

AMERICAN MADE

The manufacturing sector is stronger than you might think — but new vulnerabilities are emerging

BY JESSIE ROMERO

In 1990, nearly 90,000 North Carolinians worked in furniture manufacturing; today, that number is about 36,000. Hundreds of plants have closed, mainly due to competition from overseas producers. In the Greater Hickory area, at the center of the once-booming industry, the unemployment rate is nearly 12 percent, the second highest in the state.

But central North Carolina hasn't given up on manufacturing, says John Enamait, dean of the School of Business, Industry and Technology at Catawba Valley Community College, located in Hickory. The difference is that now it's working to attract new, high-tech companies, and retraining the workforce to use robots and computers instead of their hands. "It's not the manufacturing we're accustomed to. Folks need to have more advanced skills than just being able to run traditional manufacturing equipment."

The North Carolina furniture industry exemplifies changes that are occurring nationwide. Low-skilled, labor-intensive goods are now largely made in other countries, and the remaining companies employ more machines and fewer people than ever before. For some observers, the marked loss of manufacturing jobs, combined with the growing U.S. trade deficit, signals that U.S. manufacturing is in a state of permanent and problematic decline. Yet there are many indications that the manufacturing sector is in fact quite healthy.

The United States remains the world's largest manufacturer (as measured by real value added), and prior to the 2007-09 recession, output was at its highest level ever, even as the number of workers was at its lowest up to that point (see chart). This seeming paradox is explained by dramatic increases in productivity, which has risen faster in manufacturing than in the nonfarm business sector as a whole. In this view, rather than declining, the manufacturing

sector is transitioning into a highly efficient producer of high-tech goods. And while this transition is painful for the people and communities that lose jobs, such changes lead to higher incomes and living standards overall.

A portion of manufacturing's rapid productivity gains, however, seems to reflect the increased use of overseas suppliers rather than genuine improvements in domestic technology or worker productivity. In addition, many companies have stayed competitive by adopting a business model in which low-value-added production is moved offshore while high-value-added services such as product design and research and development (R&D) remain in the United States. But some observers question whether this model is leading to an erosion of the country's "industrial commons," thereby making it more difficult for U.S. firms to remain competitive in the future.

A Changing Sector

Manufacturing is highly sensitive to swings in the business cycle. Much of the demand for manufactured goods comes from businesses investing in new equipment and consumer purchases of durable goods such as cars and refrigerators. During a recession, demand dries up. This was especially true during the 2007-09 recession. Overall output in the United States fell about 5 percent, but manufacturing output fell 20 percent; losses in manufacturing accounted for nearly half of the total loss in GDP. Employment also declined disproportionately: Between the end of 2007, when the recession began, and the end of 2009, when the unemployment rate finally stopped rising, manufacturing lost more than 16 percent of its workforce, compared to 6 percent of the workforce overall.

Since then, however, the news in manufacturing has been relatively rosy. Growth in manufacturing output has outpaced growth in the economy overall. The relative weakness of the dollar has boosted exports, and businesses and households can't put off spending forever, explains Dan Meckstroth, chief economist at the Manufacturers Alliance for Productivity and Innovation (MAPI), an industry research group. "The recession was so long, so severe, that there was a lot of pent-up demand" for items such as cars and machinery, he says. Now, those industries are growing quickly, although output has regained only about half of the recession-related losses, and Meckstroth projects that it will not be fully recovered until 2014.

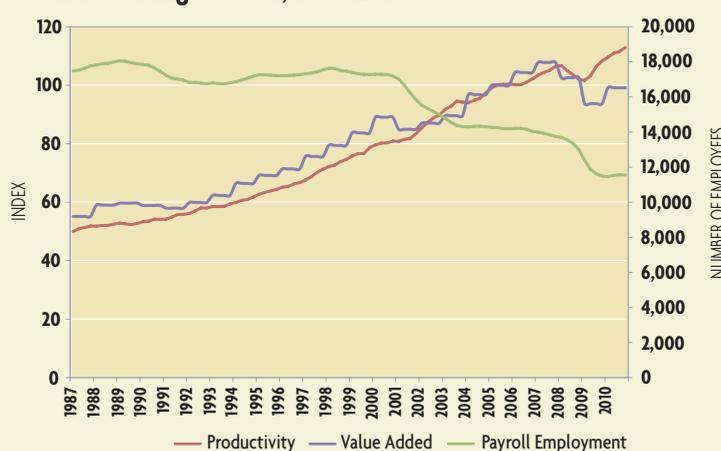
Although the sector's share of nominal GDP fell from 17.4 percent in the late 1980s to 11.8 percent in 2010, the decline is due to the fact that the relative price of manufactured goods has fallen as firms learn how to produce them more efficiently. Adjusting for price changes, during the same period manufacturing has remained about 12 percent of real GDP. The growth in manufacturing real value added — the Bureau of Economic Analysis's

measure of a sector's output — has largely kept pace with output growth in the overall nonfarm business sector, and about doubled between 1987 and 2007. (Value added is a measure that avoids double counting goods when calculating GDP. For example, if an automaker purchases \$3,000 worth of materials to build a car that it sells to the dealer for \$5,000, the value added by the automaker is \$2,000. When the dealer sells the car for \$7,000, the dealer's value added is \$2,000.)

U.S. manufacturers increasingly produce more advanced goods such as aircraft and specialized industrial equipment. What's left of the textile industry in North and South Carolina, for example, "has evolved," says Rick Kaglic, a regional economist at the Richmond Fed. "They're no longer producing cotton for jeans — they're making bullet-proof vests and high-tech fabric for the interiors of fighter jets." And at many firms, services such as engineering and product design have become more embedded in the value of their products. At TIGHitco, an aerospace components manufacturer based in Atlanta that is building a new facility in Charleston, S.C., "engineering services have absolutely become an increasing part of our business," says Jay Tiedemann, executive vice president and chief operating officer of the InterTech Group, TIGHitco's parent company. "More and more our customers want to partner with us to design a new solution to a problem."

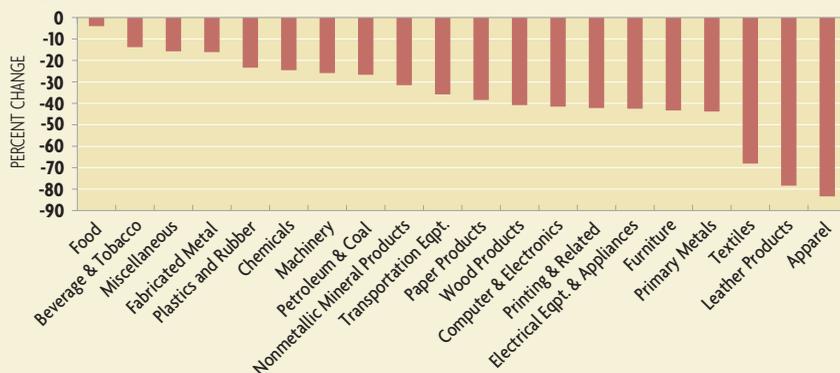
Manufacturing employment, on the other hand, has been on a steady decline for decades. In 1970, 25 percent of all nonfarm employees were employed in manufacturing. Even before the recession, the share had fallen to just above 10 percent; now it's about 9 percent. The national trends hold true in the Fifth District. In both North and South Carolina, the share of manufacturing employment has declined from about one quarter of total employment to about 12 percent in just the past 20 years. Manufacturing is a smaller part of

Manufacturing Growth, 1987-2010



NOTES: Productivity and value-added growth are on the left axis, indexed to 2005=100. Payroll employment is on the right axis. Productivity and employment data are quarterly, value-added data are annual.
 SOURCES: Bureau of Economic Analysis, Bureau of Labor Statistics, Haver Analytics; *Region Focus* calculations

Employment Declines by Industry, 1990-2011



NOTES: Data are through the third quarter of 2011. Textiles includes Textile Mills (NAICS code 313) and Textile Product Mills (NAICS code 314).

SOURCES: Bureau of Labor Statistics, Haver Analytics; *Region Focus* calculations

the economy in Maryland, Virginia, and West Virginia than in the Carolinas, but in those states the employment share also has fallen by more than half. Although manufacturing employment has increased more quickly than overall employment since the economy began adding jobs in 2010 — in South Carolina, for example, manufacturing jobs have risen steadily for more than a year — it is still well below prerecession levels, and this relatively rapid growth is more likely a temporary bounce than a long-term trend, Kaglic says.

Employment has declined across nearly all industries, but the losses are most pronounced in industries such as apparel, furniture, and electronics, which face heavy competition from other — primarily developing — countries (see chart). In these “China surge” industries, so named by economist Thomas Holmes of the University of Minnesota, employment declined by as much as 97 percent between 1997 and 2007. In the apparel industry, for example, the import penetration rate climbed from 50 percent to 73 percent between 1999 and 2007. Over the same period, apparel and textiles (which supplies U.S. apparel makers) accounted for 40 percent of the total reduction in manufacturing employment, according to the Congressional Budget Office.

A regional shift also has occurred in U.S. manufacturing, as industries have migrated from the Northeast and Midwest to the South in search of lower-cost labor. Textiles departed New England in the 1950s, and foreign automakers have located their U.S. facilities in the South, including BMW in Spartanburg, S.C. By the late 1990s, more than 20 percent of all large manufacturing plants, defined as employing more than 1,000 employees, were located in just seven Southern states, even though those states had less than 15 percent of the country’s population. Recently, South Carolina and its neighbors have become home to a burgeoning aerospace industry, as evidenced by Boeing’s recent decision to open its 787 Dreamliner facility in Charleston, rather than in its home state of Washington.

It hasn’t been all gains. Many of the same industries that moved South in search of lower cost labor have now moved

overseas in search of even cheaper labor, and the high concentration of manufacturing in the South has made the region more vulnerable to downturns. (See “District Digest” in this issue, page 48.) New industries offer hope for the future — Boeing estimates it will hire 4,000 workers — but the loss of tens of thousands of jobs in labor-intensive industries is difficult for states such as North and South Carolina to absorb.

Short-Term Pain, Long-Term Gain

These changes in the U.S. manufacturing sector have been driven primarily by two factors: globalization and rising productivity. During the past several decades, the expansion of world trade agreements, the development of container shipping, and new high-speed communications

networks have opened up the world to a remarkable degree. Between 1996 and 2006, the volume of world trade increased twice as fast as world GDP. Multinational enterprises have set up “global value chains” to produce and sell all over the world, and consumers have access to an ever-increasing array of international goods.

While job loss might be the most salient effect of freer trade for many Americans, those losses are a relatively small portion of the overall churn in the economy. Over the period 1979-1999, about 310,000 manufacturing jobs per year were lost due to import competition, according to economist Lori Kletzer of Colby College and the University of California, Santa Cruz. But this number represents only about 2 percent of the 15 million jobs lost each year in the economy overall, as calculated by Fed Chairman Ben Bernanke. In addition, unemployment generally trended downward throughout the 1980s, 1990s, and 2000s, even as import competition increased, which suggests that globalization has not had a detrimental effect on overall employment.

While the net effect on employment might not be significant, the costs are much more concentrated in some communities than in others. A recent study of local U.S. labor markets that are highly exposed to import competition, particularly from China, found that those communities have higher unemployment rates, lower wages in nonmanufacturing jobs, lower employment-to-population ratios, and receive more federal transfer benefits such as disability and income assistance payments. The study was conducted by economists David Autor of the Massachusetts Institute of Technology, David Dorn of the Centro de Estudios Monetarios y Financieros (Madrid), and Gordon Hanson of the University of California, San Diego.

Generally, though, it is believed that the gains from trade to the economy as a whole outweigh the concentrated costs. The increase in trade since World War II has increased U.S. annual incomes by an estimated \$10,000 per household, according to research by Scott Bradford of Brigham Young University and Paul Grieco and Gary Hufbauer of the

Peterson Institute for International Economics. These benefits stem from several sources. A country can earn and consume more if it specializes in producing those goods in which it has a comparative advantage, and then trades with other countries. Trade also gives firms access to new markets, which creates economies of scale by giving firms access to new and larger markets over which to spread fixed costs.

Trade also enables technological spillovers among firms and countries — for example, the “just-in-time” production processes developed by Japanese automakers have been embraced by U.S. manufacturers. In addition, jobs are created in export industries and through foreign direct investment, such as when foreign firms open new plants domestically. Import competition also lowers the prices of

A Skilled Labor Shortage

“People are our biggest challenge,” says Rick Louthan, vice president of operations for Brenco, a railroad car bearings manufacturer in Petersburg, Va. “As amazing as that sounds with unemployment so high, we are struggling to find people.” Since the company started hiring again at the beginning of 2010, they’ve had 1,000 applicants per month, but hired only about 2 percent of them, according to Cathee Andrews, Brenco’s director of human resources. Brenco requires its workers to pass basic math and reading proficiency tests, and they must be able to use a computer. That’s a change from the past, and it means that some positions go unfilled for longer than the company would like. “We’ve really raised our skill requirements,” Andrews says. “People have to be able to meet a different standard. And unfortunately, a lot of them don’t.”

It’s a challenge reported by manufacturers nationwide. As of March 2011, there were only 1.2 hires per job opening in manufacturing, compared to 2.5 during the recession, according to the industry research group Manufacturers’ Alliance for Productivity and Innovation (MAPI). Usually, the number of hires per opening increases during recessions, when there are a lot of workers available, and falls when the labor market gets tight. Currently, the number has fallen even though unemployment remains high. (The number of hires exceeds the number of openings because not all openings are captured by the Bureau of Labor Statistics data, and because some companies hire without posting a job.) Nearly half of manufacturers in a survey conducted by Deloitte and The Manufacturing Institute reported that they faced a “serious shortage” of skilled production workers, such as machinists, technicians, and craft workers. Welders are in especially high demand; the American Welding Institute estimates that there will be 400,000 vacant positions by 2014.

The shortage exists despite the fact that the unemployment rate for former manufacturing workers is nearly 10 percent. But that statistic masks significant

differences among industries; the unemployment rate for chemical workers is only 6 percent, for example, while workers who used to make wood products have a 14.4 percent unemployment rate. Workers who lost their jobs were disproportionately low-skilled, or have skills that don’t transfer from industry to another. A former sawmill worker might not be able to find work in a chemical factory.

The nation’s community college system has become a focus for policymakers concerned about retraining people who have lost their jobs and educating the next generation of high-skilled workers. In 2010, the Obama administration announced the “Skills for America’s Future” initiative, aimed at developing new training programs and creating a national credentialing system for manufacturing. In September, the Departments of Labor and Education awarded \$500 million in grants to community colleges as part of a new career training program. One of the recipients was Anne Arundel Community College, in Maryland, which received \$20 million to lead a 10-college consortium in developing new certificate programs in the STEM fields (science, technology, engineering, and mathematics).

At the same time, community colleges nationwide are facing budget cuts, which can make it difficult to offer the right kind of training. “In order to train people for skilled jobs, it takes equipment. And it’s simply not cheap,” says John Enamait, dean of the School of Business, Industry, and Technology at Catawba Valley Community College (CVCC) in Hickory, N.C. Through a private-sector grant,

CVCC offers an eight-month “mechatronics” class to train workers on computer-operated design and machining tools. The school hoped to turn the class into a full curriculum program, but needed to purchase an additional \$600,000 worth of equipment, and the funding from the state was pulled. Still, CVCC is doing its best to prepare students for the jobs of the future. “We had a state champion welder last year,” Enamait says. — JESSIE ROMERO



Instructor Mickey Tedder trains Machining Technology students at Catawba Valley Community College on a five-axis milling machine.

consumer goods, and raises domestic productivity as firms must become more efficient in order to stay competitive.

Like trade, higher productivity involves a trade-off between the costs to the workers who lose their jobs and the benefits to society of new ideas and new technologies, which help drive a country's long-term growth. That trade-off is apparent in manufacturing, where productivity has grown much more rapidly than in the economy as a whole. Between 1997 and 2007, for example, labor productivity growth in manufacturing averaged 4.1 percent per year, compared to 2.7 percent for all nonfarm business, according to the Bureau of Labor Statistics (BLS). A significant source of this increase has been new computer-aided tools, which have automated many stages of the manufacturing process. First patented in the 1950s, "computer numeric controlled" machines, which are run by computers instead of a person, have become ubiquitous in manufacturing. At Brenco, a manufacturer of railroad car bearings in Petersburg, Va., such machines now perform many of the tasks that people used to. "The foundation our company was built on was bodies — real strong manual labor," says Rick Louthan, Brenco's vice president of operations. "But automation has become a lot more important in what we do here. You have to remain competitive, and the way to do that is to decrease the labor content."

How Healthy is Manufacturing?

Manufacturing's productivity gains might not be all that they appear, however. "Those statistics aren't representative of all manufacturing," says Susan Houseman, an economist at the W.E. Upjohn Institute for Employment Research. Computer and electronics manufacturing, which accounts for only about 10 percent of the sector, is responsible for a large share of recent output and productivity growth, according to research by Houseman with economists at the Federal Reserve Board. This is because the rapid advancements in the quality of computer products, particularly semiconductors, are represented as price decreases by federal statistical agencies, and price decreases appear as value added and productivity growth in the national statistics. Although most stages of computer manufacturing have moved offshore, the technology has improved so rapidly that the industry still influences the statistics of the sector as a whole. "Once we take out the computer sector, and look at everything else in manufacturing, it doesn't look that great. Productivity growth is not that high, and output growth is pretty weak," Houseman says.

Between 1997 and 2007, productivity in computers increased 6.8 percent per year, compared to only 0.7 percent for the rest of manufacturing. Excluding the computer industry, productivity growth was 47 percent lower, and value-added growth was 69 percent lower.

An additional factor potentially inflating measurements of productivity and value-added growth is the increased use of intermediate goods that are imported from overseas, such as wafers used to make semiconductors or components of a

car's steering column. Between 1997 and 2007, the share of such goods imported from foreign suppliers, primarily in developing countries, rose from less than 17 percent to more than 25 percent. Because the decline in input prices associated with these shifts to lower-cost producers is not fully captured by the federal statistical agencies, it appears in the data that manufacturers are simply producing more goods with fewer inputs, which then are counted as productivity gains. Correcting for these price declines, Houseman and her colleagues find that manufacturing productivity would be between 6 percent and 14 percent lower, and value-added growth would be 7 percent to 18 percent lower.

These numbers could explain why wage gains for many workers largely haven't kept pace with productivity growth over the past decade. In theory, as workers become more productive, they become more valuable to their employers, and their wages increase. But if measured productivity gains reflect changes in the supply chain rather than improvements in domestic technology, the gains might not translate into higher wages for workers on the manufacturing floor.

In the durable goods sector, wages for production and nonsupervisory workers grew only 0.2 percent from 1990 to 2008, even though measured productivity about doubled over the same period, according to BLS data.

Another issue is that offshore manufacturing might have unforeseen implications for the economy as a whole. In addition to importing a growing number of intermediate inputs, many U.S. firms have shifted most of their production processes overseas, while keeping product design and R&D at home. For example, computer manufacturers began outsourcing circuit board production to South Korea, Taiwan, and China in the 1980s. This strategy generated tremendous cost savings, but also unintended consequences; over time, foreign firms began taking over engineering, design, and final assembly.

The fact that computers aren't manufactured in the United States is not a problem in and of itself, but such offshoring might be leading to the erosion of the country's "industrial commons," according to Harvard University business professors Gary Pisano and Willy Shih. The industrial commons is the network of manufacturers, suppliers, and researchers who feed off each other's knowledge and capabilities; Pisano and Shih argue that when pieces of the network disappear, future innovative capacity might disappear as well.

For example, the solar-panel industry is mostly based in Asia now, because it grew out of the semiconductor industry, which is increasingly moving offshore. Lithium-ion battery production is an industry with tremendous growth potential; the batteries power laptops, cellphones, and iPods, and are the highest value-added component of electric cars such as the Chevrolet Volt. Most lithium-ion batteries are made in Asia because the manufacturers developed there to serve the computer and electronics manufacturing industries, which are no longer present in the United States. Although the federal government recently provided \$2.5 billion in

stimulus dollars to a nascent battery industry, it might be too late for U.S. manufacturers to catch up.

As Gary Gereffi, director of the Center on Globalization, Governance, and Competitiveness at Duke University, says, “Global outsourcing hasn’t stopped where we wanted it to stop. Things like product design, R&D, marketing, logistics — these things tend to follow manufacturing pretty closely because you can build real economies of scale and scope. Other countries have rebundled the entire value chain in their economies.”

The Massachusetts Institute of Technology recently launched a task force on “Production in the Innovation Economy” to study the connection between manufacturing and innovation, and the implications for the U.S. economy. “There are emerging industries and technologies, like energy, batteries, and biotech, where innovation and R&D seem much more closely tied to production capabilities,” says professor Suzanne Berger, co-chair of the task force. “As these new technologies come online, can we keep innovation in this country? How do we preserve and sustain those innovative capabilities?”

The link between production and innovation is difficult to establish with certainty, however. Some of the most successful American companies of the past 25 years have focused on R&D and design, leaving the manufacturing to overseas suppliers, and “it’s possible that model could serve us well in the future,” Berger says. “These are questions we need to ask and examine in a systematic way.” Concerns about the loss of the United States’ industrial commons might be premature. Although developing countries have made tremendous technological gains, they have not yet caught up to the sophistication of the U.S. manufacturing sector. And while there aren’t significant data on the phenomenon, there is anecdotal evidence that U.S. companies, including General Electric, Caterpillar, and NCR, are bringing production facilities back into the country, citing concerns about rising labor costs overseas, intellectual property theft, quality control, and proximity to their customers and engineers.

Building for the Future

Barring unforeseen changes, manufacturing employment in the United States is unlikely to ever return to its peak. But that doesn’t mean that manufacturing doesn’t play an important role in the economy. “I wouldn’t look to manufacturing to be much of a job creator in the future,” says MAPI’s Meckstroth. “But there’s a lot of spinoff — it creates jobs in other sectors of the economy.” That’s because manufacturing has a large “backward multiplier”: Many different industries play a role before a final good is produced. For every Boeing that locates in a city, suppliers such as TIGHitco follow, and those suppliers need accountants and landscapers and truckers.

Moreover, manufacturing might be the centerpiece of an industrial commons that provides a platform for the development of future products. “There are a tremendous amount of learning and innovation opportunities that spin off of being able to make things,” says Gereffi of Duke University.

If there is a link between production and innovation, enacting policies that attempt to undo the changes caused by globalization and automation are unlikely to be successful at preserving that connection. Instead, a better course for policymakers is to focus on creating an environment conducive to business and innovation, for example by creating a stable fiscal environment, providing sound infrastructure, and supporting basic scientific research.

In addition, many firms report that finding skilled workers is their biggest challenge. The government is the primary provider of education in the United States, but that education often doesn’t provide the skills workers need to participate in advanced manufacturing. “We need to address the whole education system,” says Meckstroth. “We need more machinists and welders, and we need more engineers.” While such strategies aren’t likely to bring jobs back from overseas, they could help to create new ones — and ensure that the tremendous gains from trade and rising productivity continue to accrue to the U.S. economy. **RF**

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