

# *Promises and Policies*

# *The Economic Hope of the*

# *Microelectronics Industry*

by Michael I. Luger

*"Literally the chance of a lifetime... [It] can change the course of North Carolina."*

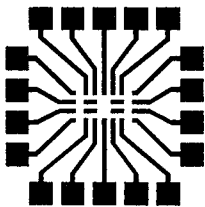
— Gov. James B. Hunt

*"Microelectronics could be the goose that lays the golden eggs."*

— Howard Lee, former Secretary of Natural Resources and Community Development

*"The crude oil of the 1980s."*

— George Herbert, chairman of the board of the Microelectronics Center of North Carolina



During the spring of 1981, state leaders used the promise of new microelectronics jobs and higher wages to convince the General Assembly to approve \$24.4 million for the Microelectronics Center of North Carolina (MCNC). Such a promise, however, does not necessarily represent the economic reality of the microelectronics issue. The complexity of the employment and growth questions surrounding the industry make accurate predictions extremely difficult. Moreover, corporate decisions which have not yet been made may ultimately determine whether the goose will in fact lay a golden egg. If the microelectronics recruitment

policy embraced by the Hunt administration is not the panacea for unemployment and low wages in North Carolina, other measures should be considered.

## **The Importance of Skill Level and Location**

**H**ow successfully can the microelectronics recruitment efforts help boost wages and job opportunities for North Carolinians? The answer to this critical question depends on how well a resulting supply of new jobs "matches" the existing pool of unemployed workers in the state. To analyze this match, two economic characteristics of primary importance must be examined for both the newly created jobs and the unemployed workers — "skill" and "location."

**The skill composition of new jobs.** The microelectronics industry employs skilled, semi-skilled, and unskilled workers. The skilled work force includes managers, engineers, and highly-trained machinists; the semi-skilled work force includes inspectors, technicians, and clerical employees; and the unskilled work force consists of custodians and assemblers.

Different types of plants employ different mixes

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*Michael Luger is assistant professor of public policy studies and economics at Duke University. The author is indebted to AnnaLee Saxenian of the University of California, Berkeley, for sharing the results of her unpublished research on the microelectronics industry in California, which includes the interviews referred to in this article. Photos by Chip Henderson.*

of employees, by skill. Plants which primarily conduct research and development use a high proportion of skilled workers while assembly establishments employ a relatively high percentage of unskilled workers. For all microelectronics plants in California's Santa Clara County, roughly 40.0 percent of the work force is skilled, 22.5 percent is semi-skilled, and 37.5 is unskilled.<sup>1</sup>

The skill breakdown which characterizes microelectronics plants in California will not be exactly reproduced in North Carolina since the Tar Heel state will contain a different mix of plant types. In a series of interviews conducted in 1980-81 with microelectronics officials in California, company spokesmen indicated that research and development and assembly facilities were much less likely to be moved to North Carolina than were "mask-making" and "wafer-fabrication" plants. According to these officials, research and development operations need to be near corporate headquarters, which will be maintained in California in most cases. Assembly plants will not be moved to North Carolina because labor is less expensive abroad, especially in Mexico, the Philippines, and Southeast Asia.

Mask making and wafer fabrication are chemical processes in which electrical properties are imparted to silicon wafers which are then tested and cut into "chips." Because these processes involve constant testing and calibration, a relatively large number of engineers and technicians are required. Though data do not exist on the skill composition of mask-making and wafer-fabrication plants alone, the breakdown would be approximately 35 percent managerial and professional, 40 percent semi-skilled, and 25 percent unskilled.<sup>2</sup>

**The skill composition of unemployed workers.** North Carolina Employment Security Commission data reveal that approximately 95 percent of all unemployed workers registering with the Commission in 1980 were unskilled. Of this unskilled group, roughly three-quarters had production work experience, especially in the construction

and textile industries.<sup>3</sup> Hence, the pool of unemployed workers with training in any skill is very small.

**The location of new jobs.** Virtually all of the industry officials interviewed stressed the need for mask-making and wafer-fabrication facilities to be located near national airports and major universities. In addition, given the nature of these manufacturing processes, these officials would find proximity to the Microelectronics Center advantageous. (See the preceding article by George Herbert for an explanation of how the Microelectronics Center, which is located in the Research Triangle Park, will function.) These factors indicate, then, that most of the new electronics jobs created in North Carolina will be located in and around the Research Triangle, perhaps stretching as far west as Greensboro. This area could be referred to as the "projected location zone." (See maps on page 29.)

**The location of unemployed workers.** There are three areas of widespread unemployment in North Carolina: the far west, particularly Swain and Graham counties; the northern tier, especially the ten-county area northeast of the Research Triangle; and the south, from Carteret County west to the suburbs of Charlotte (see "Areas of High and Low Unemployment" map). Except for Alamance, all counties within the projected location zone had unemployment rates less than six percent in 1980. The average rate for the entire seven-county area was five percent, which by some definitions is "full employment."

## Conclusions About Skill Level and Location Factors

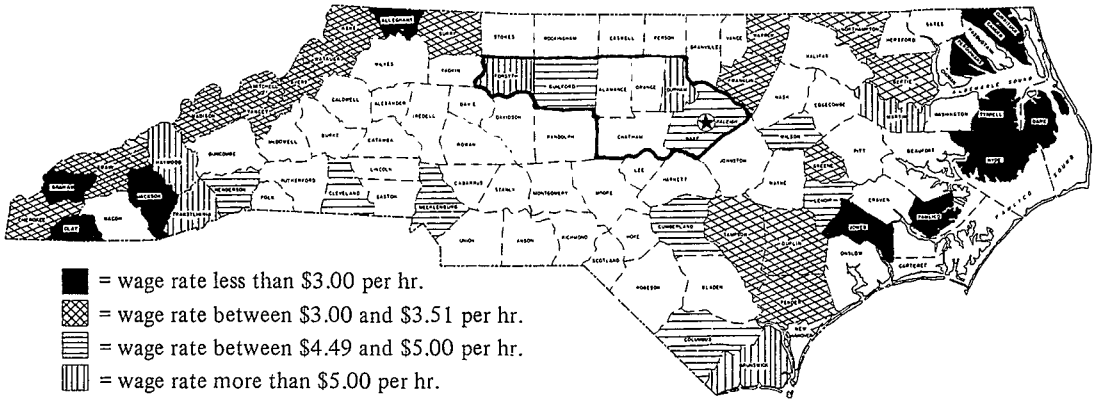
The analysis of skill composition and location factors leads to the conclusion that newly created electronics jobs and existing unemployment will not be particularly well matched in at least three ways.

(1) *The demand by new facilities for skilled*



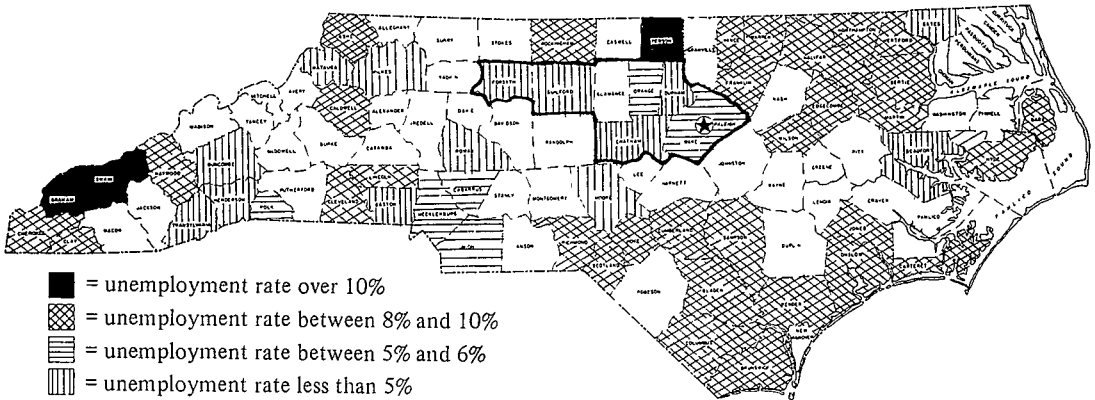
Students and instructor in the engineering technology program at Johnston Technical College.

## Areas of High and Low Wages, 1978



Source: *North Carolina County Labor Profiles*, North Carolina Department of Commerce, Business Assistance Division.

## Areas of High and Low Unemployment, 1980



Source: Employment Security Commission, Research Division.

In the maps above, the heavy dark line around a seven-county area stretching from Wake to Guilford surrounds the "projected location zone" for new microelectronics facilities.

workers will far outstrip the existing supply of such workers, especially within the projected location zone, creating "labor-market tightness." Consequently, these plants will have to import skilled employees from other states or induce those who are already employed to switch jobs. The importation of skilled workers does not benefit current North Carolinians. The practice would have negative effects, in fact, if the imported workers caused the price of housing to rise in the projected location zone. The "bidding away" of already employed engineers, managers, and skilled machinists would redound to those workers' advantage in the form of higher wages, but these wage benefits would not necessarily filter down to the less skilled workers. Moreover, luring away skilled and professional personnel would cause labor shortages in nonelectronics businesses within the projected location zone unless those existing

businesses were willing to exceed the wage offers made by the incoming plants. In the long run, this "wage war" would undermine the profitability of all businesses in the region.

Over time, the supply of skilled workers could be expanded via education and training programs. However, as a recent legislative study shows, the capacity of public educational institutions is not now sufficient to meet the projected demand for these workers.<sup>4</sup> While the Microelectronics Center is designed to help fill this gap, for the state to accommodate its new corporate residents it would have to allocate additional monies to expand university and MCNC programs.

(2) There will also be an excess demand for semi-skilled workers within the projected location zone, not only because there will not be enough workers who already possess the appropriate skills but also because there will be a shortage of workers

**Wage Rates for Selected Jobs  
in Electronics,  
Santa Clara County, California, 1978**

**Unskilled**

|                          |        |
|--------------------------|--------|
| Assembler, entry         | \$4.06 |
| Receptionist             | 4.06   |
| Shipping clerk           | 4.46   |
| Stock clerk              | 4.74   |
| Janitor                  | 5.07   |
| Machine operator         | 5.12   |
| Assembler, highest level | 5.58   |

**Semi-skilled**

|                                |      |
|--------------------------------|------|
| Secretary, intermediate        | 5.19 |
| Electronics technician, junior | 5.44 |
| Test technician, intermediate  | 5.96 |
| Fabrication inspector, senior  | 6.38 |
| Journeyman machinist           | 8.22 |

**Skilled**

|                    |      |
|--------------------|------|
| Associate engineer | 9.09 |
| Tool and die maker | 9.28 |

**Source:** From American Electronics Association, *Benchmark Wage and Salary Survey*, fall 1978, as reproduced by Axelrad, (see footnote 1 in text), Table 9, p. 25. Salaries reported for skilled jobs have been converted to wage rates to ensure comparability.

to train. The initial burden of this shortage will probably fall on nonelectronics producers already located in the area; employed, unskilled workers will be quite willing to submit to on-the-job training in microelectronics plants for jobs that will give them a wage boost.

Not all semi-skilled job slots can be filled by training workers within the plant, however. Many technical positions require experience and an understanding of practical electronics theory which can best be gained in technical schools, junior colleges, and the military. Again, to accommodate the needs of the new plants the state will have to develop appropriate training programs.

(3) *Since plants will locate in the Raleigh-Greensboro corridor, the new jobs will be out of commuting range* of many unskilled, unemployed workers in North Carolina. Even making the liberal assumption that workers will commute three hours daily, unemployed workers in over half the shaded counties on the "Areas of High and Low Unemployment" map would be unaffected by any microelectronics boom in the state. Such a result violates the intent of the Balanced Growth Policy ratified by the General Assembly in April 1979, since that policy committed the state to "encourage diversified job growth in different areas of the state,

with particular attention to those groups which have suffered from high rates of unemployment or underemployment, so that sufficient work opportunities at high wage levels can exist where people live."<sup>5</sup>

**Wage Rate Factors – What "Average" Can Hide**

**I**f the Hunt administration succeeds in inducing microelectronics firms to locate facilities in North Carolina, the average manufacturing wage rate in the state will rise. On its face, this outcome is desirable since the state ranks last in the nation in hourly manufacturing wage rates. However, average wage data can be misleading as an indicator of worker welfare because they do not reflect the extent to which wage rates differ among workers in different skill groups and locations.

In microelectronics, the wage rates of different skill groups vary significantly. In Santa Clara County, an entry-level assembler (unskilled) earns less than half of what a tool and die maker (skilled) gets paid (see box on this page). If portions of the industry do come to the Piedmont, this wage gap may widen. The wage rates of skilled and semi-skilled workers in the projected location zone will rise since there will be excess demand for such workers, especially in the short run. But the wage rates of unskilled workers – even those within the projected location zone – are not likely to rise by the same relative amount since demand for those types of workers will not significantly exceed supply. Thus, even though the microelectronics industry pays a higher average wage rate than other industries such as textiles, hosiery, or furniture, unskilled workers in microelectronics may not earn more than their counterparts in those other sectors. Average rates, then, refer to the industry, not to the worker.

In the case of new microelectronics jobs for North Carolina, the statewide, average wage coin has a flip side. The greatest wage increase will come in the projected location zone, but four of the seven counties in the area already have some of the highest wage rates in the state. Meanwhile, the job influx will exert no upward pressure on wages in the far eastern and western counties, where the wage rates are the lowest in the state (see "Areas of High and Low Wages" map). While the average wage rate for North Carolina might well increase as a result of the new microelectronics jobs, the benefits will be concentrated where they are generally needed least, again violating the balanced growth policy widely promoted by the Hunt administration and formally endorsed by the General Assembly. The more a microelectronics influx causes the average wage in North Carolina to increase, the greater the economic disparity between counties.

## Microelectronics and Economic Development Strategies

The microelectronics recruitment policy cannot really be evaluated in isolation from other development efforts. In a position paper released last year entitled "An Economic Development Strategy for the 1980s," Governor Hunt assured the public that the state would aggressively recruit many different kinds of businesses. This broad-based recruiting is important in principle for two reasons. First, it is vital for the state to achieve a diversified economic base. The state's historical reliance on a few dominant industries (most recently, tobacco, textiles, and furniture) has not been wise economically or politically. Second, other industries might be more likely than microelectronics to match the skill composition and location of the existing unemployed. Then the limited "coverage" of the microelectronics industry — by location and skill — would be less of a problem.

But even an *industrial recruitment policy* that seeks other industries as well as microelectronics is inherently limited as an *economic development strategy*. As this discussion about microelectronics illustrates, the state has very little control over where any of its recruited industries locates. "Where does a 300-pound gorilla sit?" Secretary

of Commerce D.M. (Lauch) Faircloth asked rhetorically, addressing a Duke University colloquium. "Wherever it pleases." By using industrial recruitment as the sole means of economic development the state cannot effectively plan its own future. In large part, the future is planned by others — primarily by private businesses — in an uncoordinated way.

Industrial recruitment undermines the state's control over its own destiny in another way. The plants that are moved to North Carolina usually belong to large, multi-plant, multi-locational firms headquartered in other states (and countries). These firms typically search beyond the borders of North Carolina for future profit opportunities. A company headquartered in California, for example, may decide to use the profits from a North Carolina plant to finance the construction of new microelectronics plants in Mississippi or Thailand or to buy another kind of company altogether. In time, the firm may shut down the North Carolina plant with a resulting loss of jobs.

Industrial recruitment is a suspect approach to economic development for one last reason. Most economists who study regional development agree that business incentives are not an important factor for firms making inter-regional location decisions. The microelectronics firms which are now being assiduously pursued by state officials could well have decided to come to North Carolina even

### *"Will California Keep the Silicon Valley Bonanza? Challenge from North Carolina"*

*This headline appeared in the August 1981 issue of California Journal, a public-policy magazine in California. The article, written by Journal intern Libby Lane, describes the current pressures facing microelectronics industries in California in an historical context. As Ms. Lane puts it: "There are some problems that high-tech industries, site-location firms, and the California Manufacturers Association (CMA) worry about." She describes the problems under the headings of energy, permit processes and environmental regulations, transportation, taxes, business incentives, and housing and quality of life. She leads off the "business incentives" section with the paragraphs reprinted, with permission, below.*

When governors like Jim Hunt of North Carolina say to expanding high-tech industries, "We want you," the companies know there is going to be a concerted effort on the part of state and local governments to facilitate their move in any

way possible. Some industry leaders complain that California transmits a negative attitude toward business growth, especially during the Brown Administration. Many states, in an effort to encourage growth, are offering business loans at low-interest rates if industries agree to build in a certain area and/or employ a certain number of persons.

North Carolina's Hunt epitomizes the effort of other states to win California's high-tech industries with promises of cheap land, open space, blue sky and a research triangle bounded by Duke University, North Carolina State University and the University of North Carolina. Those promises include many of the amenities that made the Silicon Valley a success three decades ago. An additional lure used by Hunt is a plan for training programs at the community colleges that will meet the educational and training needs of any high-tech company that agrees to settle in North Carolina.

if the General Assembly had not funded the Microelectronics Center. Other factors have already proven to be attractive to industry — a good climate, low workers' compensation insurance rates, relatively inexpensive housing, and perhaps most importantly, low wage rates and little unionization. (Only 6.5 percent of the labor force in North Carolina is unionized compared to 23.7 percent in California. In other states the percentage is even higher.)

The importance firms attach to wage rates and unionization in their location formula creates a dilemma for policymakers who want higher wages *and* more jobs for the state. If wage rates rise, firms will be discouraged from moving into North Carolina. If wage rates rise as a result of greater unionization, firms will be doubly discouraged from relocating here. This dilemma may explain why the Hunt administration seems to be relying on labor market tightness as a means to achieve higher wage rates for the state.

The state could de-emphasize industrial recruitment as an economic development strategy and handle the wage-jobs dilemma in other ways:

(1) If the state cannot induce established companies to move their headquarters into North Carolina, it should support the development of new enterprises owned by the state's citizens.

(2) Instead of relying on relocations from outside North Carolina, the state should encourage locally-owned small businesses to expand, especially in high unemployment areas.

(3) Rather than using labor-market tightness to increase wages in selected markets, the state should maintain a neutral policy toward union organization.

The first two of these proposals would enhance the state's control over its own future by helping to break a spiral of dependency on meeting the needs of corporations based outside North Carolina, a dependency that requires the state to discourage unionization. These two proposals would also allow the state to achieve the economic

diversity that is so important. The third proposal would lead to uniformly higher wages since unionized workers receive up to 35 percent more pay than their nonunion counterparts doing similar work.<sup>6</sup>

All this is not to say that the recruitment of microelectronics or any other industry is a bad practice for the state to follow. But this traditional approach to economic development cannot by itself achieve the full range of employment outcomes to which North Carolinians are entitled. Industrial recruitment must be folded into a comprehensive economic development plan which puts as high a value on local control and balanced growth as it puts on job creation and wage rates. □

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<sup>1</sup>These and other data about the microelectronics work force in Santa Clara County are from Marcie Axelrad, "Profile of the Electronics Industry Work Force in the Santa Clara Valley," unpublished manuscript, Project on Health and Safety in Electronics, July 1979, and from U.S. Department of Commerce, Bureau of the Census, *1977 Census of Manufacturers* (Washington, DC: USGPO, 1980). Most of Axelrad's data are for the entire electronics sector, but since that sector is mostly comprised of semiconductor plants in Santa Clara County we can use the data to draw conclusions about microelectronics.

<sup>2</sup>I arrived at this approximation by subtracting from the Santa Clara figures cited in footnote 1 those employees who work only in assembly plants and research and development facilities.

<sup>3</sup>From N.C. Employment Security Commission (ESC), *Characteristics of the Insured Unemployed* (Raleigh, May 1981) and interviews with the research division of the ESC.

<sup>4</sup>Steve Rea, "Current Status of Engineering Education in North Carolina," study prepared for Rep. Aaron Fussell (D-Wake), Vice-Chairman, House Education Committee, May 28, 1981.

<sup>5</sup>Chapter 412 of the 1979 Session Laws (HB 874), "An Act to Establish the North Carolina Balanced Growth Policy," April 19, 1979, Section 7 (1).

<sup>6</sup>U.S. Department of Labor, Bureau of Labor Statistics, *Industry Wage Survey: Semiconductors, September 1977* (Washington, D.C.: USGPO, 1979).

