

What North Carolina Makes, *Makes* North Carolina

Manufacturing's Value Proposition for a State on the Go



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Sponsored by:



Contents

Foreword

EXECUTIVE SUMMARY

1. INTRODUCTION AND PURPOSE	12
2. SNAPSHOT: NORTH CAROLINA WITH AND WITHOUT MANUFACTURING	14
3. METHODS AND DATA	19
4. MANUFACTURING’S VALUE PROPOSITION: REMARKABLE ECONOMIC IMPACT	21
5. PROSPECTS FOR MANUFACTURING GROWTH: GROWTH COMPANIES/GROWTH INDUSTRIES MATTER	48
6. POSITIONING MANUFACTURING FOR NORTH CAROLINA’S “NEXT QUANTUM LEAP”	69
7. CONCLUSION: NEXT STEPS	79
8. APPENDICES Error! Bookmark not defined.	83
9. REFERENCES	101

Foreword

Dear North Carolina Chamber Member,

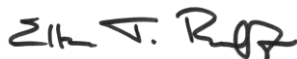
It is my honor to introduce the following report to you with thanks to the North Carolina Chamber for quantifying the true impact of manufacturing on our North Carolina economy. Perhaps more importantly, the report captures key issues that we must focus on if our communities are going to continue to grow and thrive.

We could view this report as a summary of our history and put it on a bookshelf. Or, we can use it to continue to build on the strong manufacturing foundation North Carolina has today to proactively and positively shape our state's future. I am proud that you – leaders of our state – have embraced the future and not the past.

This report, and the larger project it supports, provides us with a critical opportunity to join together and have a collective voice. In the following pages you'll see the value and promise of manufacturing in North Carolina, along with key issues that we must continue to address to make sure our state is a leading place in the world to do business. Leadership from the North Carolina Chamber is invaluable as we develop action plans that will continue to position North Carolina as “the place” to work and call home. We are particularly grateful for the input from various regional and statewide organizations and to those who attended the Manufacturers Roundtables in fall 2007.

Our combined efforts to continue to evolve the state's business climate, help companies remain competitive and attract workers to manufacturing will be crucial to our success in the years to come. After all, “What North Carolina Makes, *Makes* North Carolina.”

Sincerely,



Ellen T. Ruff
President, Duke Energy Carolinas

Manufacturing Matters Today, Shows Promise for the Future

As North Carolina's official manufacturing association (the state affiliate of NAM), it simply makes sense for our state Chamber to commission a project to reveal both the value and promise of this vital economic sector. The North Carolina Chamber is a champion of our state's manufacturers, and for good reason.

The benefits and economic impact of manufacturing in North Carolina are great – historically and today. And contrary to what we too often hear and see in the public dialogue, the growth potential of modern manufacturing here is significant.

North Carolina is the seventh largest manufacturing state in America. Manufacturing provides good jobs for our state's residents with wages that are substantially higher than in non-manufacturing jobs. Manufacturing has a greater multiplier effect on the rest of our economy than any other industry sector. And manufacturing drives private-sector development and innovation – leading to advanced technologies and products that improve our collective quality of life.

With all that manufacturing has to offer and its critical role in our economy, it is imperative that state leaders, policymakers, media and the public understand its benefits and the impact of our collective decision-making and perceptions on its future here. The North Carolina Chamber is committed to facilitating that understanding and this important project is just one example. On behalf of our Chamber, I extend sincere thanks to Duke Energy for sponsoring our work.

Manufacturing still matters in North Carolina. And it will matter well into the future, but only if we recognize its value and promise, and are willing to provide the competitive environment and tools necessary for manufacturers to flourish in today's flat, fast-paced, ever-changing world.

Lew Ebert

President and CEO, North Carolina Chamber

EXECUTIVE SUMMARY

The message of this report from the North Carolina Chamber project, “What North Carolina Makes, *Makes* North Carolina” is strong and clear: Manufacturing is alive and well in the state. It has been through some rough times during this decade, but the sector remains a major contributor to the North Carolina economy.

North Carolina manufacturing firms are showing amazing agility and workers demonstrating notable flexibility. This decade, 12 percent of the state’s manufacturers can be described as “growth businesses,” with average annual employment growth of 12.6 percent and annual sales growth of 10.3 percent – hardly a sign of an industry in decline. These businesses are at the forefront of a very exciting and promising industrial transformation taking place across the U.S. that is leading to higher levels of innovation, increased productivity, the creation of stimulating and rewarding jobs, and global integration in 21st-century manufacturing. What is occurring could be described as a kind of quiet industrial revolution.

North Carolina is the seventh largest state for manufacturing as measured as percent of total state gross domestic product (GDP). It is the second largest in non-durables manufacturing, such as textiles, apparel, leather goods, chemicals and energy. As of January 2006, there were 21,500 manufacturing establishments (operations with separate lines of business) in North Carolina, employing 728,000 workers with \$83 billion in sales.

Without manufacturing, the North Carolina economy would be approximately two-thirds its size today and have an annual average earnings per worker 5.6 percent lower than today’s statewide average. It is in the state’s best interest to take steps to promote a competitive investment environment for a healthy manufacturing sector for the foreseeable future. High-productivity manufacturing,

combined with a highly productive service sector, will ensure economic progress and improve North Carolina's prospects of moving up into the top 10 states in the nation in per capita income. (With 2006 per capita disposable income at \$28,408, North Carolina currently ranks 38th out of 50 states.) This project is ultimately about jobs – growth in good high-paying jobs to improve North Carolina's standard of living and quality of life.

For every manufacturing job in North Carolina, an additional 1.7 jobs are created indirectly through buy-supply relationships with support industries and retail and household purchasing by those directly employed in manufacturing.¹ In total, this multiplier effect means that 29 percent of the state's employment and 37.5 percent of its output in goods and services are attributable to manufacturing. The state was the No. 1 state in non-durable goods manufacturing for decades (especially textiles and plastics), but its mix of manufacturing industries is changing and becoming more diversified. Vibrant younger industries include boat building, agriculture, construction and mining machinery manufacturing, architectural and structural metals manufacturing, and aerospace products and parts manufacturing.

Manufacturing remains a “buzz issue” across the state because:

- ❖ Job losses this decade have caused business, personal and community hardships. Understandably, as a top-10 manufacturing state nationally, North Carolina had relatively more to lose as manufacturing nationwide lost employment this business cycle.

¹ A comparable economic impact assessment of the Virginia manufacturing sector found a job multiplier of 2.3.

- ❖ Jobs in manufacturing aren't as easy to come by as in the past because, with increasing productivity, fewer workers are needed per unit of output, while the jobs retained require more knowledge, training and teamwork skills.
- ❖ Some are frustrated and resentful that "jobs are going offshore," while overlooking the fact that "talent jobs" and innovation are growing on-shore as a result of technology and international trade. In fact, for the nation as a whole, studies show only a small percentage of manufacturing jobs being lost offshore relative to those lost due to technological change or productivity improvement.
- ❖ While still successful, economic development entities at state, regional and local levels are facing tough competition in recruiting manufacturing investment to the state. Even more job growth is expected to occur from entrepreneurial initiatives from inside the state; North Carolina's resurgent boat industry is an example.
- ❖ While some fear mainline manufacturing is going away, it is actually transforming and adapting, while remaining a critical growth agent for the state and nation. In fact, there are signs of a resurgent industrial sector in the U.S. as global demand for advanced U.S. products increases.
- ❖ A widely-held view that "as manufacturing goes, so goes the state" still holds.

Defining manufacturing in today's economy is becoming more difficult.

Manufacturing no longer means getting more low-paying, low-skill factories.

Manufacturing includes a complex value chain, including advanced research and product development, market research and branding, high-tech/high-performance production, advanced logistics and after-market service.

For the purposes of this report, production manufacturing is defined by NAICS codes 31-33 in federal statistics (see Appendix B for industry code descriptions). In addition, where possible, this report's economic impact analysis takes into account those industries linked both upstream and downstream to mainline production – often called “the multiplier effect” (i.e. if manufacturing were not here, various other firms/jobs would not be here).

Key storylines from this project are:

- ❖ Manufacturing is a global industry. Its ebbs and flows are influenced by constantly shifting competitiveness abroad. For North Carolina to be a lead manufacturing state in the U.S., it must be a leader globally. That means it must be constantly on watch to create a favorable business climate that matches the best locations to manufacture both nationally and overseas.
- ❖ While jobs are declining in U.S. manufacturing relative to the size of the total economy, manufacturing output is not. In other words, manufacturing productivity continues to shine, resulting in strong profits and better-paying jobs.
- ❖ Manufacturing productivity is remarkable. It leads to fewer jobs per unit of output while rewarding higher-skilled workers with higher pay. North Carolina cannot compete on low-skill jobs, and why should it? A goal of state economic growth is to continue to upgrade jobs to higher paying ones. The positive gap between earnings per job in manufacturing and the state average has been widening annually for several decades – a very real contribution to the state.
- ❖ While recruiting new investment into the state remains important, most new manufacturing jobs are being created by existing business.

- ❖ There are many manufacturing growth stories in North Carolina within particular businesses and specific industries. Indicating a healthy entrepreneurial climate between 2001 and 2006, 10 manufacturing industries were identified as “positive growth” performers, including architectural and structural metals, motor vehicle parts, ship and boat building, aerospace products and parts, and sugar and confectionary products. Industries with high-growth businesses accounting for 15 percent or more of the total were primary metals, beverage and tobacco, and plastics and rubber products.

- ❖ Off-shoring and on-shoring of manufacturing production is occurring simultaneously and quite routinely. While traditional low-skill, low-paying jobs move offshore, foreign direct investment moves on-shore, resulting in new advanced high-skill manufacturing facilities.

- ❖ Both growth and decline are occurring in the manufacturing sector, a sure sign of a dynamic industry in change. To truly understand manufacturing, one must track what is occurring industry by industry, business by business. For example, the case of textiles and medical devices is a tale of two industries.

- ❖ Manufacturing is no longer a dirty industry. It is “going green,” and has been for some time – probably faster than most other industries. Doing things better, faster, cleaner and greener makes money for North Carolina manufacturing firms while the state becomes more environmentally sustainable and energy efficient at the same time.

- ❖ Manufacturing firms are learning to become more agile and workers more are becoming more flexible.

Issues deserving further deliberation in next phases of this project include:

1. North Carolina's Manufacturing "Brand Image" as a Place to Work:

The North Carolina brand as a good place for manufacturing is very much intact, as indicated by *Site Selection* rankings and "best places to do business" rankings by CNBC and *Forbes*. But manufacturers sense slippage in public image and government enthusiasm for the industry. Because of misunderstandings about career futures, they are experiencing greater difficulty recruiting young talent into rewarding high-tech jobs.

"Manufacturing made this country strong. Now many leaders don't speak the language." (Roundtable participant)

2. Agility with Ever-Improving Productivity, the New Modus Operandi:

What all manufacturers face in common is a fast-paced, quick-changing business environment. They are being creative and many show determination to stay in North Carolina. Constantly improving productivity coupled with regular doses of innovation is their answer to global competitiveness challenges. To sustain high performance, they need predictable state and local operating conditions in which decisions affecting them by governmental entities and educational providers are timely, responsive and innovative. Most importantly, because speed is of the essence, manufacturers are looking to government to be more streamlined in its deliberations and operations. They believe lean manufacturing, Six Sigma and related other performance management tools can be applied to advantage in government.

"It's all about finding the niche! If it's a commodity product, we can't compete." (Roundtable participant)

3. Flexibility – North Carolina's New Worker: Smart workers today make themselves both valuable to current employers and marketable for their

future by constantly gaining new knowledge, learning new skills and sharpening attitudes and interpersonal skills. Their best path to employment security is training. North Carolina has a well-regarded higher education system and nationally-acclaimed customized training, but closer ties between manufacturing and community colleges, in particular, will enhance competitiveness. Early-college high schools will help, but reenergized career technical education is needed to enhance the skills of mid-level workers.

“We have a tsunami coming – loss of experienced baby boomer workers, growth of high-skill jobs and young people going elsewhere to live, play and work.” (Roundtable participant)

4. **Pro-Investment Policies:** The primary drivers of economic growth are innovation, quality workers and growth capital. Winning states are those that get the formula right for spurring investment – project and R&D investment, infrastructure investment and human capital investment. A necessary foundation is sound business tax policy. In considering changes to North Carolina’s tax policy, a common beginning point must be the recognition that tax policy is de facto industrial policy in today’s open-market economy.

5. **Trade and Infrastructure:** While trade policy is primarily a national responsibility, states can shape the trajectory of their manufacturing economies by ensuring uncongested, competitively priced freight movement. Over the next decades, U.S. freight tonnage is expected to increase by close to 3 percent annually, and transportation and warehousing employment is expected to grow at 1.1 percent annually. This industry is tightly linked with manufacturing growth. As global trade increases, further infrastructure long-range planning and financing become imperative – for rail, ports, airports, pipelines, waterways and

highways/toll roads. It is important to “right-size the problems” and “right-size the solutions.”

6. **Capital Access for Growth:** North Carolina ranks highly among states for risk capital and conventional financial services. In particular, venture capital and conventional banking have had a healthy presence. Manufacturer financing often falls in the “mezzanine” category – specialty debt financing that enables small and mid-sized firms to be closely held by individuals, families and partnerships. While major capital access gaps are not apparent, many North Carolina small and mid-sized manufacturing firms are 30 or more years old, at which point succession planning and/or corporate restructuring might be occurring in the next one to two decades. The state is endowed with several experienced private and university support organizations to help in this regard. This issue deserves watching, however, to ensure that all North Carolinians, including women and minorities, have the opportunity to become part of the “ownership class” in the state’s manufacturing industry – at the same time increasing the odds that such firms remain locally held.
7. **Growth in Advanced Business Services:** While it might appear surprising to highlight advanced business services in a manufacturing report of this nature, research on state growth is confirming that leading states have healthy and productive services sectors alongside high-performance manufacturing. Tight inter-firm networks between manufacturing and services lead to greater innovation, higher productivity and better jobs along the entire value chain. While North Carolina is strong in some advanced business industries, such as risk/venture capital, as noted above, overall this sector is under-represented and examination of the kind of business climate conducive to its growth would be worthwhile.

8. **Reliable, Competitively Priced Energy for the Long Haul:** Recent research indicates that low-cost energy strongly correlates with state economic growth. Healthy future manufacturing states will be those that take bold planning and financing steps now to foster conservation and efficiency and diversify supply. North Carolina manufacturing has benefited from low-cost energy in the past. This capacity can adapt to new environmental requirements, but additional “quantum-leap” solutions dealing with both supply and energy efficiency may be required to address long-term growth realities. A comprehensive strategy to sustain the industrial base deserves utmost priority.

9. **Healthcare Costs Matter:** In addition to competitive energy pricing, research indicates that the other business cost factor that correlates most with state economic growth this decade is health care. A recent analysis by the New America Foundation found that “many manufacturers have blamed rising healthcare costs for decisions to drop health benefits for workers or shift jobs overseas.” North Carolina manufacturers complain that healthcare costs are outpacing wages and productivity. They do not want to pass these costs on to workers by lowering wages, and they find it increasingly difficult to raise prices of their end products in highly competitive markets. This threatens both their bottom lines and their reasons to exist. Some larger manufacturers are experimenting with internal wellness programs as one way to reduce costs. Like the energy situation, those states that put bold market-responsive initiatives and public/private partnerships in place to address healthcare costs stand to gain the most as good places for manufacturing over the long haul.

1. INTRODUCTION AND PURPOSE

The North Carolina Chamber is on a mission “to ensure that North Carolina is a leading place in the world to do business.” This bold initiative requires working on many fronts – one of which is shining light on and repositioning the state’s manufacturing sector, combining a 20th-century economic foundation with continuing promise in the 21st century.

The state of North Carolina can boast a gradually improving economy for over 60 years. Gone are the days when the state was mostly rural, fueled almost exclusively by low-skill manufacturing and agriculture, with few who went on to college. It has since added vibrant tourism, financial services, high-tech industries and developed highly regarded academic institutions.

North Carolina has retained a strong name for manufacturing, held onto a “growth state” image and been well ranked by economic development commentators, such as *Site Selection* magazine, as a good place for investment. Major economic restructuring has been taking its toll, however, and in recent years North Carolina’s textiles, furniture and telecommunications manufacturing industries have been hard hit by international competition.

In May 2007, the North Carolina Chamber convened its first Manufacturing Summit as a concerted effort on the part of the business community to review the changes affecting North Carolina manufacturing.

This project is a next step – a major initiative to carefully document challenges, opportunities and action plans for positioning North Carolina’s manufacturing sector for change and growth in the 21st century. The report and its underlying surveys and data analyses summarize a seven-month investigative and brainstorming phase between September 2007 and April 2008, with preliminary

findings presented at the Chamber's Second Annual Manufacturing Summit in June 2008.

This project is ultimately about jobs; specifically, growth in quality jobs. Quality job growth is vitally important to improving state per capita income, a broad measure of economic well-being. This initial report demonstrates that production manufacturing is shedding jobs while upgrading the remaining ones to higher-skill, higher-paying jobs, a desirable condition of advancing economies. At the same time, more support and service jobs are being created by the multiplier effect as manufacturing reaches deep into the North Carolina economy. In reality, high productivity in both manufacturing and services go hand-in-hand in winning states.

This project has been an opportunity to take stock of what we have rather than what has been lost. Most importantly, this project is about the essential role manufacturing will and must play in North Carolina's overall economic growth going forward.

2. SNAPSHOT: NORTH CAROLINA WITH AND WITHOUT MANUFACTURING

“While U.S. manufacturing itself is the eighth largest economy in the world, its impact on the overall U.S. economy is much larger when [the] ‘multiplier effect’ is taken into account.” NAM “Importance of Manufacturing” 2006

This report includes a quick overview of the size and contributions of manufacturing to the state. It does this by briefly comparing what North Carolina looks like with and without manufacturing.

As of January 2006, there were 440,005 active private business establishments (operations with separate lines of business) in North Carolina. Of these, 9,638 were headquarters of multi-establishment firms. The remaining 430,367 were branches to these headquarters or “stand-alones.” Of this total, 21,543 establishments were engaged in production manufacturing. Combined, all establishments created 3.71 million jobs and generated \$424.16 billion in sales, while the manufacturers contributed 728,207 direct jobs and \$82.77 billion in sales. In a nutshell, here is what the state looks like with and without manufacturing and its related business:

- ❖ **State Gross Domestic Product: The final value of all goods and services produced in the state** (GDP is primarily composed of employment compensation and gross business profits – a good aggregate of productive capacity.)

North Carolina GDP including manufacturing, 2006	North Carolina GDP without manufacturing and its multiplier effect, 2006
\$374.5 billion	\$233.9 billion

Manufacturing’s \$140.6 billion of output accounts for 37.5 percent of the state’s GDP. This includes manufacturing’s direct output *plus* the indirect output of supply-buy linkages with non-manufacturing *and* the extra output generated by household purchases of those who work in manufacturing – called the indirect and induced effects or “output multiplier.”

Source: Bureau of Economic Analysis; IMPLAN

❖ **Jobs: Annual employment in all industries covered by state unemployment insurance (full-time and part-time)**

North Carolina annual employment including manufacturing, as of third quarter 2007	North Carolina annual employment without manufacturing and its multiplier effect, as of third quarter 2007
4,061,824 jobs	2,882,990 jobs

Manufacturing accounts for 29 percent of the state’s total employment, estimated at 1,178,834 jobs. This includes the jobs of those directly employed in manufacturing and the jobs created in support firms *and* industries as a result of supply-buy linkages with manufacturing, *plus* those jobs generated by the household purchases of those employed in manufacturing (sometimes referred to as the “jobs multiplier”).

Source: Bureau of Labor Statistics; IMPLAN

❖ **Annual Earnings: Salaries/wages, supplements to salaries/wages and proprietor income**

North Carolina annual earnings including manufacturing, 2006	North Carolina annual earnings without manufacturing and its multiplier effect, 2006
\$219.0 billion	\$144.5 billion

Manufacturing accounts for 34 percent of the state’s total earnings by place of work. This includes the earnings of those directly employed in manufacturing, both as employees and proprietors, *and* of those employed in support firms and industries engaged in supply-buy linkages with manufacturing, *plus* the earnings of those selling household services to those employed in manufacturing (sometimes referred to as the “income multiplier”).

Source: Bureau of Economic Analysis; IMPLAN

❖ **Sales Growth in North Carolina: The average annual sales growth of the private sector from the 2001 recession to 2005.**

North Carolina business annual sales growth including production manufacturing, 2001-2005	North Carolina business annual sales growth excluding production manufacturing, 2001-2005
2.6 % per year	3.6 % per year

Manufacturing hit a rough spot this decade. Manufacturing sales growth of 1.1 percent per year from 2001 to 2005 was below that for all North Carolina businesses combined at 2.6 percent. Also, manufacturing employment growth, at 1.7 percent, has been below that of all state businesses combined at 4.6 percent. This demonstrates the advantage of a well-diversified economy such that the impacts of one industry not doing well can be softened by other industries doing better.

Source: National Establishment Time Series (Dunn and Bradstreet; Walls and Assoc.); IMPLAN

❖ **Average Annual Earnings: Total annual wages and benefits per job (salaried and hourly jobs combined)**

North Carolina average annual earnings including production manufacturing, 2006	North Carolina average annual earnings excluding production manufacturing, 2006
\$41,179	\$38,893

The annual average earnings per job in North Carolina manufacturing, \$59,964, were 46 percent higher than the statewide average in 2006. Without manufacturing, the average annual wage in North Carolina would be 5.6 percent lower than it is today with manufacturing. This gap was only 18 percent in 1990, evidence that manufacturing has been adding higher-paying jobs considerably faster than the state average growth in earnings.

Source: Bureau of Economic Analysis

❖ **Merchandise Exports**

North Carolina merchandise exports, including all manufactured products, 2007	North Carolina merchandise exports excluding those manufactured, e.g. agricultural exports, 2007
\$23.35 billion	\$1.58 billion

Over 93 percent of merchandise exports from North Carolina are manufactured goods. Other merchandise exports include agricultural and livestock products; oil, gas, minerals and ores; publishers' commodities; waste and scrap; used or second-hand merchandise; goods re-exported and re-imported; and some miscellaneous special classifications.

Source: U.S. Census Bureau, Foreign Trade Division

❖ **Tax Revenue (state and local government general tax revenues from own sources)**

North Carolina tax revenues including manufacturing, 2006	North Carolina tax revenues without manufacturing and its multiplier effect, 2006
\$30.0 billion	\$20.7 billion

Largely due to its impact on business sales as well as business property taxes, 31 percent of state and local general tax revenue can be attributed to the manufacturing sector. This tax estimate includes both the direct effect of manufacturing firms and their multiplier effects.

Source: U.S. Census Bureau, State and Local Government Finances 2005-2006; IMPLAN

Snapshot Bottom Line:

Even though manufacturing job and sales growth have softened so far this decade, the magnitude of manufacturing’s contributions to the North Carolina economy remains quite remarkable. Overall, manufacturing delivered nearly 30 percent of all jobs, direct and indirect, approximately one third of total earnings and 31 percent of state and local tax revenues. Much of the state’s growing exports were attributable to manufacturing, an important balance of trade. Without manufacturing, the state would have only two-thirds its annual wealth creation (economic output) and have fewer good-paying jobs, which on average pay nearly 50 percent more in manufacturing compared with the statewide average.

3. METHODS AND DATA

This report draws on multiple sources of information, methods of data collection and analytical approaches. The main information sources are:

- a) Literature review of recent books and major studies of U.S. manufacturing
- b) Economic reports, plans and studies related to North Carolina manufacturing, the North Carolina economy and its workforce
- c) Recommendations/mini-reports from North Carolina Chamber policy committees
- d) Feedback from the state's first Manufacturing Summit, May 2007
- e) A series of Manufacturing Roundtables convened across the state
- f) Analysis of federal statistics on North Carolina manufacturing
- g) Data analysis of Dun & Bradstreet time series data on business activity called the National Establishment Times Series obtained from Walls & Associates

Four Roundtables of business interests were convened between 9/11/07 and 9/13/07 in Raleigh, Greensboro, Charlotte and Asheville. Attendees represented manufacturers and related organizations. The purpose was to listen to those on the frontline about challenges, opportunities and actionable ideas for positioning North Carolina's manufacturing for change and growth in the 21st century. Total attendance was approximately 50. Dr. Graham Toft of GrowthEconomics, Inc. served as facilitator.

Two other Roundtables were convened with intermediaries who work routinely and closely with manufacturers. The purpose was to get their first-hand impressions about what manufacturers and their workers are experiencing as the industry undergoes significant adjustments. One Roundtable was held with staff of the Industrial Extension Service of NC State University, another with the

economic development and customer relations staff of Duke Energy. A thematic summary from these Roundtables was prepared, backed up by minutes of each meeting. These notes attempted to capture the general tenor of discussion but not the verbatim remarks of particular individuals. Some statements that were particularly insightful, thoughtful or provocative, however, are shown as non-attributable quotes in this report. Additional Roundtables might be convened in later phases of this project.

To ensure robust results, four federal data sources are used comparatively: the Quarterly Census of Employment and Wages (QCEW) of the Bureau of Labor Statistics; the County Business Patterns (CBP) and Statistics of U.S. Businesses (SUSB) of the U.S. Census Bureau; private employment numbers from the Bureau of Economic Analysis (BEA); and the Census and Annual Survey of Manufacturers.

While federal data sources are very useful in exploring manufacturing at the state and local levels, more specifics were needed for this project. Federal data could not provide sufficient firm specificity to identify “growth businesses,” a factor believed to be very important in understanding future prospects for and general intelligence on an industry. Also, federal sources provide only aggregate information on manufacturing sales data and appear to undercount the total number of small businesses/establishments in a state. Furthermore, federal data sources do not report employment data when the number of establishments in a narrowly defined industry category or small geographic area is small enough to disclose specifics on individual firms. To address these limitations, the National Establishment Time Series (NETS) database is used. It is based on Dunn and Bradstreet data, available in time series through Walls & Associates. These data are for years 1990-2005.

4. MANUFACTURING'S VALUE PROPOSITION: REMARKABLE ECONOMIC IMPACT

“While we live in the Information Age, tangible items like bricks and mortar, stores and offices, factories and mines, drill presses and lathes cannot be ignored. Physical capital remains vital to our nation’s (or any nation’s) GDP, productivity, wages and employment.”

Shapiro and Pham “Economic Effects of Intellectual Property-Intensive Manufacturing in the United States.” 2007

Manufacturing’s continued relevance to developed economies can be demonstrated with a graph within the Federal Reserve Bank of Dallas’ 2007 annual report. The report’s Exhibit 8 observes nations by the percentage of their workforce engaged in manufacturing and by their output (GDP) per capita. As a nation’s income rises, the share of the workforce engaged in manufacturing first rises, as it did for North Carolina in the first half of the 20th century, then tends to decline. However, the share of employment in manufacturing declines only modestly, and gradually appears to plateau around 15-20 percent of total employment even for the wealthiest countries, such as the U.S., Switzerland, Norway and Ireland. In other words, even for advanced economies, manufacturing remains a substantial and productive sector.

And in these advanced economies, the growth pattern of particular industries is never steady or unidirectional. Most industries that make up a modern dynamic economy experience ups and downs, particularly financial services, construction, mining, energy production and manufacturing, but even parts of the more predictable service industries fluctuate from time to time – e.g. specialty health services, vocational education and entertainment. The purpose of this chapter is to explore if recent downturns in manufacturing are a sign of further decline for North Carolina or a harbinger of growth ahead after a period of transformation and realignment. This Chapter concludes the latter. Given a conducive, pro-

investment policy environment, North Carolina can look forward to further wealth and job creation from its manufacturing sector in the future.

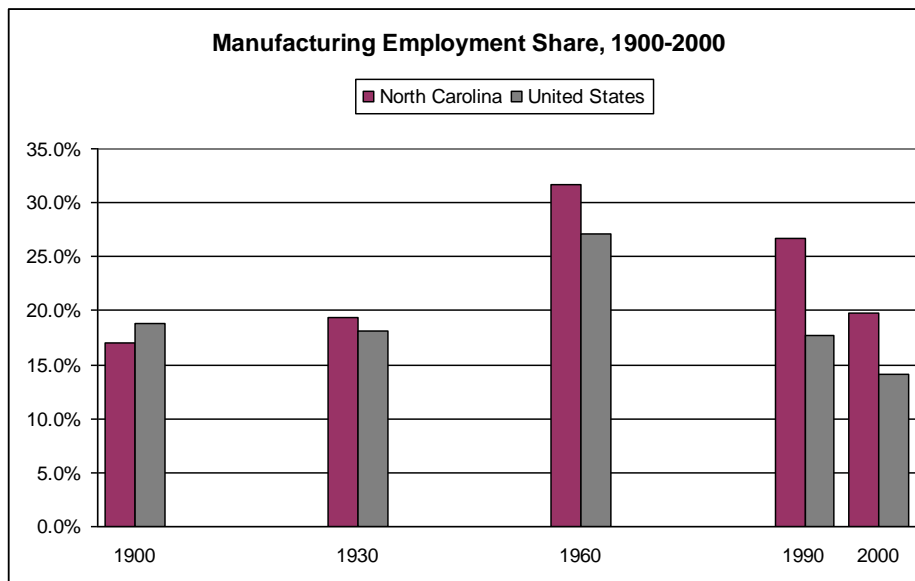
Attendees at four Manufacturing Roundtables convened as part of this inquiry reflected a wide diversity of manufacturing industries, firm sizes and market reach (see Appendix A for a summary). Traditionally, North Carolina manufacturers served domestic markets, but a number of participants were selling globally and, in a few cases, were totally global in their output. The Roundtables reflected transformations going on in all segments of manufacturing, in all North Carolina regions and industries. Some are managing quite well while others have been cutting back, especially those impacted by the restructuring of wood products and textiles. It is not possible to generalize about North Carolina's manufacturing situation as whole – one must instead break out by specific industries, businesses and regions. Opportunities and challenges vary considerably across the state. This chapter seeks to reflect the richness and diversity of North Carolina manufacturing.

4.1 20th-Century North Carolina Was Made by Manufacturing

FROM BALANCING AGRICULTURE WITH INDUSTRY TO BALANCING MANUFACTURING WITH ADVANCED SERVICES

At the turn of the 20th century, North Carolina's share of manufacturing employment was below that of the U.S. Beginning with Mississippi's "balance agriculture with industry" campaign in the 1930s, the South embarked on a major recruitment effort to attract manufacturing from the North. Manufacturing's share of employment grew dramatically from 1930 to 1960, and by 1960 North Carolina's share surpassed the U.S. share by 17 percentage points. Then, as shown in Exhibit 1, the state's share of manufacturing employment declined over the second half of the century, replicating a national trend. Since the 1930s, however, North Carolina's share of manufacturing employment has remained ahead of the U.S.

Exhibit 1



Source: Census Bureau

The last decade of the 20th century witnessed a significant decline in manufacturing's employment share, such that the percent employed in U.S.

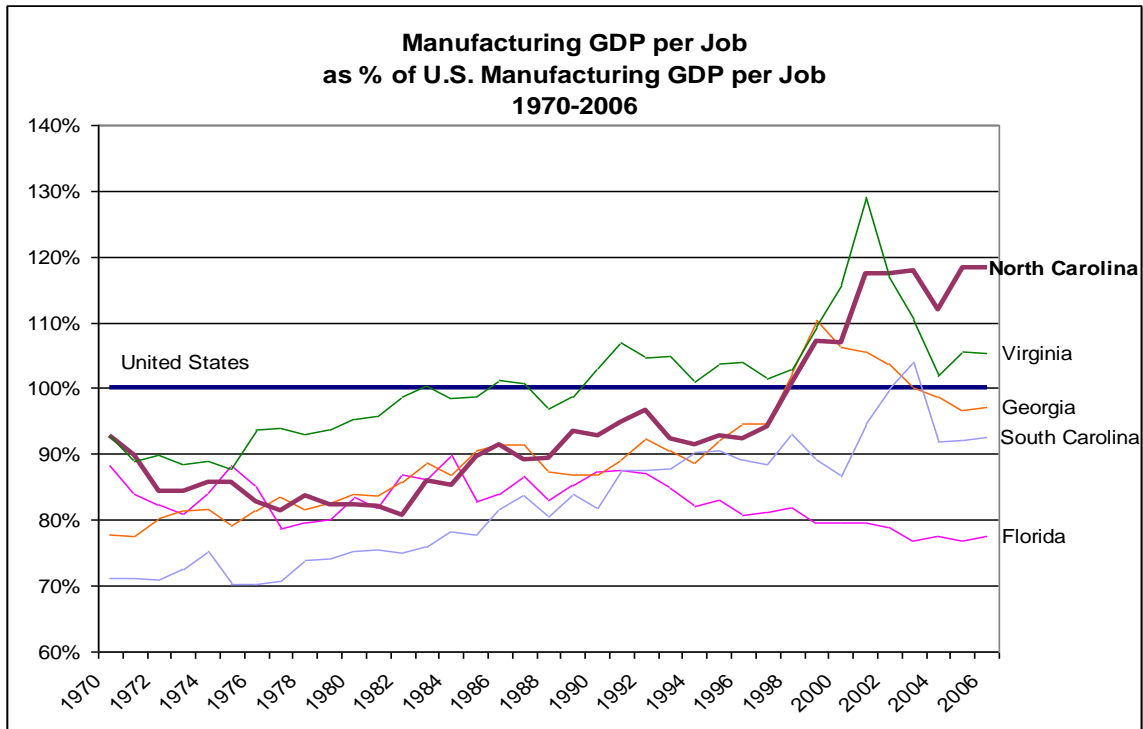
manufacturing is now lower than it was in 1900. However, in contrast to the early 1900s, North Carolina is much more concentrated in manufacturing jobs today relative to the U.S. Whereas in 1900 North Carolina was 10 percent less concentrated in manufacturing relative to the nation, by 2000 the state was 40 percent more so. Given the economic strength of U.S. manufacturing today and prospects for a renaissance in industrial technologies stimulated by global demand, the future looks bright for manufacturing in North Carolina. As manufacturing employment has declined, Research Triangle Park, in particular, has served as a magnet for advanced business services such as venture capital, IT consulting, applied R&D, and next-generation software development. The combination of advanced/smart manufacturing with advanced business services makes for a powerful mix of industry agents for growth. Recent research points to the fact that growing states have strong, vibrant advanced business services. It is unfortunate when popular economic growth discussion simplifies future prospects to: “manufacturing is dead – the future is services.” In fact, research is indicating that the leading states and regions are those that show balanced strength in both.

As North Carolina moves forward in high-performance/smart manufacturing, it must equally strengthen the presence of advanced business services. The state is adequately served in data processing, hosting and related services, management consulting services, managing offices, investment banking and securities dealing, and electronic equipment repair. Overall, it is under-represented in advanced services relative to the U.S. as a whole. It has notably low concentration in international trade financing, specialty legal services, advertising agencies and professional organizations. Tight linkages between such services and mainline manufacturing reduce lead times in responding to changing market conditions and heighten levels of creativity and productivity.

PRODUCTIVITY KEEPS MAKING A DIFFERENCE

While the share of manufacturing employment has been declining through the second half of the 20th century, North Carolina's manufacturing output per job since the beginning of the 1980s has continued to rise relative to the nation's average, surpassing the U.S. level in 1998 (Exhibit 2).

Exhibit 2



Source: Bureau of Economic Analysis

Looking purely at the *quantity* of manufacturing product, North Carolina shows a decrease in manufacturing output relative to the U.S. starting in the mid-1990s. But output per job continued to increase over the same period. This phenomenon reflects the combination of fewer jobs being coupled with much higher-valued products relative to the U.S. average. This bodes well for high performance, wealth-creating industries of the future.

AS 21ST CENTURY BEGINS, STATES' ECONOMIC FORTUNES ARE IN FLUX

There is broad consensus among North Carolina business leaders that the state is fully engaged in an economic war – a competitive economic environment characterized as open, disruptive, fast-changing and global.

If the past is any indication, some states adapt to changing economic conditions better than others. The economic fortunes of U.S. states have changed quite markedly since World War II and there is reason to believe that, within two generations, any state could be at the top or bottom of the national income rankings. The story of rapid economic progress is illustrated by neighboring state Virginia which has moved in per capita income rank among the states from 30th in 1965 to 10th in 2006. How a similar transformation can and must be accomplished for North Carolina is what motivates the North Carolina Chamber in its mission to make the state “a leading place in the world in which to do business” and, because manufacturing forms a base of its economy, ensure that the sector can continue as an engine of growth.

NORTH CAROLINA HAS MADE REMARKABLE ECONOMIC PROGRESS; NOW IS THE TIME TO DOUBLE THE EFFORT

Long term, North Carolina has made great strides in economic advancement. In 1953, its per capita income was 69.4 percent of the U.S. average. Today it is 88.9 percent. (Per capita income is a widely used measure of economic well-being.) Since the recession of 2001, however, growth in the state's per capita income has been sluggish. While North Carolina, South Carolina, Georgia and Kentucky have performed poorly this decade relative to the U.S., nearby Florida, Alabama, Mississippi, Tennessee and Virginia have done better. A fundamental issue arises for North Carolina leaders and decision makers: Can North Carolina do better economically to reach its aspirations – improving its standard of living and tax receipts to support education, infrastructure and the like? In short: “If we

don't think growth, what is our alternative?" And while it has been a hard and imaginative road getting to where the state is today, challenges for the future are even more demanding.

AS MANUFACTURING GOES, SO GOES NORTH CAROLINA

North Carolina currently ranks seventh among the states for manufacturing as a share of state private gross domestic product, but its rank has been slipping.

Exhibit 3

Manufacturing GDP as % of Private GDP, Inflation-adjusted 2006		
Rank	State	Share
1	Indiana	33.4%
2	Oregon	30.5%
3	Idaho	25.6%
4	Iowa	25.5%
5	Wisconsin	25.5%
6	Kentucky	24.3%
7	North Carolina	24.2%
8	Alabama	24.0%
9	Arkansas	24.0%
10	New Mexico	23.8%
<i>Source: Bureau of Economic Analysis</i>		

Non-durables are still driving manufacturing in North Carolina, but have been hit hardest by employment losses due to decline of textiles and related industries. At the same time, several durable manufacturing industries, such as primary metal or machine manufacturing, have shown signs of strong productivity improvements with state gross domestic product per job rising continuously this decade. With the advent of high-tech non-durables manufacturing, the worst of

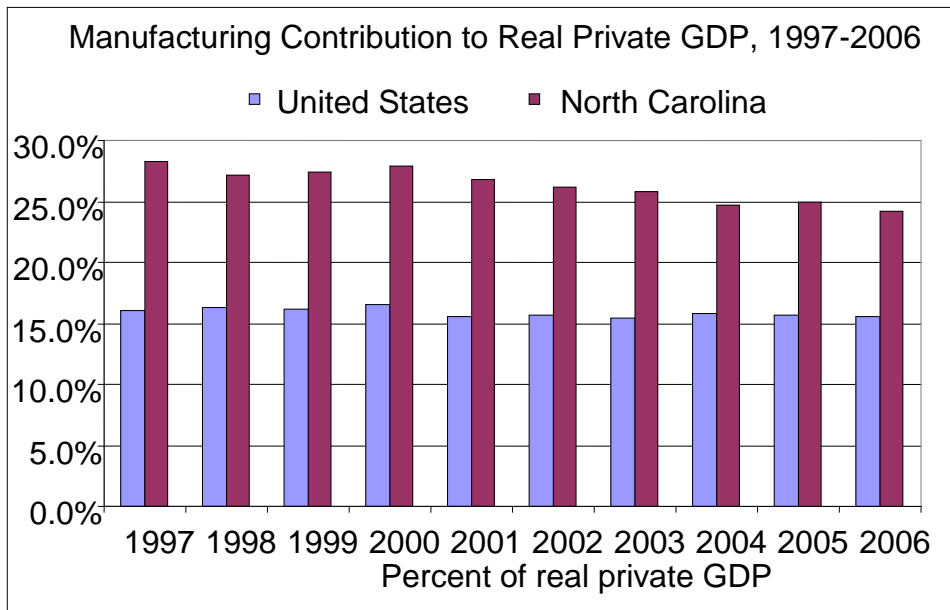
job losses overseas might be over. Now the focus turns to value-added output, productivity and developing and keeping good talent.

Exhibit 4

<u>Nondurable</u> GDP as % of Private GDP, Inflation-adjusted 2006		
Rank	State	Share
1	Louisiana	15.1%
2	North Carolina	14.0%
3	Indiana	11.0%
4	Arkansas	10.9%
5	Iowa	10.0%
6	Wisconsin	9.9%
7	South Carolina	9.8%
8	Georgia	9.1%
9	Alabama	8.8%
10	Kentucky	8.7%
<i>Source: Bureau of Economic Analysis</i>		

North Carolina has seen a decline in manufacturing's share of state private-sector GDP over the last decade (see Exhibit 5). In fact, manufacturing's recent downturn is a major reason for the state's slowdown this decade. Admittedly, the last three decades have seen a substantial drop in the share of workers in manufacturing – it's a global phenomenon.

Exhibit 5



Source: Bureau of Economic Analysis

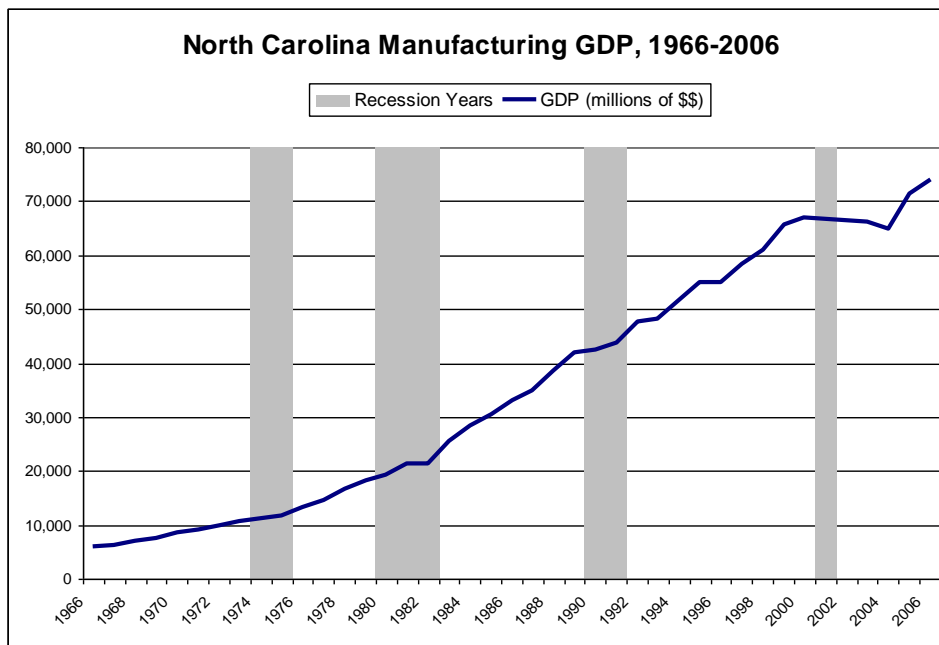
Nevertheless, at 16-19 percent of total employment, including the self-employed, manufacturing is still North Carolina's largest industry, and it continues to pay very well while offering opportunity for those without extensive post-secondary preparation. Average compensation per worker in 2006 was \$58,516 for manufacturing and \$44,604 for all private industries. Contrary to popular belief, average compensation in the manufacturing sector has not fallen behind that of the rest of the economy. Without a manufacturing renaissance over the next five to 10 years, the North Carolina economy simply will not be able to turn up fast enough to regain economic losses experienced over the past five years.

CONCLUSION: MANUFACTURING GROWTH IS NOT OVER

Few industries grow straight up. Most experience growth cycles consisting of four stages: first, an early repositioning stage – adaptation to new markets, competition, technology etc.; second, a fast-growth stage; third, a plateau/mature

stage; then, finally, an adaptation stage which phases into the first stage of the next growth cycle. The graph below shows how manufacturing's gross domestic product has grown in North Carolina for decades. This strongly upward-sloping curve has been punctuated from time to time by plateaus often associated with national recessions. The plateau from 2000 to 2004 has been longer and has cut deeper into jobs and sales than usual. But an upturn in 2005 and 2006 is evident for both North Carolina and manufacturing in the nation as a whole, likely signifying the next leg up. This next future growth cycle can be assured if the state pursues sound pro-investment, pro-competitive public policies and constructive public/private partnerships.

Exhibit 6



Source: Bureau of Economic Analysis

4.2 21st-CENTURY NORTH CAROLINA IS STILL BEING MADE BY MANUFACTURING

MANUFACTURING GROWTH EFFORTS CONTINUE TODAY

Of all the industries targeted by North Carolina's seven regional economic development partnerships, approximately 60 percent are manufacturing industries. This indicates the importance regional economic development leaders continue to place on the future of manufacturing for their areas.

According to the North Carolina Chamber's 2007 Annual Competitiveness Index (ACI), what distinguishes the state are generally strong economic drivers – productivity and labor supply, research and creativity, business vitality and capital formation. The state is also strong in education and business costs but weak in workforce preparedness, infrastructure and government efficiency. The state presents particularly well with respect to costs of doing business, and is well-regarded as a good place to do business. It gets very high marks by the “best states for business” reports of CNBC and *Forbes*. While above average, however, the Milken Institute, state Chamber ACI and other reports indicate that North Carolina has been slipping somewhat in business cost competitiveness in recent years, a factor also raised at the Manufacturing Roundtables.

INDUSTRY DIVERSITY PROVIDES NORTH CAROLINA THE CUSHION TO COPE WITH CHALLENGES

Fortunately, North Carolina manufacturing is increasingly diverse in terms of industry type and geographic location. Generalizations tend to obscure what is happening at the more disaggregate level. Over the last three decades, textiles and metals have been the biggest losers from the U.S. as competition from low-wage countries has increased with trade liberalization. Trends in food (which can

be influenced by proximity to market rather than competitiveness), paper, chemicals, and motor vehicles have been relatively stable due to comparative advantages and strong domestic demand. As a leader in non-durables manufacturing, North Carolina has benefited in such areas as food products and chemical manufacturing, while the state has been hurt in others. North Carolina remains competitive where industries shift from labor-intensive to more capital-intensive production, boosting productivity and quality.

Productivity is the root determinant of manufacturing growth and competitiveness. In fact, contrary to popular belief, the story of U.S. manufacturing is quite remarkable. Productivity growth (doing things better, faster, cheaper and greener) and strong market demand have kept manufacturing's contribution to total domestic output steady. In addition, manufacturing continues to have a high multiplier effect that results in nearly two jobs elsewhere in the economy for every manufacturing job.

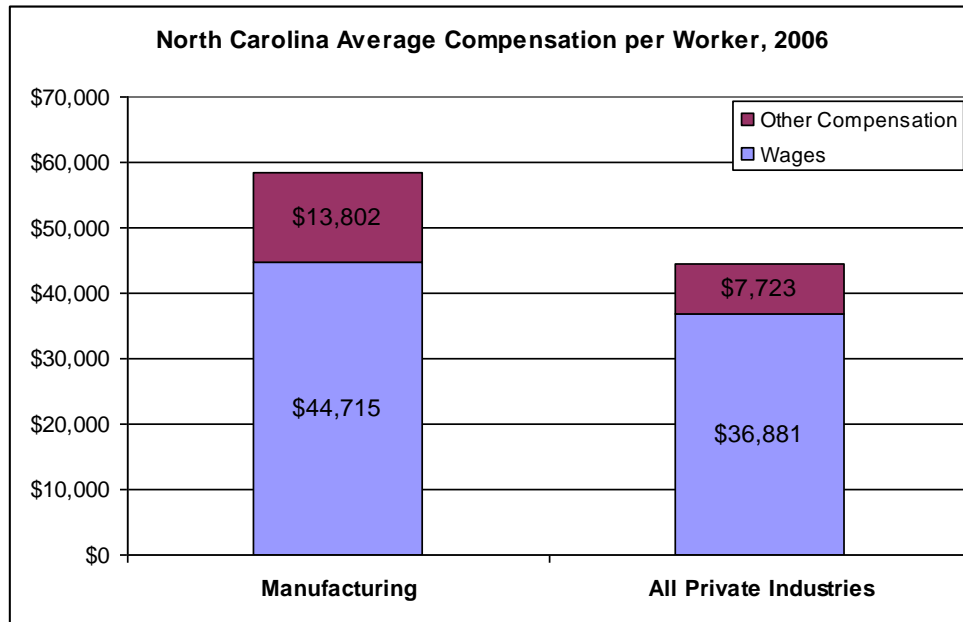
Output growth rates this decade have been strong in primary metal, computer and electronic products, transportation equipment and parts, and chemical manufacturing. On the other hand, job gains have been weak. The category "other transportation equipment" was the only major [3-digit NAICS] industry category with significant job gains between 2000 and 2006, driven especially by motor vehicle, aerospace product and parts, and ship and boat manufacturing. But within the other major manufacturing groups, several sub-industries have shown equally strong job growth since the last recession, e.g. machinery and steel and metal-related industries (see Chapter 5 for more details).

MANUFACTURING WAGES REMAIN WELL ABOVE AVERAGE

North Carolina's manufacturing average compensation per worker ranks fifth among all industries in the state, surpassed only by the following industry

categories: management of enterprises/companies, utilities, finance and insurance, and mining.

Exhibit 7



Source: Bureau of Economic Analysis

Jobs in manufacturing offer challenging and rewarding careers. Exhibit 8 is a sample of occupations in high demand in manufacturing showing projected job growth through 2016 and current median hourly wage. Their varied educational requirements indicate that good jobs are offered at all preparatory levels.

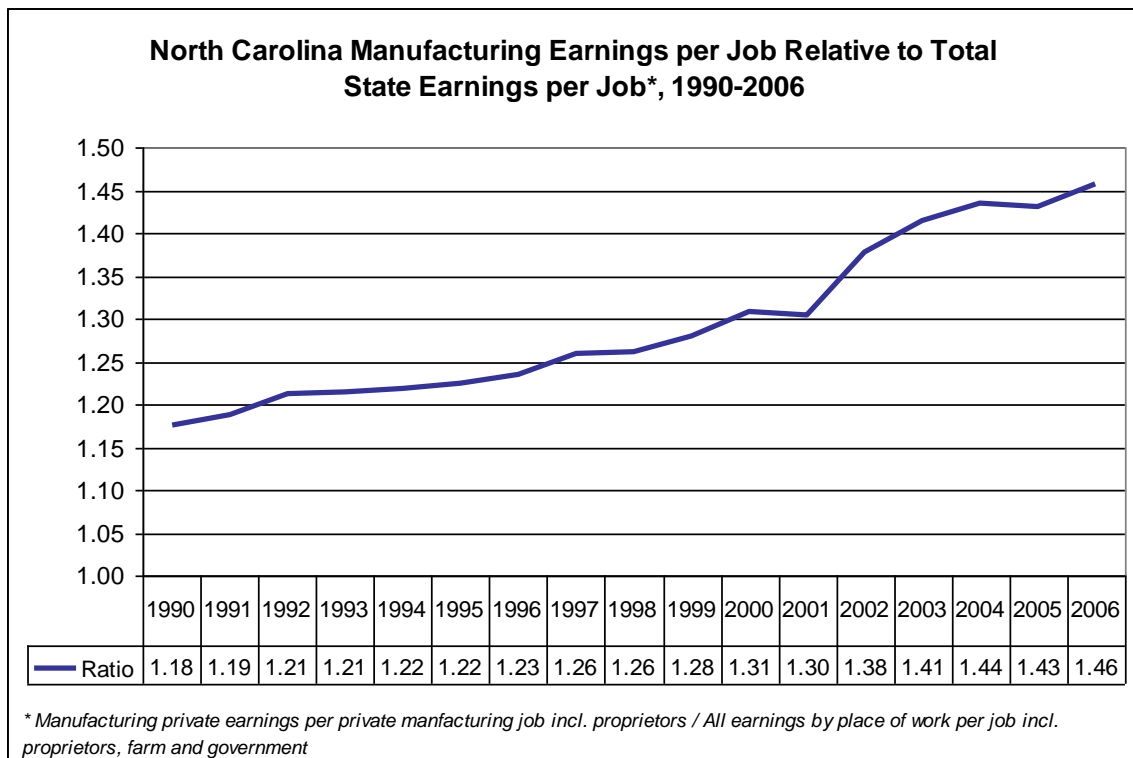
Exhibit 8:

Source: Bureau of Labor Statistics, National Occupational Projections, 2006-2016

Sample of Occupations in NC Manufacturing with Significant Job Growth and Good Pay			
Occupation	2006-2016 Projected Job Growth	Median Hourly Wage	Educational Requirement
Network systems and data communications analysts	22.6%	\$31.1	Bachelor's degree
Biological technicians	20.4%	\$17.2	Bachelor's degree
Butchers and meat cutters	13.3%	\$13.0	Long-term on-the-job training
Aircraft structure, surfaces, rigging, and systems assemblers	11.4%	\$21.8	Moderate-term on-the-job training
Tile and marble setters	10.2%	\$17.6	Long-term on-the-job training
Industrial engineers	9.9%	\$33.0	Bachelor's degree
Paralegals and legal assistants	8.3%	\$20.7	Associate's degree
Avionics technicians	8.1%	\$22.6	Postsecondary vocational award
Medical appliance technicians	7.4%	\$15.0	Long-term on-the-job training
Food scientists and technologists	5.6%	\$25.9	Bachelor's degree
Fiberglass laminators and fabricators	5.3%	\$12.5	Moderate-term on-the-job training

But maybe the most remarkable contribution manufacturing jobs are providing North Carolina and its 18 percent of the workforce is steady growth in earnings relative to the statewide average. As stated in Chapter 3, average manufacturing earnings per job were \$59,964, 46 percent higher than statewide average earnings per job. This differential has been improving at an impressive rate for more than two decades, as shown in Exhibit 9 below. In 1990 manufacturing earnings per job were 18 percent above the statewide average; in 2000, 30 percent and in 2006, 46 percent. Not only are North Carolina manufacturing jobs higher-paying, they are edging higher relative to the average almost every year.

Exhibit 9



Source: Bureau of Economic Analysis

MANUFACTURING CONTINUES TO BE SOCIAL AND FINANCIAL LEVELER

Manufacturing makes notable social contributions by providing good-paying jobs for those who work well with their hands and choose the non-college track immediately after high school. North Carolina struggles with a substantial high school dropout rate, yet undervalues the contribution manufacturing can play to help address this problem. Several manufacturers attending the Roundtables observed that manufacturing provides a good-paying career path for those with a high school diploma, who, by choice or circumstance, must learn while they earn after completing high school. Furthermore, it offers a second chance for high school dropouts. More consideration could be given to apprenticeships, internships and career technical education that provide the state with better prepared manufacturing workers while at the same time ameliorating the severe dropout problem.

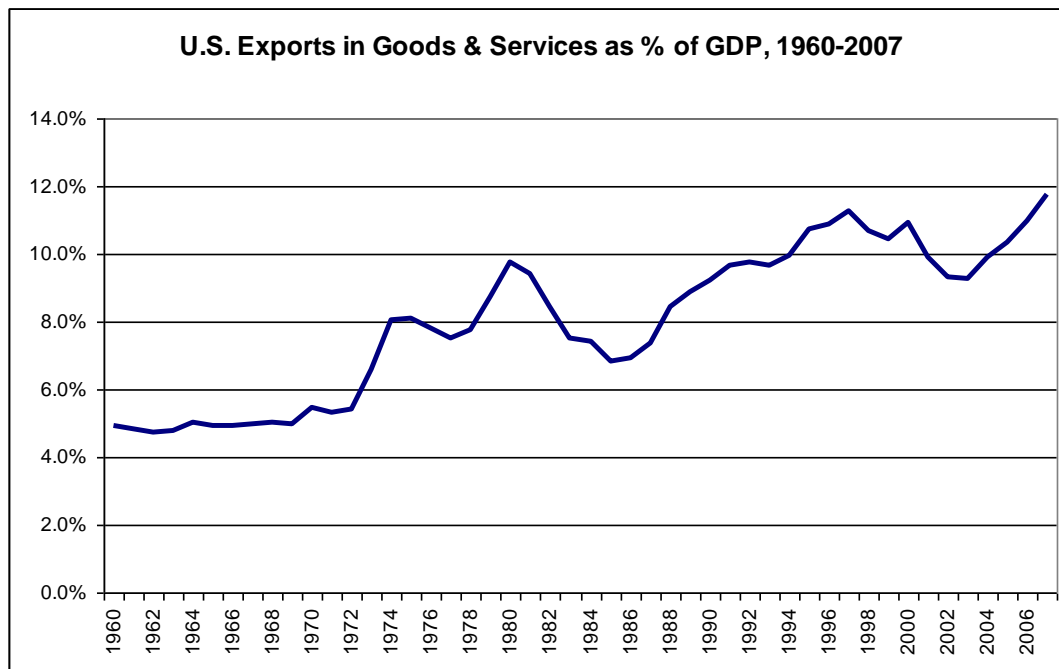
EXPORTS KEEP MAKING A BIG DIFFERENCE TO ECONOMIC GROWTH AND GROWING TALENT ON-SHORE

The global economy offers both pain and promise for the state's manufacturers and their workers. International competition is one of the reasons for manufacturing's downturn in North Carolina since the beginning of the decade. Everybody recognizes that low-cost production is moving and will continue to move off-shore. However, many Roundtable participants noted the opportunities created for the export of high-value U.S. products, technologies and know-how and for growing high-paying jobs on-shore to manage the global operations of internationally active firms. They are responding accordingly. This is particularly relevant in the current U.S. economic climate, with the U.S. economy experiencing a mid-cycle downturn or recession while the global economy is still growing, albeit at a slower pace. RSM McGladrey, in its third Manufacturing and Distribution Survey, noted in July 2008 that while U.S. manufacturers are making

increased efforts by focusing on market share, new product lines and innovations, they are underutilizing opportunities to benefit from participation in the global economy. Several Roundtable participants whose firms do a significant amount of international trade would like to see North Carolina maximize its trade-zone potential by developing an environment where goods brought into the state and subsequently exported are treated as non-tax events.

The U.S. still accounts for a major share of global manufacturing value added, as shown below. Strong global economic growth and the weak dollar over recent years have made U.S. exports even more attractive. Global manufacturing data show that May 2007 was a seven-year high in growth and that new orders to manufacturers grew at the fastest rate since July 2006.

Exhibit 10



Source: U.S. Department of Commerce, Bureau of Economic Analysis

In the top third of states, North Carolina ranked 16th in merchandise exports in 2006 and 13th in manufacturing exports, but it would do well to improve these

rankings. Its leading manufactured export category is chemical manufactures, which alone accounted for \$3.5 billion, or 17 percent, of the state's total export shipments in 2006. Export-supported jobs linked to manufacturing account for an estimated 5.1 percent of North Carolina's total private-sector employment. Nearly one-sixth (15.9 percent) of all manufacturing workers in North Carolina depend on exports for their jobs. RSM McGladrey observed in a recent aforementioned survey that companies with foreign operations are hiring U.S. workers at nearly twice the rate as their domestic-only counterparts, suggesting that offshore operations makes U.S. companies more robust.

THE “MANUFACTURING MULTIPLIER” KEEPS DOING ITS MAGIC!

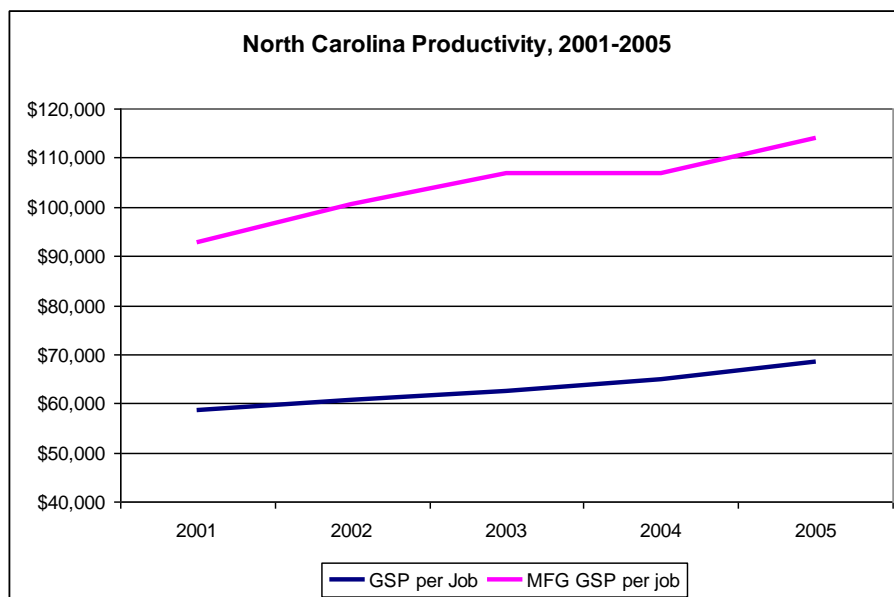
Economic multipliers seek to measure the amount of follow-through of economic activity resulting from a specific productive activity. A product or industry with a jobs multiplier of 1.5, for example, is one in which for every direct job, 0.5 jobs are created by the combined effect of industry-wide supply-buy relationships (indirect effects) and household expenditures of those directly employed, such as in retail, entertainment, housing (induced effects). Most economic multipliers are in the range of 1.5 to 2.5. For manufacturing, some run as high as 4.0 to 5.0 if there are dense inter-firm dependencies, such as between smart manufacturing and advanced services (discussed in section 4.1). North Carolina's manufacturing sector is estimated to create 1.7 additional jobs in the rest of the economy for every manufacturing job (a job multiplier of 2.7), and generate \$1.1 and \$1.2 additional dollars for every dollar of output and income in manufacturing, respectively (output multiplier of 2.1 and income multiplier of 2.2). (For further details see Chapter 2.)

PRODUCTIVITY AND INNOVATION BECOMING HALLMARKS OF SUCCESS

North Carolina is an innovation state. At each Manufacturing Roundtable convened for this project, one or more participants stressed the critical role

innovation is playing and will play in the future. This attribute affects all levels of business operations from shop floor to marketing to product development to recruitment, etc. The general consensus is that North Carolina manufacturing has been rapidly changing from a commodity orientation (mass manufacturing) to a niche orientation (mass customization). Many examples were given of firms tailoring their products to specific domestic and international markets, even in the case of a mined commodity like phosphate.

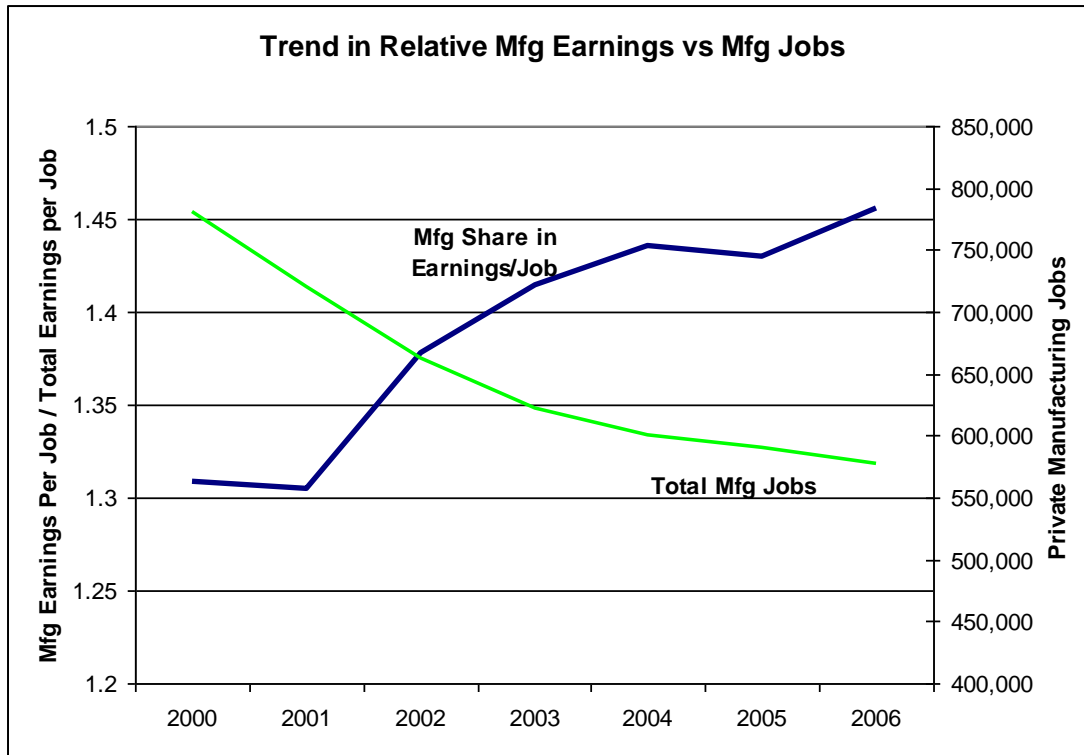
Exhibit 11: North Carolina Manufacturing Productivity



Source: Bureau of Economic Analysis

Manufacturing productivity in North Carolina has continued to outpace that of the overall economy (see Exhibit 11). The result is vividly depicted by the graphs in Exhibit 12. Higher productivity leads to higher earnings per job in manufacturing versus the economy at large. At the same time, the number of manufacturing workers has declined. It is worth noting that there are large differences in productivity between manufacturing industries. National numbers estimate, for example, that chemicals and food are contributing disproportionately to manufacturing productivity.

Exhibit 12: Productivity Pays Better, but with Fewer Workers.



Source: Bureau of Economic Analysis

While productivity is a strength, North Carolina leaders would do well to find ways to strengthen the level of R&D applied to manufacturing. The state scores well on industrial R&D investment in general, but less well with respect to R&D applied to manufacturing production. Technology development specific to North Carolina manufacturing (such as in energy efficiency and green manufacturing) and technology transfer, such as that provided by the Industrial Extension Service, deserve heightened attention.

CONCLUSION: THERE ARE MANY SIGNS THAT
MANUFACTURING CONTINUES TO MAKE ITS MARK

North Carolina is fortunate to have several industries outside of manufacturing contributing to diversification and future growth – financial services, travel and tourism and high tech, to name a few. What is apparent from the statistics above

is that manufacturing will continue to be part of the state's signature industries. Productivity is up, value of output is up, exports are up, wages are well above average, and job opportunities are diverse, including good-paying jobs for those with technical and on-the-job training. Relative to the size of the total North Carolina economy, manufacturing jobs will not be as plentiful as in the past but manufacturing job quality remains and will likely improve as technical advancements make manufacturing jobs more interesting, challenging and even better-paying. In addition, manufacturing continues to offer promise as a strong multiplier, creating nearly twice as many support and related jobs in the broader economy.

4.3 MANUFACTURING'S 21ST-CENTURY RENAISSANCE

While North Carolinians ponder the future of the state's manufacturing sector, very exciting changes are occurring in the sector nationwide – brought on, in good part, by scientific breakthroughs, advanced production technologies, and growing global demand for U.S. products. As the North Carolina manufacturing industry emerges leaner and keener from its recent downturn, it should be well positioned to capitalize on a coming renaissance of U.S. manufacturing – four dimensions of which are briefly described below: 1) global demand, 2) booming industrial technologies, 3) major scientific discoveries and 4) the creation of on-shore good-paying jobs.

FIRST, GLOBAL DEMAND IS RAPIDLY CHANGING THE GROWTH TRAJECTORY OF MANY AMERICAN MANUFACTURERS

Hardly an economist today would disagree that the rapid growth of U.S. merchandise trade is shoring up a softening domestic economy in 2007-08. Further, many believe a long wave of global growth is upon us and international trade will continue to fuel U.S. growth. Rapid growth in developing countries is translating into equipment, machinery, and advanced technical know-how from America's "hard industries" for use in modern farming, physical infrastructure, energy production, general manufacturing and the like. Worldwide, U.S. merchandise trade as a percent of U.S. GDP was 4.9 percent in 1960. For the first quarter of 2008, it was 12.7 percent. According to the Progressive Policy Institute's TradeFact, March 2008, one-ninth of all U.S. production is now for export.

According to the International Trade Administration, U.S. Department of Commerce: "In 2007, \$1.63 trillion worth of U.S. production went overseas. The figure is a modern-era record, reflecting a \$182 billion jump in goods and services exports. This was the largest increase ever – in real-dollar as well as

current-dollar terms – and was the main factor keeping the U.S. out of recession in the autumn and winter. In total, exports accounted for a third of last year's 2.2 percent GDP growth.”

Smart states will prepare for promising global trade in the future. They will concentrate on increasing profits and developing talent in their states (profits in the hands of state-headquartered firms bodes well for future business investments, philanthropic contributions and high-paying jobs close to home). These states will pay attention to basic infrastructure to support outstanding logistics, provide trade missions, export support services and export financing mechanisms. As free trade agreements come along they will take action to allow businesses located in their states, from multinationals to small independent firms, to operate with maximum flexibility and efficiency on a global scale. And, since the U.S. is a top recipient of foreign direct investment, they will seek to attract dollar investments back on their soil. The growing integration of manufacturing production at the global level has increased considerably the high stakes for countries and states in support of their manufacturing industries for competitive advantage.

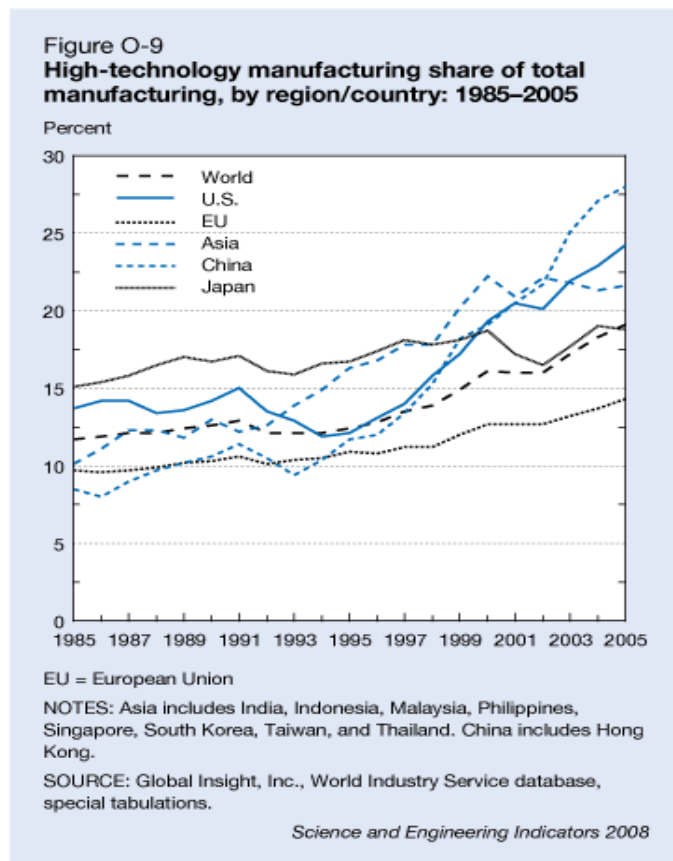
SECOND, INDUSTRIAL TECH IS BECOMING THE 21ST CENTURY HIGH-TECH

While the IT revolution rolls on at record speed, so do changes in industrial technologies aided by spirited scientific discovery. R&D-intensive industries such as aerospace, pharmaceuticals, computers and office machinery, communications equipment, and scientific (medical, precision and optical) instruments are making significant product and production breakthroughs. High-tech manufacturing's share of total U.S. manufacturing is increasing (see Exhibit 13). This trend is also apparent among many of America's toughest competitors. According to a June 2007 Eurostat Report, “Output growth in high-technology

manufacturing within the EU-27 in the period between 1990 and 2006 far exceeded the growth in less technology-intensive activities.”

By and large, the most productive manufacturing industries are those that invest most in research and development. And, on a global scale, “more money was spent on R&D activities in the United States in 2004 than in the rest of the G-7 countries combined and it represented over 40 percent of all OECD expenditures,” according to The National Science Foundations’ Science and Engineering Indicators 2008.

Exhibit 13

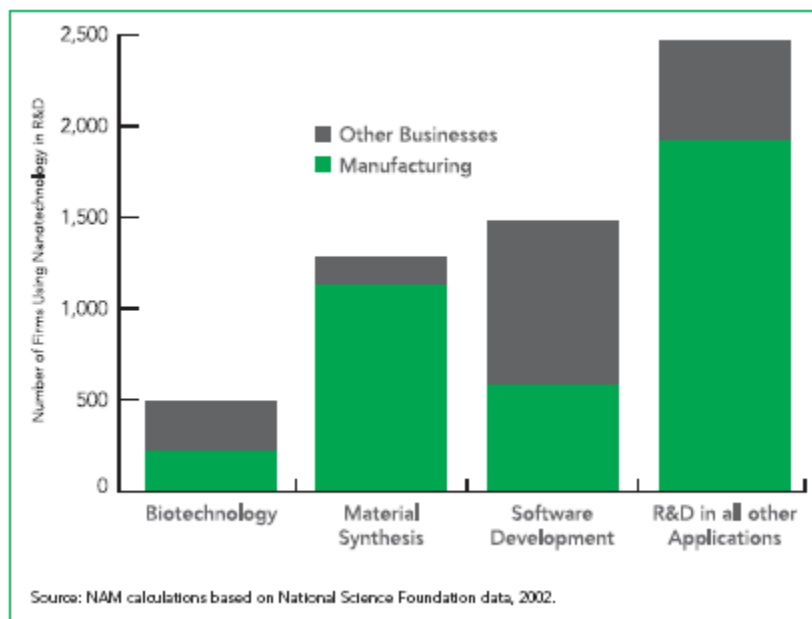


Most states have a science and technology initiative but few pay sufficient attention to the linkage between advances in industrial technology and the competitiveness of their manufacturing sectors.

THIRD, SCIENTIFIC BREAKTHROUGHS WILL CREATE A BRAVE NEW WORLD FOR MANUFACTURING

These advances in industrial R&D lead several commentators to believe that smart manufacturing is about to get a significant boost from break-throughs in such areas as nanotechnology. More manufacturing firms are engaged in nanotechnology R&D than any other industry, according to the National Science Foundation. Along with new discoveries in the material sciences, nanotechnology could transform much of manufacturing by 2020.

Exhibit 14: Manufacturing Firms Engaged in Nanotechnology Research



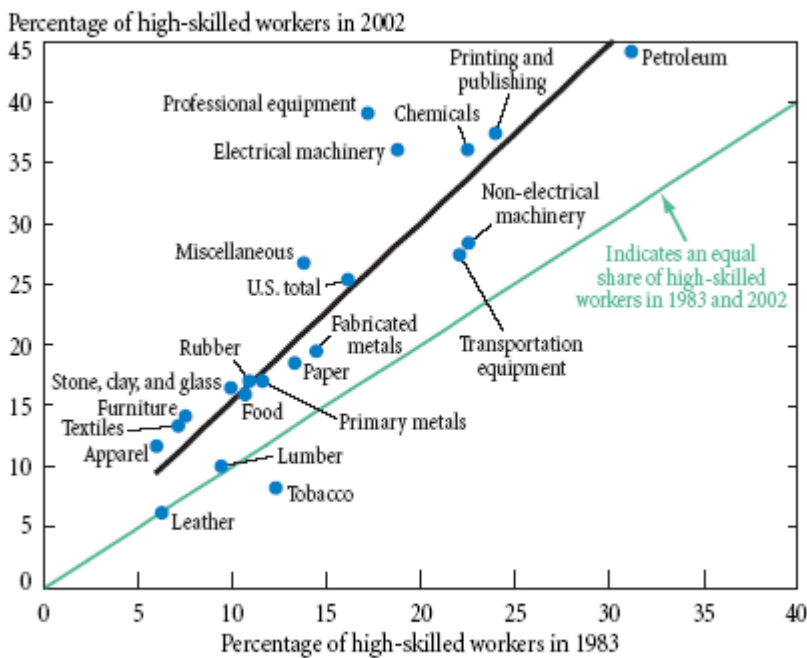
FOURTH, ALL OF THE ABOVE CAN RESULT IN MORE HIGH-QUALITY ON-SHORE JOBS

The change to high-tech manufacturing is pervasive across all manufacturing resulting in high demand for more skilled, better-educated production workers. “*A Leaner, More Skilled U.S. Manufacturing Workforce*” is the trend, according to an article by Richard Deitz and James Orr of the Federal Reserve Bank of New

York in February/March 2006. And those firms combining advances in technology with global growth opportunities face double benefit from the next manufacturing renaissance. As noted in the RSM McGladrey survey referenced in Section 4.2, firms with foreign operations are hiring in the U.S. at twice the rate of firms focused on domestic markets.

Exhibit 15

Change in the Share of High-Skilled Workers in U.S. Manufacturing Industries, 1983 to 2002



Source: U.S. Bureau of the Census, Current Population Survey.

Note: The black regression line coefficient = 1.4 (standard error = 0.20).

CONCLUSION:

BRIGHT FUTURE = TECHNOLOGY + INTERNATIONAL MARKETS + SKILLS

One only has to observe the stock performance of many U.S. industrial companies this decade to conclude that those with strong international exposure, superior technology, ongoing commitment to R&D and a skilled workforce can prosper. This is not to say that manufacturing company growth is a steady path.

Ups and downs in a fast-changing economy are highly likely. Nevertheless, the prospects for those states that retain a healthy manufacturing base look good, given U.S. technological and trade advantages. What is less certain is which will be the states that provide growth environments conducive for manufacturing going forward this century.

5. PROSPECTS FOR MANUFACTURING GROWTH: GROWTH COMPANIES/GROWTH INDUSTRIES MATTER

“... industry averages mask important differences in performance across sectors and firms: 20 percent of the firms in the five lowest-productivity sectors [out of 20 3-digit NAICS] are performing better than the average of the five highest-productivity sectors.”

EPI. “Renewing U.S. Manufacturing: Promoting a High-Road Strategy” 2008;

Luria and Rogers, 2007

This Chapter is about where manufacturing growth is occurring. It is based on the premise that growth companies and growth industries are a necessary requirement for a dynamic state economy, especially one that aspires to be counted among the “leading places in the world to do business.” It is also based on the proposition that even when a vital sector experiences a downturn, as is understood to be the case for North Carolina manufacturing in recent years, particular industries or sub-industries will still prosper, often by smart adaptation to changing markets. That is, there are always winners, even in a softening economy, and this in itself can be a sign of a robust manufacturing sector.

This Chapter has three parts: The first part reports on the nature of the employment changes in manufacturing so far this decade; the second part reports on those manufacturing industries that have been doing well in terms of job and sales growth; and the third part identifies the manufacturing growth businesses and seeks to find out how they match up with growth industries.

While numerical growth is a good thing for the state’s economy, stimulating demand and increasing the size of the workforce, it is not sufficient. Prosperous states are those that grow per capita income and productivity. More than any time in U.S. history the economic development of states is about quality growth, the kind that raises the standard of living, supports better education and infrastructure, provides opportunity for those left behind and sustains natural

assets. North Carolina's multi-decade efforts at economic change have paid off, but its per capita disposable income still has a ways to go to be counted among the leaders (its 2006 rank is 38 out of 50 states). Improving relative position in per capita income is like turning a tanker at sea. It will happen very gradually, but is achievable. Consider the remarkable change in Virginia's per capita income from 83.4 percent of the U.S in 1953 to 108 percent in 2006.

Quality economic growth means increasing productivity and value-creating innovation, which translates into healthy business profits, high-paying jobs, and investment in state-of-the-art business operations, new technology, people, public infrastructure and environmental quality. Quality growth is important to North Carolina because it:

- generates more high-paying, high-skill jobs
- creates more interesting and varied jobs
- creates more entry-level jobs, enabling those not immediately college-bound to learn employability skills
- provides more opportunities for workers to move up the earnings ladder
- generates more retained earnings for businesses to reinvest in research and development, worker training and civic initiatives
- stimulates more entrepreneurial/innovative business activity
- opens up more international trade
- creates more tax revenue for basic public services, infrastructure, education, and securing a sustainable environment for recreation and tourism.

So, how is manufacturing contributing to growth even during restructuring this decade?

5.1 How is North Carolina's Manufacturing Sector Growing?

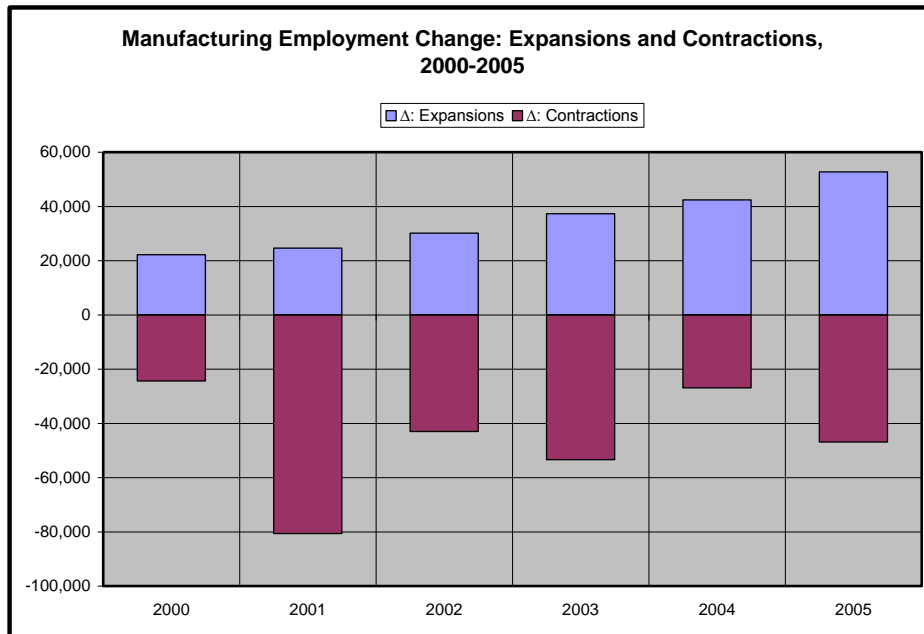
In any modern dynamic economy, jobs are constantly in flux as investments and people move to economic activities of highest value creation. What is important to know is the pattern of job gain and job loss from expansions and contractions, from business starts and failures, and from businesses moving into and out of the state. The tables below present the job dynamics of the manufacturing sector for all establishments active in any year between 2000 and 2005 based on the National Establishment Time Series.

ESTABLISHMENT EXPANSIONS AND CONTRACTIONS

As a rule of thumb, most net new jobs come from existing businesses. Between 2000 and 2005, manufacturing jobs created by expansions steadily increased from 22,183 to 52,719. Concurrently, jobs lost due to contractions continued to be a drag. However, beginning in 2004 net employment growth from net expansions in manufacturing turned positive.

Exhibit 16

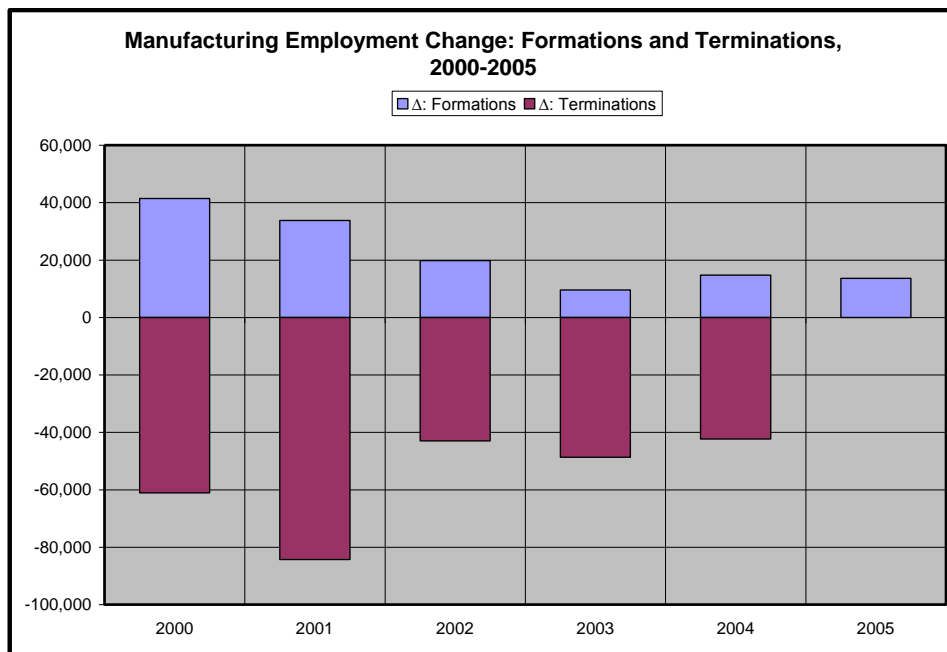
Source: NETS



ESTABLISHMENT FORMATIONS AND TERMINATIONS

In a dynamic, robust economy, businesses are starting and failing at a noticeable rate. What workers and leaders hope for is net growth in jobs from starts over failures. This decade, manufacturing establishments have experienced a negative net job growth partly because the business formation process has not kept up with the business terminations. Between 2000 and 2004, new jobs from start-up businesses have averaged 23,868 per year while job loss from terminations have averaged 55,877 (for 2005, no termination data is available until August 2008).

Exhibit 17



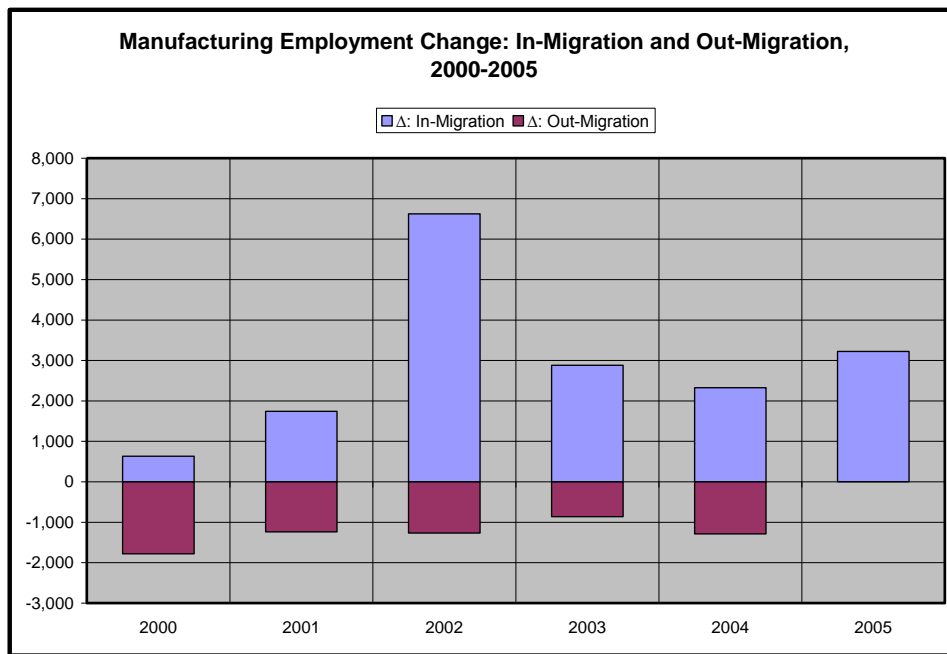
Source: NETS

MOVEMENT INTO AND OUT OF STATE

By far the smallest contributor to job gain or loss is business relocation into/out of the state. Because the migration of manufacturing establishments has been responsible for a very small share of the employment share in the manufacturing

sector, the graph below is presented at a different scale to the previous two graphs. These data show that the net movement of manufacturing business into the state has been a consistent net job gainer since 2001, averaging 2,839 per year due to in-migration and 1,288 due to out-migration between 2000 and 2004. 2005 in-migration shows a job increase over that of 2003 and 2004, although out-migration numbers are not available until August 2008. Consequently, while the net job numbers are small in comparison to expansions/contractions and starts/failures, North Carolina remains a real draw as a place to do manufacturing.

Exhibit 18



Source: NETS

GENERAL CONCLUSION: MANUFACTURING JOB GROWTH

For North Carolina to be a leading place in the world in which to do manufacturing business it has some catching up to do as a result of manufacturing's downturn this decade. To become a leading place in the world to do business, the state must do three things very well: have a superior

business climate that supports productive business operations and expansion, be a good place for start-up and for early-stage small businesses, and be attractive to new investment from the outside. Signs are that the situation with expansions and contractions is improving and, while the contribution to overall job creation by relocating businesses is usually small, in-migration exceeds out-migration at a healthy clip. Nevertheless, the entrepreneurial climate for start-ups and small young businesses appears to remain weak.

5.2 WHICH HAVE BEEN NORTH CAROLINA'S GROWTH INDUSTRIES THIS DECADE?

The analysis below covers all 4-digit NAICS manufacturing codes (see Appendix B for industry code descriptions). These totaled 86 manufacturing industries (some data as published by the federal data sources was suppressed²). As stated in Chapter 3 under methodology, industry studies of this nature must live with the fact that different data sources can lead to different results. Federal sources are not consistent among themselves because data is collected in different ways and definitions of key variables for measurement can differ. (For example, does a count of “one employed” mean one full-time equivalent job, or one person holding a job regardless whether it is part-time or full-time?) To generate robust results, four data sources are used extensively, three are federal sources and one is private: The Quarterly Census of Employment and Wages (QCEW) of the Bureau of Labor Statistics; the County Business Patterns (CBP) of the U.S. Census Bureau; the private employment numbers from the Bureau of Economic Analysis (BEA); and the Dunn and Bradstreet–based National Establishment Time Series (NETS) from Walls & Associates.

The focus of the analysis for this first phase of the North Carolina Chamber’s manufacturing project is jobs/employment change. Later reports might examine growth in business/industry output e.g. sales/revenue. The years of analysis are 2001-2005 for CBP and NETS and 2001- 2006 for QCEW and BEA. The year 2001 was chosen because it marks the bottom of the last recession or, in other words, the beginning of the current business cycle.

² There was no data available from either CBP or QCEW for NAICS 3365-Railroad rolling stock mfg, and NAICS 3369-Other transportation equipment mfg

HOW MUCH DECLINE HAS MANUFACTURING EXPERIENCED THIS DECADE?

First, it is pertinent to ask the question: “Is the widely-held view correct that North Carolina manufacturing has declined in jobs this decade?”

Exhibit 19

Annual Compounded Job Growth, 2001-2005/6	
Data Source	Growth Rate
CBP	-5.3%
QCEW	-4.7%
BEA	-4.4%
NETS	-5.0%

At the aggregate level, all sources agree that, since the last recession, North Carolina’s manufacturing sector has experienced a substantial job loss of a total 18 to 20 percent or about 4-5 percent compounded annually. The most recent data from the North Carolina Manufacturers Register shows that during 2007, the manufacturing sector still showed employment losses of 2.3 percent.³

Performances within manufacturing, however, have been quite diverse. Comparing employment growth for 2001 to 2005/6 from the most complete two federal data sources at the 4-digit level (QCEW and CBP) and NETS, the following industries stand out:

³ Manufacturers News, March 4th 2008

Positive Growth Industries

These are industries with positive annual compounding growth as obtained from at least two of the three data sources (with one at least at 2 percent or above per year) and not more than 5 percent negative in the third data source:

Exhibit 20

NAICS Code	Industry Name
3113	Sugar & confectionery product mfg
3114	Fruit & veg preserving & specialty food mfg
3311	Iron & steel mills & ferroalloy mfg
3323	Architectural & structural metals mfg
3324	Boiler, tank & shipping container mfg
3352	Household appliance mfg
3363	Motor vehicle parts mfg
3364	Aerospace product & parts mfg
3366	Ship & boat building
3379	Other furniture related product mfg

Promising Growth Industries

These industries reported at least 2 percent positive annual growth according to one of the data sources but slight negative growth according to the other two data sources (or no data was available). Consequently, this list is a little more ambiguous than the “Positive Growth Industries” list, but still quite promising.

Exhibit 21

NAICS Code	Industry Name
3161	Leather & hide tanning & finishing
3241	Petroleum & coal products mfg

3255	Paint, coating & adhesive mfg
3279	Other nonmetallic mineral product mfg
3314	Nonferrous (excl. alum) production & processing
3327	Mach shops, turn prod, screw, nut, bolt mfg
3331	Ag, construction & mining machinery mfg
3341	Computer & peripheral equipment mfg
3369	Other transportation equipment mfg

Steady State Industries

These industries have grown according to at least two of the data sources within +/- 2 percent annually and show less than 2 percent negative growth in not more than one data source between 2001-2005/6. They are likely to be at a turning point.

Exhibit 22

NAICS Code	Industry Name
3116	Animal slaughtering & processing
3254	Pharmaceutical & medicine mfg
3273	Cement & concrete product mfg

Industry Forecasts

These recent growth industries comport with two industry forecasts for North Carolina. The Bureau of Labor Statistics 2004-2014 state projections for North Carolina are only available at the 3-digit NAICS level, but can still give insight into the main categories represented by strong growth expectations. The growth industries identified above are represented in 12 out of the 21 3-digit NAICS manufacturing industries identified by the BLS.

Regarding fabricated metal manufacturing, it is expected to grow 1.1 percent annually in North Carolina, and the more recent national projections to 2016 expect the sub-industry "Architectural & structural metals" manufacturing, shown

above, to grow by 0.5 percent annually. According to a recent workforce study by the North Carolina Commission on Workforce Development, the niche sub-industry “Ornamental and architectural metal products” manufacturing is expected to grow even stronger at 1.7 percent annually between 2007 and 2017.

Food manufacturing in North Carolina is expected to grow 0.8 percent annually through 2014, while transportation equipment has the strongest representation among the “Positive Growth” groups above. It is expected to grow 1 percent annually in North Carolina to 2014. National projections to 2016 see the ship and boat building industry growing at 1.1 percent annually. Four out of seven sub-industries in the transportation equipment category appear among the list above.

Two other industry groups stand out: Chemical manufacturing and Nonmetallic Mineral product manufacturing. Chemical manufacturing is expected to grow in North Carolina at 1 percent annually to 2014, although not nationally. National projections show pharmaceutical and medicine manufacturing to grow strongly at 2.2 percent annually. For nonmetallic mineral product manufacturing in North Carolina, the two promising growth sub-industries are cement and concrete products and other nonmetallic mineral products.

GENERAL CONCLUSION ABOUT GROWTH INDUSTRIES

This decade is a tale of specialty industries making it under challenging economic conditions – a healthy sign that North Carolina manufacturing industries are turning around one by one. Industry clusters that stand out are in fabricated metals, transportation equipment and food manufacturing. 2007 data from the North Carolina Manufacturers Register confirms that food products and fabricated metal industries were the only job gainers in 2007.⁴ Sub-industries *within* each 3-digit industry vary substantially and are often at odds with national

⁴ Manufacturers News, March 4th 2008

performances and projections. This could point to continued successful small niche clusters that are not well known, such as boat building.

The three categories above, Positive Growth, Promising Growth and Steady State, account for 156,125 jobs. These represent 21 percent of all North Carolina manufacturing employment (NETS).

5.3 WHICH ARE NORTH CAROLINA'S FASTEST-GROWING BUSINESSES?

The purpose of this section is to search for specific manufacturing businesses growing regardless of their specific industry. By doing this one can determine if businesses are adapting to new challenges across the gamut of North Carolina manufacturing and geographic regions or concentrated to certain industries and/or parts of the state. Using an advanced search method on the NETS (D&B) database, just over 12 percent of manufacturing establishments were identified as “growth businesses” in the 2000-2005 data period. These 2,620 establishments form the analysis group for the discussion below.

THE PERFORMANCE OF MANUFACTURING GROWTH BUSINESSES

Exhibit 23

Establishment Count, 2000-2005			
	2000	2005	Annual Growth
Growth Establishments	2,443	2,620	1.4%
Negative or Flat Growth	12,809	18,923	8.1%
All	15,252	21,543	7.2%

Source: NETS

Manufacturing growth establishments represented 12 percent of all establishments, 24 percent of all employment and 25 percent of all sales in manufacturing in 2005. While they did not grow in number as fast as establishments overall, in jobs and sales they grew on average annually 10 to 12 percent faster than the manufacturing sector overall.

Exhibit 24

Employment and Sales by Growth Performance, 2000-2005						
	Employment			Sales		
	2000	2005	Annual Growth	2000	2005	Annual Growth
Growth Establishments	96,827	174,930	12.6%	\$12,798,131,508	\$20,884,618,405	10.3%
Negative or Flat Growth Establishments	594,440	553,277	-1.4%	\$73,312,126,190	\$61,885,248,812	-3.3%
All	691,267	728,207	1.0%	\$86,110,257,698	\$82,769,867,217	-0.8%

Source: NETS

WHICH TYPES OF ESTABLISHMENTS ARE GROWING?

Growth establishments in manufacturing are present in a wide variety of industries. Some industries stand out as particularly growth-oriented according to NETS. The previous section pointed to several niche industries in primary metal manufacturing as showing promising signs of growth, and state projections continue to expect annual growth, albeit small, over the next years. Compared to other 3-digit manufacturing industries, primary metal manufacturing has the second highest share of growth establishments relative to its industry size. At the same time, this share represents only a small number of establishments and jobs, reflecting niche industries with small to medium-sized employment.

Petroleum and coal products are a special case in this industry analysis. It shows the highest share of growth establishments at close to 20 percent and representing over 90 percent of employment in that industry! NETS data covers a much larger share of establishments and employment in this NAICS code than federal data sources; this might explain why it shows a strong growth rate this decade while federal data sources have only seen decline. However, it does

comport with the industry analysis of neighboring state Virginia, where the petroleum and coal industry has been the only growth niche in the manufacturing sector.⁵

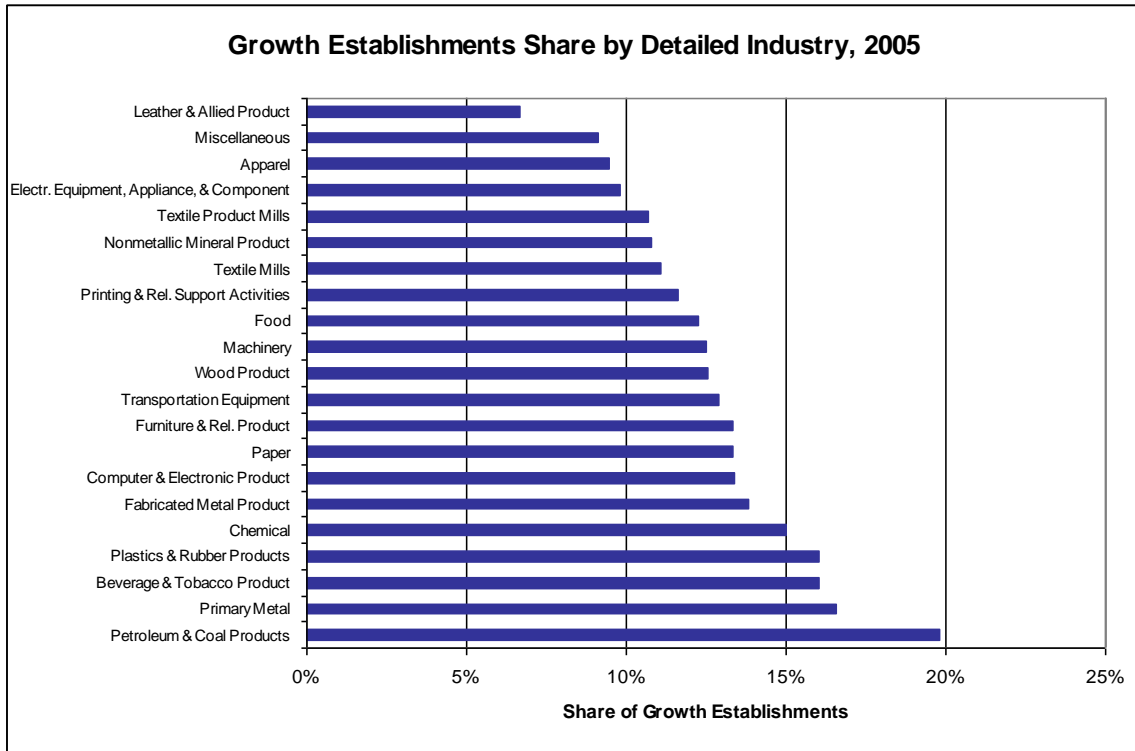
Another growth-oriented industry that stands out unexpectedly is beverage and tobacco products. It shows a high share of growth companies responsible for over 50 percent of jobs in the industry (though small in absolute numbers). Performance for this industry this decade, however, shows negative employment growth in all data sources.

Several manufacturing industries have experienced a solid share of growth companies representing a moderate share of jobs and establishments. These middle-of-the-pack performers, such as chemicals and fabricated metals, might be just at a turning point where some niche industries such as pharmaceuticals or architectural and structural metals could pull the industry into a positive growth path as state and national projections predict.

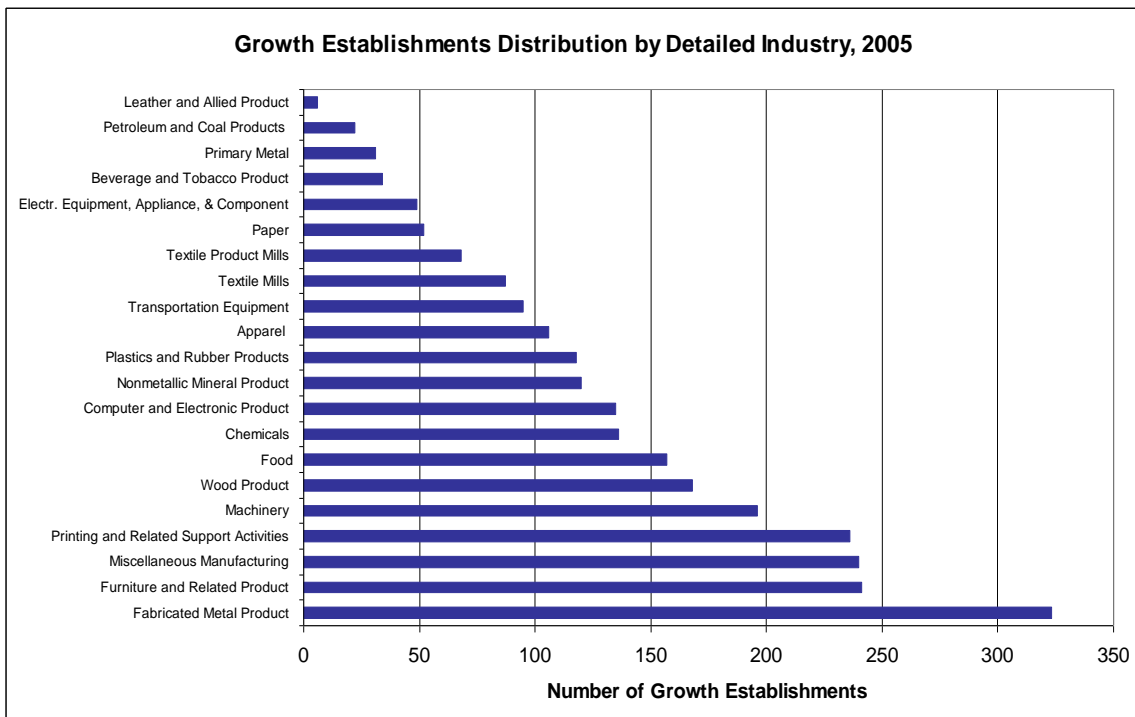
The food and transportation equipment manufacturing industries in North Carolina are other candidates for future growth with industry projections expecting continued employment growth. Performance this decade has been somewhat ambiguous in both cases but several niche markets emerged at the more detailed industry level, e.g. in ship and boat building, which are reflected in the middle of the pack share of growth companies in both industries in the following graphs.

⁵ Manufacturing Impact and Economic Diversification Plan FY2007-2011 (2006). Virginia Economic Development Partnership. www.virginiaallies.org/pdfs/MfgPlan.pdf

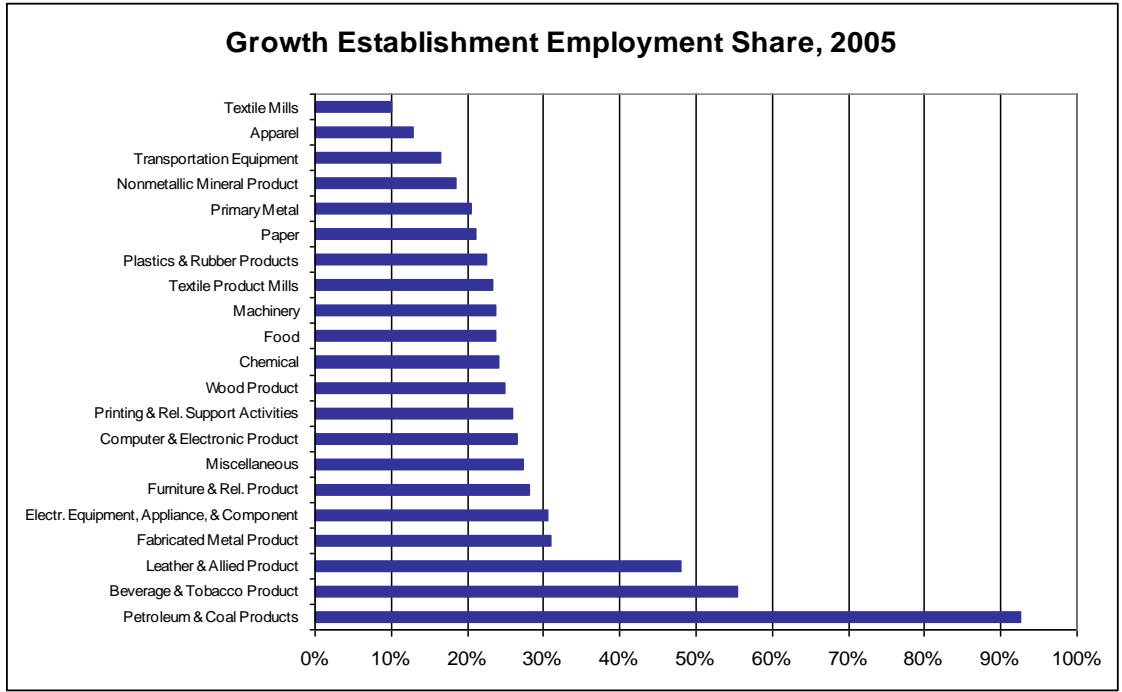
Exhibit 25



Source: NETS



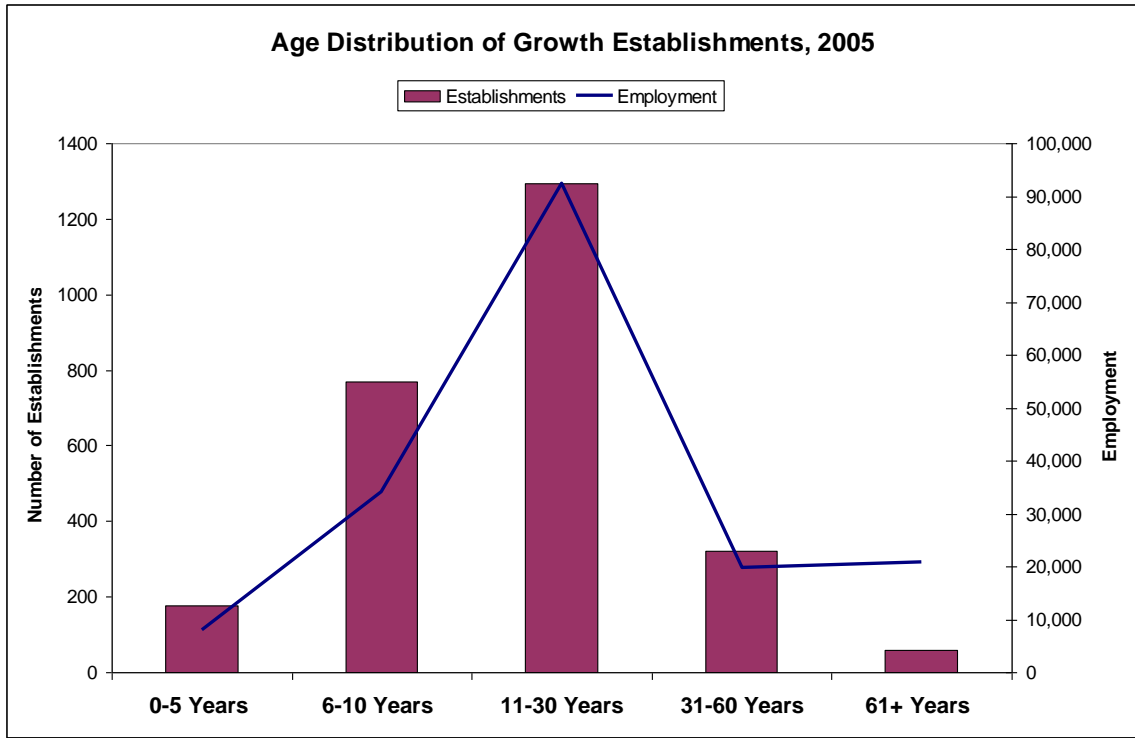
Source: NETS



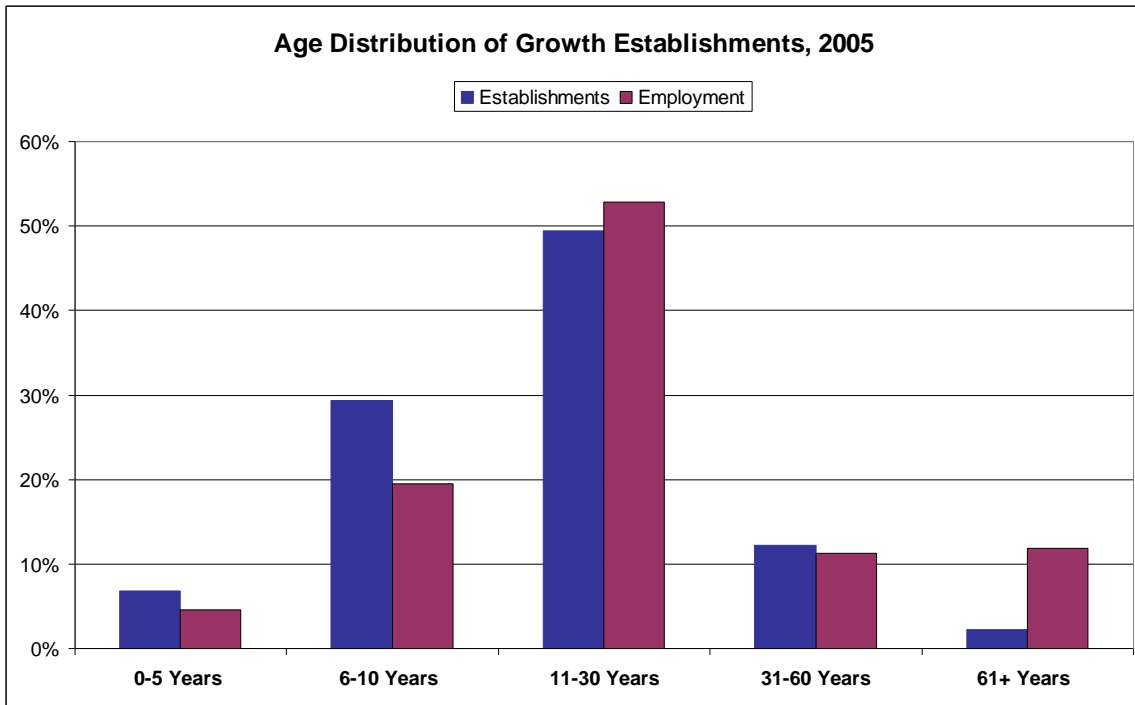
Source: NETS

Growth establishments in manufacturing are present in all age groups, but establishments 11 to 30 years old represent close to 50 percent of all growth establishments and 53 percent of all jobs in growth companies. However, the age group with the biggest *employment* growth between 2000 and 2005 were 61 years and older (see Exhibit 26).

Exhibit 26



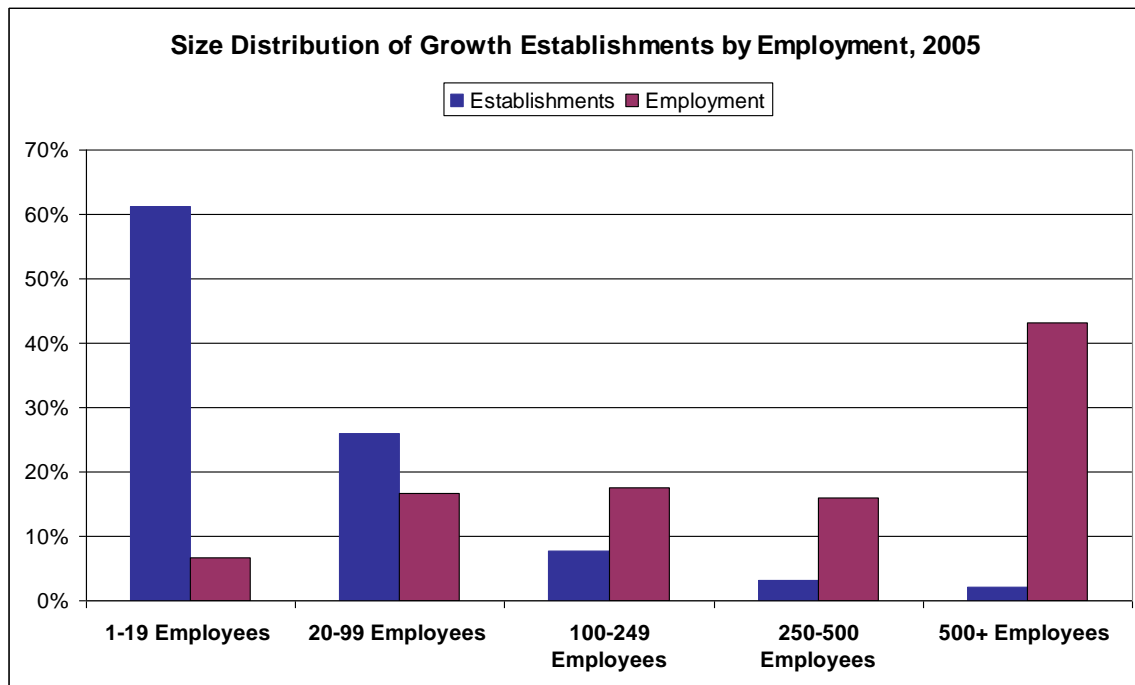
Source: NETS



Source: NETS

By employment size, small establishments of up to 100 employees contribute 87 percent of all growth establishments in manufacturing and 23 percent of all jobs. Mid-sized companies of 100 to 500 employees represented 11 percent of all manufacturing growth establishments but provided 33.5 percent of all employment.

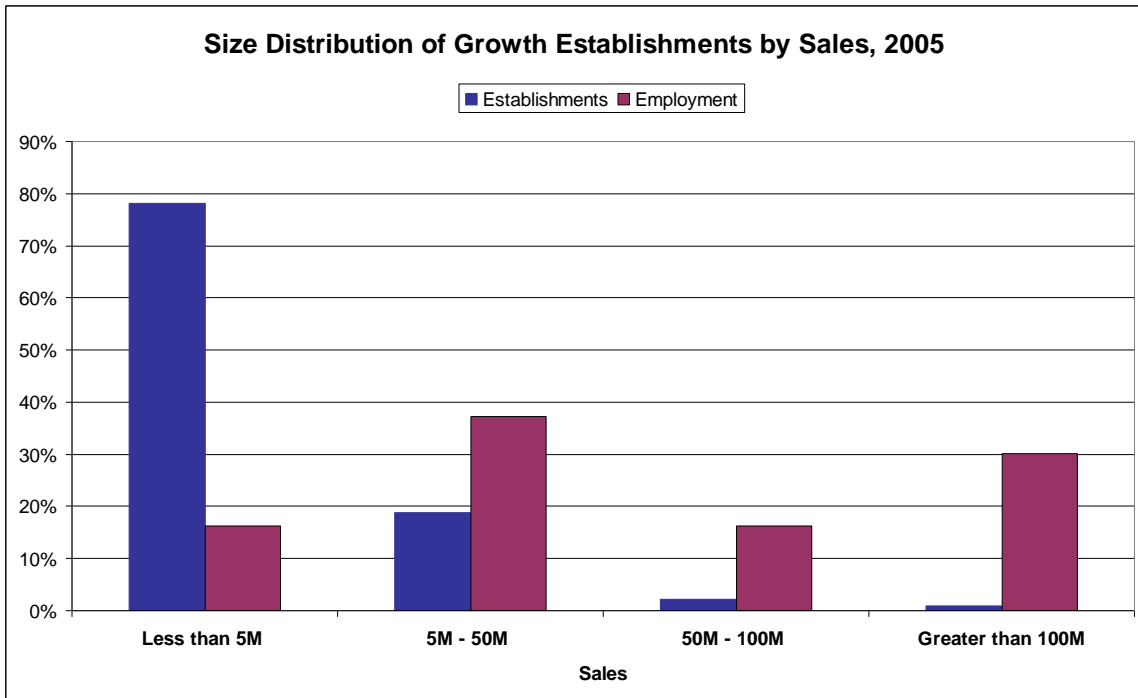
Exhibit 27



Source: NETS

In terms of sales size, manufacturing growth establishments are dominated by companies with less than \$50 million in sales in 2005, which represent 97 percent of all growth establishments. Jobs are almost equally distributed between companies with sales less than \$50 million and those with sales greater than \$50 million, however (see Exhibit 28).

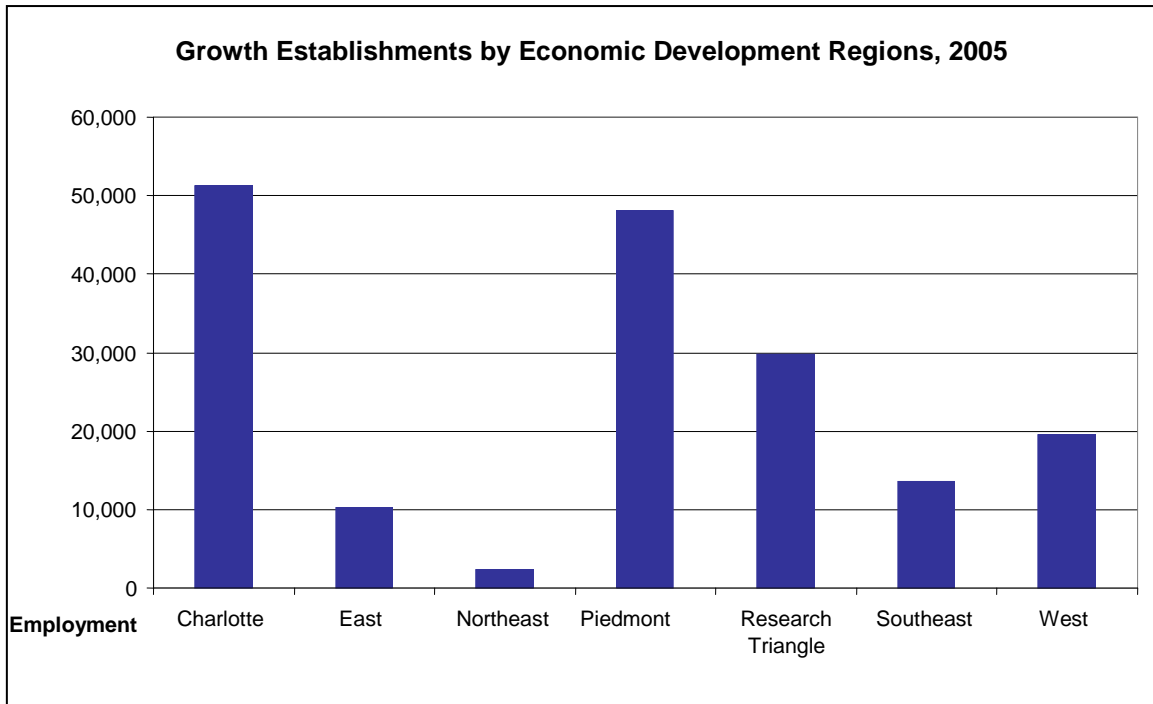
Exhibit 28



Source: NETS

Growth establishments in manufacturing are present in all parts of North Carolina, but naturally agglomerate in the Charlotte, Triad and Triangle regions (see Exhibit 29).

Exhibit 29



Source: NETS

CONCLUSION: GROWTH BUSINESSES ARE EVERYWHERE!

These results point to constructive adaptations taking place broadly across the manufacturing sector. Growth businesses can be found in all 3-digit NAICS industries (20 in all) and well distributed across the state, although larger numbers can be found in the Raleigh-Durham and the Piedmont-Triad regions. No dominant pattern is detectable. Since growth and decline are occurring concurrently across the board and competitive conditions are changing rapidly, it becomes difficult for the state to focus policy on particular manufacturing industries. Rather, universal policies that treat all manufacturing businesses equally and foster competitive and innovative behaviors appear to be the most practical and least intrusive.

6. POSITIONING MANUFACTURING FOR NORTH CAROLINA'S NEXT QUANTUM LEAP

There is broad consensus among North Carolina business leaders and decision-makers that the state is fully engaged in an economic war – a competitive economic environment characterized as open, disruptive, fast-changing and global. The primary purpose of this manufacturing report by the North Carolina Chamber is to document the value of the industry to North Carolina and to examine its contributions to future state prosperity in this new global economic order. To that end this report does not include specific policy objectives or recommendations. Certain issues have repeatedly surfaced as the project has progressed, however, that relate to positioning manufacturing for a promising future in the state resulting in the growth of quality jobs. Each item is only briefly described below. These topics will serve as a backdrop for further deliberations in 2009.

North Carolina is at a critical juncture in its economic growth journey, somewhat akin to a time four decades ago which led to bold steps to create Research Triangle Park. With hindsight, the Research Triangle Park (RTP) initiative can be described as a quantum leap in growth strategy. Today North Carolina can attribute its growth and economic diversity of recent decades, in part, to the catalytic role of RTP. It is the envy of many states as they, like North Carolina, face unfamiliar economic growth challenges stemming from mounting competitive forces, globalization, demographic shifts and technology change.

Will North Carolina step out ahead of the pack again as it did four decades ago? And what will North Carolina's next leap look like? Will it be physical development initiatives like RTP, a focused effort on select industry clusters, a comprehensive package of pro-investment policies, or a combination? As one of the project's Roundtable participants put it:

“It is not just a matter of tweaking public policies to foster growth anymore – we are competing in a globally different world and state pro-business policies must be totally redesigned from the ground up.” (Roundtable participant)

As policy backdrop:

Hopefully the checklist of issues below serves as a useful agenda for fostering such collective dialogue and problem-solving around manufacturing growth.

Manufacturing Roundtables convened for this project surfaced seven underlying themes central to North Carolina manufacturers maintaining or improving competitiveness:

- independence/minimal interference
- abundant degrees of freedom to experiment/flexibility to act
- ease in connecting discovery with commercialization
- sound infrastructure and economic foundations
- well-prepared workforce
- good strategic intelligence, especially on technology trends and market change
- opportunities to network creatively

Following are nine key issues deserving in-depth deliberation and resolution in the next phase of this project:

1. North Carolina’s Manufacturing “Brand Image” as a Place to Work:

The North Carolina brand as a good place for manufacturing is very much intact as indicated by *Site Selection* rankings and “best places to do business” rankings by CNBC and *Forbes*. But manufacturers sense slippage in public image and government enthusiasm for the industry. Because of misunderstandings about

career futures, they are experiencing greater difficulty recruiting young talent into very promising high-tech, rewarding jobs.

“Manufacturing made this country strong. Now many leaders don’t speak the language.” (Roundtable participant)

Roundtables were broadly unanimous that the competitive advantages that brought them to the state are less a sell today – inexpensive land, a non-union environment, ease of doing business. What continues to set North Carolina apart are generally positive economic drivers – productivity and labor supply, research and creativity, business vitality and capital formation. The state is generally strong in education and business costs but weak in workforce preparedness, infrastructure and government efficiency.

Manufacturers are concerned that state leaders, the media and the public at large don’t see as much of a future in manufacturing. Roundtable participants have the impression that manufacturing is no longer seen of vital importance to the state, despite the fact that it still accounts for substantial employment and good-paying jobs (see Chapter 2). Decision makers, the media and the public see manufacturing in decline because jobs are being lost. They may, in fact, fail to take into account gross manufacturing output and productivity as reflected in pay per worker and profits to owners and share holders. Roundtable participants acknowledge that manufacturers are doing more with less. Consequently, manufacturing is not as much of a job creator as in the past, but continues as a wealth creator and job multiplier. Some participants pointed out that manufacturers may be partly to blame for a negative image because they have not told the story of their recent competitive challenges well.

2. Agility with Ever-Improving Productivity, the New Modus Operandi:

What all manufacturers face in common is a fast-paced, quick-changing business environment. They are being creative and many show determination to stay in

North Carolina. Constantly improving productivity coupled with regular doses of innovation is their answer to global competitiveness challenges. To sustain high performance, however, they need predictable state and local operating conditions in which the decisions affecting them by governmental entities and educational providers are timely, responsive and innovative. Most importantly, because speed is of the essence, manufacturers are looking to government to be more streamlined in its deliberations and operations. Considerable frustration is evident regarding the regulatory environment – local, state and federal. The general feeling is that government bureaucracies are not sensitive to the speed, responsiveness and professionalism required of businesses in a nimble and competitive world. Some went so far as to suggest that government is a greater threat to competitiveness than any other factor. They believe lean manufacturing, Six Sigma and related other performance management tools could be applied to improve government.

Manufacturing's future has become the hot topic it is today partly because the industry has moved so quickly from a predictable state in the 90s to a turbulent state this decade. While some assert mistakenly that manufacturing is a thing of the past in North Carolina, a better assessment is that manufacturing is dynamic. This dynamic environment has necessitated agility in firms to respond to changing markets, new competitors, advancing technologies and global opportunities. Likewise, workers have become more flexible, recognizing that manufacturing job change, even career change is now the norm. They have retooled with the help of educators and trainers, who are, in turn, becoming more responsive to rapidly changing needs.

One does not need to look far to find examples of agility and flexibility. In 2005, the truck body building business was booming due to freight flows brought on by global trade and imminent new truck emissions standards that would increase prices. Freightliner, located in Cleveland, about 40 miles north of Charlotte, experienced rapid growth with heavy-duty truck sales setting a record in 2006.

Today, only three years hence, the industry is suffering from a downturn in the U.S. economy and a slump in sales due to the higher prices of less-polluting trucks. The company let 1,200 workers go a year ago, downsizing from three to two shifts, and in April of this year announced further cutbacks of 1,500 workers. Firms are learning to adjust quickly – they must.

3. Flexibility – North Carolina’s New Worker:

Smart workers today make themselves both valuable to current employers and marketable for their future by constantly gaining new knowledge, learning new skills and sharpening attitudes and interpersonal skills. Their best path to employment security is training. North Carolina has a well-regarded higher education system and nationally acclaimed customized training, but closer ties between manufacturing and community colleges, in particular, will enhance competitiveness. Early college high schools will help, but reenergized career technical education is needed to enhance the skill levels of mid-level workers.

“We have a tsunami coming – loss of experienced baby boomer workers, growth of high-skill jobs and young people going elsewhere to live, play and work.”
(Roundtable participant)

Over the same time period that jobs are being lost, new ones are being created. For example, the Hickory region has suffered due to overseas competition in furniture and textiles manufacturing. Relatively recently, Sutter Street Manufacturing announced the location of a facility that will create 820 jobs over five years with an investment of approximately \$2.7 million. One of the reasons for the location decision is the advantage of high-level furniture-related skills in the region. In addition, workers there have been retooling – going back to school for added skills. Regional leaders have made major efforts over the last three years to improve post-secondary educational opportunities. A successful planning partnership called Future Forward has resulted in the building of an education/training center to provide advanced technical and business training by

a number of colleges from both inside and outside the region. In other words, “we must be dancing fast” – highly informed, energetic and aggressive in preparing for changing technologies, labor conditions and markets. One area mentioned at all Roundtables is the need for immediate improvement in school-to-career programs for manufacturing to address a serious shortage of skilled and mid-level workers.

*“Tech education is now critical and it is non-existent in North Carolina!”
(Roundtable participant)*

4. Pro-Investment Policies:

The primary drivers of economic growth are innovation, quality workers and growth capital. Winning states are those that get the formula right for spurring investment – project and R&D investment, infrastructure investment and human capital investment. A necessary foundation is sound business tax policy. For those groups currently crafting changes to North Carolina’s tax policy a common beginning point must be the recognition that tax policy is de facto industrial policy in today’s open market economy.

Government seldom acts quickly enough in response to changing market conditions, but it can provide manufacturers with a stable tax climate that fosters, or at least does not discourage, investment. On the face of it, North Carolina ranks well on business tax burden. Where it falls short is in the complexity of its tax structure which evolved in very different economic times. North Carolina’s tax policy is currently under review by a number of groups. What manufacturers need is a predictable, simple tax regime that treats every business similarly; that does not penalize investment, especially capital investment, R&D/innovation investment and training investment; and that uses business location incentives thoughtfully and strategically based on sound rate of return.

“It’s all about finding the niche! If it’s a commodity product, we can’t compete.”
(Roundtable participant)

At every Roundtable, one or more participants stressed the critical role creativity and innovation is playing and will play in the future. This quality affects all levels of business operations from shop floor to marketing to product development to recruitment, etc. The general consensus is that North Carolina manufacturing has been rapidly changing from a commodity orientation (mass manufacturing) to a niche orientation (mass customization). Many examples were given where firms are tailoring their products to specific domestic and international markets, even in the case of a mined commodity like phosphate.

5. Trade and Infrastructure:

While trade policy is primarily a national responsibility, states can shape the trajectory of their manufacturing economies by ensuring uncongested, competitively priced freight movement. Over the next decades, U.S. freight tonnage is expected to increase by close to 3 percent annually, and transportation and warehousing employment is expected to grow at 1.1 percent annually. This industry is tightly linked with manufacturing growth. As global trade increases, further infrastructure long-range planning and financing become imperative – for rail, ports, airports, pipelines, waterways and highways/toll roads. It is important to “right-size the problems” and “right-size the solutions.”

Hardly an economist would disagree that the level and growth of U.S. trade has been buoying the US economy through its current downturn (in 2007, U.S. manufacturing exports grew 10.9 percent while manufacturing imports grew 4.9 percent). Despite various understandable concerns about fair trade and the off-shoring of jobs, trade often results in growth in the very kinds of jobs advancing states like North Carolina seek. World demand for America’s advanced products calls for even further on-shore investment, technology infusion and productivity improvement, leading to higher skill and higher-paying jobs on-shore. An earlier

discussion in Chapter 5 describes how North Carolina is benefiting from the U.S. trade boom.

International competition is one of the reasons for manufacturing's downturn in North Carolina since the beginning of the decade. Everybody recognizes that low-cost production is moving and will continue to move off-shore. Many Roundtable participants, however, noted the opportunities created for export of high-value products, technologies and know-how. They are responding accordingly. Several firms that do a significant amount of international trade would like to see North Carolina maximize its trade-zone potential by developing a regime in which goods brought into the state and subsequently exported are treated as non-tax events.

But trade issues are largely a national concern. What can and should states do to be sure they are on the receiving end of export-led growth and international investment? The issue most on the minds of North Carolina manufacturers is infrastructure, especially transportation infrastructure, but also local water, sewer and related utilities. In both cases, participants at the Manufacturers Roundtables expressed concern that North Carolina is not looking ahead sufficiently, inadequately anticipating future demand. These comments are congruent with the North Carolina Chamber's 2007 Annual Competitiveness Index, which rates the state below average on infrastructure and noted that its physical infrastructure score had been falling in recent years.

It stands to reason that increased trade is enabled by a reliable, efficient transportation system and network of market-responsive logistics firms. This calls for long-range planning, development, financing and maintenance of ports, railroads, highways, bridges, inter-coastal waterways, pipelines and airports. The future of the transportation and logistics sectors is inextricably linked with that of the state's manufacturing sector.

In a similar fashion, manufacturing depends on local infrastructure, particularly congestion-free local streets and roads and sound water supply and wastewater systems. And because of the nature of business decision-making in a fast-paced economy, they need quick action by local planning and zoning authorities. Several Roundtables participants expressed frustration that local planning and zoning rules and procedures fail to take into account the speed with which manufacturers must respond to stay competitive.

6. Capital Access for Growth:

North Carolina ranks well among states for risk capital and conventional financial services. In particular, venture capital and conventional banking have a healthy presence. Manufacturer financing often falls in the “mezzanine” category – specialty debt financing that enables small and mid-sized firms to be closely held by individuals, families and partnerships. While major capital access gaps are not apparent, many North Carolina small and mid-sized manufacturing firms are 30 or more years old, at which point succession planning and/or corporate restructuring might be occurring in the next one to two decades. The state is endowed with several experienced private and university support organizations to help in this regard. This issue deserves watching, however, to ensure that all North Carolinians, including women and minorities, have the opportunity to become part of the “ownership class” in the state’s manufacturing industry – at the same time increasing the odds that such firms remain locally held.

7. Growth in Advanced Business Services:

While it might appear surprising to highlight advanced business services in a manufacturing report of this nature, research on state growth is confirming that leading states have healthy and productive services sectors alongside high-performance manufacturing. Tight inter-firm networks between manufacturing and services lead to greater innovation, higher productivity and better jobs along the entire value chain. While North Carolina is strong in some advanced business

industries, such as in risk /venture capital as noted above, overall this sector is under-represented.

8. Reliable, Competitively Priced Energy for the Long Haul:

Recent research indicates that low-cost energy strongly correlates with state economic growth. Healthy future manufacturing states will be those that take bold planning and financing steps now to foster conservation and efficiency and diversify supply. North Carolina manufacturing has benefited from low-cost energy in the past. This capacity can adapt to new environmental requirements, but additional quantum-leap solutions dealing with both supply and energy efficiency may be required to address long-term growth realities.

9. Healthcare Costs Matter:

In addition to competitive energy pricing, research indicates that the other business cost factor that correlates most with state economic growth this decade is health care. A recent analysis by the New America Foundation found that “many manufacturers have blamed rising healthcare costs for decisions to drop health benefits for workers or shift jobs overseas.” Employers in the U.S. “spend 11.3 percent of payroll on healthcare on average vs. 4.9 percent among the foreign sample, which is weighted by trade value. Employer contributions in the U.S. manufacturing industry were even higher at 13 percent of payroll.” North Carolina manufacturers complain that healthcare costs are outpacing wages and productivity. They do not want to pass these costs on to workers by lowering wages but find it increasingly difficult to raise prices of their end products in highly competitive markets. This threatens both their bottom lines and reasons to exist. Some larger manufacturers are experimenting with internal wellness programs as one way to reduce costs. Like the energy situation, those states that put bold market-responsive initiatives and public/private partnerships in place to address healthcare costs stand to gain the most as good places for manufacturing in the long haul.

7. CONCLUSION AND NEXT STEPS

The growth pattern of particular industries is never steady or unidirectional. Most industries that make up a modern dynamic economy experience ups and downs, particularly financial services, construction, mining, energy production and manufacturing. Even parts of the more predictable service industries fluctuate from time to time, e.g. specialty health services, vocational education and entertainment. There is little doubt that North Carolina manufacturing has been through a rough spot that has taken its toll on individual workers, their families, communities and businesses. But there are healthy signs of industry repositioning and growth ahead. Given a policy environment conducive to investment, North Carolina can look forward to more wealth creation from its manufacturing sector in the future, resulting in quality higher-paying jobs with opportunities for an improved standard of living and quality of life.

The outlook for U.S. manufacturing looks very promising this century. A “second industrial revolution” is underway with the development of advanced industrial technologies spurred by growth in global demand, the search for greener production solutions and breakthroughs from scientific discoveries in nanotech, materials sciences, biotech and the like. The future of the nation’s manufacturing sector, however, does not appear to capture the imagination of state policymakers and leaders, as much as, say, the life sciences. This provides a unique opportunity for a few states to aggressively position their manufacturing growth with the intent to dominate in this sector 30-40 years from now. These will be states that not only recognize the advantages of increasing numbers of higher-paying production jobs, but also see the advantages profitable manufacturers bring as a magnet for allied businesses and an expanded tax base. In fact, as North Carolina contemplates its opportunities in pursuing a manufacturing strategy it must not only address several key competitive challenges directly facing manufacturing, but also must consider the synergies necessary with other sectors of the economy, including the following:

- ❖ Advanced logistics, since production manufacturing is part of a complex value chain and the growing global markets for manufactured products require superior transport and infrastructure.
- ❖ High-performance, advanced business services that offer superior and creative support in such activities as legal, financing, advertising, IT and repair and maintenance.
- ❖ Inter-firm R&D collaborations including tight linkages between universities/other research centers and the industrial extension service with manufacturing businesses. This includes expanded creative connections with educational institutions, especially North Carolina's community colleges.

In the 20th century, North Carolina was successful at growing its manufacturing base largely by paying attention to the direct needs of the manufacturers. A manufacturing growth strategy of the 21st century must take into account cross-sector considerations in a more comprehensive strategy, seeking to maximize the multiplier effect, since jobs in manufacturing often create between two and four times that number of jobs in the rest of the economy.

Also, in earlier times North Carolina's economic development approach was to focus on direct aid to businesses, such as tax and financial incentives, subsidized land and customized training. In the future, these tools can best be used more strategically, while government pays more attention to the business climate overall. Given the uncertainties of a fast-paced, disruptive and global economic landscape, this is an opportune time to consider the closing guiding principles offered on the following page. This report is not intended for policy recommendations, as they will come later. Thoughtful review of the facts and trends presented in this report, however, points to the conclusion that seizing economic opportunity today is very much in the hands of workers, inventors,

researchers, managers and investors – with government playing a supportive role. Prosperous states will be those with competitive businesses, and competitive businesses flourish where they have maximum flexibility to respond quickly and creatively to the changing marketplace. The following principles are offered as a framework for the next phase of this Chamber project:

Principle 1: Pro-Market – advocating open and efficient markets with maximum freedom to individuals and businesses to experiment in innovative and entrepreneurial ways. This includes enabling the growth of competitive product markets in such support areas as transportation services, energy efficiency and supply, health care and training.

Principle 2: Pro-Trade – an environment conducive for export, import, moving goods, establishing international joint ventures, trade licensing and know-how, operating to advantage both on-shore and off-shore.

Principle 3: Pro-Innovation – Tight linkages between the discovery processes, especially at universities, and the commercialization of new products and processes.

Principle 4: Pro-Green – Opportunities to innovate to minimize waste and pollution, optimize the use of scarce resources, and respond to changing market preferences for green products and services.

These Principles can best be refined and promulgated via a partnership between manufacturers, other businesses, government, education and the civic sector – a social “infrastructure for collaboration” with which North Carolina has a good track record, including its vision, creation and implementation of Research Triangle Park. The paraphrased comment from a participant at one of the four statewide manufacturers’ Roundtables provides food for thought at the end of

this first (investigative) phase of “What North Carolina Makes, Makes North Carolina”:

“Manufacturing companies can be quite introverted – third-party organizations (e.g. Chambers, business networks, educational institutions) can open up new channels. This project needs to set up a mechanism to follow up on recommendations for action, with strong motivations for manufacturers to remain involved. It needs to continue to use data to drive the state Chamber agenda on manufacturing issues coupled with a long-term vision for manufacturing policy priorities, capitalizing on clusters/existing industry alliances, existing regional partnerships and university-business alliances.”

8. APPENDICES

APPENDIX A

WHAT NC MANUFACTURERS TOLD US

Themes Recurring at Four Manufacturing Roundtables

Convened September 11-13, 2007

Facilitator: Graham Toft, GrowthEconomics, Inc.

A series of Roundtables representing manufacturers and related organizations were convened by the North Carolina Chamber in Raleigh, Greensboro, Charlotte and Asheville as part of a major initiative to document challenges, opportunities and action plans for positioning North Carolina's manufacturing sector for change and growth in the 21st century. Total attendance was approximately 50. This investigative and brainstorming phase provided a framework for more detailed research that followed.

Note: The following thematic summary is taken from notes prepared from the Roundtables organized around topics as a collection of participant remarks. These notes attempted to capture the general tenor of discussion and not the verbatim remarks of particular individuals. Some statements that were particularly insightful, thoughtful or provocative, however, are shown as quotes not attributable to particular individuals or firms.

8.1 The State of North Carolina Manufacturing

NC Manufacturing is Both Diverse and Complex

“Once you leave the Triangle, growth and workforce problems are different – there are two North Carolinas.”

Attendance at the Roundtables reflected a wide diversity of manufacturing industries, sizes of firms and market reach. Traditionally North Carolina manufacturers served domestic markets, but a number of participants were selling globally and, in a few cases, were totally global in their delivery. The Roundtables reflected transformations going on in all branches of manufacturing, in all regions and industries. Some are managing quite well while others have been cutting back, especially those impacted by the restructuring of wood products and textiles. It is not possible to generalize about North Carolina’s manufacturing situation as a whole – one must instead break out by specific industries and regions. The opportunities and challenges vary considerably across the state.

Dancing Fast

“We have a tsunami coming — loss of experienced baby boomer workers, growth of high skill jobs and young people going elsewhere to live, play and work.”

In an earlier study of this type in New York, one manufacturer reported: “We are dancing fast.” These words aptly describe the tone at the Roundtables here. Participants were highly energetic and aggressive in how they are responding to changing technologies, labor conditions and markets. They are taking charge of their destinies with determination. Some plan to stay in North Carolina, while others are looking seriously elsewhere.

Innovation: The Idea Economy is Now.

“It’s all about finding the niche! If it’s a commodity product, we can’t compete.”

At every Roundtable, one or more participants stressed the critical role creativity and innovation is playing and will play in the future. This quality affects all levels of business operations from shop floor to marketing to product development to recruitment, etc. The general consensus is that North Carolina manufacturing has been rapidly changing from a commodity orientation (mass manufacturing) to a niche orientation (mass customization). Many examples were given of firms tailoring their products to specific domestic and international markets, even in the case of a mined commodity like phosphate.

Flexibility makes the Difference: Flexible Firms, Flexible Workers, Flexible Educators, Flexible Bureaucrats.

Innovation, flexibility and speed go hand in hand. The firms participating recognize that how they do business is constantly changing – they must be nimble and agile. Internal flexibility is achieved with a workforce able to think on its feet and in real time, something many see lacking from those coming out of high school. But business flexibility and agility is also affected by the way government does business with companies, which is generally insufficiently sensitive to the demands of time and performance required of manufacturers. One civic-minded firm took over a year to obtain all the permits and approvals necessary for the refurbishment of an inner-city facility. On reflection it would have been better to move to a greenfield site. Another is still waiting for final operating permits set in motion in 2001.

Global Economy is Both Pain and Promise

International competition is one of the reasons for manufacturing's downturn in North Carolina since the beginning of the decade. Everybody recognizes that low-cost production is moving and will continue to move offshore. However, many Roundtable participants noted the opportunities created for export of high-value products, technologies and know-how. They are responding accordingly. Several firms that do a significant amount of international trade would like to see North Carolina become a "free trade zone" where goods brought into the state and subsequently exported are treated as non-tax events.

8.2 Business Climate Issues and Concerns for Manufacturing

State Leaders, the Media & the Public Don't See a Future in Manufacturing

“Manufacturing made this country strong. Now many leaders don't speak the language.”

By and large, participants have the impression that manufacturing is no longer seen of vital importance to the state, despite the fact that it still accounts for substantial employment and good-paying jobs. Decision makers, the media and the public may see manufacturing in decline because jobs are being lost. They often fail to take into account gross manufacturing output and productivity as reflected in pay per worker and profits to owners/shareholders. Participants acknowledge that manufacturers are doing more with less. Consequently, manufacturing is not as much of a job creator as in the past, but continues as a wealth creator. Some participants pointed out that manufacturers may be partly to blame for this negative image because they have not told the story well of their recent competitive challenges and what it means to the state .

Whittling Away of North Carolina's Manufacturing Competitiveness

“It has taken a long time to build the state's reputation as pro-business, but now we seem to be killing it a little at a time.”

Roundtables were broadly unanimous that the competitive advantages that brought them to the state – inexpensive land, a non-union environment, ease of doing business – are less of a sell today. The state's edge has diminished relative to other states. This is not to diminish a widely held view that North Carolina remains a good place to do business. But examples were offered of other states' costs of doing business getting much closer to those of North Carolina, and some other states are even more business-friendly in some

regards – especially toward existing business. If this is happening to many traditional factors of business climate, how does North Carolina still pay close attention to these while addressing other factors gaining importance in today’s business location decisions and growth, such as a skilled workforce, quality of life, ease of mobility, amenity value and minimal cost of delay by government?

Business Taxation Still Matters

North Carolina’s business taxes came up as an issue at all roundtables. The issues surfaced appear to relate mostly to tax structure and less to total tax burden. For many, an overhaul of business taxation is long overdue.

Incentives for Business:

Grow by Business Attraction or Grow Organically?

These Roundtables were convened during a week in which the legislature passed special incentives for a small group of companies to support their future expansion. Participants recognized the importance business incentives have played in fostering investment and growth in North Carolina; in fact, some of the firms participating have been beneficiaries. However, participants are genuinely concerned that North Carolina incentives practices lack “business discipline,” e.g. fit with strategic goals and have a clear return on investment. Several participants offered the proposition that the state would be better off creating “the best business climate of any state” through tax policy, regulatory policy, worker training, etc. rather than channel public assistance to particular companies. This would appear to be congruent with creating an open, flexible, creative business climate for the state as a whole.

Paradoxes in the Workforce

“North Carolina has been good to us. Many years ago we moved here due to its non-union environment, but these advantages are diminishing. Tech education is now critical and it is non-existent in North Carolina!”

On the one hand, the participants were generally satisfied with the labor market in the state. People can be employed relatively easily, they have a good work ethic and unions do not interfere in work rules, to date. They complained of significant problems with the workforce, however. First, changing demographics means that a lot of older workers will be retiring and employers will lose their expertise. Second, general feeling appears to be that technical and vocational education has been undervalued and that a career-pathway approach for preparing workers for manufacturing is missing. Examples were offered in some parts of the state where local manufacturers, educators and elected officials are responding by creating their own workforce preparation systems for manufacturing beginning in high school. These models are worthy of further examination.

Inhospitable Regulatory Environment

“The biggest competitor in the world is our own government – EEOC, EPA, OSHA...”

Considerable frustration is evident regarding the regulatory environment – local, state and federal. The general feeling is that government bureaucracies are not sensitive to the speed, responsiveness and professionalism required of businesses in a nimble and competitive world. Their hope is that government could show the same attributes. Some went so far as to suggest that government is a greater threat to competitiveness than any other factor.

Critical Infrastructure

Two areas of infrastructure are of high priority to manufacturers. The first is the transportation system and the second is local utilities in support of site development. In both cases, participants are concerned that North Carolina is not looking ahead and adequately preparing for the future.

8.3 Things that Could Make a Big Difference to North Carolina Manufacturing

Participants were asked for the most important action they would like to see from the North Carolina Chamber's manufacturing project. Here are suggestions:

Regulatory Flexibility and Efficiency

“We have to accept every year we'll get more regulation – have to just live with it! But government agencies have to do the same and get better coordinated – one hand of government tells you one thing and the other tells you something different!”

- One-stop permitting
- Apply lean principles to the regulatory process

School-to-Career Programs Now!

- Refine and extend early experiments at school-to-career programs in manufacturing, possibly utilizing recent North Carolina legislation that makes more seamless school-to-community college education possible.

Community College Recognition of Post-Secondary Occupational Training

- Strike balance between the role of community colleges as junior colleges offering transfer programs toward the bachelor's level and occupational schools providing terminal certificates/skill preparations for new and incumbent workers.
- Strike a balance between the preparation of workers for new, emerging industries and mainline manufacturing.

Local Utilities and Development Approvals

-Better educate and equip local officials to handle the development process with speed and professionalism

Thinking Outside the Box

“It is not just a matter of tweaking public policies to foster growth anymore – we are competing in a globally different world and state pro-business policies must be totally redesigned from the ground up.”

-There are many “policy shops” in North Carolina – the state is not short of fresh ideas or studies. However, it is deficient in mechanisms for collective dialogue and problem-solving in non-adversarial settings.

A Free Trade Zone?

-Could North Carolina, possibly in partnership with some adjacent states, set up a “free trade zone” with aggressive tax, regulatory and training regimes conducive to business growth?

Infrastructure

-Pay attention to long-range planning and budgeting for transportation, water services and alternative energy, including nuclear.

A New Partnership Environment

“Manufacturing companies can be quite introverted – third party organizations (e.g. Chambers, business networks, educational institutions) can open up new channels.”

-Set up a public/private initiative to implement the recommendations of this project, with strong motivations for manufacturers to remain involved. Use data to drive the Chamber agenda on manufacturing issues coupled with a long-term vision for manufacturing policy priorities.

APPENDIX B

Industry Code Descriptions

NAICS Code	Industry	Description	Example of North Carolina Establishment
311	Food Manufacturing	Industries in the Food Manufacturing subsector transform livestock and agricultural products into products for intermediate or final consumption. The industry groups are distinguished by the raw materials (generally of animal or vegetable origin) processed into food products. The food products manufactured in these establishments are typically sold to wholesalers or retailers for distribution to consumers, but establishments primarily engaged in retailing bakery and candy products made on the premises not for immediate consumption are included.	SARA LEE BAKERY GROUP INC
312	Beverage and Tobacco Product Manufacturing	Industries in the Beverage and Tobacco Product Manufacturing subsector manufacture beverages and tobacco products. Within the industry group Beverage Manufacturing, establishments are divided according to: (1) those that manufacture nonalcoholic beverages (including ice manufacturing); (2) those that manufacture alcoholic beverages through the fermentation process; and (3) those that produce distilled alcoholic beverages. The industry group, Tobacco Manufacturing, includes two types of establishments: (1) those engaged in redrying and stemming tobacco and, (2) those that manufacture tobacco products, such as cigarettes and cigars.	PEPSI BOTTLING GROUP INC, PHILIP MORRIS USA INC
313	Textile Mills	Industries in the Textile Mills subsector group are establishments that transform a basic fiber into a product, such as yarn or fabric. The key is that the product is used further in manufacturing usable items, such as apparel, for individual or industrial consumption. If the continued manufacturing is performed at the same establishment, it is classified within this subsector. If it is performed at a separate establishment, it is classified elsewhere in manufacturing. The main processes in this subsector include	NATIONAL TEXTILES LLC

		preparation and spinning of fiber, knitting or weaving of fabric, and the finishing of the textile.	
314	Textile Product Mills	Industries in the Textile Product Mills subsector group establishments that make textile products (except apparel). With a few exceptions, processes used in these industries are generally cut and sew (i.e., purchasing fabric and cutting and sewing to make nonapparel textile products, such as sheets and towels).	EX-CELL HOME FASHIONS INC
315	Apparel Manufacturing	Industries in the Apparel Manufacturing subsector are grouped according to two distinct manufacturing processes: (1) cutting and sewing to make a garment and (2) first knitting fabric and then cutting and sewing the fabric into a garment. If knitting is done alone, it is classified in the Textile Mills subsector.	HANESBRANDS INC
316	Leather and Allied Product Manufacturing	Establishments in the Leather and Allied Product Manufacturing subsector transform hides into leather by tanning or curing and fabricating the leather into products for final consumption. In addition, manufacturing of similar products (except apparel) from other materials, such as "leather substitutes," are included in this subsector. For example, rubber footwear, textile luggage, and plastics purses or wallets are examples of "leather substitute" products included in this group.	WELLCO ENTERPRISES INC
321	Wood Product Manufacturing	Industries in the Wood Product Manufacturing subsector manufacture wood products, such as lumber, plywood, veneers, wood containers, wood flooring, wood trusses, manufactured homes (i.e., mobile home), and prefabricated wood buildings. The production processes of the Wood Product Manufacturing subsector include sawing, planing, shaping, laminating, and assembling of wood products starting from logs that are cut into bolts, or lumber that then may be further cut, or shaped by lathes or other shaping tools. The lumber or other transformed wood shapes may also be subsequently planed or smoothed, and assembled into finished products, such as wood containers. The Wood Product Manufacturing subsector includes establishments that make wood products from logs and bolts that are sawed	COLUMBIA PLYWOOD CORPORATION

		and shaped, and establishments that purchase sawed lumber and make wood products. With the exception of sawmills and wood preservation establishments, the establishments are grouped into industries mainly based on the specific products manufactured.	
322	Paper Manufacturing	Industries in the Paper Manufacturing subsector make pulp, paper, or converted paper products. The manufacturing of these products is grouped together because they are often carried out in a single establishment. The manufacturing of pulp involves separating the cellulose fibers from other impurities in wood or used paper. The manufacturing of paper involves matting these fibers into a sheet, and converted paper products are made from paper and other materials by various cutting and shaping techniques and includes coating and laminating activities.	BLUE RIDGE PAPER PRODUCTS INC
323	Printing and Related Support Activities	Industries in the Printing and Related Support Activities subsector print products, such as newspapers, books, labels, business cards, stationery, business forms, and other materials, and perform support activities, such as data imaging, platemaking services, and bookbinding. The support activities included here are an integral part of the printing industry, and a product (a printing plate, a bound book, or a computer disk or file) that is an integral part of the printing industry is almost always provided by these operations.	NEWS & RECORD COMMERCIAL PRINTING
324	Petroleum and Coal Products Manufacturing	The Petroleum and Coal Products Manufacturing subsector is based on the transformation of crude petroleum and coal into usable products. The dominant process is petroleum refining that involves the separation of crude petroleum into component products through such techniques as cracking and distillation. In addition, this subsector includes establishments that primarily further process refined petroleum and coal products and produce products, such as asphalt coatings and petroleum lubricating oils.	CARLISLE COMPANIES INC (Asphalt Shingle and Coating Materials Manufacturing), APAC-ATLANTIC INC
325	Chemical Manufacturing	The Chemical Manufacturing subsector is based on the transformation of organic and inorganic raw materials by a chemical process and the formulation of products. This	BAXTER HEALTHCARE CORPORATION, SYNGENTA CROP

		subsector distinguishes the production of basic chemicals that comprise the first industry group from the production of intermediate and end products produced by further processing of basic chemicals that make up the remaining industry groups.	PROTECTION INC
326	Plastics and Rubber Products Manufacturing	Industries in the Plastics and Rubber Products Manufacturing subsector make goods by processing plastics materials and raw rubber. The core technology employed by establishments in this subsector is that of plastics or rubber product production. Plastics and rubber are combined in the same subsector because plastics are increasingly being used as a substitute for rubber; however the subsector is generally restricted to the production of products made of just one material, either solely plastics or rubber.	TECHNIMARK INC, CONTINENTAL TIRE NORTH AMERICA
327	Nonmetallic Mineral Product Manufacturing	The Nonmetallic Mineral Product Manufacturing subsector transforms mined or quarried nonmetallic minerals, such as sand, gravel, stone, clay, and refractory materials, into products for intermediate or final consumption. Processes used include grinding, mixing, cutting, shaping, and honing. Heat often is used in the process and chemicals are frequently mixed to change the composition, purity, and chemical properties for the intended product. For example, glass is produced by heating silica sand to the melting point (sometimes combined with cullet or recycled glass) and then drawn, floated, or blow molded to the desired shape or thickness. Refractory materials are heated and then formed into bricks or other shapes for use in industrial applications. The Nonmetallic Mineral Product Manufacturing subsector includes establishments that manufacture products, such as bricks, refractories, ceramic products, and glass and glass products, such as plate glass and containers. Also included are cement and concrete products, lime, gypsum and other nonmetallic mineral products including abrasive products, ceramic plumbing fixtures, statuary, cut stone products, and mineral wool. The products are used in a wide range of activities from construction and heavy and light manufacturing to articles for personal use.	PPG INDUSTRIES FIBER GLASS PDTS

331	Primary Metal Manufacturing	Industries in the Primary Metal Manufacturing subsector smelt and/or refine ferrous and nonferrous metals from ore, pig or scrap, using electrometallurgical and other process metallurgical techniques. Establishments in this subsector also manufacture metal alloys and superalloys by introducing other chemical elements to pure metals. The output of smelting and refining, usually in ingot form, is used in rolling, drawing, and extruding operations to make sheet, strip, bar, rod, or wire, and in molten form to make castings and other basic metal products.	TIMKEN COMPANY
332	Fabricated Metal Product Manufacturing	Industries in the Fabricated Metal Product Manufacturing subsector transform metal into intermediate or end products, other than machinery, computers and electronics, and metal furniture or treating metals and metal formed products fabricated elsewhere. Important fabricated metal processes are forging, stamping, bending, forming, and machining, used to shape individual pieces of metal; and other processes, such as welding and assembling, used to join separate parts together. Establishments in this subsector may use one of these processes or a combination of these processes.	GKN DRIVELINE NORTH AMERICA
333	Machinery Manufacturing	Industries in the Machinery Manufacturing subsector create end products that apply mechanical force, for example, the application of gears and levers, to perform work. Some important processes for the manufacture of machinery are forging, stamping, bending, forming, and machining that are used to shape individual pieces of metal. Processes, such as welding and assembling are used to join separate parts together. Although these processes are similar to those used in metal fabricating establishments, machinery manufacturing is different because it typically employs multiple metal forming processes in manufacturing the various parts of the machine. Moreover, complex assembly operations are an inherent part of the production process.	DEERE-HITACHI CONSTRUCTION MACHINERY CORP
334	Computer and Electronic Product	Industries in the Computer and Electronic Product Manufacturing subsector group establishments that manufacture computers, computer peripherals,	CISCO SYSTEMS INC

	Manufacturing	communications equipment, and similar electronic products, and establishments that manufacture components for such products.	
335	Electrical Equipment, Appliance, and Component Manufacturing	Industries in the Electrical Equipment, Appliance, and Component Manufacturing subsector manufacture products that generate, distribute and use electrical power. Good manufactured in these establishments include electric lamp bulbs, lighting fixtures, small and major electrical appliances and parts, electric motors, generators, transformers, and switchgear apparatus	SIEMENS ENERGY & AUTOMATION
336	Transportation Equipment Manufacturing	Industries in the Transportation Equipment Manufacturing subsector produce equipment for transporting people and goods. Transportation equipment is a type of machinery.	FREIGHTLINER LLC
337	Furniture and Related Product Manufacturing	Industries in the Furniture and Related Product Manufacturing subsector make furniture and related articles, such as mattresses, window blinds, cabinets, and fixtures. The processes used in the manufacture of furniture include the cutting, bending, molding, laminating, and assembly of such materials as wood, metal, glass, plastics, and rattan. However, the integrated design of the article for both esthetic and functional qualities is also a major part of the process of manufacturing furniture, so design services are included as well. NAICS attempts to keep furniture manufacturing together, but there are two notable exceptions: seating for transportation equipment and laboratory and hospital furniture. These exceptions are related to that fact that some of the aspects of the production process for these products, primarily the design, are highly integrated with that of other manufactured goods, namely motor vehicles and health equipment.	KLAUSSNER FURNITURE INDUSTRIES INC
339	Miscellaneous Manufacturing	Industries in the Miscellaneous Manufacturing subsector make a wide range of products that cannot readily be classified in specific NAICS subsectors in manufacturing. Processes used by these establishments vary significantly, both among and within industries. For example, a variety of manufacturing processes are used in manufacturing sporting and athletic goods that include products, such as tennis	TELEFLEX MEDICAL INCORPORATED, TOYO SEAL AMERICA CORPORATION, CANDLE CORPORATION OF AMERICA

		racquets and golf balls. The processes for these products differ from each other, and the processes differ significantly from the fabrication processes used in making dolls or toys, the melting and shaping of precious metals to make jewelry, and the bending, forming, and assembly used in making medical products.	
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