

SUMMARY

At the Crossroads:
North Carolina's Place in the
Knowledge Economy of the 21st Century

prepared for

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At the Crossroads: North Carolina's Place in the Knowledge Economy of the 21st Century

North Carolina's economy is at a crossroads. With about one-quarter of its workforce in manufacturing, almost ten percentage points higher than the national average, the state still ranks as the most manufacturing-intensive economy in the U.S. Each year, North Carolina attracts more new manufacturing plants than most other states. Although there is also a high rate of plant closings, the state's economy is generally healthy, with a statewide unemployment rate near 4 percent. Some of the state's new manufacturing growth is in emerging sectors, notably in software development, health, and pharmaceuticals. A growing complex of knowledge resources (universities, medical centers, and research institutes), particularly in the Research Triangle area, has induced considerable high tech growth, including a sizable number of new start-up and spin-off companies. General economic growth, especially in the high technology industries, has pushed personal income up, rising by 6.6 percent between 1995 and 1996 for the state as a whole.

While these trends are indeed positive, the state must not be lulled into a false sense of security about its economic future. *At the Crossroads* considers North Carolina's economic prospects by assessing its research strengths in industry and the academy as well as its likely ability to respond to shifting R&D funding priorities in Washington. Our focus on R&D recognizes that successful economies in the early 21st century will be those with a strong knowledge base. In particular, the competitive position of North Carolina in the global economy of the future likely will rest on the ability of businesses and universities to work together to create and commercialize new products and processes.

The report suggests that North Carolina's current volume and distribution of knowledge-based resources raises some concerns about the state's future. The state's traditional economic base consists of industries that are declining nationally, and which depend upon relatively modest amounts of R&D inputs. Because of the sectoral mix, and the prominence

Additional detail is available in the full report *At the Crossroads: North Carolina's Place in the Knowledge Economy of the 21st Century*, available from the North Carolina Board of Science and Technology beginning in late April, 1998. ■

of manufacturing branch plants, research and development activity in the state is generally relatively low. Moreover, much of the state's R&D activity is concentrated in only a few technology sectors, institutions, and regions. Limited R&D activity is desirable only in the sense that it renders the state less vulnerable to cutbacks in federally-funded, defense-related R&D. But, on balance, it is potentially problematic for at least three reasons.

First, R&D that leads to *process innovations* increases industry productivity. Productivity, in turn, enables North Carolina businesses to prosper in the ever-competitive global marketplace. Fewer workers per dollar of output may be employed, but those who remain in the workforce earn higher wages. That is essential if the state is to rank higher among states in per capita income (despite a strong economy, it has not been able to rise above 33rd in rank during the 1990s). Although North Carolina firms may certainly continue to adopt best-practice process technologies developed outside the state, the comparative absence of R&D (and headquarters) operations of major corporations means that North Carolina's economic destiny is subject to greater external control than is the case for many otherwise comparable manufacturing states.

Second, R&D leading to new *products* enables the state to grow new businesses. New business development is critical to absorb the workers displaced in traditional industries as a result of the movement of labor-intensive production offshore, as well as the continued process of automation here. In other words, new process technologies drive productivity advances, raising incomes but freeing up labor that must be absorbed elsewhere in the economy. New enterprise start-ups as a result of research and development activity in existing industry and universities are necessary to provide new employment opportunities.

Finally, a more even geographic and sectoral distribution of knowledge resources helps reduce geographic economic inequities. Research demonstrates that firms benefit from proximity to research universities and institutes through the increased access to knowledge and expertise as well as trained labor. Firms also benefit, for many of the same reasons, from proximity near R&D performing industries. And, of course, a more even distribution of knowledge-intensive, higher wage jobs means a more even distribution of income. In North Carolina, the better-paying, high tech jobs are concentrated in a relatively small number of counties (primarily in the Raleigh-Durham and Charlotte regions). In 1995, for example, per capita personal income ranged from \$12,334 in Hoke county to \$28,520 in Mecklenberg county.

Implications and Guides to Policy

The report raises some old and difficult questions for policy makers: what can be done to ensure a smooth transition from a traditional manufacturing to a knowledge-based economy? And, how can we help expand knowledge resources more broadly in geographic terms, so that R&D can occur in non-metropolitan counties with small and medium sized manufacturing establishments? Accomplishing those two tasks will help prevent chronic displaced worker problems, and will help increase incomes in the state.

Our analysis of the impact of possible changes in federal R&D spending suggests that the state is well poised to capitalize on projected shifts in federal research priorities toward health and the environment. That is particularly encouraging since the current budget picture suggests a growth in federal R&D spending in North Carolina even with a balanced budget. However, federal R&D dollars that come into North Carolina do not have as large a ripple effect as they could because of the state's relatively modest concentration of high technology industry. Much R&D-related spending leaks out of the state (as North Carolina R&D performers purchase inputs and services from high technology firms located elsewhere in the U.S.). As the knowledge intensiveness of the economy grows, a greater share of such spending will remain inside the state's borders.

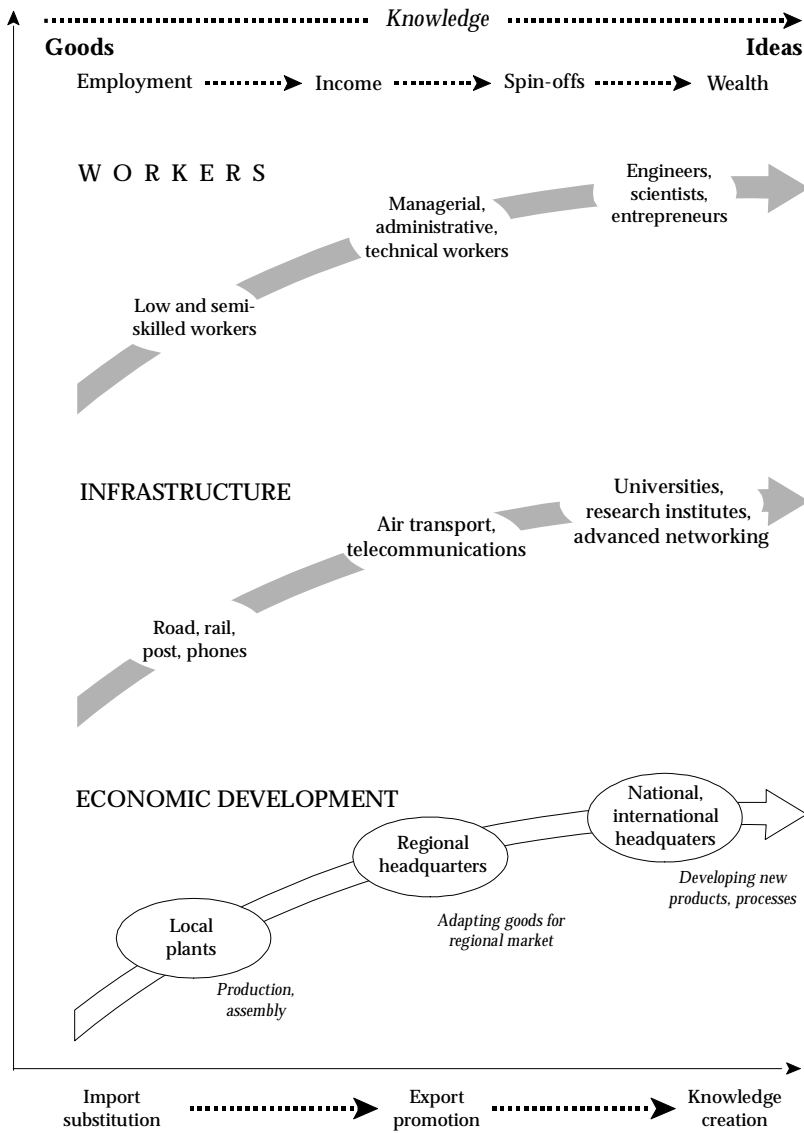
The challenge facing decision makers may be cast in terms of the trajectory on along which economies move as they develop (see figure, next page). Less developed economies (or regions) produce goods, primarily to ensure that local needs are met (import substitution). The measure of their success is employment growth. Those economies require a healthy number of low and semi-skilled workers as well as roads, rail lines, postal service, and telephones. At the next stage of development, economies produce for export and to generate income for the region. They may develop regional headquarters. They require technical, managerial, and administrative workers, and more rapid communications. The most mature economies produce knowledge and generate wealth. As loci of control, they develop into national or international headquarters locations. Their personnel needs are skewed toward knowledge workers while their infrastructure needs are tilted toward knowledge resources.

We can consider North Carolina to be moving up this trajectory. The table on the following page translates the trajectory into specific business requirements. In the early stages of development (the lower part of the trajectory), businesses need worker and managerial training, technical assistance, and help establishing buyer-supplier networks. As the businesses become more mature, their needs change. Those at the top of the trajectory require specialized equipment, a good work environment, and connections with knowledge resources around the world. This table also shows an intermediate point along the trajectory where businesses commercialize either applied or basic research. For that, licensing and patenting assistance is needed, as well as incubator space, marketing assistance, entrepreneurial training, and financing.

The state can help move the economy up the trajectory by providing the appropriate services. Indeed, many of the state's efforts over the past two decades fit into this matrix. The development of MCNC and the Biotechnology Center, for example, are consistent with later-stage development. The development of the information superhighway similarly allows businesses to connect with knowledge resources around the world.

In terms of assistance for commercializing the results of applied and basic research, the state already provides some of the needed services through the university system. In addition, the Technology Development Authority identifies targets for start-up capital. But the relevant question is what more can be done? The report provides a few principles:

The Evolution of Knowledge along Economic Development Continuum



■ *Put resources where there is likely to be a payoff because of existing critical mass.*

The report identifies where industrial and university strengths coincide. Efforts are already underway in some of those sectors (the Biotechnology Center with pharmaceuticals; MCNC with telecommunications and electronics). Further efforts could be made toward other clusters, e.g., industrial chemicals and environmental technologies.

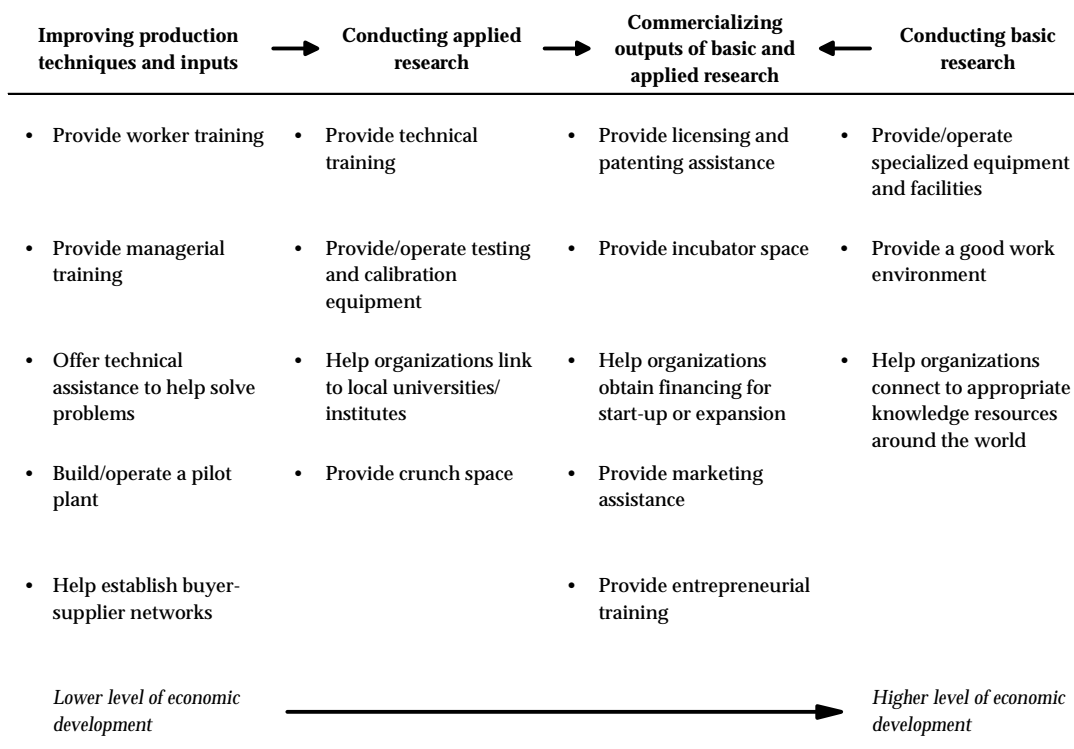
■ *Identify industries that are likely to be winners.*

The limitation of any type of industrial policy is in being able to pick winners and avoid losers. Indeed, the market does that reasonably well. But, to pull the economy up the trajectory, the state needs to be proactive. Our analysis has identified some good business development targets. For example, twenty-five industries are technology-intensive and growing in terms of jobs and wages.

■ *Develop home grown businesses that may emerge as headquarters and/or research centers.*

The payoff from successful start-ups and spin-offs is substantial—the creation of quality jobs and income growth at SAS, Sphinx, Emrex,

Appropriate Services along Economic Development Continuum



and Quintiles are cases in point. The North Carolina economy is much riper for entrepreneurial development today than it has ever been.

■ *Invest in knowledge infrastructure.*

The old mindset among industrial developers was that roads needed to be built to ensure that jobs would come, especially in non-metropolitan areas. As we move into the 21st century, knowledge infrastructure plays that role. To get growth into regions that need it, we need to consider the strategic use of telecommunication links, business parks, institutions of higher education (and training), in addition to transportation nodes. The Global TransPark is one model.

■ *Invest in people.*

As traditional industries continue to downsize and new businesses start-up and expand, our workforce needs to be upgraded so that employees can make the transition. Similarly, entry-level workers (in high school) need to be prepared for work that requires computation and a higher level of skills than in the past. This suggests a host of school-to-work and displaced worker programs. It also implies a rethinking of traditional methods of training and education delivery, as well as a better meshing of the needs of industry with the missions' of the state's universities and community colleges.