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## HIGHLIGHTS

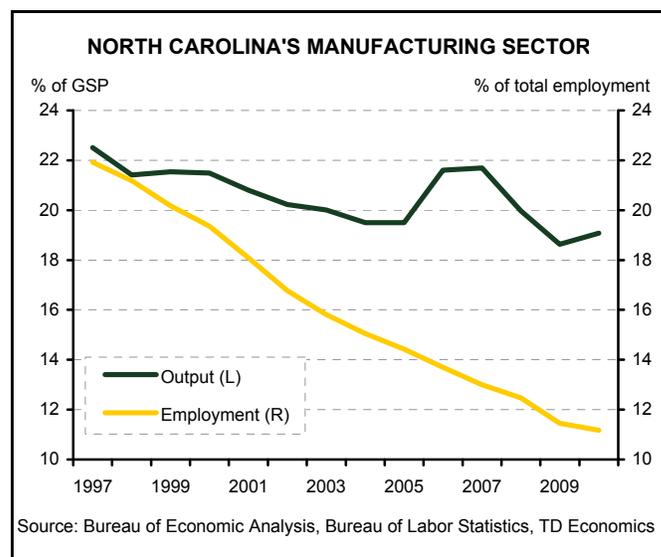
- North Carolina is transitioning from traditional manufacturing, like textile and apparel, to high-tech manufacturing, biotechnology and services.
- The state is seeing its middle-skilled jobs disappearing and its workforce is increasingly being pulled towards both ends of the skills curve.
- The declining matured industries are biting into North Carolina's economic growth and keeping the state's unemployment rate above its historical level. The transition towards high-tech industries is creating imbalances between the demand for new jobs and the supply of dislocated workers.
- It is a necessary transition that will allow the state to become more insulated to economic downturns. Firstly, high-skilled jobs are less sensitive to economic contractions than medium-skilled jobs, and secondly, manufacturing is becoming less volatile. The creation of high-tech business clusters is also enhancing efficiency, improving productivity and bolstering the state's output.
- On net, the positives outweigh the negatives, and North Carolina's underlying economic fundamentals are getting stronger.

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## INDUSTRIAL TRANSFORMATION: THE CASE OF NORTH CAROLINA

North Carolina has seen its economy transform on many fronts. For one, it has transitioned from traditional manufacturing to high-tech manufacturing and service activities. Second, there has been a shift in demand from medium-skilled workers to high-skilled labor. Even though manufacturing remains the largest sector in North Carolina, its role is diminishing. Between 1999 and 2010, North Carolina's manufacturing output went from 22% of its economy to 19%, and its manufacturing jobs went from 20% of total employment to 11%. Nonetheless, while manufacturing as a whole has lost share, not all of its sub-sectors have fared the same. High-tech computer and electronic, and pharmaceutical and medicine manufacturing have grown strongly and are poised to play a leading role in the state's manufacturing sector.

North Carolina's industrial transition is not without its side effects. The loss of traditional manufacturing industries is subtracting from North Carolina's real Gross State Product (GSP) and it is keeping the state's unemployment rate elevated. Moreover, the transition towards high-tech industries is creating imbalances in the labor market and is driving a wedge between the state's output and employment. Nonetheless, it is a necessary transition that will allow North Carolina to become more insulated to economic downturns. High-tech goods industries are inherently less volatile than the former traditional industries of textile and apparel. And, the creation of high-tech business clusters is enhancing efficiency, improving productivity and increasing the state's output. While particular groups of people, sectors and regions are hit hard by the transition, the state as a whole is growing richer and becoming more diverse. On net, the positives outweigh the negatives, and North Carolina's underlying economic fundamentals are getting stronger.



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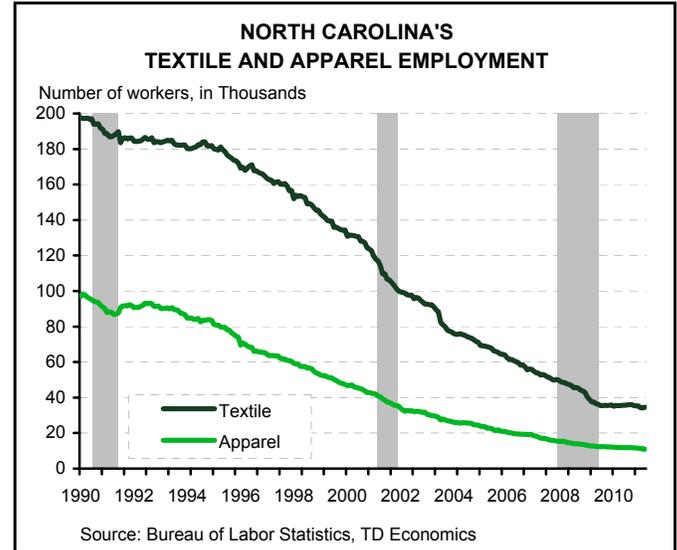
### From textiles to high-tech

Since the early 20th century, North Carolina has depended heavily on non-durable manufacturing industries like textiles and apparel. However, the state's role was significantly marginalized during the last decade. In 1999, textile and

apparel production accounted for 11% of North Carolina’s manufacturing output, which was above the South Atlantic average of 9% and substantially higher than the national average of 3.5%. Ten years later, the size of North Carolina’s textile and apparel output has converged with the average for the South Atlantic, amounting to slightly less than 5% of the state’s manufacturing production. Given that these industries are labor intensive, the declines in the labor force were more severe. In 1999, about 188,000 people worked in textile and apparel in North Carolina. Today that number stands at a mere 47,000. These industries are facing fierce competition from abroad. Abundant labor, low wages, undervalued foreign currencies, coupled sometimes with no minimum wage laws and lax environmental laws are making foreign textile and apparel products cheaper compared to the domestically produced ones.

Unfortunately, the outlook of North Carolina’s traditional industries is rather dire, and declines are likely to persist. The state has recognized the need to move forward, and has shifted away from textile and apparel industries towards high-tech and biotechnology industries. The state was successful in creating a cluster of high-tech firms (like IBM and Cisco Systems) in the Research Triangle Park – a prosperous region in the heart of the state that is surrounded by world-class research universities marked by North Carolina State University in Raleigh, Duke University in Durham, and University of North Carolina at Chapel Hill. In turn, the highly-ranked engineering and computer science programs at the universities attract even more high-tech firms in the region.

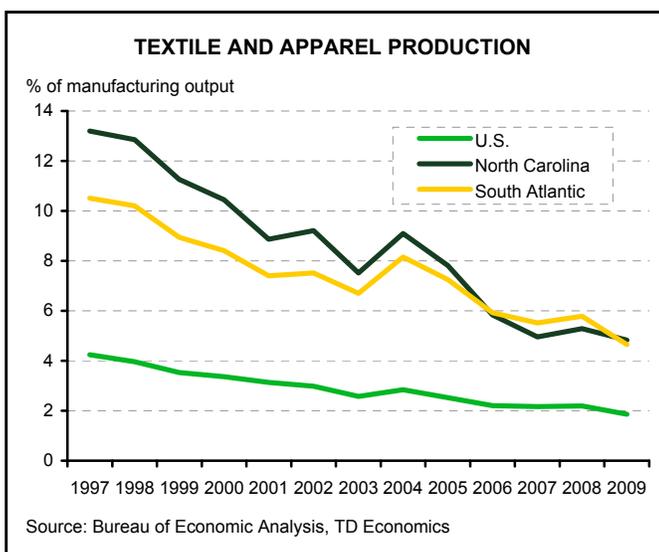
In addition, a growing presence of firms in the fields of life sciences and pharmaceuticals (like GlaxoSmithKline,

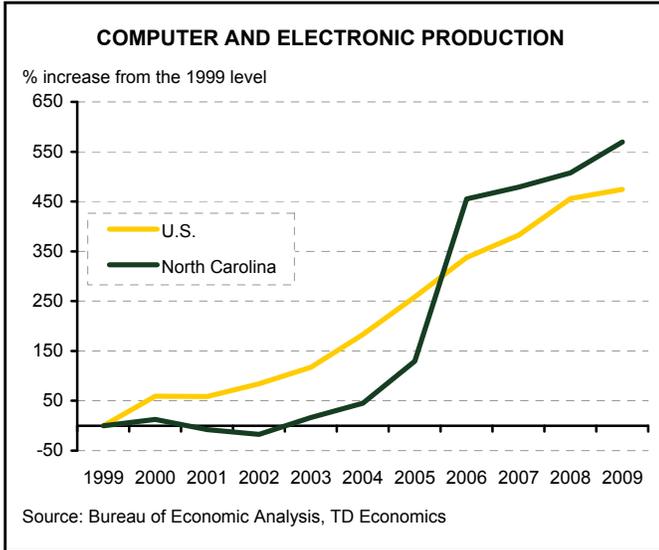


Merck & Co, and Bayer) enabled the Research Triangle Park to establish itself as one of the largest biotechnology centers in the country. Once again, the high concentration of firms in health sciences in the Park reflects the well-equipped nearby universities, which have well-regarded biomedical research programs and schools of medicine and nursing.

While the surrounding universities are the Park’s strongest assets, there are other factors that contributed to its success. It has an existing base of high-tech activity, well developed networks of infrastructure, and the right mix of private and public planning. While the Park is owned and operated by a private organization, state and local governments share the cost of public services and provide incentives through tax credits and grants to businesses moving into the region. What is more, the state government decreased the property taxes paid by the Research Triangle Park’s landowners, which in turn makes it an even more attracting place for high-tech firms to relocate.

So, the efforts to increase the state’s output, enhance efficiency and enjoy the benefits of large scale production are paying off. Some of the non-durable manufacturing sector declines were offset by the high-tech durable sector, like computer and electronics, and by the chemical sector, like pharmaceuticals. Between 1999 and 2009, computer and electronics manufacturing output went up by a massive 569%, which surpassed the national increase of 475%. Likewise, chemical manufacturing output increased by just over 9%, while the national average declined by 3%. Although data on North Carolina’s manufacturing sub-sectors is only available until 2009, preliminary indicators revealed that during the recent recovery cycle, computer, electronics and





chemical manufacturing output outperformed textile and apparel production.

The shift in output and resources towards high potential industries like biotechnology and high-tech and away from traditional manufacturing sectors is deepening a labor market divide by pushing workers to the tail ends of the skill distribution.

**Shift in skill levels is also occurring**

North Carolina is seeing middle-skill jobs disappear and its workforce become increasingly polarized between those that have high-skills and those that have low-skills. On the one hand, whether in services or manufacturing, we are seeing an ongoing push towards high-skilled jobs. Between 1999 and 2009, the share of high-skilled labor in North Carolina grew by 14.3%. High-tech industries are creat-

ing a lot of new high-skilled jobs in engineering, software design, nano-manufacturing and bio-processing, to name a few. Between 1999 and 2010, jobs in software design services rose by 24% and jobs in pharmaceutical and medicine manufacturing went up by 11%. While these increases do not offset the large losses recorded in textile and apparel manufacturing, pharmaceutical and medicine was the fastest growing manufacturing sub-sector in the state during the past decade. And, it appears that this momentum is holding. Pharmaceutical jobs are well poised to grow faster than other manufacturing jobs over the next decade. These and other high-skilled jobs generate higher incomes as they require significant investment in education and training. In 2010, the average weekly wage per employee in pharmaceutical and medicine manufacturing was \$1750, whereas in textile mills manufacturing was \$687 and in apparel manufacturing was \$646. This obviously offers a positive pay-off to the state as those incomes recycle through the economy through retail sales, higher tax revenues etc. The higher pay and increased demand also acted as a magnet in attracting talented high-skilled workers into the state from other states or countries. Over the last decade, about 40% of in-migrating adult workers had high-skills, whereas the corresponding share in Georgia and South Carolina was 37%.

However, there is a downside to this transition. The tragedy of the high-tech industries is that many medium-skilled manufacturing workers, who used to work at the textile and apparel factories, are discovering that they do not have the skills to compete for the jobs that are in high demand. For instance, only 5% of the occupations in the Research Triangle Park require medium-skilled production workers. Although medium-skilled workers usually have a high

**South Atlantic 2009 State Occupation Skill Shares\***

	High	% change <sup>2</sup>	Medium	% change <sup>2</sup>	Low	% change <sup>2</sup>
Delaware	31.9	33.1	49.3	-15.6	18.5	7.7
Florida	27.2	7.4	50.2	-6.1	21.9	6.6
Georgia	30.7	16.7	50.7	-10.1	18.1	7.3
Maryland	36.2	14.2	44.4	-11.2	19.1	5.7
North Carolina	29.5	14.3	50.3	-12.2	19.8	20.1
South Carolina	26.7	6.9	52.4	-9.3	20.4	20.6
Virginia	34.6	21.2	46.3	-12.7	18.8	3.3
West Virginia	25.9	1.1	53.8	-2.9	19.9	6.2
U.S.	30.8	13.9	49.4	-9.7	19.8	8.5

\* Total non-farm, non-military employment, may not sum to 100% due to incomplete data or rounding.

<sup>2</sup> % change from 1999 to 2009.

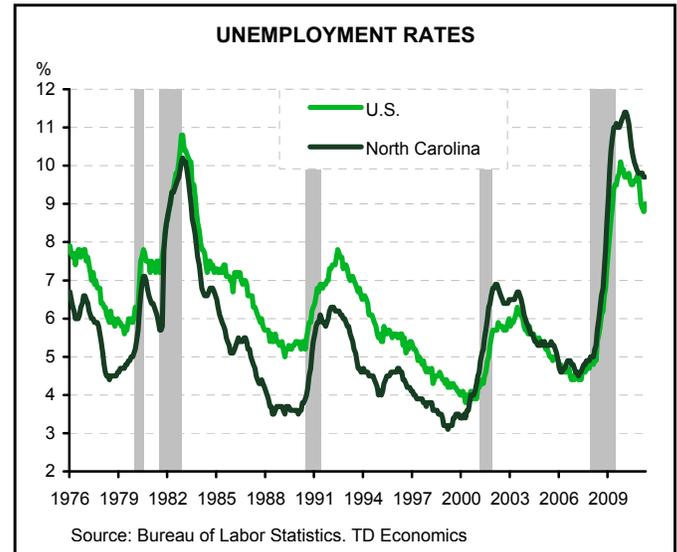
Source: TD Economics, Bureau of Labor Statistics, Census Bureau

school diploma, they do not have extensive education and the necessary skills required to use, maintain and program the new state-of-the-art automated machines. And, to make matters more difficult for these workers, even the “new era” of middle-skilled jobs require more formal education and training. If workers do not have the resources or inclination to obtain the new higher skills, they often have to settle for low-skill jobs. This is evident by the 12.2% decline in North Carolina’s share of middle-skilled workers, the third sharpest decline in the South Atlantic region, alongside a 20.1% increase in the state’s share of low-skilled jobs, one of the fastest increases in the region. The increase in the latter is also attributed to the large number of low-skilled in-migrant workers. Over the last decade, roughly 31% of adults moving into North Carolina had low-skills.

Locally, people living in the Mountains and Coastal regions of North Carolina were among the first to move either up or down the skills curve. Usually, rural areas are structurally more dependent on manufacturing, or a handful of large employers, than other areas. With more and more factories closing their doors, job opportunities are limited to low-skilled service jobs. So, workers either settled for the low-skilled jobs or relocated to the nearby metropolitan areas and pursued a career in the new high-skilled jobs.

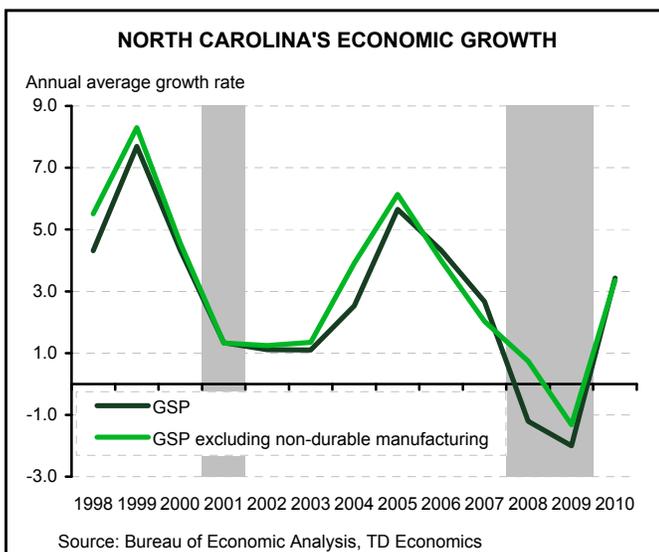
**Key issues and challenges**

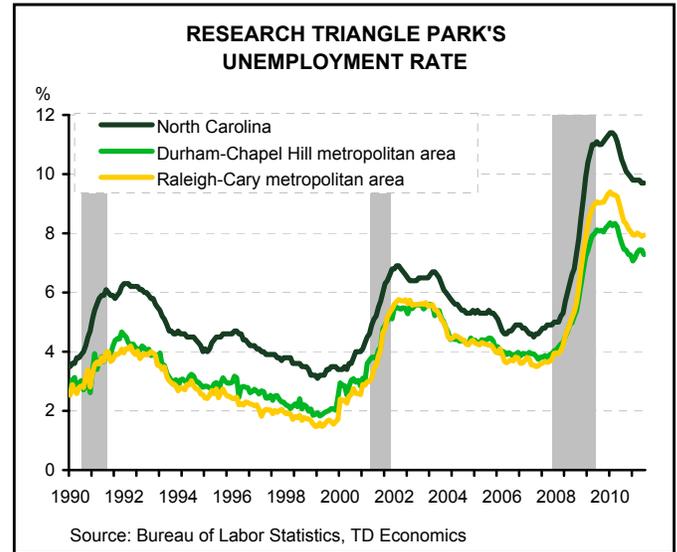
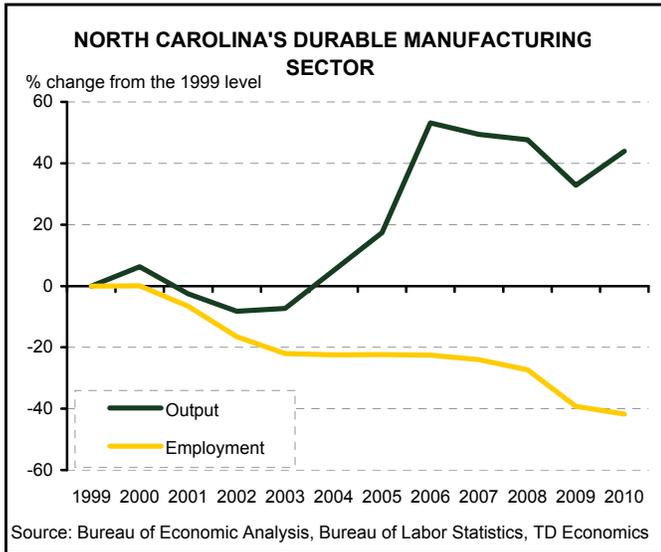
Nobody said that the industrial transition from old school manufacturing to high-tech sectors was going to be smooth. The contracting non-durable manufacturing sector subtracted about 0.4 percentage points annually from North Carolina’s overall economic growth between 1999 and 2010. Also, over the same period, declining non-durable manu-



facturing jobs cut average annual employment growth to 0.3% from 0.8%. Given that these industries are more labor intensive, when they decline, they tend to shed a lot of jobs. Between 1999 and 2010, textile jobs tumbled by 74%, and apparel jobs plummeted by 77%. Textile and apparel sectors alone eliminated almost half of the manufacturing jobs lost over the last decade. This in turn put upward pressure on the state’s unemployment rate and also prevented the historical relationship between the U.S. and North Carolina’s unemployment rates from being restored. From 1980 to 2000, North Carolina’s unemployment rate was below the national rate on average by 1.2 percentage points. However, North Carolina’s structural issues kept its jobless rate at or above the national rate after 2001.

The transition to high-tech industries and the adoption of new technologies is also driving a wedge between output and employment. New technologies enable manufacturers to produce more output with fewer workers. Two areas in manufacturing that saw their output levels skyrocket, but their payrolls plummet, were the computer and electronic sector, and the transportation equipment sector. By 2009, high-tech computer and electronic manufacturing output in North Carolina went up by a whopping 569% from its 1999 level, whereas jobs declined by 35%. Similarly, transportation equipment output, which includes motor vehicles, aircrafts and auto parts, increased by 26% between 1999 and 2009, but jobs decreased by 36%. Even in manufacturing areas where both output and employment expanded, output grew at a rate that is sometimes eight times faster than jobs. For instance, North Carolina’s food manufacturing sector saw its output increase by 8% during the last decade, but recorded a corresponding rise in jobs of only 1.1%.





The transition to high-tech industries from matured ones is also creating imbalances in the labor market. The demand for the number of people needed to work in capital intensive industries, like pharmaceuticals, does not meet the supply of dislocated textile and apparel workers. For instance, when a pharmaceutical company opens, it adds about 50-100 jobs. But, when a textile factory closes, it sheds roughly 300-500 employees. On top of that, the greatest declines are felt in smaller rural communities, whereas the bulk of the emerging jobs are concentrated in the state's larger metropolitan areas.

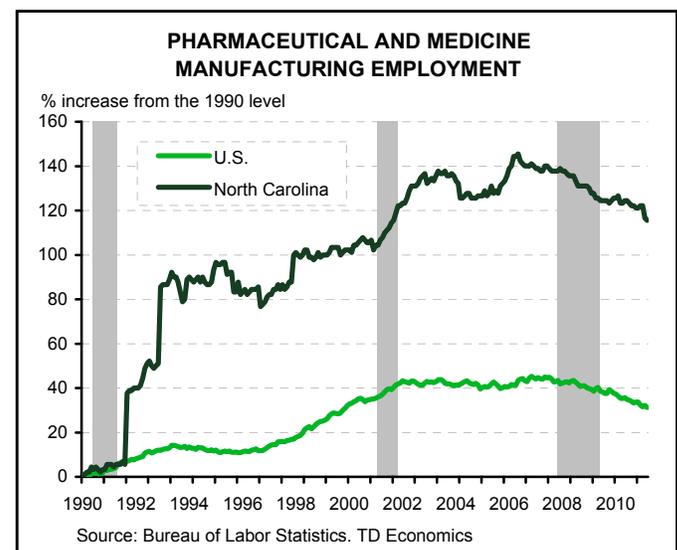
While new technologies are usually blamed for the polarization of the labor market and the ongoing wedge between manufacturing employment and output, they are also responsible for the stellar improvements in labor productivity, which generates economic growth and increases the standards of living.

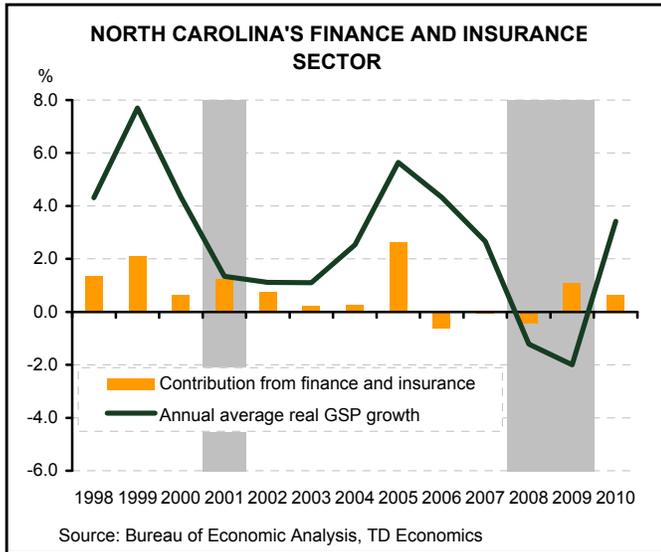
**Positive opportunities**

Although the negative effects tend to get more attention, we should not underestimate the positive opportunities created by industrial transition. For one, high-skilled jobs tend to be more resilient than medium-skilled workers during economic downturns. This was apparent in the Research Triangle Park, where the oversized share of high-skilled jobs somewhat buffered the Park during the recent recession. The Park's unemployment rate was always below the statewide rate. The rate peaked at 8.4% in Durham-Chapel Hill metropolitan area, and at 9.4% in Raleigh-Cary, compared to 11.4% statewide. In April 2011, the unemployment rate was down to 7.3% in Durham-Chapel Hill and 7.9% in Raleigh-Cary, the two lowest unemployment rates in the state. The declines in the jobless rates were fueled

by solid employment gains. In particular, the Raleigh-Cary metropolitan area recovered 61% of the jobs lost during the recession – the largest percentage improvement in the state and a far stronger performance than that seen in the U.S. as a whole.

Another advantage of shifting towards high-tech computer and electronics, and pharmaceutical and medicine is that these manufacturing sub-sectors tend to be less volatile during economic downturns than other manufacturing sub-sectors. Even when the economy is under-performing, pharmaceutical companies tend to do well and high-tech computers tend to become smarter. During the last recession, pharmaceutical and medicine jobs were the least shed among the non-durable manufacturing sub-sectors. Moreover, computer and electronics jobs recorded the smallest percentage decline among the durable manufacturing sub-sectors.



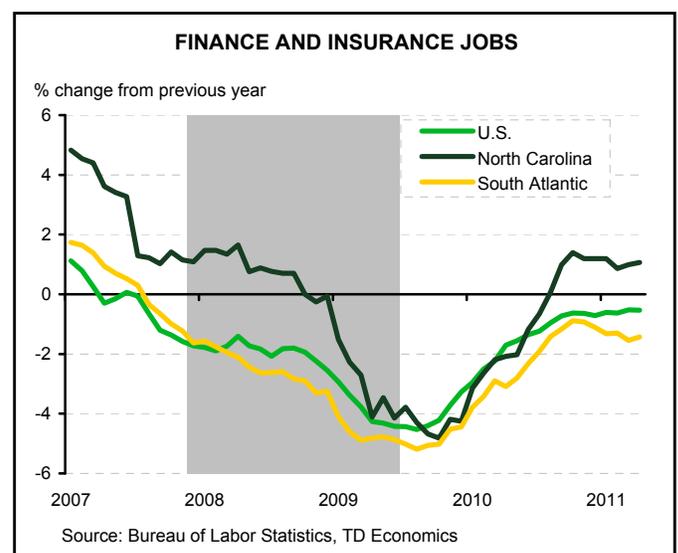


Overall, manufacturing payrolls tumbled by 17% over the course of the recession. While this was a hefty drop, things could have been much worse. For the size and the duration of the recession, we estimate that manufacturing jobs could have fallen by 18% - 23%. So, as the share of high-tech and drug-producing firms increase in North Carolina, manufacturing jobs should become less volatile and less sensitive to economic downturns.

Moreover, the positive benefits of business clusters are apparent in other sectors of North Carolina's economy. The growing presence of financial services, mainly in Charlotte, has made the state the second largest financial center in the country. The expanding finance and insurance sector is not only offsetting some of the declines in non-durable manufacturing output, but it is also contributing positively to the overall economic growth. Between 1999 and 2010, the financial and insurance sector added roughly 0.5 percentage points to North Carolina's economic growth, on an average annual basis. This sector was the number one contributor to North Carolina's GSP between 1999-2002, in 2005 and in 2009. As a share of North Carolina's economy, finance and insurance output has grown to an oversized 12% in 2010 from 8% in 1999. As a result, the finance and insurance sector created approximately 15,000 new jobs between 1999 and 2010. Furthermore, in 2010 North Carolina's finance and insurance employment at 1.2% recorded the largest percentage increase in the South Atlantic region. The process of recouping some of the finance jobs lost during the recession is already underway in North Carolina, whereas the majority of the South Atlantic states are still shedding finance and insurance jobs.

The process of developing clusters does not end in metropolitan areas. In an effort to deal with the economic hardships created by contracting matured industries, smaller communities are also creating new clusters. The foothills of North Carolina are investing in high-tech industries. The south western part of the state is marketing itself as a Data Center Corridor and was successful in enticing technological giants like Apple, Facebook and Google to build huge data centers in Maiden, Rutherford County and Lenoir, respectively. Generous tax incentives, the low cost of water and electricity, coupled with the abundance of power were the main factors that attracted these companies to the region. In the near-term, the massive investment will create construction jobs, and in the long-term, it will create permanent jobs that could be more resilient to economic downturns. Moreover, it could create new opportunities for supporting industries in technical services.

The Coastal region of North Carolina chose a different cluster. Rather than investing in high-tech industries, the region is focusing on its natural competitive advantage – tourism. The state's barrier islands and the Atlantic coast prove to be a favorable destination for new residents seeking to retire and a point of attraction for tourists. While tourism activity is expected to remain a strong sector for growth in North Carolina in the next two years, the sector often creates low-skill service jobs that usually pay less than the middle-skill manufacturing jobs. On top of that, jobs in the tourism sector are more volatile. They are sensitive to economic downturns and weather swings, implying that unseasonable trends can leave many workers with no jobs for an extended period.



**Bottom Line**

North Carolina is transitioning from traditional manufacturing industries, like textile and apparel, to high-tech manufacturing, biotechnology and services. While manufacturing remains the largest sector in North Carolina, it is not destined to remain so. Textile, apparel and furniture producing industries are the state's fastest declining industries. At the same time, no manufacturing industry is among the state's fastest growing industries. Although computer and electronics, and pharmaceutical and medicine are the best performing manufacturing sub-sectors, they are not expanding fast enough to offset the sharp declines in matured industries, and they still underperform service-related industries in healthcare, education, and professional and business activities.

Industrial transition is not always smooth. North Carolina's labor force is increasingly pushed at the tail ends of the skills curve. There is an imbalance between the supply of dislocated workers and the demand of new jobs. And, the new industries tend to produce more output with fewer workers. As a result, the state's structural problems kept its unemployment rate at or above the national rate over the last decade. On the other hand, North Carolina is benefiting from the industrial transition. It is becoming more diverse and more resilient to economic downturns. Business clusters tend to enhance efficiency, improve labor productivity, and bolster the state's output. Between 1999 and 2010, North Carolina's economy over-performed the U.S. economy by roughly 0.4 percentage points, on an average annual basis.

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