 1: FINDINGS

Toward a More Prosperous
Rural North Carolina

Principal Investigators

Kenneth Poole, President and CEO,
Center for Regional Economic Competitiveness

Mark White, Vice President-Research, Center for
Regional Economic Competitiveness

Project Administration

Jason Gray,
Director of Research and Innovation, Rural Center

Elaine Matthews,
Senior Vice President, Rural Center

[February 2013](#)

CONTENTS

| | |
|--|----|
| Introduction | 1 |
| Recommendation: Establish the North Carolina Manufacturing Council | 3 |
| Manufacturing critical to the economy | 4 |
| Diversified, rapidly changing | 7 |
| Growth opportunities in manufacturing | 26 |
| Common factors for success, common challenges | 33 |
| Employment in clusters | 35 |
| Methodology and notes | 48 |

Our Manufacturing Future

PART 1: FINDINGS

Toward a More Prosperous Rural North Carolina

Introduction

In North Carolina, there is growing optimism about the future of manufacturing. For the first time in 16 years, North Carolina experienced a net gain in manufacturing jobs in 2011, adding more than 3,000 jobs in one year. That growth trend continued into 2012, bringing total manufacturing jobs today to 440,000.

The fact is, manufacturing never lost its importance to the state's economy, even during the period of greatest job loss. It remains the top contributor to the state's gross domestic product and produces 84 percent of state exports. For rural North Carolina it is especially important, accounting for \$9.3 billion in annual rural wages, 14 percent of the overall rural employment and more than 20 percent of employment in 18 rural counties.

That employment is once again beginning to increase is hopeful news indeed.

Why does the tide appear to be turning?

- Across the state, surviving manufacturers have transformed to become stronger, leaner and more innovative. This transformation applies to a broad range of manufacturers, including textiles, furniture, equipment, electronics, vehicles and vehicle components.
- Manufacturers in some industries are beginning to shift from foreign to local sources as the costs of doing business internationally increase.

- Others are recognizing they can compete globally by adapting to a rising demand for customization and to a continuous demand for new and innovative products.
- At the same time, emerging high tech industries such as pharmaceuticals and aviation have developed a significant presence in the state, building on North Carolina's capabilities in life sciences, electronics and instrumentation, informatics and materials science.

Today, discussions about manufacturing are focusing more on growing a strong base than on saving a declining economic sector. Job creation through innovation and business expansion, particularly in small and medium-size manufacturers, is at the heart of this new dialogue. More specifically, the focus is on positioning companies for growth through technological and business process innovation as well as through diversifying customers and markets.

The urgency for action

The N.C. Rural Economic Development Center believes that North Carolina can lead a manufacturing resurgence that benefits working people, small and large communities, manufacturers themselves and hundreds of businesses that contribute to and benefit from a healthy manufacturing sector. To move forward, such action will require an extraordinary partnership among business and public sector leaders at the highest levels. Many other states are already well

advanced in their initiatives. North Carolina will need to move with speed and urgency to compete successfully.

The key question then becomes, to what extent can North Carolina take advantage of this potential manufacturing renaissance? Furthermore, how can policy makers ensure these opportunities will spread across the state to its rural areas where the growth has been less robust and opportunities fewer?

The Board of Directors of the N.C. Rural Economic Development Center authorized a study of rural manufacturing in early 2012 to determine its potential for stimulating job and income growth in rural North Carolina.

The study is North Carolina's most extensive analysis of manufacturing statewide. While the center's primary interest is in determining the trends, challenges and prospects for North Carolina's 85 rural counties,¹ they must be addressed in the context of the state as a whole. A positive future for manufacturing in North Carolina will require success in both rural and urban settings and a substantial increase in market connections between the two as well as connections with the rest of the nation and world.

Our Manufacturing Future presents the initial findings of this investigation to industry leaders, elected officials and all those who are actively working to build economic opportunity in North Carolina.

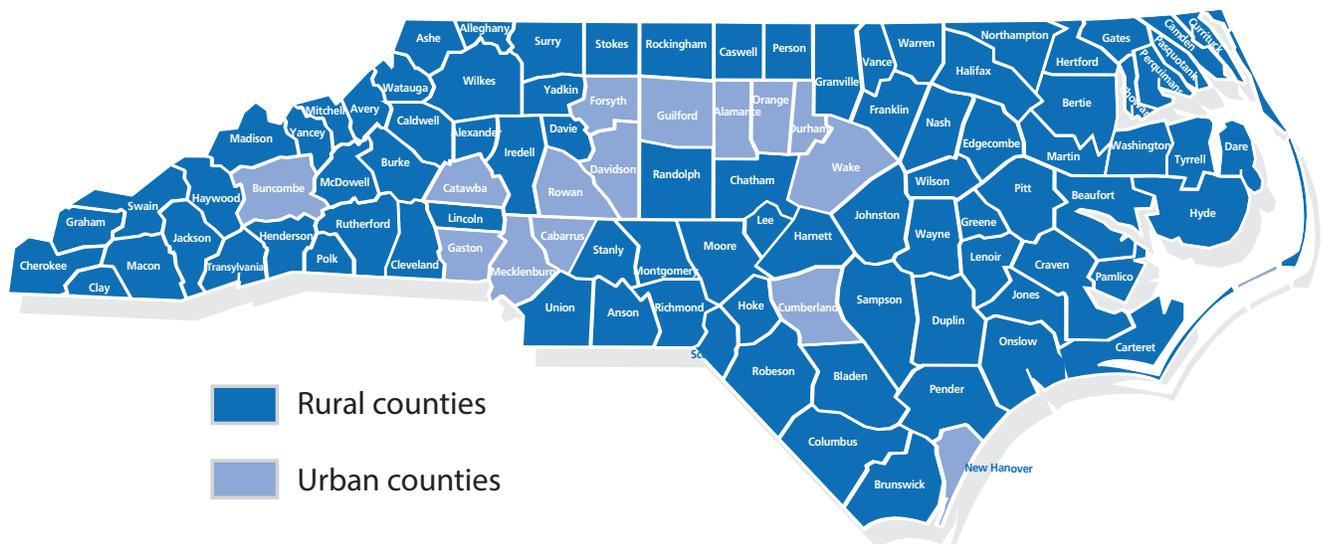
The Rural Center will follow in March 2013 with recommendations for expanding opportunities for North Carolina manufacturers, including small firms and those located in rural communities. One overarching recommendation, however, merits immediate attention: *establishment of a high-level North Carolina Manufacturing Council to develop and oversee a cohesive, statewide manufacturing policy agenda.* This recommendation is outlined on the following page.

We extend our appreciation to the many people who have generously given their time to make this study and the resulting report possible: members of the Rural Center Board of Directors and Rural Partners Corporate Group; members of our manufacturing stakeholders' advisory group; and many others who participated in interviews, focus groups and regional meetings.

We also thank the Center for Regional Economic Competitiveness whose research for this project involved outreach to more than a hundred manufacturers, business leaders, economic professionals and technical assistance providers; data development that included economic modeling, cluster analysis and value-chain analysis; and analysis of manufacturing initiatives in other states.

We hope that this report will serve as a fundamental source of information to all who participate in the important work ahead and that it will contribute to economic opportunity for North Carolina workers and businesses.

Rural North Carolina



Rural: 80 counties with a population density of fewer than 250 people per square mile and 5 counties that have higher densities but retain significant rural characteristics

Recommendation: Establish the North Carolina Manufacturing Council

The N.C. Rural Economic Development Center believes that North Carolina can lead a manufacturing resurgence that benefits working people, small and large communities, manufacturers themselves and the multitude of businesses that contribute to and benefit from a healthy manufacturing sector. Such action will require an extraordinary partnership among business and public sector leaders. Many other states are already well advanced in their initiatives. North Carolina will need to move forward with speed and urgency to be competitive.

RECOMMENDATION: If manufacturing is to reach its full potential in North Carolina, it must have a strong voice at the highest levels. We recommend that the Governor of North Carolina immediately establish the North Carolina Manufacturing Council to develop a robust, cohesive manufacturing policy agenda for North Carolina. The policy agenda should 1) encourage manufacturers to implement growth strategies and 2) prioritize and guide government policy initiatives to best address the challenges and enhance opportunities for manufacturing.

- The council should be responsible for examining the:
 - > role of manufacturing in North Carolina;
 - > talent and workforce needs of the sector;
 - > domestic and international market opportunities;
 - > internal and external factors that inhibit competitiveness; and
 - > policies and practices for government and industry, individually and collaboratively, to enhance manufacturing competitiveness and growth.
- The Manufacturing Council should advise the Governor, General Assembly, executive agencies including the North Carolina Department of Commerce, and other relevant entities on proposed programs and policy changes that pertain to manufacturing.
- The Manufacturing Council should be composed of exceptional individuals representing North Carolina's manufacturing sector, tapped from across the state, from multiple industries and from companies of varying size; and economic and educational organizations that provide expertise and support services.
- The work of the council will require full-time staffing to coordinate fact gathering, strategy development, collaboration among key private and public sector leaders, and advocacy. The council's executive director should have direct access to the Governor and other policy makers.
- The council should take steps to ensure that strategies and services address the needs of *all* state manufacturers, inclusive of small and medium size manufacturers and manufacturers in rural areas hard hit by job losses over the last decade.
- The North Carolina Manufacturing Council should be established by May 2013 and be challenged to deliver a state manufacturing policy agenda by May 2014, but should have the flexibility to make interim recommendations prior to full agenda delivery.

Manufacturing critical to the economy

North Carolina has a long and proud history as a manufacturing state. For decades, the manufacture of furniture, apparel, textiles and tobacco products formed the pillars of the state's economy. Dramatic changes in these industries have led to a significant decline in manufacturing employment in recent decades. Despite employment declines, manufacturing remains critical to the state's economy, not only as a source of jobs, but also in its contribution to gross domestic product and as a source of exports.

Manufacturing represents 20 percent of the state's GDP. Its companies purchase significant inputs from many other sectors – including research and development, professional services, agriculture, travel, construction and trucking. And because manufacturing is a large exporter, much of this activity results from new money being brought into the state economy.

Manufacturing remains a vital source of jobs

North Carolina has suffered severe manufacturing job losses over the past decade. Figure 1 compares the state's manufacturing employment with that of other southeastern states. North Carolina currently employs about 440,000 people in manufacturing, only 62 percent of its employment in 2001. The rate of decline in North Carolina is greater than that of any other southeastern state and greater than the nation as a whole. Nationally, manufacturing employment has declined to about 72 percent of what it was in 2001.

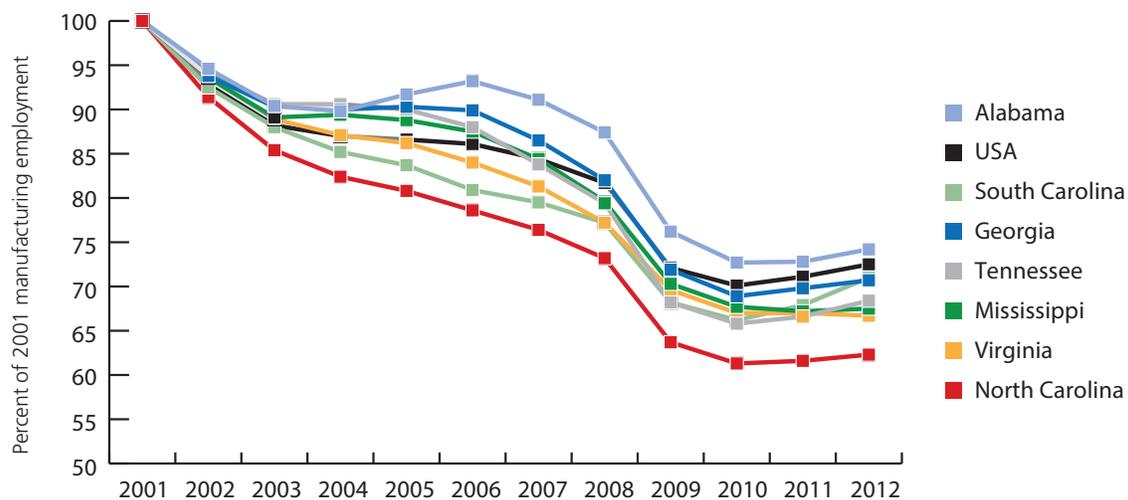
The shift was driven by many factors, primarily the dominance of labor-intensive, low-skill industries that made the transition to Far East sourcing easier. Just four industries—textiles, textile products, apparel and furniture manufacturing—accounted for more than half (54 percent) of the state's net manufacturing job losses between 2001 and 2012.

Even so, manufacturing remains a vital source of employment for the state and its rural counties. Nationally, manufacturing accounted for 8.9 percent of total employment in 2012. In North Carolina, the share was 10.9 percent of total employment, and in North Carolina's 85 rural counties, the share was still greater at 14.4 percent. Figure 2 shows that manufacturing jobs account for an especially large share of employment in the state's Foothills, Sandhills, the Piedmont Triad and along the east's I-95 corridor.

In 18 rural counties, manufacturing accounts for more than 20 percent of local employment. Often, that employment is concentrated in a small number of companies, which increases a community's vulnerability to economic change. The closure of even a small facility can leave local residents with few alternative employment options.

Looking forward, the picture for manufacturing looks much brighter than in the recent past. Since 2010, nationwide gross job gains in manufacturing have exceeded gross job losses. A similar turnaround began to emerge in North Carolina the following year, when manufacturing

Figure 1: Change in manufacturing employment in southeastern states (2001=100)



Source: Economic Modeling Specialists International Q2 2012

recorded its first net increase in employment since 1995. Rural North Carolina, too, saw manufacturing jobs increasing in 2011 and into 2012. Manufacturing may never again dominate the employment scene as it did in the 1970s and '80s, but opportunities are clearly emerging in new manufacturing sectors in the state.

Manufacturing provides good jobs

The manufacturing sector is not just a source of employment, but a source of good jobs that offer relatively high wages and benefits. In 2012, the average annual manufac-

turing wage in North Carolina was \$53,337, which was 32 percent greater than the private, non-manufacturing wage of \$40,425. Within rural counties, the manufacturing wage averaged \$42,297, which was 30 percent greater than the private, non-manufacturing wage.

Manufacturing creates wealth

While jobs are an important way of measuring the impact of manufacturing, they are by no means its only contribution. Manufacturing attracts dollars to a region, creating wealth among area companies, business people and workers. This is evidenced by the fact that manufacturing accounts for 20

Figure 2: Manufacturing as a share of total employment

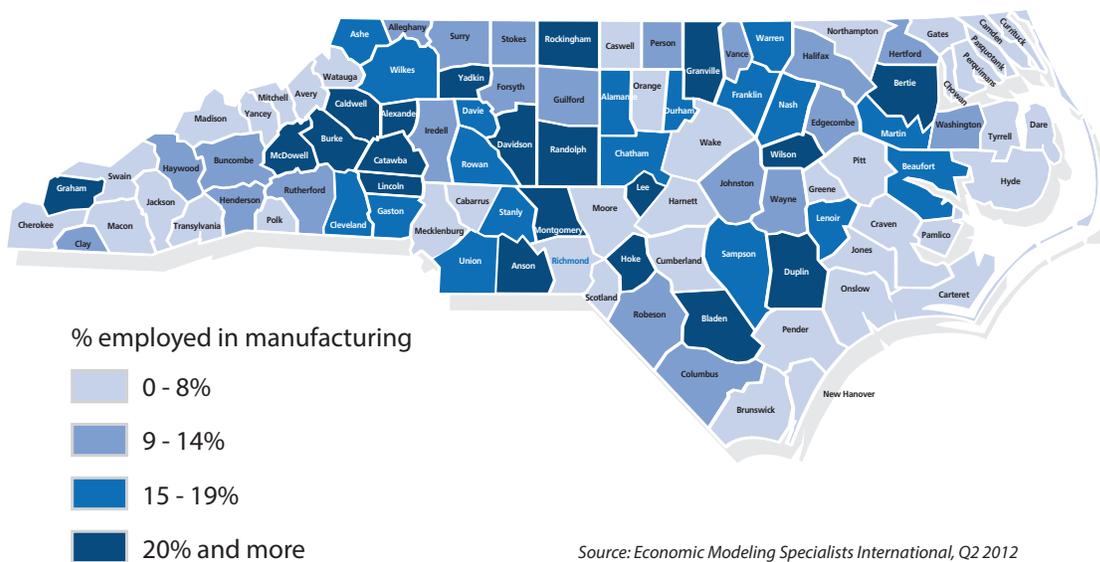


Figure 3: Employment and wages

| | North Carolina | Urban North Carolina | Rural North Carolina |
|---|----------------|----------------------|----------------------|
| MFG jobs (2012) | 438,982 | 217,206 | 221,776 |
| MFG as a % of total employment | 10.9% | 8.9% | 13.8% |
| Avg annual MFG wage | \$53,337 | \$64,610 | \$42,297 |
| Avg annual private wage (Excluding MFG) | \$40,425 | \$44,826 | \$32,458 |
| MFG wages relative to private avg wages (excluding MFG) | 132% | 144% | 130% |

Source: Economic Modeling Specialists International

percent of state GDP but only 10.9 percent of employment. As Figure 4 illustrates, manufacturing is by far the state's largest economic sector. In fact, North Carolina relies more on manufacturing as a share of its economy than any other southeastern state.

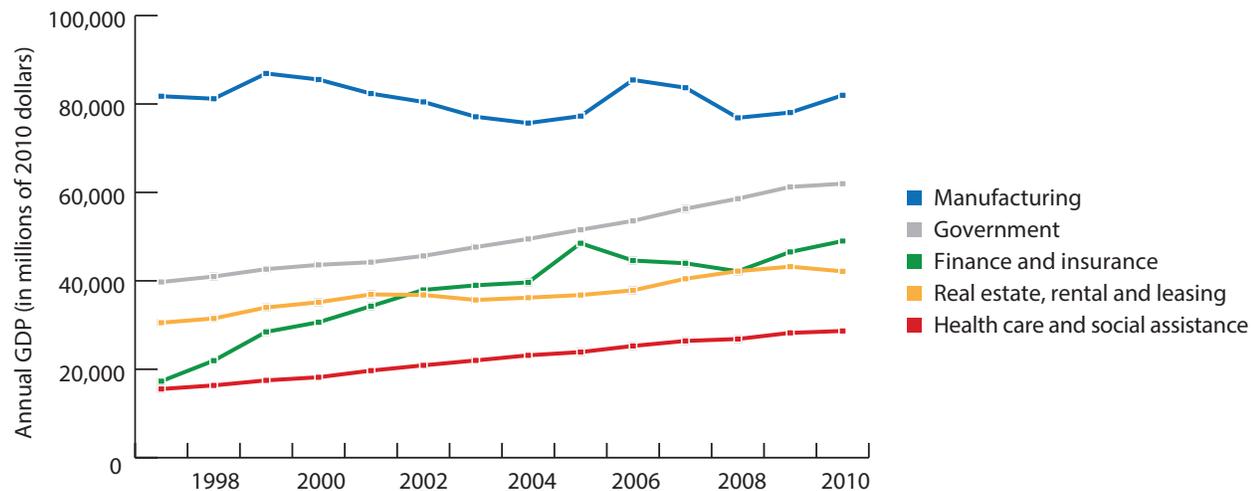
Manufacturing also drives the economy by attracting new money to the state through international customers. Figure 5 shows that in 2011, manufactured commodities accounted for 84.4 percent of North Carolina's total foreign exports. Top export commodities include civilian aircraft parts, tobacco, yarn, pharmaceuticals, tractor-trailers and pork, illustrating the importance of traditional industries as well as emerging ones.

A diverse manufacturing base means that North Carolina is less subject to industry-specific business cycles than other states might be. In 2011, North Carolina's top commodity, civilian aircraft parts, accounted for 3.5 percent of total exports. By contrast, South Carolina's top commodity, passenger vehicles, accounted for almost 28 percent of the state's total exports.

Both large and small firms play important roles in manufacturing. The 1,200 large firms (with 100+ employees) represent just 19 percent of all manufacturers but employ 79 percent of the manufacturing workforce. In contrast, small companies (20 or fewer employees) account for only 7 percent of the state's manufacturing workforce but number 5,400.¹

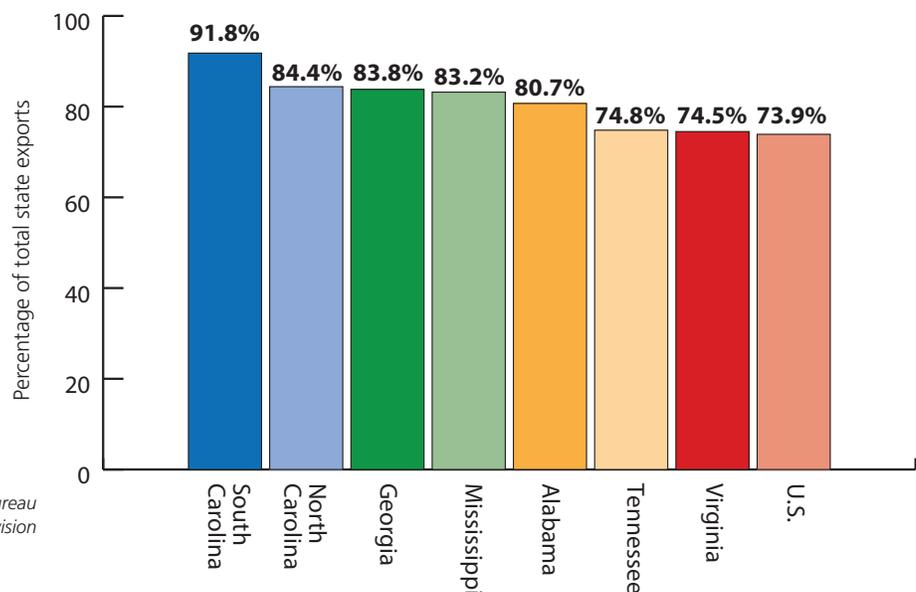
¹ U.S. Small Business Administration, <http://www.sba.gov/advocacy/849/12162>

Figure 4: Top 5 GDP sectors in North Carolina



Source: U.S. Bureau of Economic Analysis

Figure 5: Manufactured goods as a share of total exports (2011)



Source: U.S. Census Bureau Foreign Trade Division

Diversified, rapidly changing

North Carolina's manufacturing sector is increasingly diverse and complex. Consider the changes of the last 20 years. In 1992, 50 percent of the state's manufacturing employment was in the production of textiles, tobacco products and furniture. By 2012, these industries made up less than 20 percent of employment in manufacturing. The other 80 percent consisted of such industries as pharmaceuticals, aviation, transportation and electronics.

To better understand this new manufacturing environment, the Rural Center looked closely at manufacturing *clusters* – product-related industries that have a strong set of buying and selling relationships. These trading relationships were identified through data provided by the U.S. Economic Census, which is conducted every five years.

This study emphasizes the 25 manufacturing clusters that employ the most people in North Carolina, classifying each as stable, at-risk or emerging. It should be noted, however, that these labels reflect trends of recent years, but do not necessarily reflect the potential future contribution of the sectors. For example, textiles has obviously been “at-risk,” but the remaining textile firms have largely focused, adapted and transitioned to being very competitive. They now hold high potential for growth in their respective niches.

Stable These clusters represent large numbers of jobs and relatively stable employment levels over time. Stable clusters often represent the foundations of the economy and traditional sources of employment. These clusters include electronics, fabricated metal products and meat processing.

At-risk These clusters have sustained significant employment losses, often at a rate faster than the corresponding national cluster. In several instances, a majority of the job losses occurred in rural counties. These clusters include textiles, furniture, logging and wood-milling.

Emerging These clusters are employment areas that are beginning to develop a critical mass of activity. They may not be as highly concentrated in North Carolina as in other states, but they are frequently growing at a faster rate than the rest of the country and may represent opportunities for growth. These clusters include packaged foods, breweries and distilleries, and aviation and aerospace.

The following pages present an overview of these manufacturing clusters. We look first at North Carolina's 25 clusters; then at rural clusters; then at clusters by the seven economic regions. In a few instances, additional clusters (beyond the 15 identified statewide) are analyzed because of their regional importance.

North Carolina Manufacturing Clusters

The state's 25 largest manufacturing clusters represent a diverse set of industries, from aerospace to meat processing, furniture to medical instruments, logging to pharmaceuticals. (See pages 37-49 for maps showing employment concentrations in all 25 clusters.)

- Textiles and furniture have been classified as at-risk clusters. Each has sustained significant employment loss, often declining faster than the corresponding national cluster. Jobs in these clusters have been especially susceptible to outsourcing. They should not be dismissed, however. Each features a sizable base of companies, many of which survived the recession by producing high-quality, skill-intensive products. Furthermore, North Carolina has a unique position in the market that can help it compete

in global niches such as custom and institutional furnishings, nonwoven products for motor vehicles and medical devices, and nanofabrics for use in composite materials.

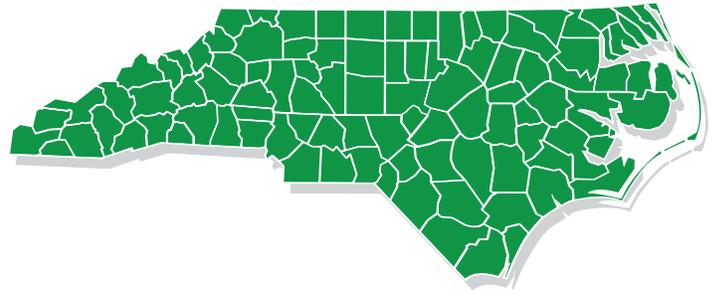
- The logging and wood milling cluster was hit hard by the recession and housing crisis, with the cluster losing about 4,000 jobs between 2007 and 2012. With the gradually improving housing industry, these sectors should take a positive turn. Foreign demand for chips and pulp could enhance the recovery.
- A more stable cluster is electronics manufacturing, which is the state's second largest and highest-paying, employing 32,600 people earning an average wage that exceeds \$100,000.

| Manufacturing Cluster | Employment 2012 | Stable/At Risk/ Emerging | Average Wage | Number of Firms | Relative Concentration* |
|--|-----------------|-----------------------------|--------------|-----------------|-------------------------|
| Aviation and aerospace | 10,180 | Emerging | \$88,975 | 45 | 0.58 |
| Breweries and distilleries | 1,797 | Emerging | \$61,249 | 35 | 1.06 |
| Building products | 14,831 | Stable | \$37,801 | 419 | 1.10 |
| Chemical products | 20,773 | Stable | \$60,826 | 462 | 1.25 |
| Electrical equipment | 12,987 | Stable | \$59,488 | 346 | 1.26 |
| Electronics | 32,632 | Stable | \$104,053 | 401 | 1.02 |
| Fabricated metal products | 27,972 | Stable | \$44,309 | 1,418 | 0.66 |
| Furniture | 28,008 | At-Risk | \$32,911 | 611 | 4.06 |
| Glass products | 3,754 | Stable | \$61,217 | 40 | 2.03 |
| Hardware | 9,667 | Stable | \$51,530 | 91 | 2.42 |
| Household appliances | 4,994 | Emerging | \$62,344 | 63 | 1.00 |
| Industrial machinery | 19,903 | Stable | \$61,612 | 414 | 1.00 |
| Logging and wood milling | 9,067 | At-Risk | \$36,768 | 685 | 1.79 |
| Meat processing | 31,064 | Stable | \$29,645 | 131 | 2.17 |
| Medical and dental instruments, supplies | 7,216 | Emerging | \$54,337 | 147 | 0.91 |
| Nonwoven goods | 31,563 | Stable | \$44,302 | 673 | 2.21 |
| Packaged foods | 16,084 | Emerging | \$39,877 | 410 | 0.68 |
| Paper products | 15,567 | Stable | \$53,531 | 227 | 1.37 |
| Pharmaceutical and biological products | 21,154 | Stable | \$93,361 | 99 | 2.56 |
| Plastics | 11,801 | At-Risk | \$54,631 | 252 | 1.15 |
| Printing | 11,062 | Stable | \$44,025 | 964 | 0.82 |
| Textiles and apparel | 38,581 | At-Risk | \$34,769 | 761 | 4.17 |
| Tobacco products | 6,153 | Stable | \$69,960 | 26 | 14.52 |
| Transportation equipment | 22,172 | Stable | \$54,322 | 205 | 0.98 |
| Wiring devices | 3,917 | At-Risk | \$53,477 | 34 | 3.12 |

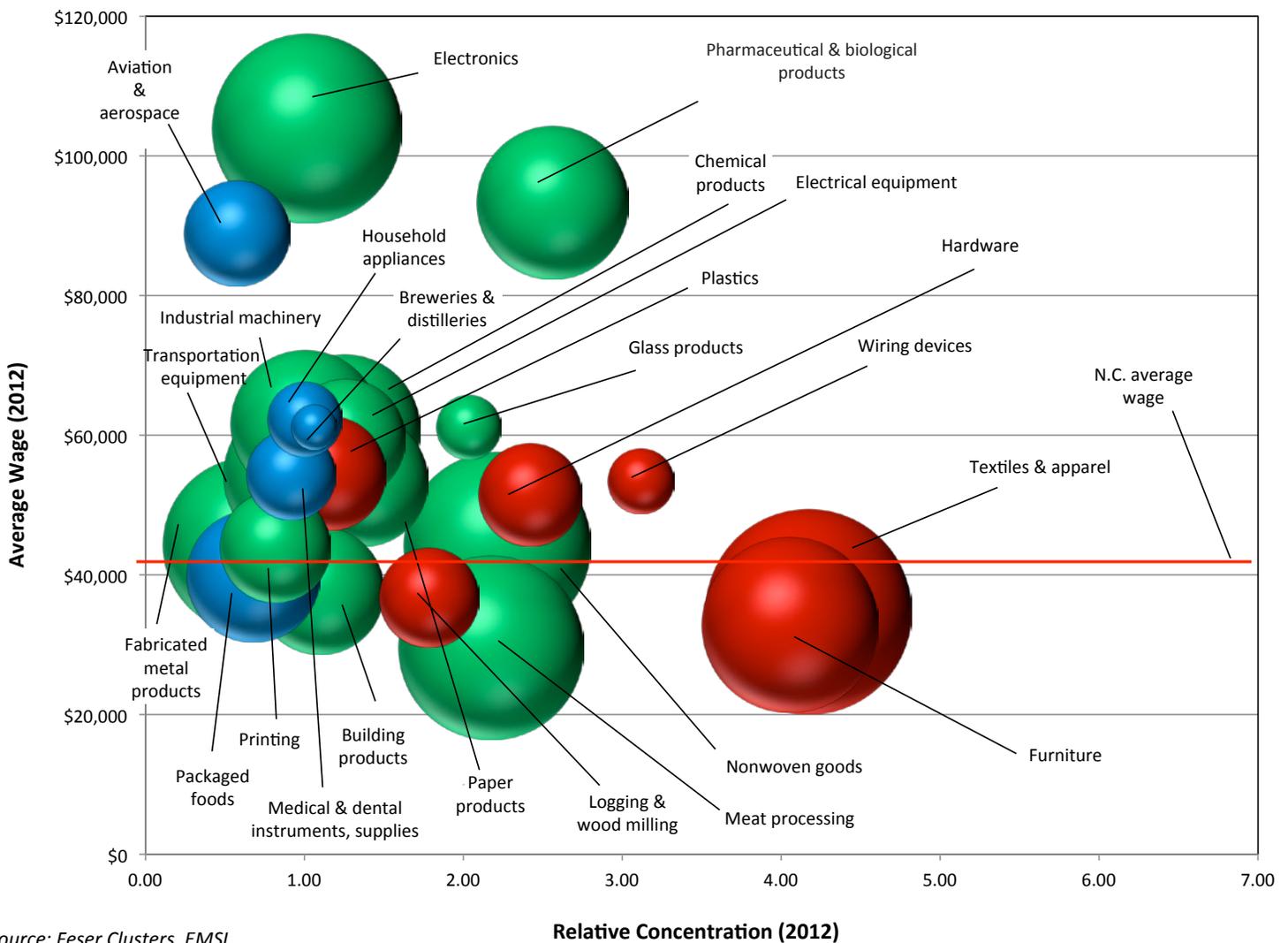
*Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally. A value over 1.0 indicates a concentration higher than the national average.

- Industrial machinery is another large, stable cluster, with about 20,000 jobs. This cluster includes an array of industries such as companies that make construction equipment, industrial air compressors and forklifts, all of which are growing.
- Other growing clusters include food-related industries, breweries and distilleries, aviation and aerospace, and medical and dental instruments and supplies.

North Carolina



North Carolina Clusters



Source: Feser Clusters, EMSI

LEGEND

Red = At-risk clusters that have sustained significant job losses, often at a rate faster than the corresponding national cluster.

Green = Stable clusters that have offered relatively steady employment levels over time.

Blue = Emerging clusters that are beginning to show signs of developing a critical mass of activity within the state.

Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally.

The relative concentration for tobacco products is 14.52, which places it outside this chart.

Rural North Carolina Manufacturing Clusters

Several manufacturing clusters are highly concentrated in rural areas. For instance, the state's 85 rural counties include 95 percent of the state's meat-processing jobs, 87 percent of logging and wood-milling jobs and 78 percent of jobs in breweries and distilleries. In contrast, rural counties are home to only 16 percent of jobs in electronics manufacturing.

In addition, rural manufacturing clusters tend to have lower wages than the state average. At the extreme is electronics manufacturing, in which the average rural wage is \$54,000 less the average urban wage.

- Employment in the pharmaceutical and biological products cluster is evenly split between rural and urban areas. Research and development tends to take place in urban

areas while contract manufacturing is more likely to be located in rural areas.

- Rural North Carolina is home to more than 29,000 meat processing jobs, many of them in large pork and poultry facilities. In relative terms, rural North Carolina has six times the rate of employment in meat processing as the nation overall.
- Rural counties claim almost 60 percent of the state's employment in textiles and 50 percent of the employment in furniture manufacturing.
- The household appliances cluster grew 3.2 percent annually between 2007 and 2012, compared to a 4.7 annual decline nationally during the same period. The cluster is

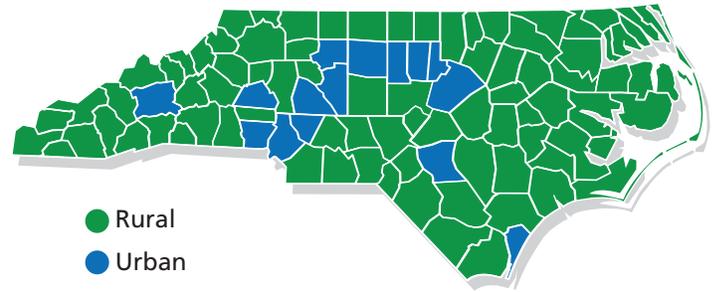
| Manufacturing Cluster | Employment 2012 | Stable/At Risk/ Emerging | Average Wage | Number of Firms | Relative Concentration* |
|--|-----------------|-----------------------------|--------------|-----------------|-------------------------|
| Aviation and aerospace | 3,894 | Emerging | \$71,688 | 21 | 0.54 |
| Breweries and distilleries | 1,401 | Emerging | \$66,127 | 13 | 2.05 |
| Building products | 7,663 | At-risk | \$35,534 | 245 | 1.41 |
| Chemical products | 9,805 | Stable | \$52,267 | 191 | 1.47 |
| Electrical equipment | 3,334 | At-risk | \$46,759 | 130 | 0.80 |
| Electronics | 5,113 | Stable | \$49,293 | 121 | 0.39 |
| Fabricated metal products | 14,207 | Stable | \$42,151 | 698 | 0.83 |
| Furniture | 14,520 | At-risk | \$30,745 | 278 | 5.21 |
| Glass products | 1,577 | Stable | \$57,524 | 14 | 2.11 |
| Hardware | 3,902 | Stable | \$44,772 | 42 | 2.42 |
| Household appliances | 2,877 | Stable | \$52,031 | 29 | 1.43 |
| Industrial machinery | 9,444 | Stable | \$53,465 | 176 | 1.18 |
| Logging and wood milling | 7,883 | At-risk | \$36,801 | 594 | 3.85 |
| Meat processing | 29,609 | Stable | \$28,956 | 107 | 5.13 |
| Medical and dental instruments, supplies | 3,678 | Emerging | \$44,238 | 60 | 1.15 |
| Nonwoven goods | 17,755 | Stable | \$42,111 | 353 | 3.08 |
| Packaged foods | 7,286 | Stable | \$35,914 | 173 | 0.76 |
| Paper products | 8,361 | Stable | \$55,047 | 85 | 1.82 |
| Pharmaceutical and biological products | 12,223 | Stable | \$70,063 | 48 | 3.67 |
| Plastics | 4,159 | At-risk | \$46,995 | 121 | 1.01 |
| Textiles and apparel | 22,353 | At-risk | \$31,033 | 385 | 5.98 |
| Tobacco products | 2,449 | Stable | \$42,506 | 15 | 14.32 |
| Transportation equipment | 9,511 | Stable | \$50,158 | 100 | 1.04 |
| Wiring devices | 1,164 | At-risk | \$42,755 | 13 | 2.29 |

*Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally. A value over 1.0 indicates a concentration higher than the national average.

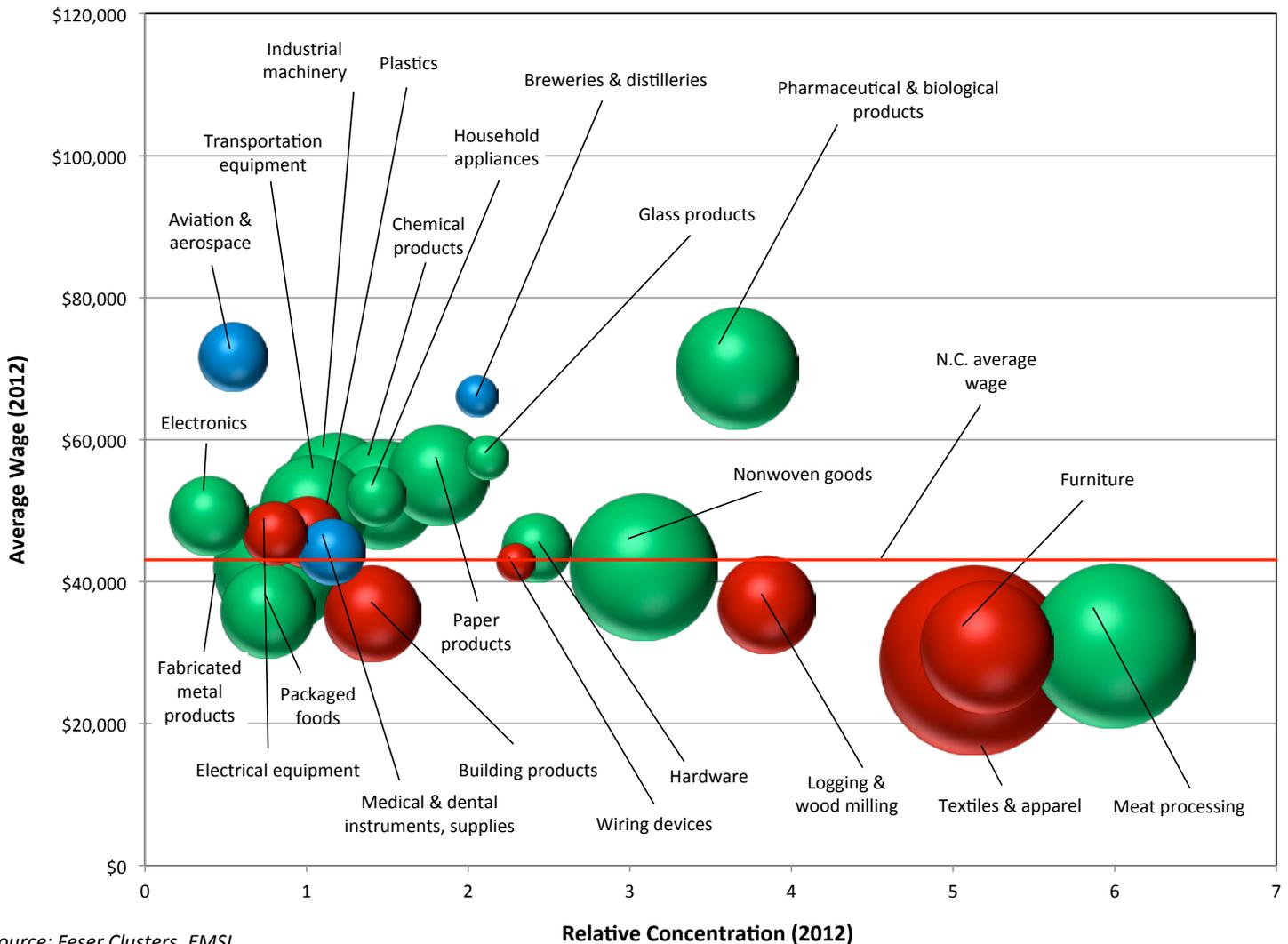
expected to grow modestly during the next five years although much of its potential in rural counties lies with a small number of companies in eastern North Carolina.

- Key manufacturing clusters that hold promise for growth in rural North Carolina include transportation equipment, pharmaceuticals, industrial machinery, packaged foods, medical and dental instruments, and aviation and aerospace.

North Carolina Rural and Urban Counties



Rural Clusters



Source: Feser Clusters, EMSI

LEGEND

- Red** = At-risk clusters that have sustained significant job losses, often at a rate faster than the corresponding national cluster.
- Green** = Stable clusters that have offered relatively steady employment levels over time.
- Blue** = Emerging clusters that are beginning to show signs of developing a critical mass of activity within the state.

Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally. The relative concentration for tobacco products is 14.32, which places it outside this chart.

AdvantageWest Manufacturing Clusters

Counties: Alleghany, Ashe, Avery, Buncombe, Burke, Caldwell, Clay, Cherokee, Graham, Haywood, Henderson, Jackson, Macon, Madison, McDowell, Mitchell, Polk, Rutherford, Swain, Transylvania, Watauga, Wilkes, Yancey

The manufacturing base in this western partnership of 23 counties relies heavily on furniture and textiles, two of North Carolina's most traditional industries.

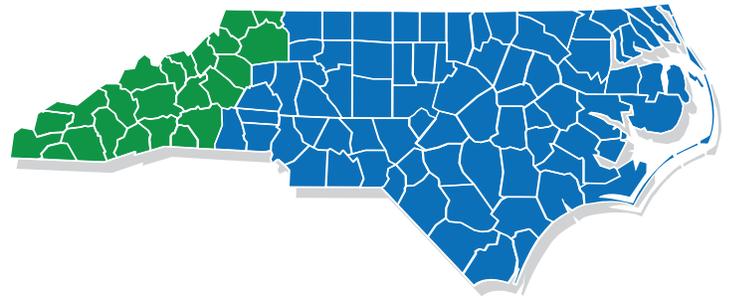
- The furniture and textiles clusters in the region account for nearly 9,500 jobs, a third fewer than in 2007. Surviving firms have relied on the manufacture of high-quality and highly customized products.

- The largest and most stable clusters include electrical equipment, transportation equipment and nonwoven goods, all of which reflect potential for growth. Firms that manufacture electrical and transportation equipment pay an average wage that exceeds the state average.
- Several emerging clusters show potential for growth. These industries include chemical products, fabricated metal products, medical and dental instruments, and aviation and aerospace.

| Manufacturing cluster | Employment 2012 | Stable/At-Risk/ Emerging | Average Wage | Number of Firms | Relative Concentration* |
|--|-----------------|-----------------------------|--------------|-----------------|-------------------------|
| Aviation and aerospace | 521 | Emerging | \$60,792 | 8 | 0.37 |
| Breweries and distilleries | 288 | Emerging | \$44,714 | 10 | 1.77 |
| Building products | 2,339 | At-Risk | \$33,732 | 62 | 1.80 |
| Chemical products | 1,384 | Emerging | \$42,638 | 37 | 0.87 |
| Electrical equipment | 2,953 | Stable | \$58,261 | 31 | 2.98 |
| Fabricated metal products | 3,185 | Emerging | \$39,870 | 179 | 0.78 |
| Furniture | 5,094 | At-Risk | \$32,069 | 82 | 7.67 |
| Hardware | 1,076 | Stable | \$45,023 | 15 | 2.80 |
| Industrial machinery | 1,351 | At-Risk | \$52,749 | 35 | 0.71 |
| Logging and wood milling | 1,110 | At-Risk | \$31,685 | 121 | 2.27 |
| Meat processing | 3,221 | Stable | \$28,400 | 15 | 2.34 |
| Medical and dental instruments, supplies | 570 | Emerging | \$33,999 | 14 | 0.75 |
| Nonwoven goods | 4,061 | Stable | \$38,618 | 95 | 2.96 |
| Packaged foods | 1,214 | Stable | \$35,473 | 41 | 0.53 |
| Paper products | 3,037 | Stable | \$54,384 | 20 | 2.77 |
| Pharmaceutical and biological products | 2,553 | Stable | \$45,172 | 11 | 3.21 |
| Textiles and apparel | 4,372 | At-Risk | \$33,590 | 110 | 4.91 |
| Transportation equipment | 2,891 | Stable | \$51,423 | 23 | 1.33 |
| Wiring devices | 761 | At-Risk | \$40,526 | 5 | 6.29 |

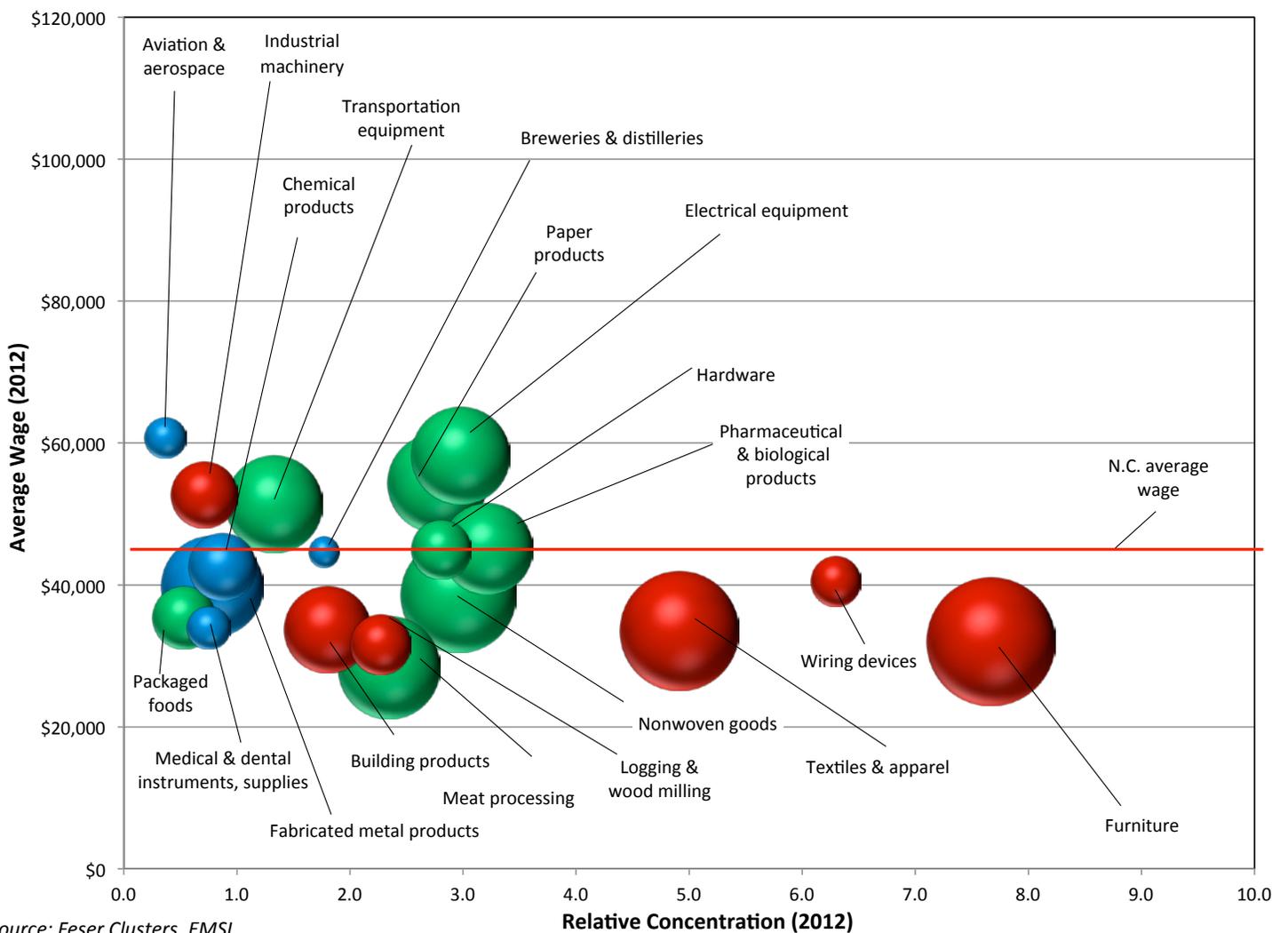
*Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally. A value over 1.0 indicates a concentration higher than the national average.

AdvantageWest Counties



- The region in recent years has sought to grow food-related clusters. Although it provides relatively low wages, the meat processing cluster is stable and employs more than 3,000 people in an area with a high concentration of unskilled and semi-skilled workers. Packaged food employs another 1,200. Several breweries and distilleries, such as Sierra Nevada, Oskar Blues and New Belgium, have emerged in the past few years and provide 300 jobs.

Advantage West Clusters



Source: Feser Clusters, EMSI

LEGEND

Red = At-risk clusters that have sustained significant job losses, often at a rate faster than the corresponding national cluster.

Green = Stable clusters that have offered relatively steady employment levels over time.

Blue = Emerging clusters that are beginning to show signs of developing a critical mass of activity within the state.

Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally.

Charlotte Partnership Manufacturing Clusters

Counties: Alexander, Anson, Cabarrus, Catawba, Cleveland, Gaston, Iredell, Lincoln, Mecklenburg, Rowan, Stanly, Union

With an urban core, this region boasts a large and diverse manufacturing base. Although the economic development partnership that covers this region includes four South Carolina counties, only the region's 12 North Carolina counties were studied for this project.

- The Charlotte region is home to a number of relatively large and high-paying clusters. More than 9,000 people are employed in the industrial machinery cluster, which includes global firms such as Ingersoll and Rand. Employ-

ment in this cluster fell between 2007 and 2012, but at a rate comparable to the national decline. About 8,700 people work in transportation equipment manufacturing, in companies such as Freightliner.

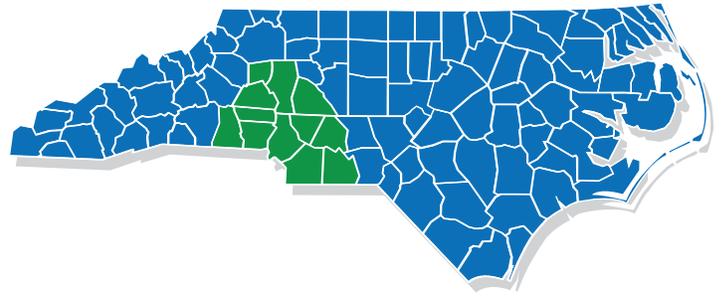
- The region's growing clusters include household appliances, as well as probable turn-arounds in industrial machinery, transportation equipment, motor vehicles and fabricated metal products. Additional clusters not always associated with the region—such as pharmaceutical and biological products—have become a more robust presence in the past five years.

| Manufacturing Cluster | Employment 2012 | Stable/At Risk/ Emerging | Average Wage | Number of Firms | Relative Concentration* |
|--|-----------------|-----------------------------|--------------|-----------------|-------------------------|
| Aviation and aerospace | 751 | Stable | \$76,988 | 14 | 0.20 |
| Building products | 3,495 | Stable | \$42,287 | 121 | 1.02 |
| Chemical products | 4,701 | Stable | \$59,015 | 153 | 1.12 |
| Electrical equipment | 2,271 | Stable | \$51,113 | 93 | 0.87 |
| Electronics | 3,765 | Stable | \$76,106 | 83 | 0.46 |
| Fabricated metal products | 8,423 | Stable | \$45,567 | 488 | 0.78 |
| Furniture | 11,580 | At-risk | \$34,177 | 207 | 6.59 |
| Glass products | 1,583 | Stable | \$52,554 | 14 | 3.37 |
| Hardware | 3,738 | At-risk | \$55,860 | 31 | 3.68 |
| Household appliances | 1,129 | Emerging | \$104,532 | 18 | 0.89 |
| Industrial machinery | 9,249 | Stable | \$66,733 | 187 | 1.84 |
| Meat processing | 2,774 | Stable | \$31,296 | 25 | 0.76 |
| Medical and dental instruments, supplies | 1,369 | Stable | \$53,939 | 37 | 0.68 |
| Nonwoven goods | 7,898 | Stable | \$42,413 | 205 | 2.18 |
| Packaged foods | 4,963 | Stable | \$48,703 | 89 | 0.82 |
| Paper products | 4,393 | Stable | \$51,795 | 84 | 1.52 |
| Pharmaceutical and biological products | 740 | Emerging | \$52,972 | 15 | 0.35 |
| Plastics | 5,034 | Stable | \$64,471 | 102 | 1.94 |
| Textiles and apparel | 9,278 | At-risk | \$32,704 | 208 | 3.94 |
| Transportation equipment | 8,729 | Stable | \$53,222 | 87 | 1.52 |

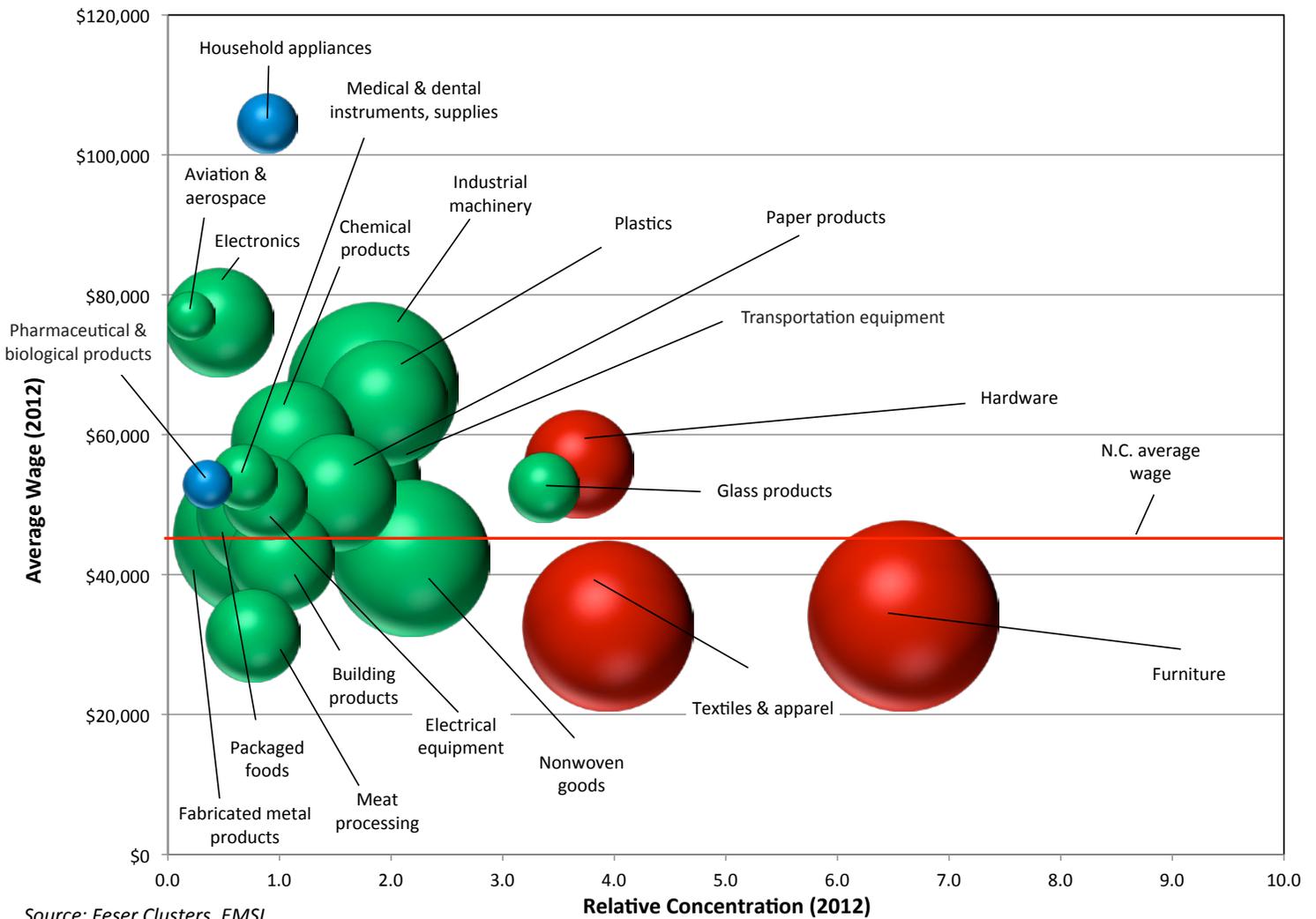
*Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally. A value over 1.0 indicates a concentration higher than the national average.

- Although the region's two largest clusters, furniture and textiles, have shed significant jobs and pay lower-than-average wages, the industries remain important sources of employment, particularly in Catawba and Alexander counties.

Charlotte Partnership Counties



Charlotte Partnership Clusters



Source: Feser Clusters, EMSI

LEGEND

- Red** = At-risk clusters that have sustained significant job losses, often at a rate faster than the corresponding national cluster.
- Green** = Stable clusters that have offered relatively steady employment levels over time.
- Blue** = Emerging clusters that are beginning to show signs of developing a critical mass of activity within the state.

Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally.

Piedmont Triad Manufacturing Clusters

Counties: Alamance, Caswell, Davidson, Davie, Forsyth, Guilford, Montgomery, Randolph, Rockingham, Stokes, Surry, Yadkin

This central N.C. region features a traditional manufacturing base of textiles and furniture, together with growing aviation and medical-based industries.

- Textiles is the region's largest manufacturing cluster, despite the fact it lost nearly 9,000 jobs between 2007 and 2012. It remains to be seen what happens with this sector as global competitive factors change and North Carolina companies adapt.
- Furniture manufacturing remains strong. Although this cluster also shed jobs, the decline was less sharp than in the country overall and, like textiles, may or may not demonstrate growth. The tobacco industry lost significant

employment as well, but the R.J. Reynolds Tobacco Co. headquarters contributes jobs with wages that are much higher than average. Furthermore, the state's tradition in tobacco means that research and development on new and improved products, including alternative uses for tobacco, could become the foundation for future economic activity across the state.

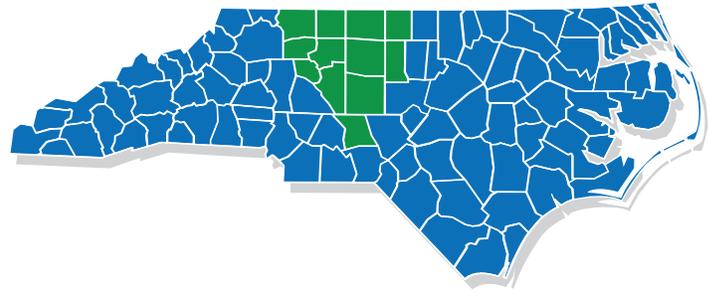
- Large, stable clusters in this region include nonwoven goods, chemical products and building products. Each of these clusters accounts for at least 5,000 jobs. Although each lost employment between 2007 and 2012, these losses occurred at a rate slower than in the country overall. Nearly 7,800 people are employed in the fabricated metal products, but job losses in this cluster were slightly higher than those nationally.

| Manufacturing Cluster | Employment 2012 | Stable/At Risk/ Emerging | Average Wage | Number of Firms | Relative Concentration* |
|--|-----------------|-----------------------------|--------------|-----------------|-------------------------|
| Aviation and aerospace | 3,166 | Emerging | \$97,647 | 9 | 1.05 |
| Breweries and distilleries | 810 | Emerging | \$77,580 | 1 | 2.80 |
| Building products | 5,789 | Stable | \$36,939 | 94 | 2.51 |
| Chemical products | 5,890 | Stable | \$66,751 | 116 | 2.08 |
| Electrical equipment | 1,696 | Stable | \$44,202 | 68 | 0.96 |
| Electronics | 3,576 | Stable | \$69,599 | 46 | 0.65 |
| Fabricated metal products | 7,786 | Stable | \$44,343 | 299 | 1.07 |
| Furniture | 9,670 | Stable | \$31,174 | 207 | 8.19 |
| Hardware | 1,830 | Stable | \$48,723 | 20 | 2.68 |
| Household appliances | 865 | Emerging | \$46,910 | 14 | 1.02 |
| Industrial machinery | 3,942 | Stable | \$61,516 | 76 | 1.16 |
| Logging and wood milling | 2,206 | Stable | \$37,531 | 107 | 2.54 |
| Meat processing | 1,854 | Emerging | \$26,331 | 16 | 0.76 |
| Medical and dental instruments, supplies | 1,686 | Emerging | \$50,647 | 24 | 1.25 |
| Nonwoven goods | 7,372 | Stable | \$40,803 | 152 | 3.02 |
| Packaged foods | 2,044 | Emerging | \$45,128 | 78 | 0.50 |
| Paper products | 4,200 | Stable | \$49,609 | 64 | 2.16 |
| Pharmaceutical and biological products | 1,083 | Emerging | \$69,699 | 6 | 0.77 |
| Plastics | 2,850 | Stable | \$46,115 | 43 | 1.63 |
| Printing | 3,461 | Stable | \$41,174 | 232 | 1.50 |
| Textiles and apparel | 16,292 | At-risk | \$38,237 | 250 | 10.30 |
| Tobacco products | 3,621 | At-risk | \$91,094 | 13 | 49.98 |
| Transportation equipment | 4,422 | Stable | \$63,617 | 46 | 1.14 |
| Wiring devices | 2,305 | Stable | \$58,150 | 11 | 10.72 |

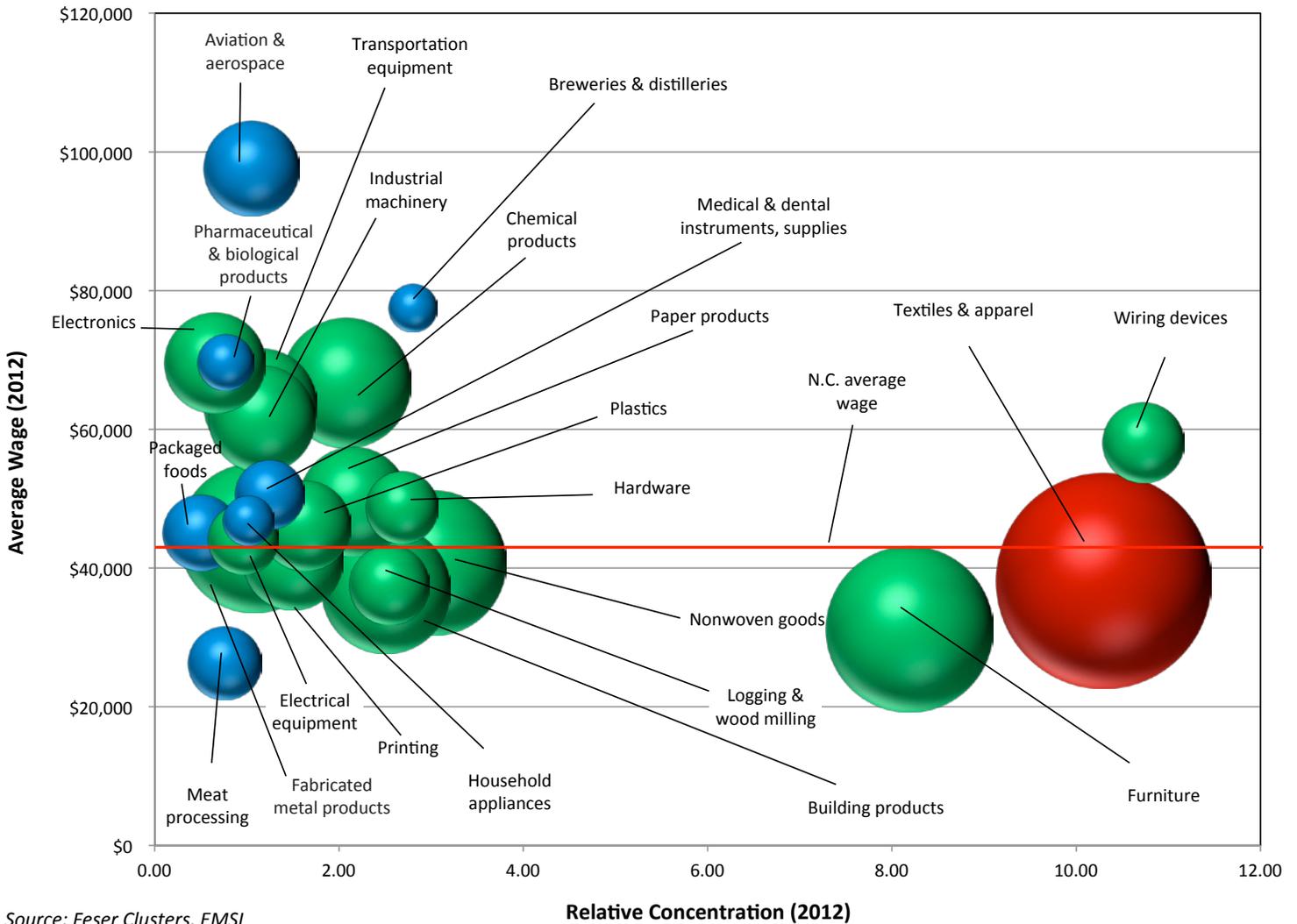
*Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally. A value over 1.0 indicates a concentration higher than the national average.

- Growing clusters include aviation and aerospace, packaged foods, meat processing, breweries and distilleries, pharmaceutical and biological products, and medical and dental instruments. Resulting developments in biotechnology, robotics and artificial limbs could flow from the state's capabilities in electronics, fabricated metals and life sciences.

Piedmont Triad Counties



Piedmont Triad Clusters



LEGEND

- Red** = At-risk clusters that have sustained significant job losses, often at a rate faster than the corresponding national cluster.
- Green** = Stable clusters that have offered relatively steady employment levels over time.
- Blue** = Emerging clusters that are beginning to show signs of developing a critical mass of activity within the state.

Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally. The relative concentration for tobacco products is 49.98, which places it off this chart.

Research Triangle Manufacturing Clusters

Counties: Chatham, Durham, Franklin, Granville, Harnett, Johnston, Lee, Moore, Orange, Person, Vance, Wake, Warren

This 13-county region is dominated by two large, high-paying clusters: electronics, and pharmaceutical and biological products.

- With nearly 22,000 jobs, electronics manufacturing is the region's largest cluster, totaling two-thirds of all such employment in the state. Pharmaceutical and biological prod-

ucts manufacturing employs more than 12,000 people in the region, more than half of the state's total employment in these industries. Within the region, each of these clusters pays an average wage in excess of \$100,000.

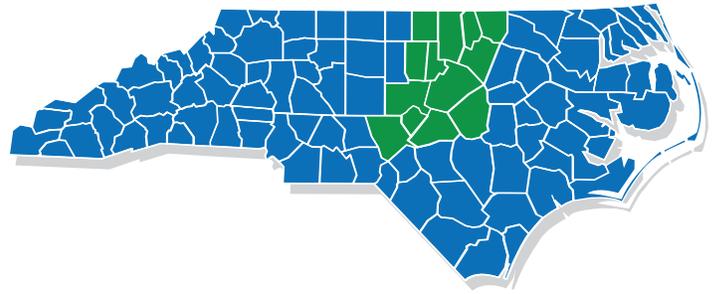
- The next two largest clusters are chemical products and electrical equipment, each of which employs more than 4,000 people and added jobs between 2007 and 2012. This is significant, as both clusters lost employment nationally during this time.

| Manufacturing Cluster | Employment 2012 | Stable/At Risk/ Emerging | Average Wage | Number of Firms | Relative Concentration* |
|--|-----------------|-----------------------------|--------------|-----------------|-------------------------|
| Building products | 1,585 | Stable | \$37,783 | 54 | 0.52 |
| Chemical products | 4,016 | Stable | \$59,645 | 53 | 1.07 |
| Electrical equipment | 4,055 | Stable | \$75,468 | 73 | 1.73 |
| Electronics | 21,830 | Stable | \$123,645 | 156 | 3.00 |
| Fabricated metal products | 3,700 | Stable | \$42,065 | 184 | 0.39 |
| Hardware | 1,148 | Emerging | \$63,397 | 9 | 1.27 |
| Industrial machinery | 2,865 | Stable | \$60,341 | 35 | 0.64 |
| Logging and wood milling | 1,712 | Stable | \$40,765 | 111 | 1.49 |
| Meat processing | 3,086 | At-risk | \$29,591 | 15 | 0.95 |
| Medical and dental instruments, supplies | 2,558 | Emerging | \$66,876 | 40 | 1.43 |
| Nonwoven goods | 3,519 | Stable | \$41,770 | 68 | 1.09 |
| Packaged foods | 1,831 | At-risk | \$30,130 | 65 | 0.34 |
| Pharmaceutical and biological products | 12,164 | Stable | \$116,111 | 42 | 6.50 |
| Plastics | 1,495 | At-risk | \$45,157 | 25 | 0.65 |
| Textiles and apparel | 2,895 | Stable | \$30,929 | 69 | 1.38 |
| Transportation equipment | 2,034 | Stable | \$51,170 | 18 | 0.40 |

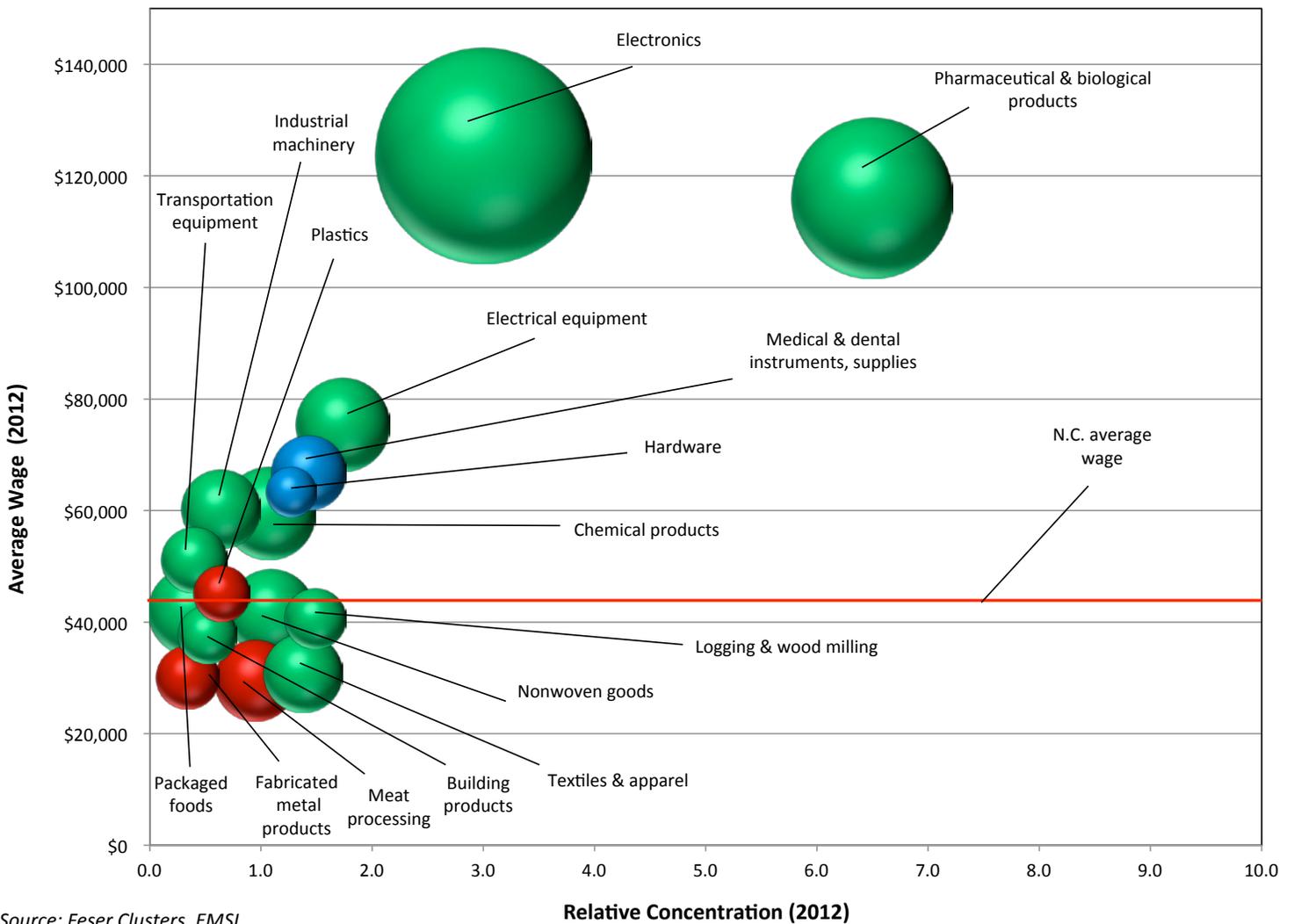
*Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally. A value over 1.0 indicates a concentration higher than the national average.

- This region has three clusters defined as at-risk: plastics, meat processing and packaged foods. Although food-related clusters grew in other parts of the state, this was not the case in the Research Triangle. Nearly a third of the meat processing jobs were lost from 2007 to 2012.

Research Triangle Counties



Research Triangle Clusters



Source: Feser Clusters, EMSI

LEGEND

- Red** = At-risk clusters that have sustained significant job losses, often at a rate faster than the corresponding national cluster.
- Green** = Stable clusters that have offered relatively steady employment levels over time.
- Blue** = Emerging clusters that are beginning to show signs of developing a critical mass of activity within the state.

Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally.

Northeast Partnership Manufacturing Clusters

Counties: Beaufort, Bertie, Camden, Chowan, Currituck, Dare, Gates, Halifax, Hertford, Hyde, Martin, Northampton, Pasquotank, Perquimans, Tyrrell, Washington

The smallest of North Carolina's regional partnerships, this 13-county area is known for its abundance of natural resources, including available land and access to timber.

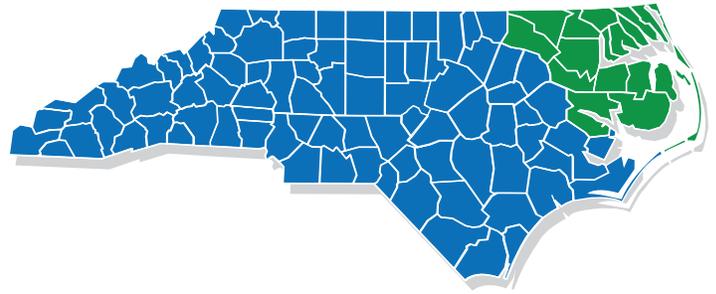
- Logging and wood-milling is one of the region's bigger and more concentrated clusters, accounting for more than 1,200 jobs in the region. Paper products manufacturing is a related cluster that saw steep job losses from 2007 to 2012.
- Food- and agriculture-related clusters are crucial to the region. As the region's largest cluster, meat processing employs more than 2,000 people. Wages are relatively low, however, averaging \$26,262 — approximately \$5,000 less than the regional average. Packaged foods is a growing cluster. Its wages exceed the regional average but are lower than the state average of \$42,744.
- Iron and steel production is another growing cluster, albeit one that is highly dependent on a single company, Nucor Steel in Hertford County. Jobs in this cluster pay higher-than-average wages.

| Manufacturing Cluster | Employment 2012 | Stable/At Risk/ Emerging | Average Wage | Number of Firms | Relative Concentration* |
|---------------------------|-----------------|-----------------------------|--------------|-----------------|-------------------------|
| Aviation and aerospace | 2,658 | Stable | \$54,052 | 25 | 4.93 |
| Boat building | 427 | Emerging | \$39,407 | 20 | 16.30 |
| Building products | 395 | At-risk | \$43,307 | 9 | 0.96 |
| Chemical products | 574 | Emerging | \$62,798 | 6 | 1.13 |
| Fabricated metal products | 495 | Emerging | \$44,133 | 30 | 0.38 |
| Iron and steel products | 652 | Emerging | \$62,799 | 2 | 4.35 |
| Logging and wood milling | 1,215 | Stable | \$34,922 | 97 | 7.84 |
| Meat processing | 2,039 | Stable | \$26,262 | 8 | 4.67 |
| Nonwoven goods | 810 | At-risk | \$45,083 | 14 | 1.86 |
| Packaged foods | 783 | Emerging | \$38,571 | 9 | 1.08 |
| Paper products | 450 | Stable | \$85,341 | 3 | 1.29 |
| Textiles and apparel | 668 | At-risk | \$39,446 | 15 | 2.36 |
| Transportation equipment | 454 | At-risk | \$44,156 | 4 | 0.66 |

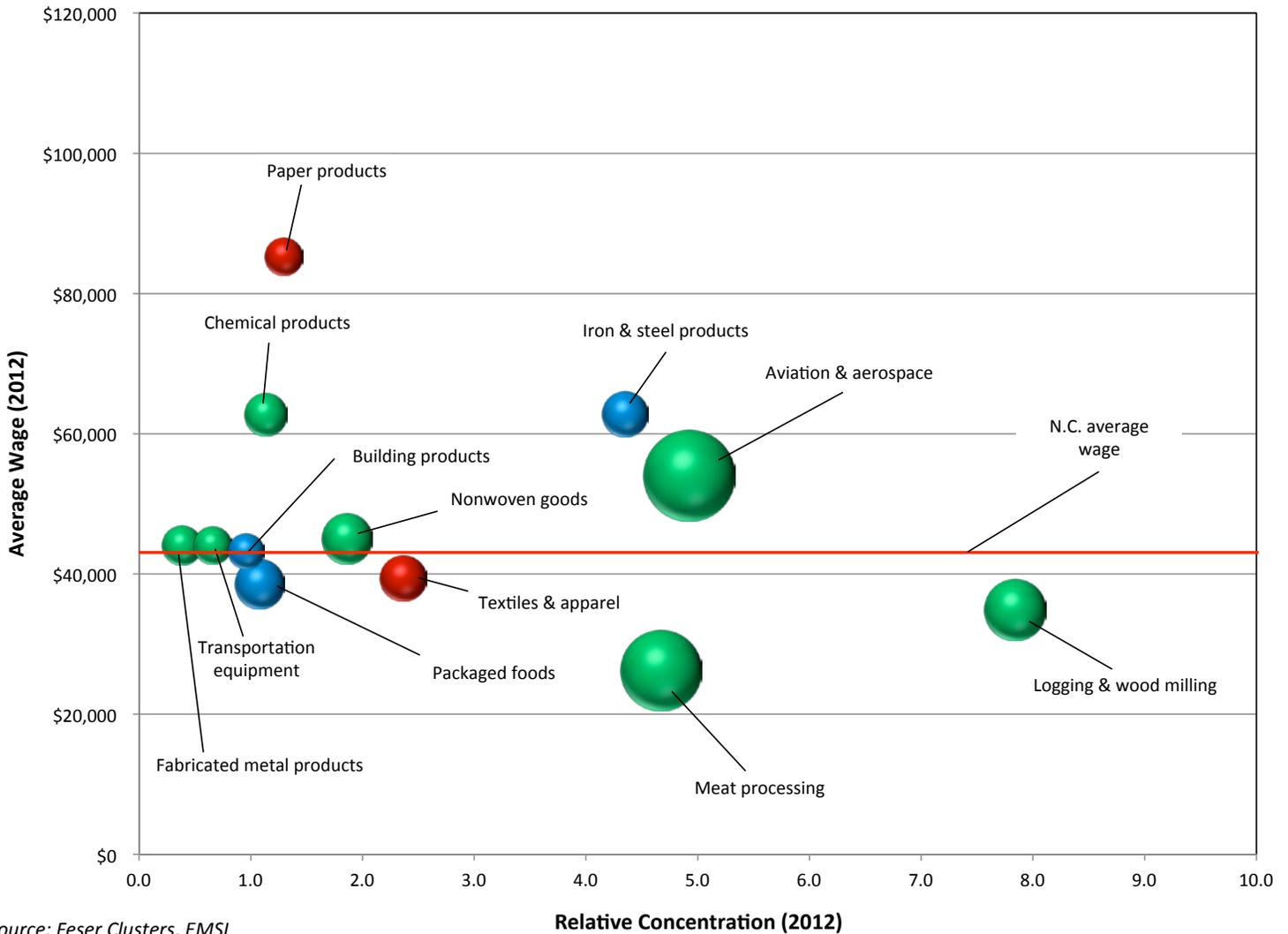
*Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally. A value over 1.0 indicates a concentration higher than the national average.

- Driven by the U.S. Coast Guard air station in Elizabeth City, aviation and aerospace is another important, and high-paying, cluster in the region. The facility is home to about 2,600 jobs. In addition, the region is home to a number of companies that manufacture and retrofit the components needed to maintain the aircraft.

Northeast Partnership Counties



Northeast Partnership Clusters



Source: Feser Clusters, EMSI

LEGEND

Red = At-risk clusters that have sustained significant job losses, often at a rate faster than the corresponding national cluster.

Green = Stable clusters that have offered relatively steady employment levels over time.

Blue = Emerging clusters that are beginning to show signs of developing a critical mass of activity within the state.

Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally.

The relative concentration for boat building is 16.30, which places it off this chart.

This accounting of the aviation and aerospace jobs includes those at the U.S. Coast Guard air station in Elizabeth City.

Eastern Partnership Manufacturing Clusters

Counties: Carteret, Craven, Duplin, Edgecombe, Greene, Jones, Lenoir, Nash, Onslow, Pamlico, Pitt, Wayne, Wilson

The meat processing and packaged food clusters include some of this region's biggest employers. Meat processing is the largest cluster, providing jobs for about 13,000 people.

- Packaged foods accounted for about 3,300 jobs in 2012. Mt. Olive Pickle Company Inc. is one of the cluster's highest-profile employers.
- Meat processing and packaged foods pay relatively low wages and depend on a large concentration of low-skill workers. The average wages for these clusters are below the state average.

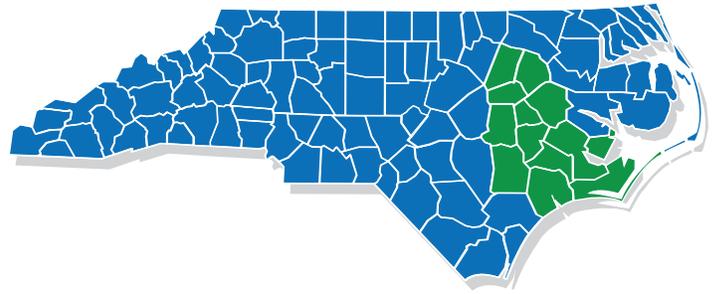
- The region's pharmaceutical and biological products cluster has been a strong source of new employment, with almost 1,800 jobs added since 2007. This growth occurred as the cluster was shrinking nationally. The cluster employed 4,500 people in 2012, with jobs that paid an average of \$71,468. Most of this employment is concentrated in the Rocky Mount, Wilson and Greenville areas.
- The aviation and aerospace cluster is growing in this region. Seymour Johnson Air Force Base and Fleet Readiness Center East are major employers. In addition, commercial aviation firms have made investments in Kinston, Goldsboro and Wilson.

| Manufacturing Cluster | Employment 2012 | Stable/At Risk/ Emerging | Average Wage | Number of Firms | Relative Concentration* |
|--|-----------------|-----------------------------|--------------|-----------------|-------------------------|
| Aviation and aerospace | 2,266 | Stable | \$52,915 | 25 | 1.15 |
| Boat building | 789 | At-risk | \$44,073 | 18 | 8.22 |
| Building products | 644 | Emerging | \$31,398 | 21 | 0.43 |
| Chemical products | 1,718 | Emerging | \$60,454 | 16 | 0.93 |
| Electrical equipment | 940 | At-risk | \$52,307 | 11 | 0.81 |
| Fabricated metal products | 2,333 | Emerging | \$46,365 | 58 | 0.49 |
| Hardware | 1,537 | At-risk | \$44,737 | 5 | 3.44 |
| Household appliances | 2,194 | Stable | \$53,660 | 5 | 3.94 |
| Industrial machinery | 1,727 | At-risk | \$47,670 | 12 | 0.78 |
| Logging and wood milling | 1,365 | At-risk | \$35,460 | 79 | 2.4 |
| Meat processing | 7,544 | Stable | \$29,323 | 18 | 4.72 |
| Nonwoven goods | 3,786 | Stable | \$53,632 | 25 | 2.37 |
| Packaged foods | 3,329 | Stable | \$31,089 | 27 | 1.25 |
| Pharmaceutical and biological products | 4,508 | Stable | \$68,160 | 13 | 4.88 |
| Textiles and apparel | 1,733 | At-risk | \$33,970 | 14 | 1.67 |
| Transportation equipment | 2,316 | Emerging | \$51,867 | 7 | 0.92 |

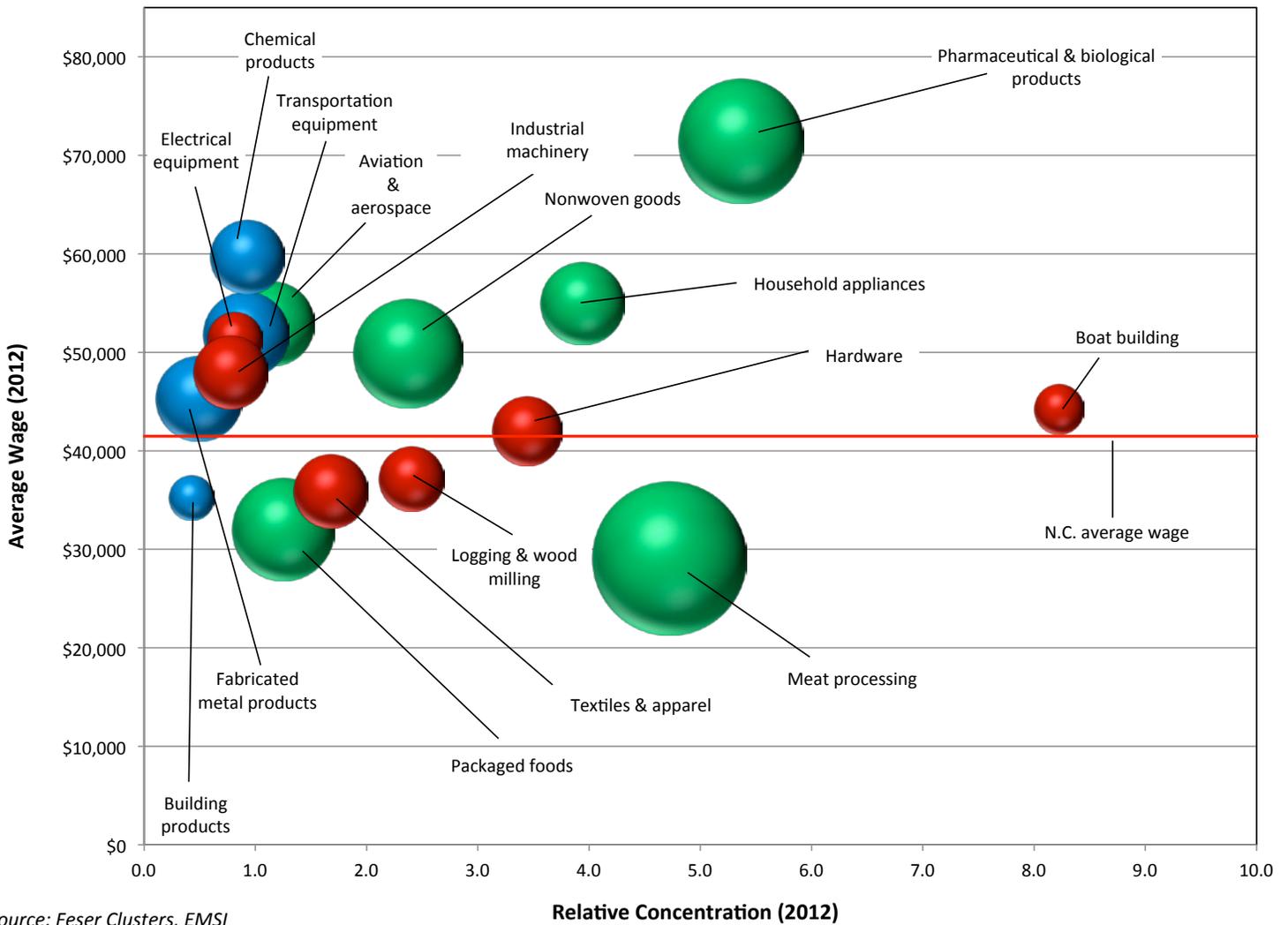
*Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally. A value over 1.0 indicates a concentration higher than the national average.

- The recession crippled the region's boat-building industry, at least temporarily. The cluster declined from about 2,300 jobs in 2007 to 800 jobs in 2012. Hardware manufacturing and building products also shed significant numbers of jobs.

Eastern Partnership Counties



Eastern Partnership Clusters



Source: Feser Clusters, EMSI

LEGEND

- Red** = At-risk clusters that have sustained significant job losses, often at a rate faster than the corresponding national cluster.
- Green** = Stable clusters that have offered relatively steady employment levels over time.
- Blue** = Emerging clusters that are beginning to show signs of developing a critical mass of activity within the state.

Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally.

Southeast Partnership Manufacturing Clusters

Counties: Bladen, Brunswick, Columbus, Cumberland, Hoke, New Hanover, Pender, Richmond, Robeson, Sampson, Scotland

The region's largest cluster is meat processing, which is seven times more concentrated in the regional economy than it is in the overall U.S. economy. The southeast region is home to almost one-third of the state's meat-processing jobs.

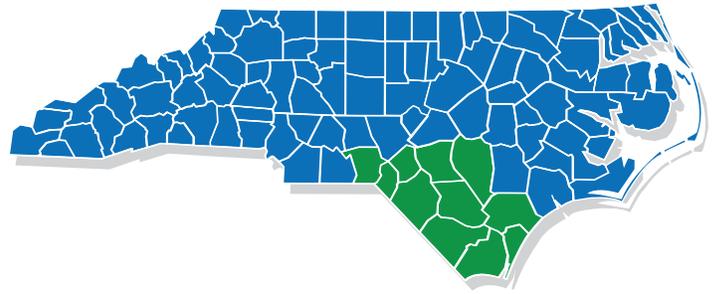
- This cluster employs more than 10,000 workers at an average wage that is 75 percent of the state average wage.
- The packaged food cluster is growing; it added jobs from 2007 to 2012 even as the cluster declined nationwide. As a result, it is becoming more concentrated in the region and could continue to be a source of new jobs.
- Stable clusters in the region include nonwoven goods and chemical products. Aviation and aerospace is a smaller cluster that pays average wages that are more than twice the state average.

| Manufacturing Cluster | Employment 2012 | Stable/At Risk/ Emerging | Average Wage | Number of Firms | Relative Concentration* |
|---------------------------|-----------------|--------------------------|--------------|-----------------|-------------------------|
| Aviation and aerospace | 1,763 | Stable | \$100,918 | 5 | 1.09 |
| Chemical products | 2,415 | Stable | \$70,278 | 37 | 1.33 |
| Electrical equipment | 870 | Stable | \$55,761 | 21 | 0.77 |
| Fabricated metal products | 1,907 | Stable | \$48,235 | 86 | 0.41 |
| Glass products | 1,123 | Stable | \$75,899 | 4 | 5.54 |
| Logging and wood milling | 812 | At-risk | \$39,536 | 79 | 1.46 |
| Meat processing | 10,536 | Stable | \$31,208 | 22 | 6.72 |
| Transportation equipment | 1,317 | At-risk | \$49,009 | 11 | 0.53 |
| Nonwoven goods | 3,992 | Stable | \$56,576 | 40 | 2.55 |
| Packaged foods | 1,824 | Emerging | \$37,730 | 34 | 0.70 |
| Paper products | 1,699 | Stable | \$57,761 | 19 | 1.36 |
| Plastics | 808 | Stable | \$54,474 | 19 | 0.72 |
| Textiles and apparel | 3,312 | At-risk | \$26,634 | 49 | 3.26 |
| Transportation equipment | 1,317 | At-risk | \$49,009 | 11 | 0.53 |

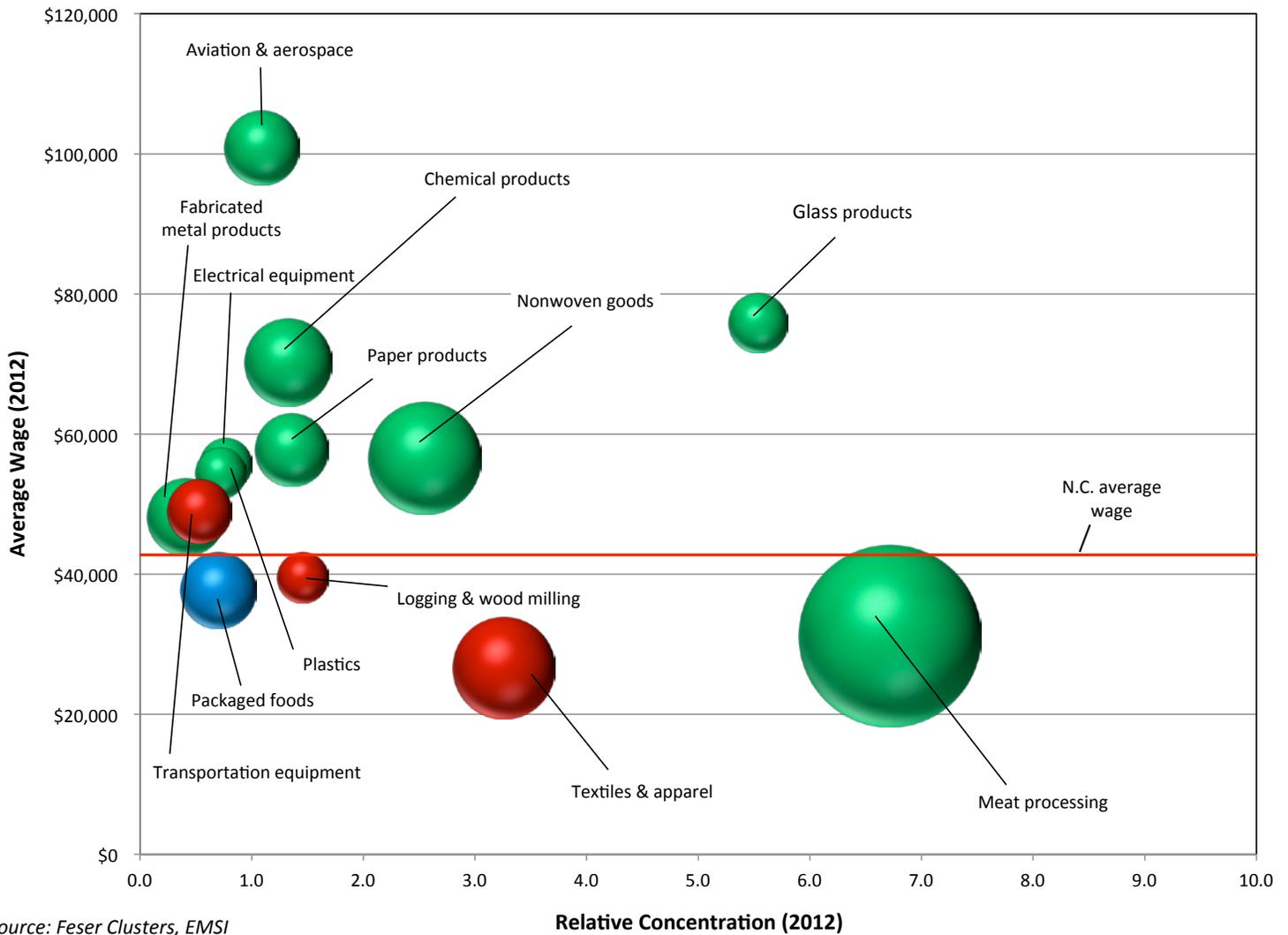
*Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally. A value over 1.0 indicates a concentration higher than the national average.

Southeast Partnership Counties

- As in other areas, textiles is the region's most at-risk cluster. It employs approximately 3,300 people, down from more than 5,000 in 2007. Among other clusters that saw significant job losses: logging and wood-milling, and transportation equipment.



Southeast Partnership Clusters



Source: Feser Clusters, EMSI

LEGEND

Red = At-risk clusters that have sustained significant job losses, often at a rate faster than the corresponding national cluster.

Green = Stable clusters that have offered relatively steady employment levels over time.

Blue = Emerging clusters that are beginning to show signs of developing a critical mass of activity within the state.

Relative concentration reflects the percentage of a region's cluster employment compared with the cluster's total employment nationally.

Growth opportunities in manufacturing

The Rural Center selected for further analysis six manufacturing clusters that present a range of economic and employment opportunities in the 85 rural counties. Each cluster has a significant presence in the state, has demonstrated a competitive advantage and offers relatively good wages. Together, they represent a group of stable and emerging clusters that could help reshape the state's manufacturing base and produce much-needed jobs.

SELECTED CLUSTERS

Transportation equipment

Pharmaceutical and biological equipment

Industrial machinery

Packaged foods

Medical and dental instruments and supplies

Aviation and aerospace

It is important to stress that these are not the only clusters in rural North Carolina that have potential for adding wealth and growing jobs. The six clusters described in the following pages were selected because they represent an overall balance in projected growth, long-term stability, relatively high wages, strong multiplier effects and important cross-sector linkages. Further, their established footholds suggest they merit particular attention and offer insights into the most critical challenges facing the state's rural manufacturers.

In this analysis, industries are grouped according to their overall clusters, with the relationships among these industries further defined as value-chains. When industries in a cluster form a value-chain, they function as suppliers and customers of one another. For example, industries that make auto parts combine a wide variety of components (often made by other metal or composite fabricators) into a number of different products. These products are sold to customers at a price that reflects the cost of inputs combined with the value created by the firm (including its profit margin). The combination of those industries represent a value-chain.

These value-chains indicate the full impact of employment trends, average wages and the relative concentration of industries in the state or region.

Within each cluster, a single important industry—referred to here as the core industry—received a deeper look. The examination included interviews with selected business leaders and others with specialized knowledge of industry trends. The interviews covered issues related to company supply chains, workforce preparation and development, innovation and technology, and overall impressions of the manufacturing climate in North Carolina.

Transportation Equipment: Motor Vehicle Parts

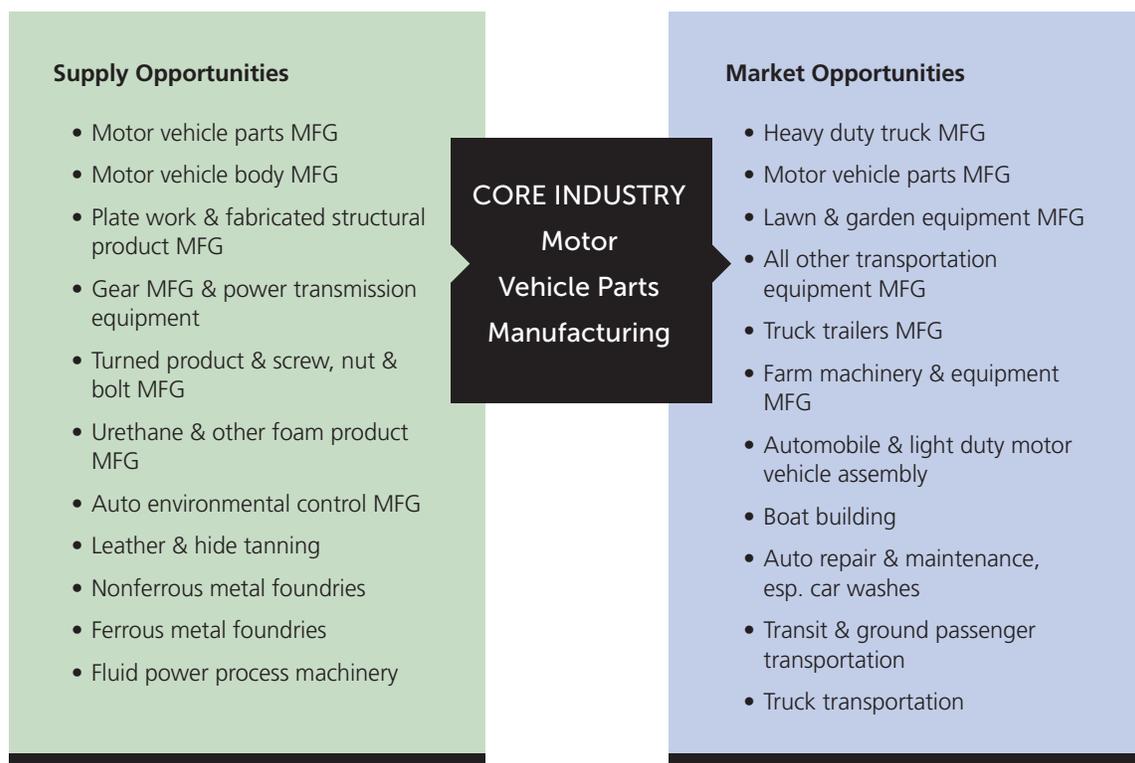
Transportation manufacturers manage some of the world's most complex supply chains. It has been estimated that 15,000 parts go into the making of an average motor vehicle.²

Automakers have opened a number of plants across the South in recent years. Some states, such as South Carolina and Kentucky, rely on one or two manufacturers to anchor their automotive economies. North Carolina does not have as great a volume, but is more diverse, with a variety of motor vehicle firms making such equipment as buses, ambulances and tractor-trailers.

The core industry—motor vehicle parts manufacturing—accounts for 65 percent of total transportation employment in the state. Many of these firms produce parts not only for the vehicle industry, but for agricultural equipment manufacturers and appliance builders. This diversity of customers creates a more resilient company that in most cases can better weather fluctuating economic cycles.

CLUSTER LINKAGES

Motor Vehicle Parts Manufacturing



²Thomas Klier and James Rubenstein, "Who Really Made Your Car?" W.E. Upjohn Institute for Employment Research, Kalamazoo, Mich., 2008, page 1.

Pharmaceutical and Biological Products: Pharmaceuticals and Medicine

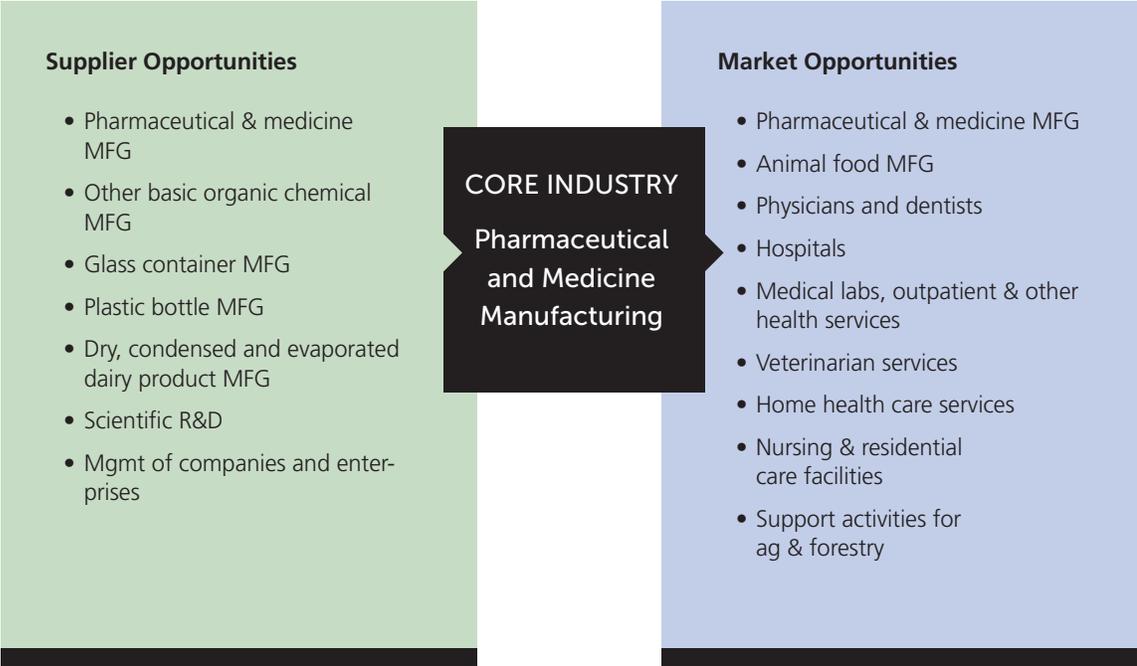
Although this cluster has a large presence in the Research Triangle Region, it is also one of the largest manufacturing groupings in rural North Carolina.

Pharmaceutical and biological products, the cluster's core industry, has a significant presence in rural locations such as Wilson, Pitt and Nash counties. There is also potential for a broader range of manufacturing and collaboration between pharmaceutical and agri-biological products.

To be successful in pharmaceutical manufacturing, companies must continually innovate, quickly developing new products, processes and technologies. Because the Research Triangle Park boasts such a strong base of firms, nearby companies can easily tap into its expertise. Local firms also benefit from the N.C. Biotechnology Center, which plays an important role in building connections between companies and the innovation and training resources they need to succeed. Further, as the bio-pharma industry develops, there is the potential for strong collaboration between the development activities in the Research Triangle and the agricultural industry in the northeast, east and southeast.

CLUSTER LINKAGES

Pharmaceutical and Medicine Manufacturing



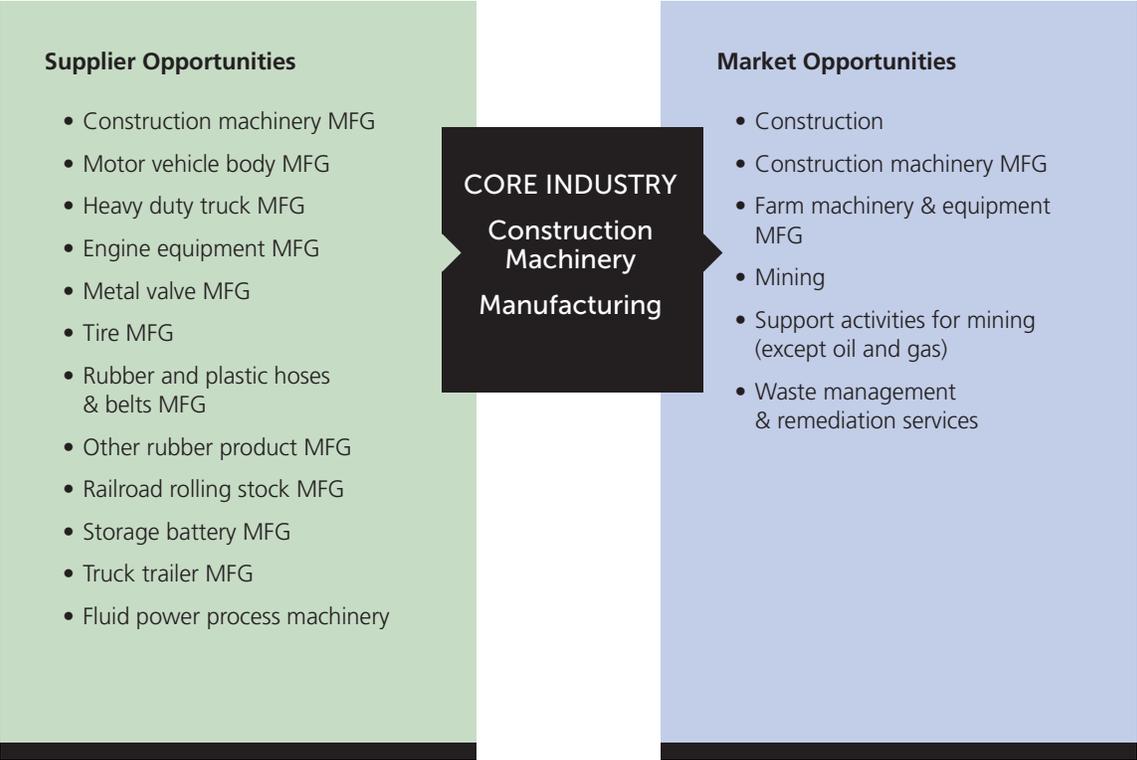
Industrial Machinery: Construction Machinery

Similar to transportation equipment, North Carolina’s industrial machinery cluster is large and diverse. These include material handling equipment such as conveyors, forklifts, cranes and construction machinery, along with ancillary equipment such as air compressors and the full range of components. For purposes of this study, construction machinery was chosen as the cluster’s core industry.

Construction machinery, the cluster’s largest industry, accounts for about 2,000 jobs in rural North Carolina. Many of its larger companies operate within global production networks, in some cases receiving parts and subassemblies from places such as Mexico and China. To take advantage of business opportunities through the industry’s major supply chains, companies must embrace world-class best management and production practices.

Working within that global marketplace from a base in North Carolina has its advantages. Among those noted by company representatives: the state’s strong business climate, access to interstate highways, proximity to major markets and the relative proximity to large steel suppliers.

CLUSTER LINKAGES Construction Machinery Manufacturing



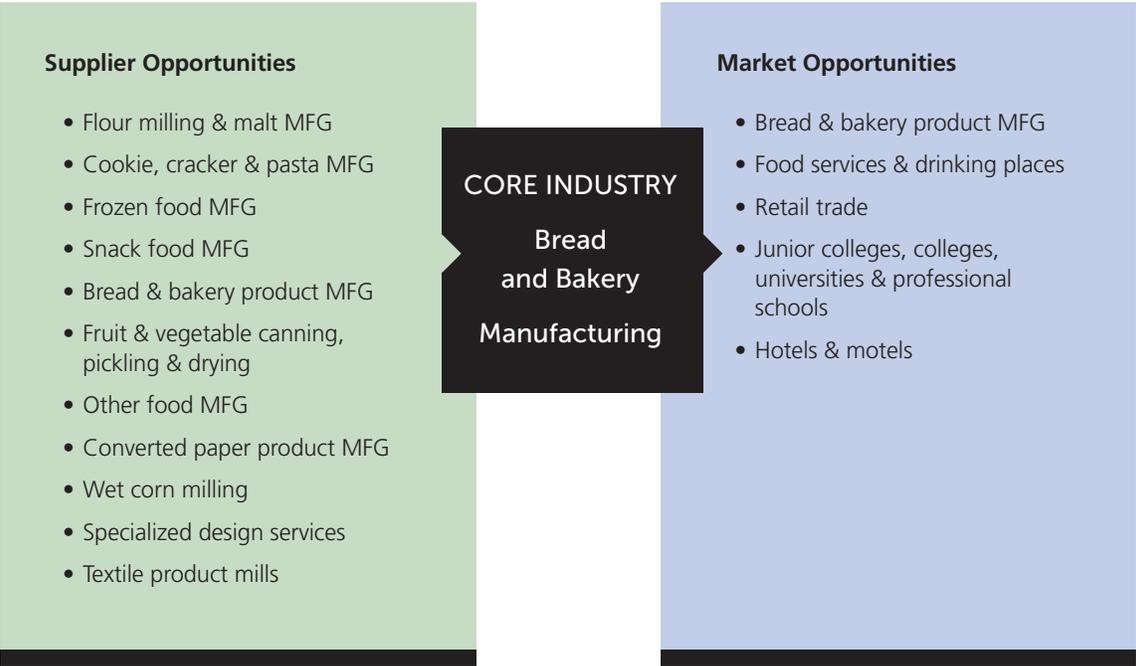
Packaged Foods: Bread and Bakery Products

North Carolina firms hold strong positions in this key cluster, which is separate from the related clusters of meat processing, and breweries and distilleries. Large-scale employers include nationally prominent companies such as Campbell’s Soup, Sara Lee and the Cheesecake Company, along others that provide prepared foods for restaurants and supermarkets. A number of small-scale producers make specialty products such as nuts and sauces.

Selected for analysis as the core industry was bread and bakery product manufacturing, which accounts for one-third of all the jobs.

In bread and bakery products, the strongest links in the value-chain come from the demand for high volumes of food products and with large-volume customers. Some of the state’s success in this cluster is tied to the increasing demands of the food service and retail trade, which has been driven by domestic population growth and growing foreign demand from the increasing middle class population.

CLUSTER LINKAGES Bread and Bakery Manufacturing



Medical and Dental Instruments: Surgical and Medical Instruments

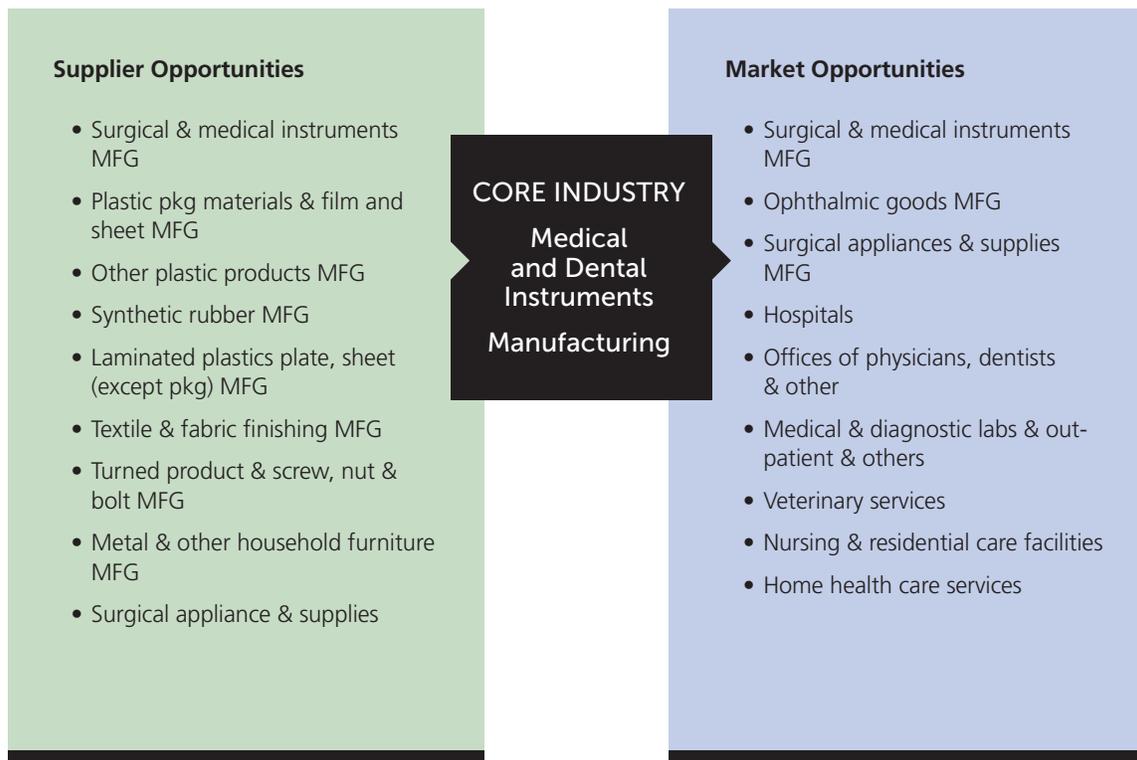
Unlike the other highlighted clusters, most of the important firms in this cluster are located in urban areas, where they benefit from concentrated research communities and where they have easier access to entrepreneurial venture capital. The cluster also stands out for the relatively few companies that drive its growth. While startups and small research-and-development firms initiate most developments, production for the consumer market is generally conducted by large manufacturers.

Surgical and medical instruments, the cluster's core industry, accounts for just over half of the cluster's statewide employment. The North Carolina industry grew 5.4 percent annually between 2007 and 2012, faster than the national rate in both urban and rural counties. Approximately 70 percent of the job gains, or about 850 jobs statewide, were added in rural counties.

Although most of the industry's research-intensive operations will likely remain in urban areas, rural communities have the opportunity to capture more production activities. At the production stage, relative cost factors, transportation and proximity to markets take on greater importance. Opportunities are particularly strong for device manufacturers connected to major medical centers. Further opportunities could be developed if rural hospitals were to become more engaged in developing new technologies and procedures.

CLUSTER LINKAGES

Medical and Dental Instruments Manufacturing



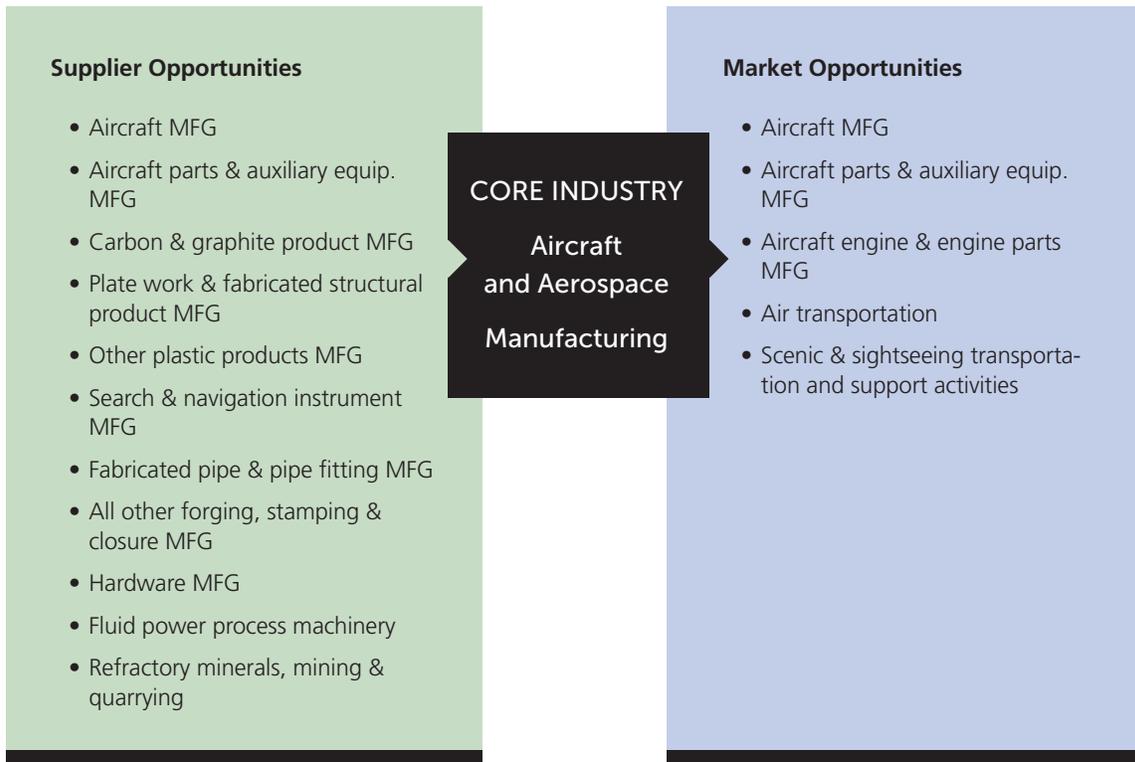
Aviation and Aerospace: Aircraft Parts and Auxiliary Equipment

Although the smallest of the six clusters, aviation and aerospace offers great potential for adding high-skill, high-paying jobs in North Carolina. Beyond the state’s largest aviation equipment manufacturers and their direct suppliers, there are a number of smaller firms doing related work, together with military facilities that employ significant numbers of workers.

The availability of a trained workforce is a pressing need for many of these companies, particularly those in rural areas. Attracting top scientific and engineering talent to rural North Carolina can be difficult, a challenge that one company met by establishing a regional office in the Triangle rather than in its rural community.

The need for workers doesn’t stop with engineers. The dearth of qualified job candidates for machinist positions has led some firms to implement small-scale apprenticeship programs. Companies have had great success with these programs, recruiting workers from community colleges and temp agencies.

CLUSTER LINKAGES Aviation and Aerospace Manufacturing



Common factors for success, common challenges

In exploring rural North Carolina's manufacturing clusters, we talked with dozens of business leaders throughout the supply chains about the steps they are taking to be competitive and the challenges they still face. In both cases, we found that they have more in common than they have differences.

FACTORS FOR SUCCESS

For example, we found that the most competitive businesses:

- **Adopt lean manufacturing practices and a continuous improvement mindset**

As best practices in lean production techniques have spread, more companies are embracing at least some lean principles to increase efficiency. Implementing these principles is necessary but not sufficient to remain cost competitive and sustain relationships with larger buyers, particularly original equipment manufacturers. Many of the most successful firms invest in industry-recognized certifications to demonstrate internal mastery of continuous improvement principles. The most successful industries are those that have many manufacturers seeking continuous improvement.

- **Create and sell unique products**

Most manufacturers selling products in the commodity market—focused on achieving high volumes and low costs—have already shifted to off-shore production. Remaining domestic firms largely compete on innovation rather than on price, focusing on products and processes to meet specialized needs. Higher profit margins and better-paying jobs resulted from responsiveness to and anticipation of customer needs, creative approaches to problem solving and products that address technical problems.

- **Maximize assets by seeking external expertise and support**

Successful manufacturers take advantage of available knowledge and resources. For instance, they may seek knowledge from nearby universities to solve technical problems of high value to a customer or to make their product outperform a competitor's. Companies interviewed were aware of resources offered by state or regional organizations and use them to gain an edge—whether by improving their product, increasing their supply of talent or leveraging their limited resources for capital investments. These firms develop relationships with their local community college, often obtaining customized training and/or recruiting their best students.

- **Identify customer niches in multiple markets**

Most successful manufacturers are continuously researching specialized market niches in which they are best suited to operate. Although these niches may have low-volume demands, the company often need not compete exclusively on price because it can customize a product to meet the challenge. Quality, timeliness and impact may open doors. Innovation enables firms supplying components to other companies to create their own competitive market advantage. Ultimately, successful manufacturers operating with small production runs must find multiple customers. A broad customer base often leads to a diversity of products that help the company remain successful in the face of market contractions. These companies, however, must find their customers wherever the customers operate—in global as well as domestic markets.

- **Invest in worker training and skill development**

Successful manufacturers are much more likely to view their own workforce as an investment rather than a cost. Company executives are as quick to invest in training as they are in equipment maintenance, and they recognize that workers with flexible skills, who may require higher wages and benefits, are more likely to generate greater return for the company. Almost every manufacturer faces some workforce challenges. Successful companies are more likely to take a variety of approaches to addressing their challenges—ranging from on-the-job training and apprenticeships to working closely with colleges and universities to ensure that these institutions are responding to the company’s current talent needs and anticipating its needs in the future.

COMMON CHALLENGES

Not only do industry clusters have common success factors, they also have many common challenges that may inhibit growth and success.

- **Overcoming business and regulatory climate barriers**

Continuous bad news has shaken the confidence of the state’s public and private sector economic leaders in manufacturing. As a result, the state needs a collective attitude adjustment on future of manufacturing. The state also needs to consider tax credits for new investments in emerging companies and industries that are most likely to create jobs, in innovative strategies for saving on energy costs and in strategies for improving access to equity and debt capital by small and medium-size manufacturers.

- **Accessing skilled talent**

Rural manufacturers prosper when their workers can satisfy customers by producing high quality goods at competitive prices. In some cases, jobseekers, especially dislocated manufacturing workers, are ill prepared for the work available in advanced manufacturing firms. In other cases, the best workers do not view manufacturing as a viable career option. The workforce needs of modern manufacturing have evolved far more quickly than the ability of the state’s education and training systems to respond—whether because students or companies are not demanding the programs or because available funds are insufficient to support highly-quality technical training.

- **Insufficient business product or process innovation**

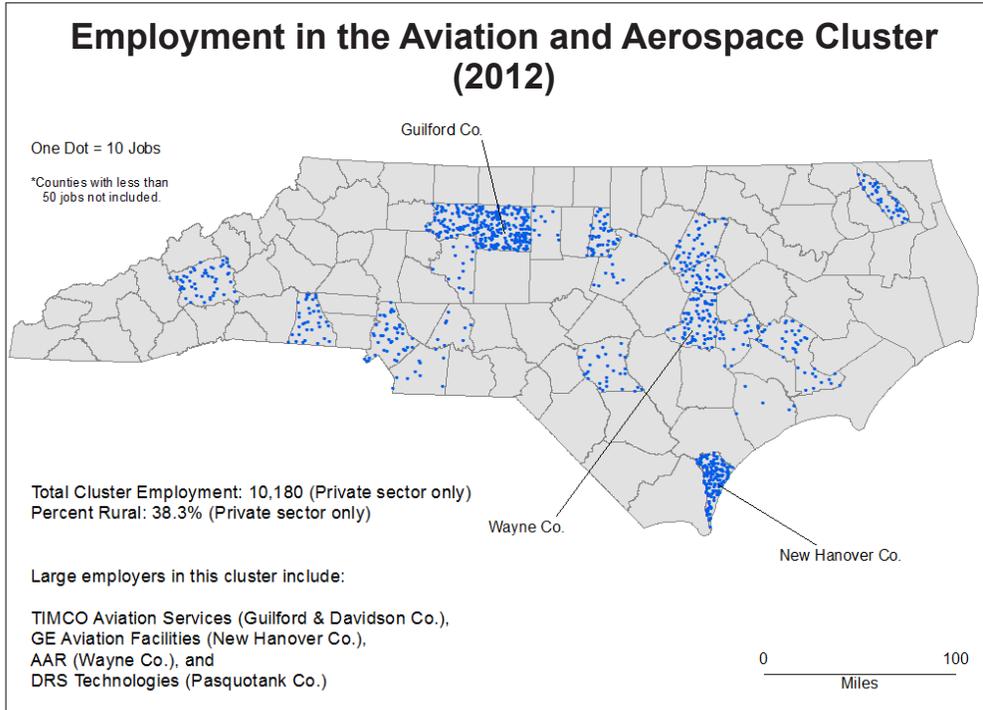
Fundamental to the growth of rural manufacturers is their ability to transform, adapting to a more competitive and constantly changing marketplace. In general, small and medium-size manufacturers invest less in new product development and process innovation and are much less connected to external expertise. North Carolina has invested in resources for research and development, but very little has been targeted to accelerate technology transfer and promote innovation among small and medium-size manufacturers.

- **Limited capacity of small firms in finding new customers**

For growing firms, the first priority should be increasing sales, especially from new customers, new markets and new products. Because most rural manufacturers are focused on day-to-day operations, few executives have time and resources to fully leverage business development opportunities. Many smaller firms need help from external sources or partners to serve new customers, investigate new markets and adapt their existing products.

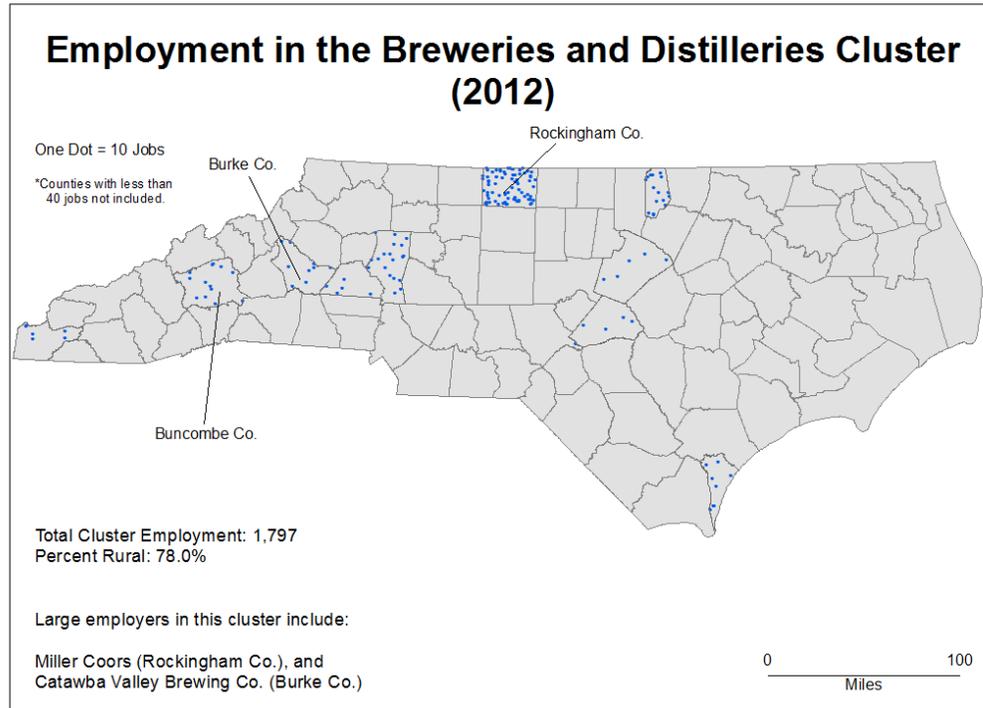
Employment in manufacturing clusters

Employment in each of the state's 25 largest manufacturing clusters is shown on the following pages. Each dot represents ten jobs in that manufacturing cluster.



Source: Economic Modeling Specialists Int'l.
 Covered Employment, Q2 2012

Center for Regional Economic Competitiveness



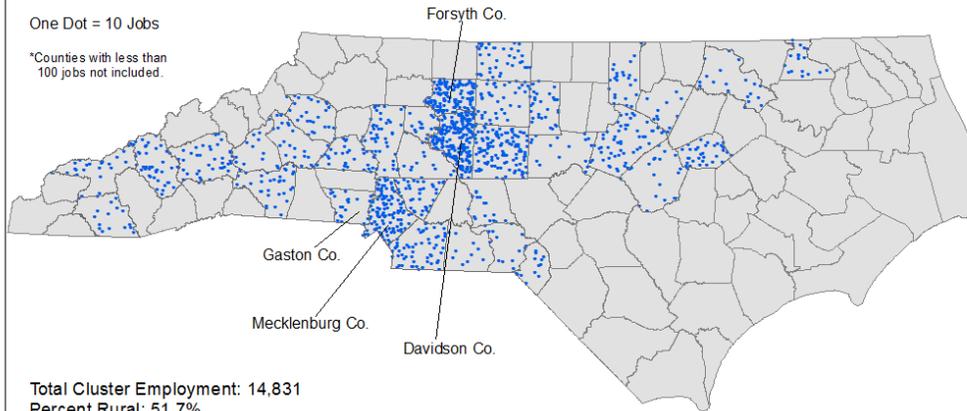
Source: Economic Modeling Specialists Int'l.
 Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Employment in the Building Products MFG Cluster (2012)

One Dot = 10 Jobs

*Counties with less than 100 jobs not included.



Total Cluster Employment: 14,831
Percent Rural: 51.7%

Large employers in this cluster include:

Rubbermaid (Mecklenburg Co.),
Wilbert (Gaston Co.), and
Windsor Window & Doors (Union Co.)

0 100
Miles

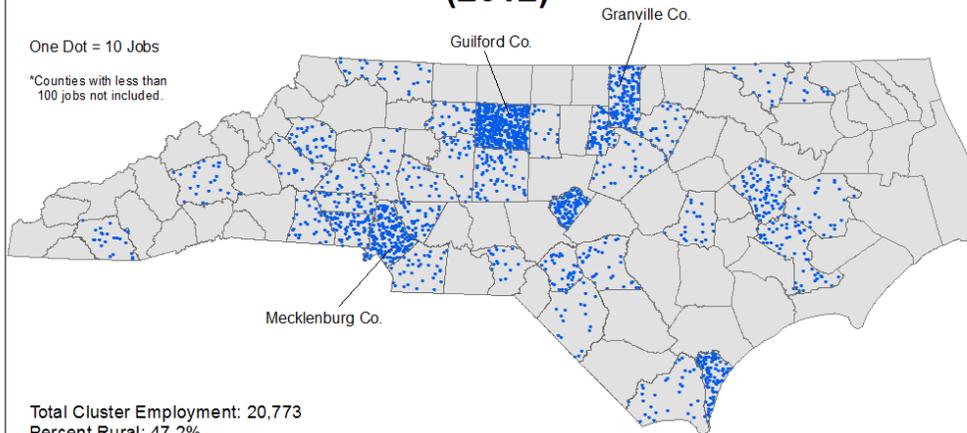
Source: Economic Modeling Specialists Int'l.
Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Employment in the Chemical Products MFG Cluster (2012)

One Dot = 10 Jobs

*Counties with less than 100 jobs not included.



Total Cluster Employment: 20,773
Percent Rural: 47.2%

Large employers in this cluster include:

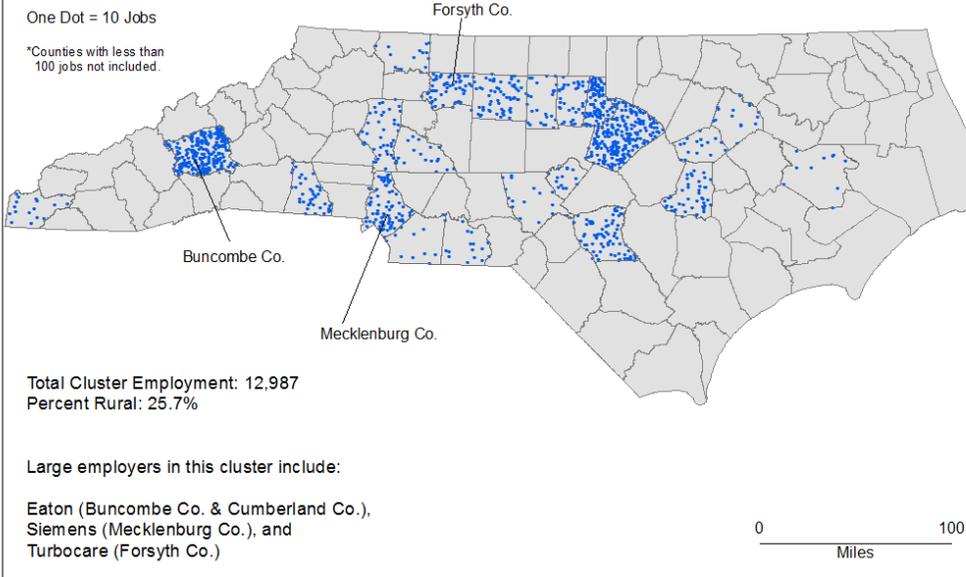
Revlon (Granville Co.),
Syngenta Crop Protection Inc (Guilford Co.), and
HB Fuller Co (Wake Co.)

0 100
Miles

Source: Economic Modeling Specialists Int'l.
Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

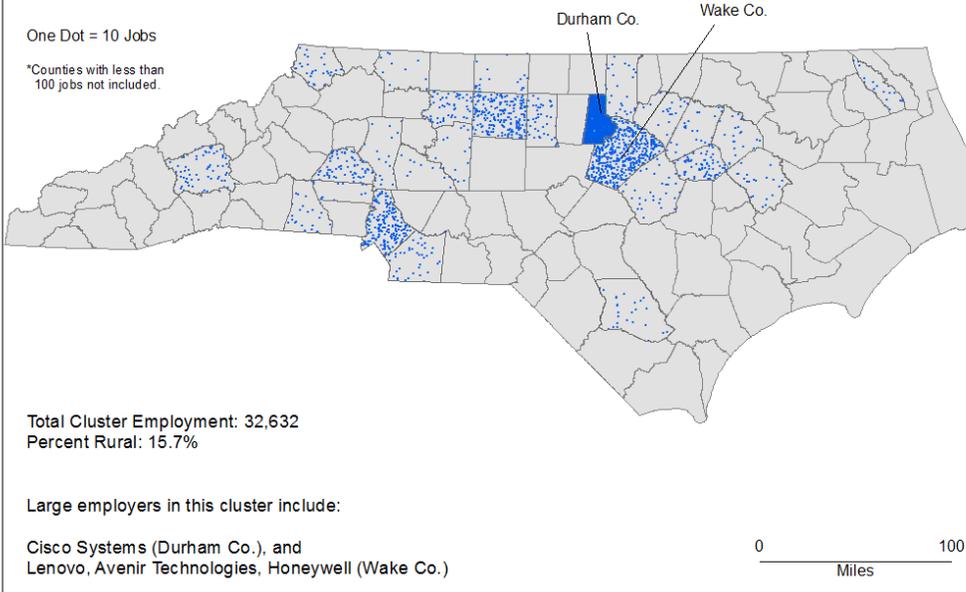
Employment in the Electrical Equipment MFG Cluster (2012)



Source: Economic Modeling Specialists Int'l.
 Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Employment in the Electronics Manufacturing Cluster (2012)



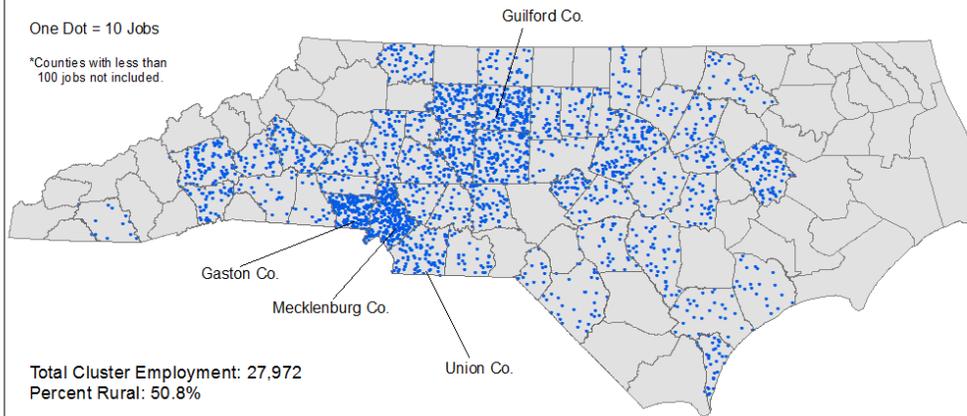
Source: Economic Modeling Specialists Int'l.
 Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Employment in the Fabricated Metal Products MFG Cluster (2012)

One Dot = 10 Jobs

*Counties with less than 100 jobs not included.



Total Cluster Employment: 27,972
Percent Rural: 50.8%

Large employers in this cluster include:

AB Carter Inc. (Gaston Co.),
Charlotte Pipe & Foundry Co. (Mecklenburg Co. & Union Co.),
Carolina Carports (Surry Co.), and
Endura Products (Guilford Co.)

0 100
Miles

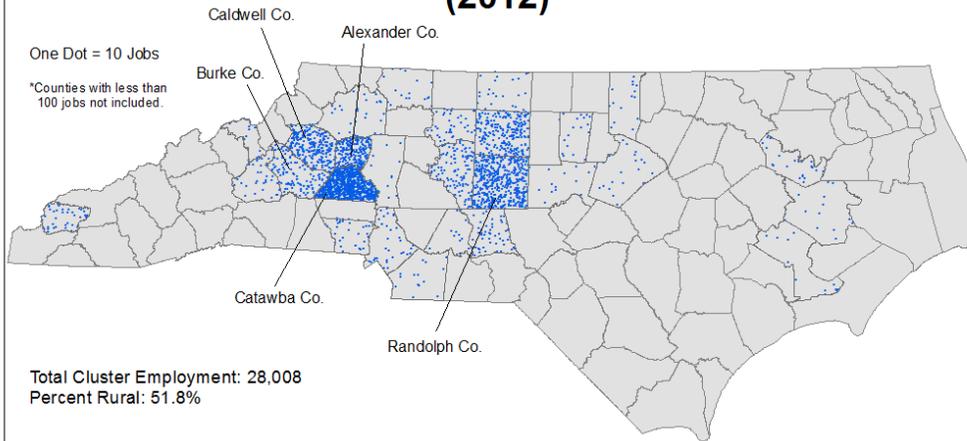
Source: Economic Modeling Specialists Int'l.
Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Employment in the Furniture Manufacturing Cluster (2012)

One Dot = 10 Jobs

*Counties with less than 100 jobs not included.



Total Cluster Employment: 28,008
Percent Rural: 51.8%

Large employers in this cluster include:

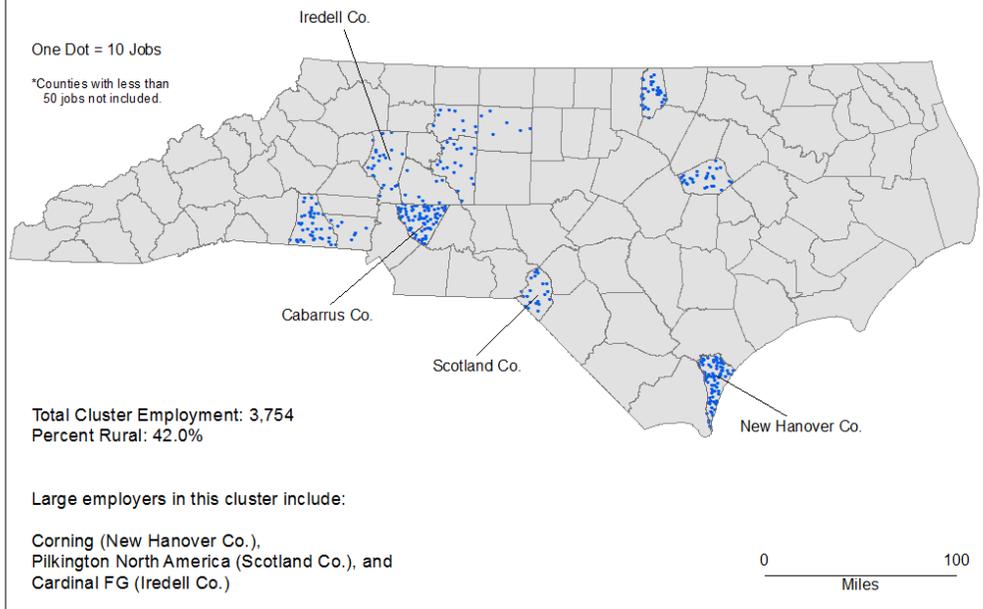
Klaussner Home Furnishings (Randolph Co.),
Henredon (Burke Co.),
Broyhill (Caldwell Co.),
Hickory Chair, Vanguard Furniture (Catawba Co.), and
Mitchell Gold, Craftmaster Furniture (Alexander Co.)

0 100
Miles

Source: Economic Modeling Specialists Int'l.
Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

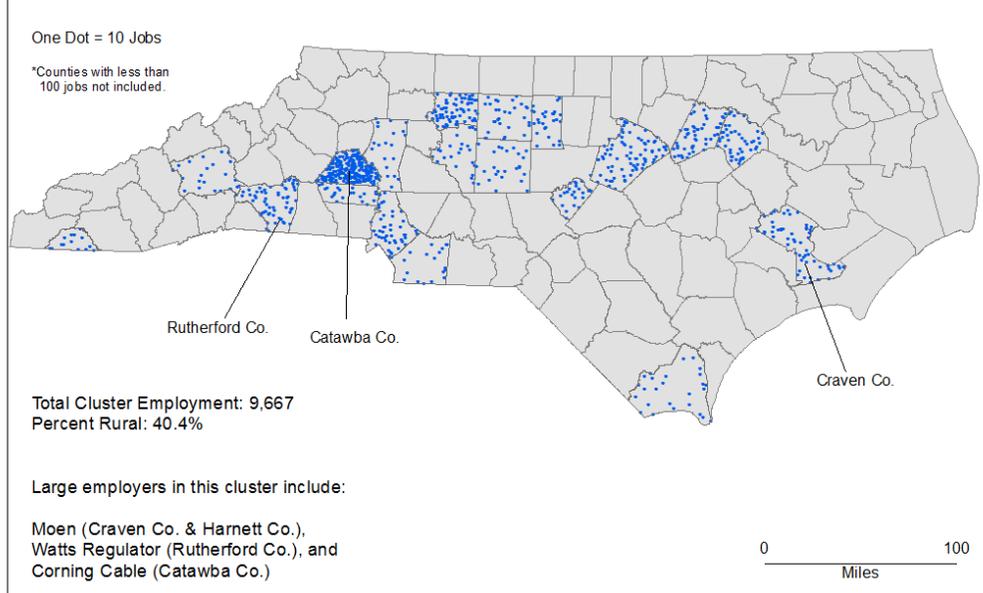
Employment in Glass Products Cluster (2012)



Source: Economic Modeling Specialists Int'l.
 Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Employment in the Hardware Manufacturing Cluster (2012)



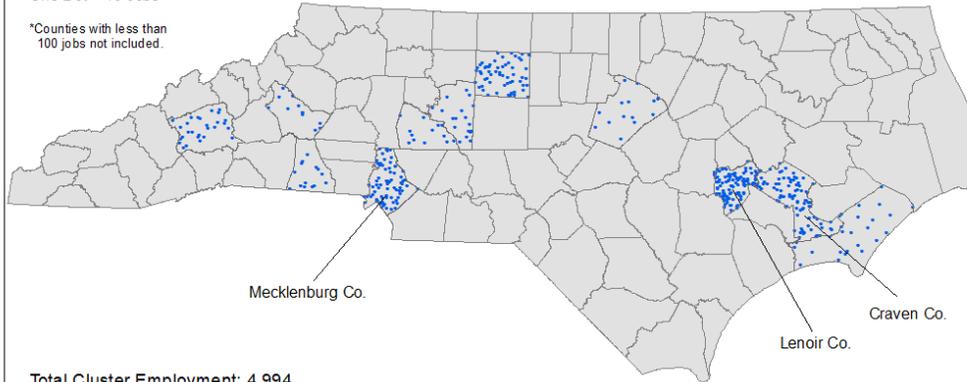
Source: Economic Modeling Specialists Int'l.
 Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Employment in the Household Appliance Cluster (2012)

One Dot = 10 Jobs

*Counties with less than 100 jobs not included.



Total Cluster Employment: 4,994
Percent Rural: 57.6%

Large employers in this cluster include:

Electrolux (Lenoir Co.), and
BOSCH Home Appliances (Craven Co.)

0 100
Miles

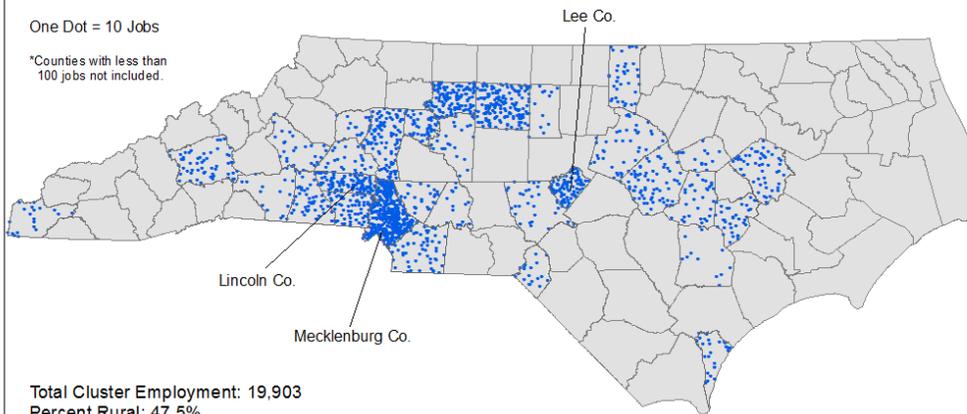
Source: Economic Modeling Specialists Int'l.
Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Employment in the Industrial Machinery MFG Cluster (2012)

One Dot = 10 Jobs

*Counties with less than 100 jobs not included.



Total Cluster Employment: 19,903
Percent Rural: 47.5%

Large employers in this cluster include:

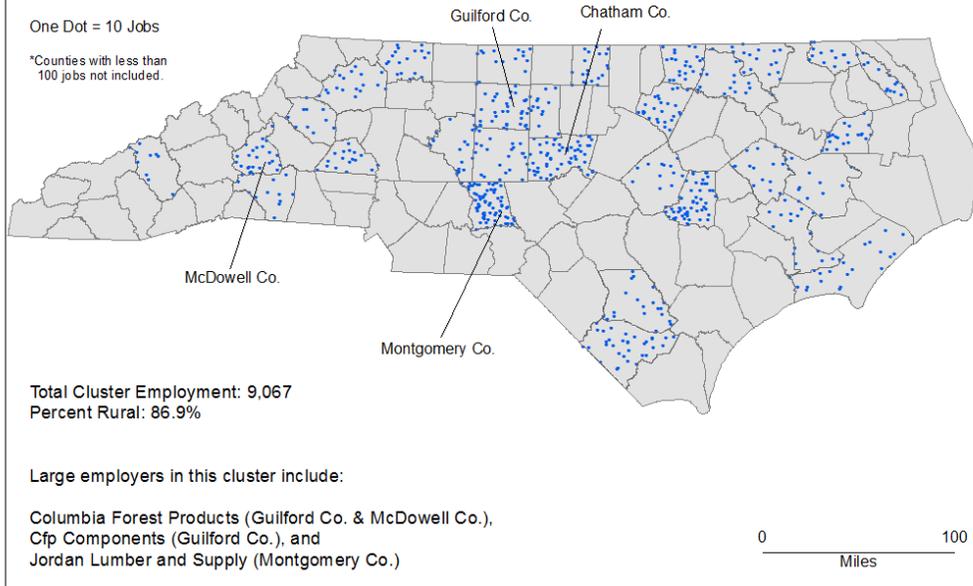
Ingersoll-Rand (Mecklenburg Co.),
Caterpillar (Lee & Johnston Co.), and
Timken (Lincoln Co.)

0 100
Miles

Source: Economic Modeling Specialists Int'l.
Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

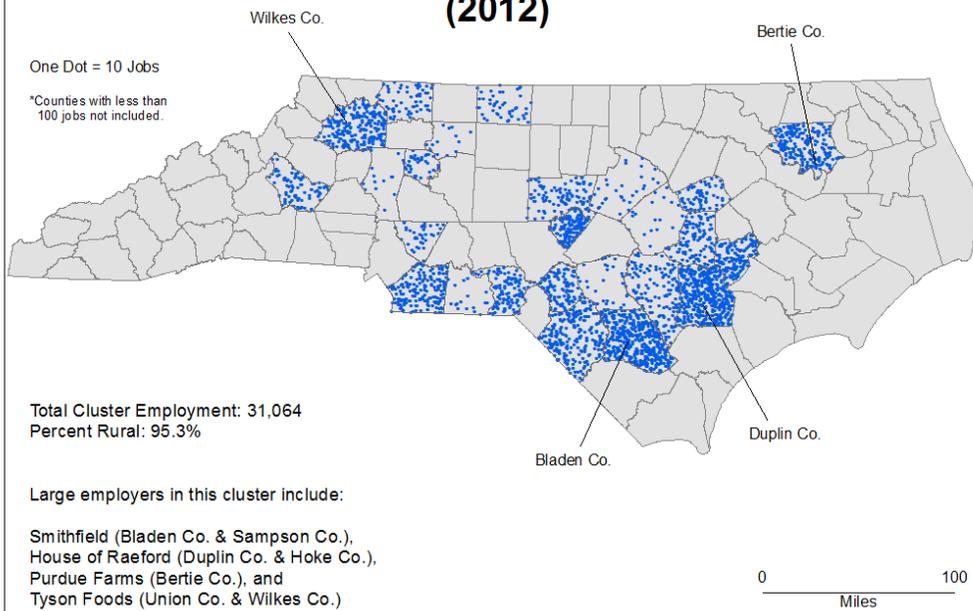
Employment in the Logging and Wood Milling Cluster (2012)



Source: Economic Modeling Specialists Int'l.
 Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Employment in the Meat Processing Cluster (2012)



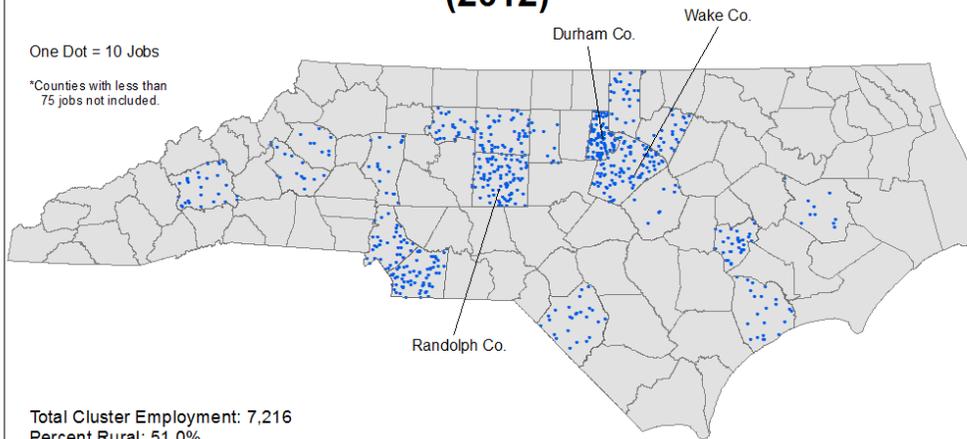
Source: Economic Modeling Specialists Int'l.
 Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Employment in the Medical Instruments MFG Cluster (2012)

One Dot = 10 Jobs

*Counties with less than 75 jobs not included.



Total Cluster Employment: 7,216
Percent Rural: 51.0%

Large employers in this cluster include:

Becton Dickinson (Durham & Wilson Co.),
Teleflex (Durham & Randolph Co.), and
BioMerieux (Durham Co.)

0 100
Miles

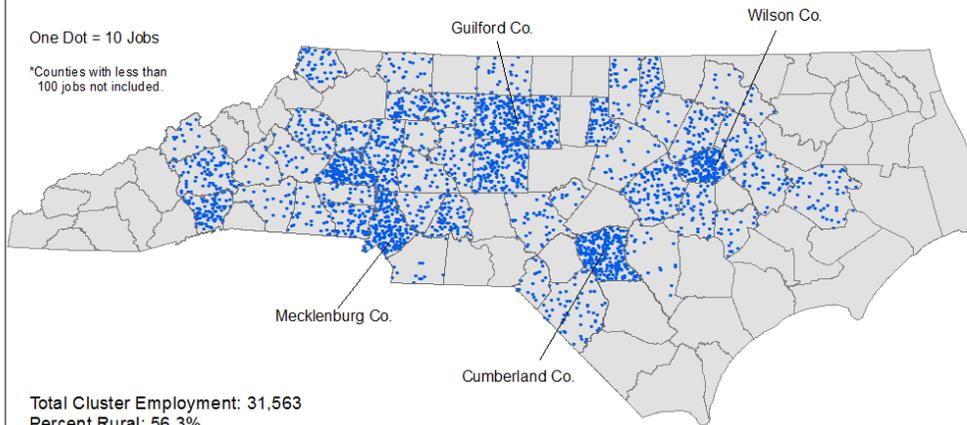
Source: Economic Modeling Specialists Int'l.
Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Employment in the Nonwoven Goods MFG Cluster (2012)

One Dot = 10 Jobs

*Counties with less than 100 jobs not included.



Total Cluster Employment: 31,563
Percent Rural: 56.3%

Large employers in this cluster include:

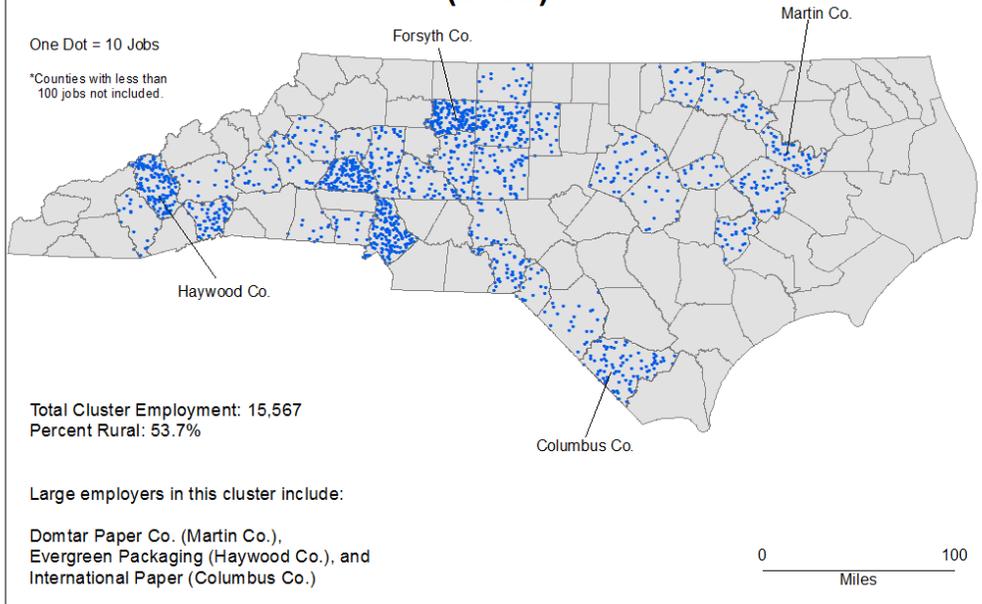
Bridgestone Firestone (Wilson Co.),
Goodyear (Cumberland Co.), and
Burlington Industries (Guilford Co.)

0 100
Miles

Source: Economic Modeling Specialists Int'l.
Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

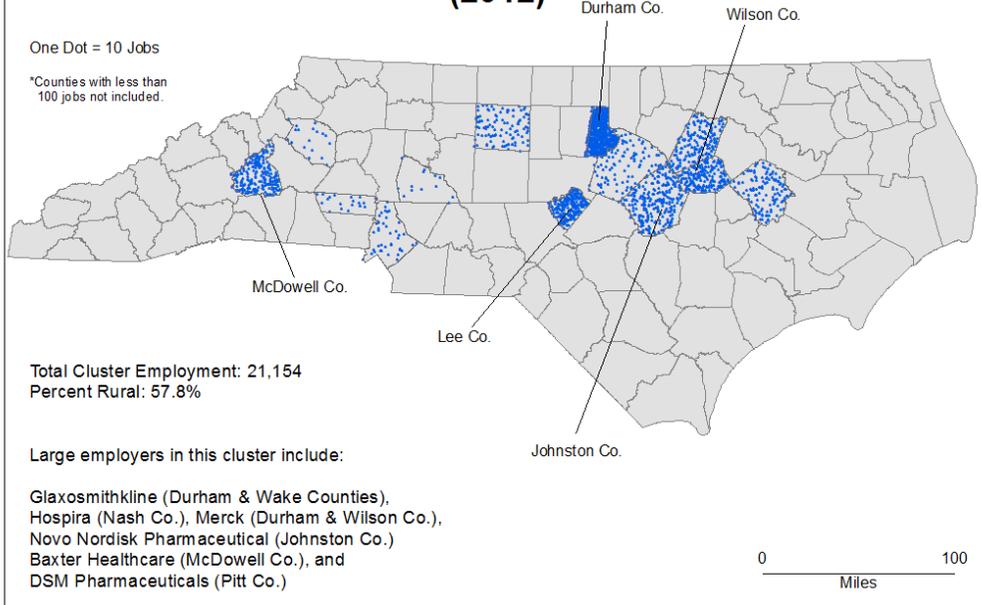
Employment in the Paper Products MFG Cluster (2012)



Source: Economic Modeling Specialists Int'l.
 Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Employment in the Pharmaceutical Products MFG Cluster (2012)



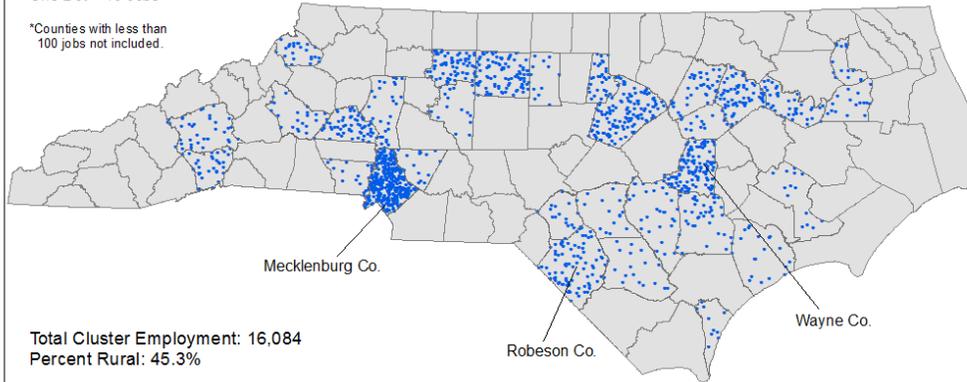
Source: Economic Modeling Specialists Int'l.
 Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Employment in the Packaged Foods MFG Cluster (2012)

One Dot = 10 Jobs

*Counties with less than 100 jobs not included.



Total Cluster Employment: 16,084
Percent Rural: 45.3%

Large employers in this cluster include:

Mt. Olive Pickles (Wayne Co.),
Campbell's Soup (Robeson Co.),
Frito-Lay (Mecklenburg Co.), and
Snyders-Lance (Mecklenburg Co.)

0 100
Miles

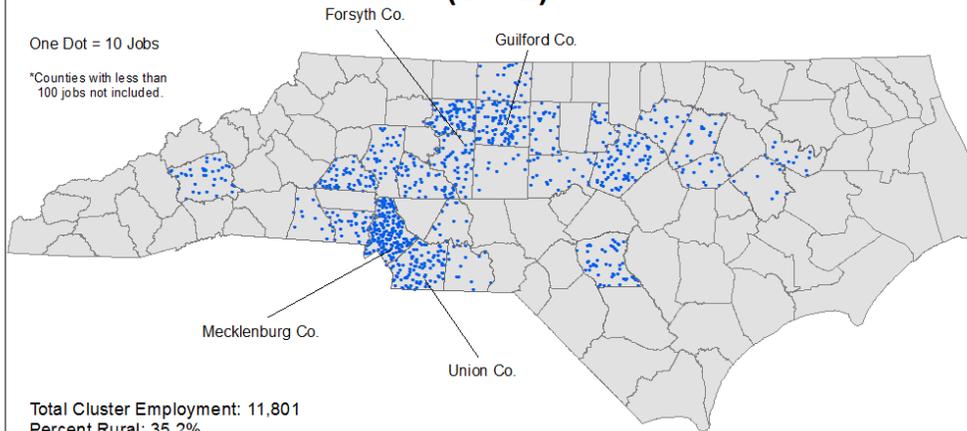
Source: Economic Modeling Specialists Int'l.
Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Employment in the Plastics Manufacturing Cluster (2012)

One Dot = 10 Jobs

*Counties with less than 100 jobs not included.



Total Cluster Employment: 11,801
Percent Rural: 35.2%

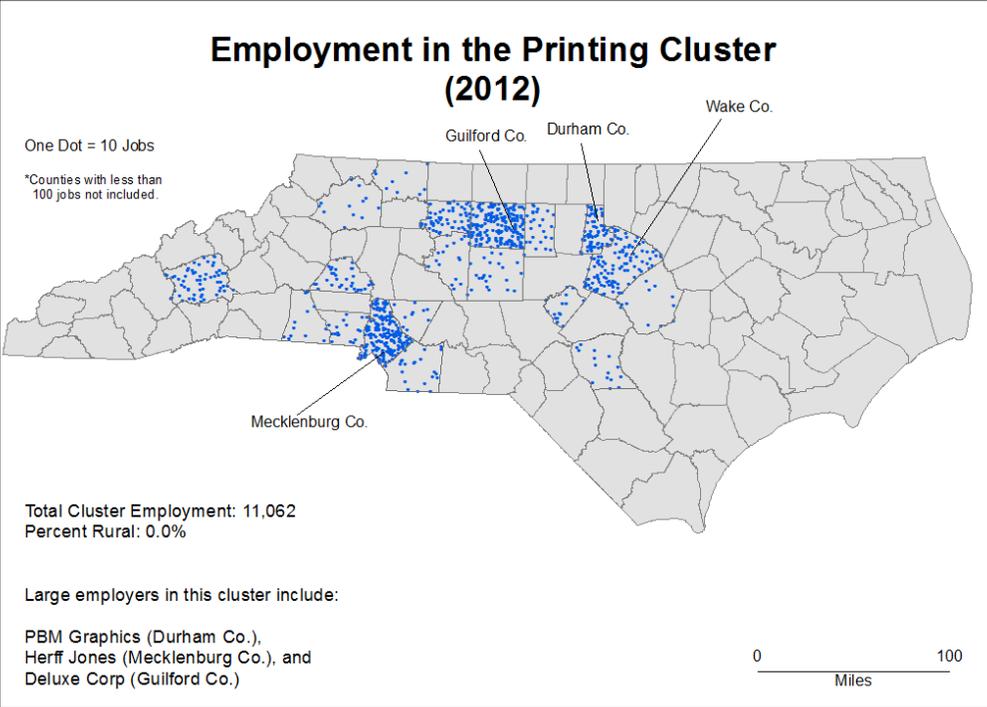
Large employers in this cluster include:

Charlotte Pipe & Foundry Co. (Mecklenburg Co. & Union Co.),
Coca-Cola Bottling Co. (Mecklenburg Co.), and
Pepsi Bottling Ventures (Forsyth Co.)

0 100
Miles

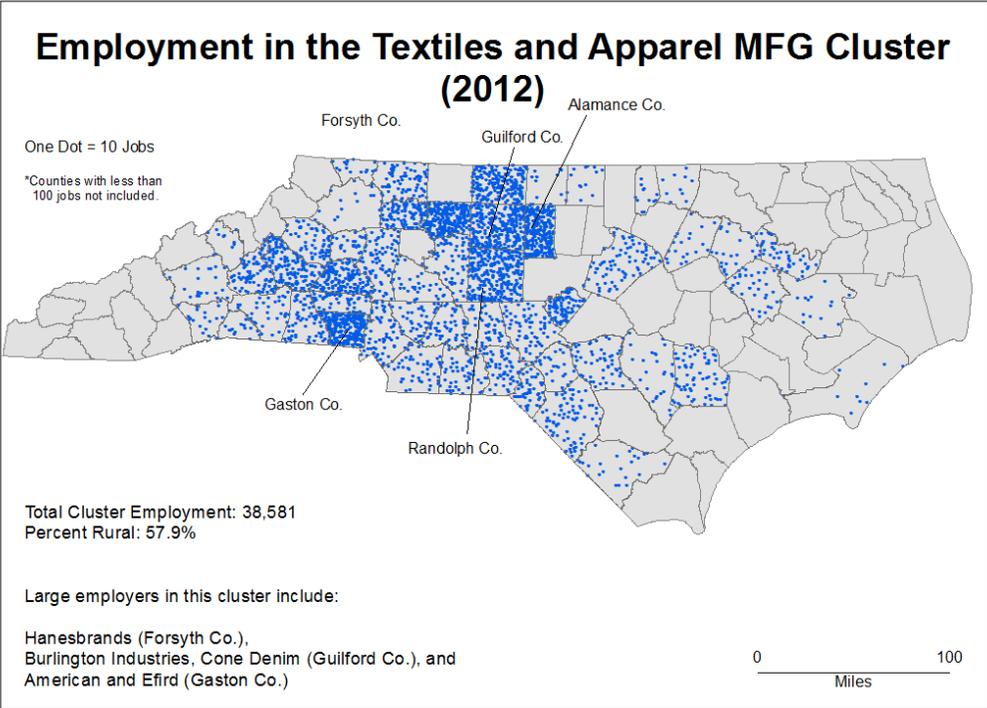
Source: Economic Modeling Specialists Int'l.
Covered Employment, Q2 2012

Center for Regional Economic Competitiveness



Source: Economic Modeling Specialists Int'l.
 Covered Employment, Q2 2012

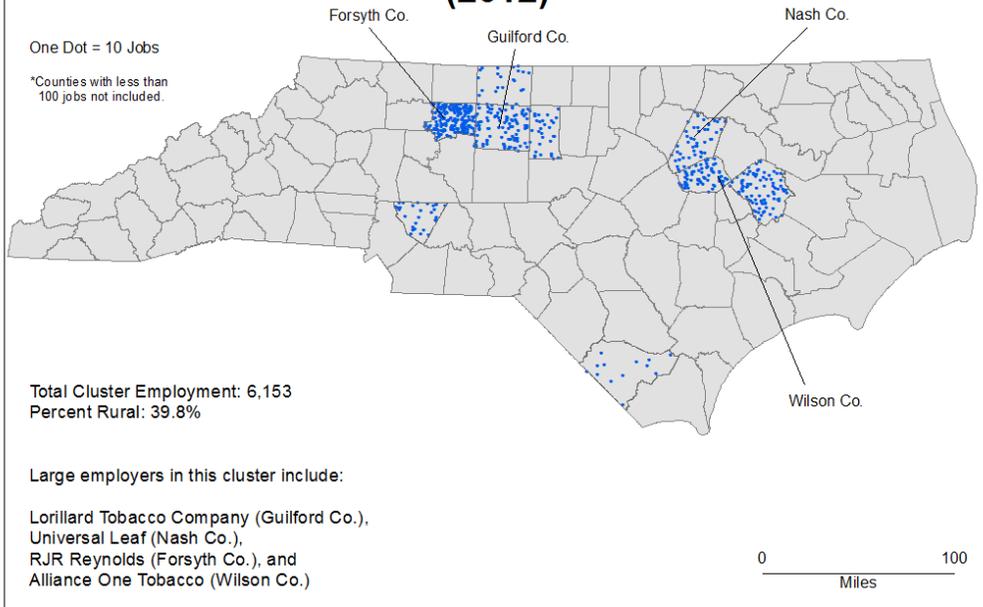
Center for Regional Economic Competitiveness



Source: Economic Modeling Specialists Int'l.
 Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

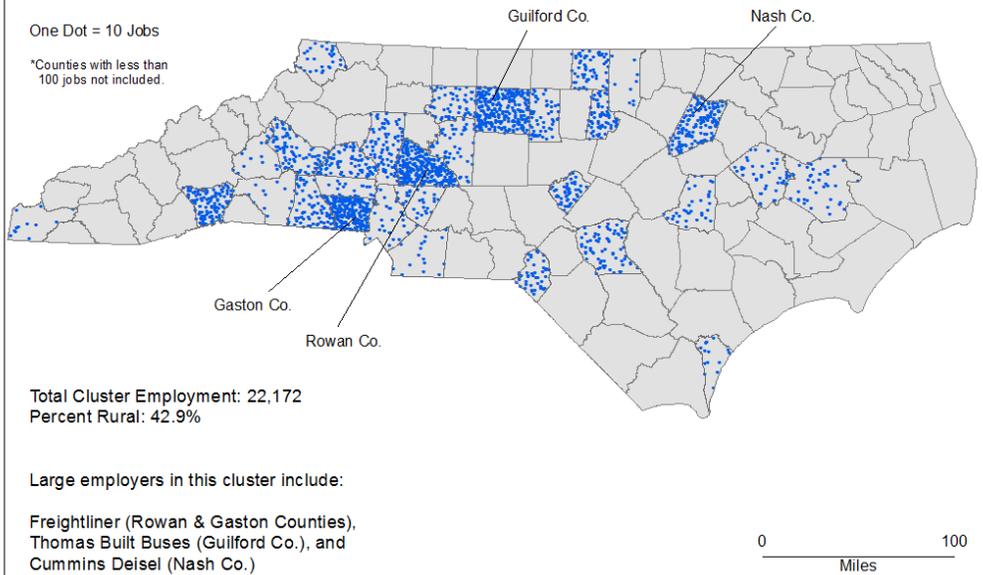
Employment in the Tobacco Products MFG Cluster (2012)



Source: Economic Modeling Specialists Int'l.
Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

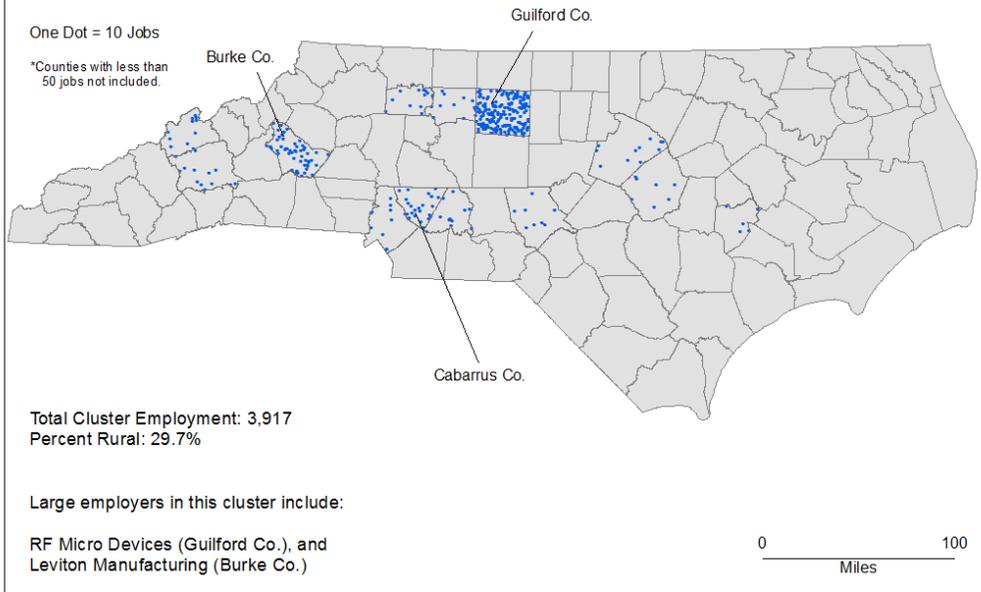
Employment in the Transportation Equipment MFG Cluster (2012)



Source: Economic Modeling Specialists Int'l.
Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Employment in the Wiring Devices MFG Cluster (2012)



Source: *Economic Modeling Specialists Int'l.*
Covered Employment, Q2 2012

Center for Regional Economic Competitiveness

Methodology

Interviews

Between July and November of 2012 the research team and Rural Center staff conducted outreach to more than a hundred manufacturers, business leaders, technical assistance providers and economic development professionals through intensive interviews, focus groups and regional briefings.

Employment data

Unless noted otherwise, Economic Modeling Specialists International. (EMSI) provided the wage and employment data at the county and industry level. EMSI creates its estimated county and industry employment numbers by using several data sources, starting with the Quarterly Census of Employment and Wages (QCEW) produced for the U.S. Bureau of Labor Statistics (BLS) by the North Carolina Division of Employment Security. Those data are combined with U.S. Bureau of Economic Analysis statistics from that agency's Regional Economic Information System, as well as data from the U.S. Census Bureau County Business Patterns and the American Community Survey. These data were organized so as to create estimates for the state and aggregates of rural and urban counties.

In this case, EMSI data are approximately equivalent to QCEW data from the BLS, which include only employment covered under the unemployment compensation system. Thus, self-employed workers and temporary workers not reported as part of quarterly company payroll records are not counted in this analysis. Forecasts are based on current industry data, a 15-year trend within each industry and growth rate projections from both state and federal sources. In some instances, local knowledge was used to adjust EMSI's modeled data to better reflect known employment in some key industries (e.g., aviation).

About the cluster analysis

One way to understand a regional economy is to look not just at growth trends in specific industries, but how those industries interact with one another. Specifically, companies have different purchasing and sales patterns depending on the type of industry and the location of their vendors and customers. Those buying and selling relationships can be

modeled into value chains that describe which industries purchase from which other industries. These value-chain patterns can help to cluster industries into meaningful groupings.

The data used to construct these industry clusters is from the quinquennial U.S. Economic Census (last completed in 2007) in which companies report their purchasing and sales activity. Furthermore, this focus on buying and selling relationships can help to narrow policy makers' attention to a few key driver industries representing the core of important industry clusters. Small impacts on these driver industries could have broader consequences for the regional economy.

The goal of this analysis is to identify potential sources of growth, particularly those activities that make up North Carolina's manufacturing economy. The cluster definitions used in this report are based on nationwide analysis of inter-industry buying and selling relationships undertaken by Professor Edward Feser of the Department of Urban and Regional Planning at the University of Illinois. A complete description of the methodology used to construct these clusters can be found on Professor Feser's website.³ Feser's analysis showed 54 value-chain clusters nationwide with 37 clusters focused primarily on manufacturing activities. Here, Feser's value-chain clusters are analyzed through the lens of future employment trends, relative industry concentration in the region and the quality of the opportunities they provide the region and its workers.

It should also be noted that industry cluster research typically assumes that the linked or related industries are located in geographic proximity. In practice, these linkages are just as likely to be national or global, meaning that companies in the same cluster are not necessarily part of the same value chain. Companies in the same manufacturing cluster, therefore, may not necessarily trade directly with one another, even though they may buy from or sell to companies in similar industries in other parts of the country.

About the value-chain analysis

The cluster analysis described above provides a top-down view of the economy. To better understand the opportunities available (or potentially available) for some of these key clusters, we have taken a somewhat different approach. It begins with a single industry and then examines that industry's linkages to other industries within the broader value chain.

³ http://www.urban.uiuc.edu/faculty/feser/Pubs/VC_Methods.pdf It should also be noted that the set of clusters used in this report are an updated version of those described in the online document.

Once again, the project team collaborated with Edward Feser to develop a benchmark model of suppliers and markets for each industry pertinent to this analysis. The study relies on the U.S. input-output national accounts. This approach uses the U.S. economy as a surrogate for the world economy for two reasons: (1) the U.S. represents the most developed as well as tightly integrated economy in the world and (2) the data for U.S. economic inputs and outputs are available for detailed industry categories.

In considering the value-chain analysis, it is important to note that the linkages are based on intermediate sales between industries and not the final demand. As a result, this approach does not account for the ultimate consumer of these goods. In economic terms, government is considered a final demand purchaser so it is not included in the input-output model. This should be considered where government is actually a market for a product or service—an important case for industries such as aviation and aerospace.

The value-chain mapping approach allows us to better understand how targeted core industries interact within the private sector. The analysis seeks to identify private sector suppliers and markets specific to each of the core industries. For each core industry, the analysis considers three issues. First, it considers the directionality of linkages (whether they are forward or backward linkages). Second, it addresses the proximity of the linkages: to whom does the core industry sell most directly and from whom does it buy. Third, it considers the magnitude of the linkages: what industries does the core industry buy from, and sell to, the most.

The goal is to determine the structure of inter-industry linkages because understanding the existence and strength of these linkages provides policy makers with a better understanding of an industry's growth potential. Linked industries where growth occurs can reinforce the potential strength of the core industry and bode well for efforts to further develop the core industry. Conversely, where linked industries are not present locally, gaps may exist that need to be better understood for core industry growth.

Selected References

Feser, Edward. (October 2005) Benchmark value chain industry clusters for applied regional research. University of Illinois at Urbana-Champaign, Regional Economics Applications Laboratory.

Governor's Manufacturing Advisory Council, Team Pennsylvania Foundation. (July 2012) Recommendations: PA made stronger economy through manufacturing.

Governor's Manufacturing Advisory Council, Team Pennsylvania Foundation. (2012) Recommendations to encourage growth in Pennsylvania's manufacturing sector.

Lane, Brent, & Jolly, Jason G. (January 21, 2009) An evaluation of North Carolina's economic development incentive programs: Summary of analysis, findings and recommendations. Chapel Hill, N.C.: University of North Carolina, Center for Competitive Economies.

Toft, Graham S., & Melton, Sherry B. (2008) What North Carolina makes, makes North Carolina: Manufacturing's value proposition for a state on the go. Raleigh, N.C.: North Carolina Chamber of Commerce.

U.S. Census Bureau. Longitudinal employer-household dynamics. Quarterly Workforce Indicators. Available at <http://lehd.did.census.gov/datatools/qwiapp.html>

U.S. Census Bureau. (2012) U.S. exports of goods by state, based on origin of movement, by NAICS-based product. Website. Available at http://www.census.gov/foreign-trade/statistics/state/origin_movement/index.html

U.S. Department of Labor and Training, Workforce Development – Business Service Center. Available at <http://www.dlt.ri.gov/bwc/taxcredits.htm>

U.S. International Trade Administration. Exporters Database. Website. Available at <http://tse.export.gov/EDB/SelectReports.aspx?DATA=ExporterDB>

U.S. Government. (August 9, 2007) America Competes Act. Public Law 110–69. Section 3008. Available at <http://arpa-e.energy.gov/Portals/0/Documents/About/PL-110-69.pdf>

Rural Center Board of Directors

Valeria L. Lee, Chair
Bill Gibson, 1st Vice Chair
Larry Wooten, 2nd Vice Chair
Mikki Sager, Secretary
Curtis Wynn, Treasurer
Billy Ray Hall, President

W. Ted Alexander
Andy Anderson
Rex L. Baker
Frank V. Beam
Leslie Boney
Charles P. Brown
Anita R. Brown-Graham
Janice Brumit
James S. Bryan
Everette Clark
J. Keith Crisco
Brian Crutchfield
Robin G. Cummings
Lige Daughtridge
Ilana Dubester
Lewis Ebert
Patricia Ferguson
Bobbie Jacobs Ghaffar
Grant Godwin
Scott T. Hamilton
Andrea Harris
CeCe Hipps

Lenna Hobson
Lenora Jarvis-Mackey
Howard Jones
Alice M. Keeney
Robert L. Luddy
Wayne McDevitt
Patricia Mitchell
John Nelms
Allan Oocumma
Chris Parrish
Robert B. Partin
Scott Ralls
Alan Rice
Jarette L. Sampson
Cleveland Simpson
Joseph Stanley
Charles Smith
Steven W. Troxler
Jennifer Tolle Whiteside
Frank Alfred Wilson
Leon Wilson
Greg Winkler

Emeritus Members
Robert B. Jordan
Thomas W. Lambeth
Kelly S. King

Rural Partners Corporate Group

ACEC of North Carolina
AT&T North Carolina
Atkins Global
Bank of America
BB&T Charitable Foundation
Blue Cross Blue Shield of North Carolina
East Carolina Bank
First Citizens Bank
Jordan Lumber
Macon Bank
Martin Marietta Materials
McGill Associates
Mechanics and Farmers Bank
Murphy Electric Power Board

Nexsen Pruet
North Carolina Farm Bureau
North Carolina Mutual
Life Insurance Company
North Carolina's Touchstone Energy Cooperatives
Piedmont Natural Gas
PNC Bank
Progress Energy
Rivers & Associates
Sanford Holshouser
Sepi Engineering & Construction
The Wooten Company
Wells Fargo

Report Authors: Elaine Matthews, Matt Ehlers
Editor: Garnet Bass
Design: Julie Schmidt

THE NORTH CAROLINA RURAL ECONOMIC DEVELOPMENT CENTER

The N.C. Rural Economic Development Center is a private, nonprofit organization whose mission is to develop sound economic strategies that improve the quality of life in rural North Carolina, with a special focus on individuals with low to moderate incomes and communities with limited resources. The center operates a multifaceted program that includes conducting research into rural issues; testing promising rural development strategies; advocating for policy and program innovations; and building the productive capacity of rural leaders, entrepreneurs and community organizations. President: Billy Ray Hall



N.C. Rural Economic Development Center
4021 Cary Drive
Raleigh NC 27610
919-250-4314
www.ncruralcenter.org