

1989 ECONOMIC IMPACT OF THE  
GEORGIA TECH RESEARCH INSTITUTE

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## EXECUTIVE SUMMARY

GTRI impacts Georgia's economy through the revenue it earns, the services it provides through state-funded assistance to industry and communities, and the spin-off companies it generates through the research it conducts. In economic impact analysis, it is the revenue from sources outside the state that stimulates real growth in the state's economy. These new monies circulate through the Georgia economy to provide employment, income, and local and state tax revenues, through stimulating activity in a wide variety of industries.

For the Fiscal year ending June 1989, the estimated income to GTRI from outside sources totaled \$85.2 million, which paid the salaries of 1,543 people, forming the primary direct impacts of GTRI.

### DIRECT IMPACTS:

Salaries to GTRI employees	\$53,300,000
Purchases of goods and services	<u>31,900,000</u>
Total Injection	\$85,200,000
Employment	1,543

Of the purchases made from Georgia firms, a re-spending process occurs with portions going to individuals, Georgia firms, and non-Georgia firms. The purchases made from Georgia firms continue to stimulate the economy. These purchases increase income and employment in the Georgia firms supplying GTRI and, to the extent these firms purchase from other Georgia firms, additional economic stimulation is produced. The total economic stimulation resulting from the original \$85.2 million income injection, as estimated in this analysis, form the indirect impacts, comprised of increases to income, employment, and state and local government revenues.

**INDIRECT IMPACTS:**

Revenues from industrial activity	\$91,300,000
Incomes	\$28,800,000
State and local taxes	\$6,800,000
Employment	1,253

These impacts, both direct and indirect, form the total quantifiable economic impact of GTRI on Georgia's economy. State funding is provided to GTRI for service and technology transfer programs (as outlined below), as mandatory cost sharing on federal programs, to supplement funds for the purchase of new research equipment, and to partially support internal research.

In FY 1989, \$2.9 million of the \$10.8 million state allocation to GTRI represented an investment by the state in GTRI's efforts to attract research funds to Georgia. This investment yields (1) increased tax dollars, (2) increased incomes to Georgia citizens, and (3) increased employment opportunities.

One measure of the return to the state from the \$2.9 million investment is the increase in state and local tax revenues of \$6.8 million. Stated differently, for every dollar of state funds appropriated for the GTRI research effort, \$2.34 is returned to state and local governments. The state investment in GTRI research also contributes to the creation of almost 2,800 job opportunities for Georgians paying an average salary of almost \$30,000 per year, for a total increase to incomes of an estimated \$28.1 million.

<b>TOTAL IMPACTS:</b>	<u>Direct</u>	<u>Indirect</u>	<u>Total</u>
Revenues	\$85,200,000	\$91,300,000	\$176,000,000
Incomes	\$53,300,000	\$28,800,000	\$82,100,000
Taxes		\$6,800,000	\$6,800,000
Employment	1,543	1,253	2,796

These impacts measure the effects of the income brought into the state's economy by GTRI. They do not include the increased productivity, higher business volumes, enhanced governmental efficiency, or improved competitive position

Georgia enjoys as a result of the service programs conducted by GTRI. The impacts of these programs, occurring in two broad areas, are much more difficult to quantify, though no less important. First, is the service provided Georgia individuals, companies, and governments made possible by GTRI programs, often with state support. The second arises from the application of research conducted at GTRI.

Among the science and technology transfer programs at GTRI are the following:

- Technical and managerial assistance is supplied through the field office system which responded to over 3,000 requests in FY 1989.
- Research assistance (10 to 12 research topics per year) provides critical information to economic development agencies at the state and regional levels.
- Assistance is provided Georgia firms to develop markets for their products with the federal government. These firms are generally first-time bidders on government contracts, and their success brought over \$12 million in federal funds into Georgia that probably would have gone elsewhere without this program.
- Firms in the southeastern U.S. are assisted in their efforts to meet strengthening international competition, resulting in saved jobs in Georgia and other states.
- Small and medium-sized, predominantly minority or ethnically owned firms, are assisted in a broad array of problem areas resulting in an estimated 213 jobs saved or created, and an increase in investment of \$575,000 in fiscal year 1989.
- Firms are assisted in their efforts to provide safe workplaces.
- Energy and manufacturing costs are saved through energy conservation assistance.
- Managers are trained in modern management techniques.
- Agricultural processing industries are assisted in their efforts to remain technologically competitive.



#### **TOTAL SERVICE PROGRAM INTERACTIONS:**

- 2,166 Technical Assists to Industry
  - 6,204 Responses to Information Requests
  - 519 Workshops, Seminars, and Training Programs
  - 268 Promotional Presentations
  - 530 Industrial/Economic Development Assists
- 9,687 TOTAL

Economic development also occurs from the research conducted at GTRI, through the intellectual skills and entrepreneurship of its employees. These companies are known as "spin-offs," and although GTRI cannot take credit for the accomplishments of these firms, it is reasonable to conclude that their location in Georgia is due to GTRI's existence. Patents obtained on inventions and copyrights obtained on computer software result in royalties from companies inside and outside the state, and the training received by student employees assist in transferring important technological advances to Georgia firms.

#### **SPIN-OFF COMPANIES:**

**Nineteen spin-off companies** have been identified, ranging in size from over 3,000 employees to one employee.

These companies generally produce or design electronic components, although many are in highly divergent areas. Virtually all classified as "hi-tech," they assist in providing a dynamic aspect to Georgia's economy important in today's global marketplace.

## INTRODUCTION

The Georgia Tech Research Institute (GTRI), formerly known as the Engineering Experiment Station, is a multifaceted organization created in 1919 by the Georgia General Assembly and modified in 1960 and again in 1984 when it received its present name to reflect its changing role in a dynamic Georgia economy. The charge given GTRI in its commission includes research, development, and service to promote the general welfare of Georgians through science, technology, and industrial and economic development. Among the duties enumerated are those necessary "to formulate and implement a program of research which will seek to enhance the economic and industrial development of the State of Georgia...(and) to render assistance to national programs of science, technology, and preparedness."

Each of these duties affects the Georgia economy in various ways. First, through its assistance to national programs, GTRI derives income in the form of grants and contracts, predominantly from sources outside of Georgia. The primary economic impacts from these research activities are the salaries provided Georgia citizens and the sales revenues accruing to Georgia companies from the purchases made in the course of conducting the research.

A second significant impact of GTRI research involves the companies formed either by former GTRI employees or others who take advantage of GTRI research results. These "spin-off" companies provide additional employment to Georgians generally in high-quality, high-paying positions.

A third area of impact occurs as a result of the services performed for primarily small, rural firms typically lacking easy access to the technical expertise available to larger firms. Access to GTRI's expertise, through the regional office system, improves their productivity, enables them to pursue new product lines and markets, and preserves their place as major sources of employment growth in Georgia's economy.

Fourth, GTRI assists many governmental and other non-profit organizations in their goals to improve efficiency and assist in local economic development efforts. These services have led to (1) major investments in products using new technologies, (2) the development of improved institutional structures assisting in



maintaining Georgia's highly-competitive position, and (3) greater efficiency in governmental operations.

Fifth, assistance to firms in their efforts to procure federal contracts has resulted in the development of new markets for Georgia products. This assistance has resulted in many contract awards, bringing in new funds to stimulate Georgia's economy.

Sixth, assistance targeting firms adversely affected by imports has restored competitiveness and retained employment that otherwise would have been lost.

Seventh, providing small and medium-sized firms, predominantly minority-owned, with technical and managerial assistance both in the start-up and operations phases has allowed firms to succeed that might otherwise have failed.

Eighth, providing assistance to firms and governments has improved the safety of the workplace and the home, added to our knowledge of the environmental questions facing our society (such as hazardous waste management), and has assisted in reducing our exposure to materials such as asbestos and radon.

Ninth, providing training to supervisors and middle managers in the tools of modern management improves their effectiveness and increases our competitive abilities.

Tenth, providing technical assistance to conserve energy reduces manufacturing costs and our dependence on imported petroleum.

Eleventh, research programs to improve the efficiency of agricultural processing industries, such as poultry, ensure continued productivity increases necessary for long-term vitality.

Each of these areas of economic impact stimulates the Georgia economy in many ways -- some easily quantifiable, others less so. Each of these areas and the approaches used to estimate their impact are discussed in the following sections.

## SECTION I

### METHODOLOGY

An injection of funds, or a retention of funds which would otherwise be lost, generates a respending process that affects sectors of the economy sometimes remote from the point of the initial injection. This initial injection, called the direct impact, would, in this case, be the income generated, and the employment provided, by GTRI. GTRI, in turn, pays salaries to its employees and purchases goods and services. A portion of these purchases are from Georgia firms, which stimulate additional purchases in Georgia as these rounds of transactions make their way through the economy. Purchases made from non-Georgia firms anywhere in this chain of purchasing represent a leakage of the original monetary stimulus.

The total expenditures by Georgia households and companies resulting from the injection of funds are called the indirect impacts. The size of the indirect impacts is a function of how much is respent within Georgia. If a high proportion of expenditures are made within Georgia, the multiplier effect will be larger, i.e., the indirect impacts will be larger than if a high proportion of the expenditures are made from non-Georgia firms. The indirect impacts therefore are based primarily upon the spending patterns of the recipients of the original injection and secondly upon the expenditure patterns of each Georgia resident or firm subsequently receiving additional expenditures. These complex expenditure patterns are contained within the Georgia input/output model used to quantify the indirect impacts and to specify how those impacts are distributed among industries and households in Georgia. The indirect impacts also result in increased collections of income, business, and property taxes paid to state and local governments. There are no direct state and local government tax revenue impacts because, as a state institution, GTRI pays no taxes directly.

The input/output approach used here to estimate economic impact examines the economy at a highly disaggregated level, tracing the flow of dollars at the household and firm level as well as linkages among firms. To produce and sell an additional unit of output, local firms require a variety of resources including food, services, and labor. This relationship is technological in the sense that the firm's

production requirements make it dependent on other firms, some of which are local and others not.

Input/output analysis allows the inclusion of indirect effects both from the purchases by firms, as described by their linkages, and from the purchases of households receiving the income generated through the economic activity. Like firms, households purchase goods and services in a pattern which creates additional indirect impacts on local firms.

The sum of the expenditures made by firms and households from both direct and indirect impacts provides the total level of economic activity attributable to GTRI activities. The household income paid in the course of this economic activity and the average wage in each of the industries involved are then used to estimate the employment impacts from both direct and indirect sources. Each industry and household also pays taxes to state and local governments based upon this activity. The amount of taxes is estimated from average tax collection rates for each industry and household.

The path of the income injection from outside sources through the state's economy is determined by the pattern of GTRI expenditures and the subsequent spending patterns of the people and organizations receiving income from GTRI's expenditures. The GTRI spending pattern was estimated from two sources of information. The first consisted of GTRI accounting records. Unfortunately, these records are not detailed enough or organized in a fashion to enable the development of a spending pattern consistent with the requirements of the input/output model used to describe the Georgia economy. Therefore, a second information source was consulted to fill in the gaps. This was the spending pattern exhibited, on average, by research organizations in the U.S. available from the national input/output model. Together, these information sources provided a complete spending pattern tailored to the profile exhibited by GTRI.

Other funds used by GTRI come from sources inside the Georgia economy and are not appropriately included as part of an economic impact analysis using the methodology employed for external funding. The rationale for this exclusion is that funds internal to the Georgia economy, such as state appropriations, have an opportunity cost. That is, internal funds, if not devoted to GTRI activities, would be



available for other activities having economic impacts of their own. For example, these funds could be used to pay off bonded indebtedness thus reducing the burden on taxpayers represented by repayment of principal and interest. The appropriate framework for assessing state appropriations, therefore, is to calculate the rate of return to the state from expenditures and compare it to the costs which would be avoided by paying off debt (or reducing any increases to indebtedness). If the benefits of an appropriation exceed the costs of debt, then the appropriation is desirable. Performing this assessment requires a cost-benefit analysis beyond the scope of the present effort. Therefore, the services provided Georgia citizens and companies supported by \$6.1 million in state funding are not included in the quantitative analysis of GTRI economic impacts. Rather, they are presented qualitatively with specific examples to demonstrate the type of services provided and their effectiveness.

A portion of the state funds received by GTRI not included in this qualitative analysis are devoted to supporting research through capital equipment purchases and reducing internal risk necessary to maintain the competitiveness of GTRI. Without this support, a continued contract research effort would be in jeopardy and GTRI's ability to continue to bring outside funds into the state's economy would be compromised. In this sense, the \$2.9 million in research support funding by the state represents an investment by the state for which the economic impacts are the return. An assessment of the quality of this investment is included in this analysis.

The state appropriation to GTRI is comprised of \$6.1 million supporting service programs, \$2.9 million supported research initiatives, and \$1.8 million in miscellaneous funding (predominantly for retirement) for a total of \$10.8 million.

## SECTION II

### RESEARCH IMPACTS

GTRI conducts research on a wide variety of topics important to government and business. Much of this research is sponsored by organizations outside of Georgia and would not be conducted in Georgia if not for the existence of GTRI. Research funds brought into the state from outside organizations represent an injection of income to the state's economy, circulating throughout the state and benefitting many Georgians. In fiscal year 1989, GTRI's operating budget totaled \$100.5 million. Of this, \$85.2 million was identified as representing an income injection to the state's economy.

Of course, there are benefits to the state and the nation beyond those quantified here. The present analysis only includes the benefits associated with the income-generation effects of the funds brought into the state. It does not include the advances in knowledge, and their application, resulting from the research conducted at GTRI.

#### Income and Economic Activity Impacts

The \$85.2 million injection to Georgia's economy has an eventual impact of over \$176 million in new industrial activity and over \$82 million in increased household incomes, as shown in Table 1. This increase in household income comprises about \$53 million in payroll to GTRI employees and about \$29 million in payroll to other employees distributed throughout the state.

Table 1

#### Direct and Indirect Economic Impacts of GTRI Research Operations

	Industrial Activity (Million \$)	Employment (Persons)	Household Income (Million \$)	State and Local Taxes (Million \$)
Direct Impacts	85.2	1,543	53.3	
Indirect Impacts	<u>91.3</u>	<u>1,253</u>	<u>28.8</u>	<u>6.8</u>
Total Impacts	176.5	2,796	82.1	6.8



### Employment Impacts

GTRI employs 1,543 people directly, including 671 research professionals, 354 support personnel, 130 part-time research and support personnel, and 388 students. GTRI purchases from Georgia businesses create an additional 1,253 jobs, resulting in an estimated 2,796 jobs, as shown in Table 1.

The employment provided by GTRI accomplishes several important objectives for continuing Georgia's economic development. The experience gained, and research performed, forms the basis for many new businesses, as discussed in the subsequent section on spin-off companies. Another important benefit is the employment opportunities offered students. This employment provides in-depth research experience to supplement the educational process. The increased skills of the students, many of whom ultimately are employed by Georgia firms, improve productivity and assist in the transfer of the latest technological advances. It should be additionally noted that these benefits accrue largely as a result of research support from sources outside the state.

The additional 1,253 jobs are scattered throughout industries across the state. The largest impacts occur in personal and business services; eating and drinking places; finance, insurance, and real estate; transportation; retail trade; and electrical machinery and equipment.

### Impact on State and Local Government Revenues

As a state agency, GTRI does not pay taxes. The employees of and suppliers to GTRI (and their subsequent employees and suppliers), however, pay income, sales, and property taxes to state and local governments. The original funds, circulated through the state's economy, originate outside the state and represent a true increase to the tax base.

The level of impact on taxes is estimated from the input/output model structure and average tax payments by individuals and firms. The estimated increase to tax collections totals over \$6.8 million split approximately evenly between state and local government levels, as shown in Table 1.

### Historical Comparison of GTRI Economic Impacts

Although GTRI has assisted in the development of Georgia's economy for 55 years\*, analyses assessing its impact have been conducted only since 1970, and those sporadically. In 1970, GTRI's total (direct and indirect) impact on economic activity in Georgia was estimated at \$12.4 million which, converted to 1989 dollars, equals \$32.3 million. The average annual rate of real growth between 1970 and 1989, therefore is about 9.3 percent. The growth in real state and local revenues generated, as shown in Table 2, is 8.0 percent and the growth in GTRI's state allocation, used to perform additional services as well as support the research effort, has grown at 2.7 percent in real terms. Historical annual data, where available, are given in Appendix I.

Table 2

#### Historical Comparison of GTRI Economic Impacts\*\*

	1970 Nominal (Million 1970 \$)	1970 Real (Million 1989 \$)	1989 (Million \$)	Average Annual Growth (%)*
Total Impacts	12.4	32.3	176.4	9.3%
State and Local Tax Revenues	.6	1.6	6.8	8.0%
State Appropriations	2.5	6.5	10.8	2.7%

\*Corrected for inflation

\*\*It should be noted that the methodology used to estimate the 1970 economic impact differs somewhat from present methods. The errors introduced by this difference, however, are minor relative to the actual growth occurring since 1970. While it is not possible to quantify the difference between the reported 1970 impacts and what those impacts would have been using the 1989 methods, the 1989 methods are generally more conservative. The impact growth rates provided should therefore be considered as conservative estimates of the actual growth in impacts. These caveats do not apply to the growth rates calculated for state appropriations, which are based upon actual, rather than estimated, data.

*\*Even though GTRI was originally chartered in 1919, it received its first funding in 1934, hence 55 rather than 70 years of actual service.*

### State Funding in Support of Research

The primary use of state funds allocated to GTRI is to perform services to the state under specific programs. The impact of these programs is discussed in Sections III and IV of this report. A small portion of the state's allocation, however, is designated as support for the research conducted at GTRI. These funds assist in the procurement of equipment and sustaining research important to GTRI's continued position on the frontier of contract research. Without this support, GTRI's ability to continue to be chosen as the site of national research projects would be jeopardized. In this sense, these funds represent an investment by the state in GTRI's research activities. This investment was \$2.9 million in FY 1989. The estimated return to state and local governments through increased tax receipts in FY 1989 alone was \$6.8 million, or 234% of the F.Y. 1989 investment.

### SECTION III

#### RESEARCH SPINOFFS FROM GTRI ACTIVITIES

Research conducted at GTRI and the research personnel brought to (or retained in) Georgia by GTRI, have lead to the formation of technologically-based companies, known as "spin-off" firms. Research also creates intellectual properties, such as patents and copyrights, that have commercial value, i.e., revenues generated from the royalties and fees paid by the users of the intellectual properties.

##### Spin-off Companies

Spin-off companies generally have many desirable characteristics, including the production of high-value-added products, low pollution, high salaries, attractive growth prospects, and the potential for attracting additional, similarly attractive firms as suppliers. Although GTRI cannot take credit for the output of these firms, it is probable that if GTRI did not exist the chances of these firms locating in Georgia would be considerably reduced. It is in this sense that GTRI includes these spin-off firms as part of its overall economic impact.

A survey of GTRI laboratory directors, and division chiefs, and individuals in the Office of the Director was conducted to identify spin-off companies and to verify their connection to GTRI. Nineteen firms were identified, predominantly created by former GTRI employees. These companies, with their current employment and sales revenues for the previous year (where available), are listed in Table 3. The total employment in these companies exceeds 4,000, the largest being Scientific-Atlanta with its 3,000-plus employees.

These companies typically supply products on the cutting edge of technology in the areas of electronics, advanced ceramics, and communications. Their expertise helps ensure Georgia's participation in the evolution of technology both in the production of high-technology products and the use of advanced technologies in the

##### Intellectual Properties

Another research spin-off is the revenue generated from inventions and software developed at GTRI on which patents or copyrights are held. The royalties and fees paid to GTRI by the users of these intellectual properties amounted to over \$310,000 in 1989. These payments, however, represent only a small part of the total



impact which also includes a portion of the employment by the companies using these properties, the salaries they pay, and the sales they generate.

**Table 3**

**Spin-off Companies of GTRI**

<u>Name</u>	<u>Number of Employees</u>	<u>Year Founded</u>	<u>Sales</u>
Applied Dynamics	2	1974	\$400,000
Consultants Choice	22	1977	\$1.1 million
Electronic Assembly Services, Inc.	53	1977	\$2.4 million
EMS (Electromagnetic Sciences)	600	1968	\$67 million
ERDAS, Inc.	70	1978	\$5 million
Gilmore Aerospace	6	1985	\$900,000
Integrated Systems, Inc.	9	1980	\$650,000
Ionic Atlanta	6	1982	\$380,000
IVEX	44	1983	\$5 million
Micrometrics	12	1964	NA
Millimeter Wave Technology	15	1981	\$1 million
Music Lovers Jukebox, Inc.	2	1984	0
Pearl Communications, Inc.	6	1982	<\$1 million
Powder Technologies, Inc.	2	1984	0
Pulse Technologies, Inc.	4	1982	\$365,000
Scientific-Atlanta	3,072	1953	\$547 million
Scientific Research Corp.	7	1988	\$2 million
Syntek (formerly Gulf Applied Research)	12	1983	\$1.5 million
Wegener Communications Co.	152	1978	NA



## SECTION IV

### IMPACT OF ACTIVITIES INTERNAL TO GEORGIA'S ECONOMY

GTRI interacts directly with individuals and organizations throughout the state in many ways. These GTRI activities have impacts additional to those resulting from the operation of the multiplier mechanism. Because many of these activities are funded from state revenues, it is not appropriate to estimate their impact as a function of the multiplier effect. The appropriate methodology would be cost-benefit analysis, which would require an assessment of how each of the interactions affected the eventual outcome. Deriving such effects requires an evaluation of what would have happened without GTRI intervention. Although this can be reasonably done in specific cases, it cannot be done systematically from existing data. Our approach is, therefore, to discuss each type of impact in the terms appropriate to each of GTRI's activities. The impacts are quantified according to the measures available supplemented with qualitative discussions.

The breadth and variety of GTRI interactions with the state's economy creates a difficult measurement problem. Types of interaction are best measured by a variety of yardsticks peculiar to their activity and impact. Several measures which reflect the overall magnitude of GTRI's interaction are possible, however, for those programs which have received state support. The level of state support for these activities was \$6.1 million in FY 1989. These interactions, covering fiscal year 1989, are in addition to interactions conducted on a contractual basis, and include:

- 2,166 technical assists to industry
- 6,204 responses to information requests
- 519 workshops, seminars, and training programs.
- 268 promotional presentations
- 530 industrial/economic development assists

The major components of these interactions are discussed in the following.

#### GTRI's Field Office System

GTRI's most extensive interaction with Georgia's economy occurs through the 12 field offices. These satellite organizations assist local industry and government with diverse technical and management questions. Their value to the

local communities is enhanced by the permanent presence of these offices and the expertise that accumulates over time.

The firms receiving assistance are primarily small companies located in isolated areas. Services address engineering questions related to process, layout, productivity, energy conservation, quality control, maintenance, and computer hardware and software selection. Management matters involve financial analysis, marketing analysis, inventory control, cash flow, and personnel training needs.

Local governments and development authorities also benefit from GTRI's field office system, receiving assistance with energy management, computer selection, support for responding to industrial prospects, and equipment maintenance.

Services provided can be as simple as responding to a request for information on a specific process or product readily available from secondary sources, or as complex as a complete analysis of and recommendation for a manufacturing plant's layout.

These interactions totaled almost 3,000 in 1989. Typical projects and outcomes include:

- Recommendations to a carpet manufacturer regarding material handling, process change, and organizational realignment, resulting in estimated savings of \$150,000 per year.
- Assessment of the housing needs of mill workers in Gordon County.
- Provision of in-plant cooling needs of an industrial prospect to the Thomaston/Upson County Chamber of Commerce.
- A labor supply and needs analysis focusing on manufacturing, for the Greene County Chamber of Commerce.
- Provision of monitoring and testing methods to a Statesboro manufacturer to isolate communications problems between the firm's CAD stations and a remote computer.
- Help in identifying an expansion location in Georgia for an Augusta sportswear manufacturer.
- Training in continuous quality improvement for a Savannah food processor.

- An economic development preparedness program for the Danielsville Chamber of Commerce.
- Plastics recycling research for the Hall County government.

#### **Economic Development Research Assistance**

In-depth research projects are conducted 10 to 12 times per year on topics recommended by officials active in economic development issues statewide. The subjects of this research, always conducted on a regional basis, include:

- Assessing the most appropriate industries for a region to approach as a potential plant location.
- Conducting feasibility analyses of industries that could use a Georgia resource. Examples include oriented strand board, film-face plywood, and cut-flower cultivation.
- Doing market assessments of tourism potential.
- Analyzing Georgia productivity relative to other states.
- Examining issues related to economic development such as the definition of economic regions, evaluation of industry targeting methodologies, and the potential for import substitution through match-marketing.

These projects have resulted in the location of new wood products industries in Georgia, the strengthening of local infrastructure, and increases in the effectiveness of the marketing efforts undertaken by local development officials. Of less tangible benefit is the continued support of the development of regional structures which make more efficient use of limited economic development resources and present greater capabilities to potential new industry.

#### **Procurement Assistance**

The federal government is the largest single customer of American business. The rigid, sometimes labyrinthine, regulations which must be met to initiate a business relationship with this customer, however, restrict entry into this market. It has been estimated that 90 percent of all government contracts from military bases located in Georgia are awarded to non-Georgia firms. This is especially true of small

and/or new firms. A program at GTRI, the Georgia Procurement Counseling Center, helps firms meet the federal requirements for successful bidding on procurement contracts, attracting federal dollars into the state not likely to have been brought in otherwise.

During fiscal year 1989, the procurement assistance program participated in 95 successful bid submittals totalling over \$12.5 million in contracts. Over \$10.5 million of these contracts were awarded to firms that had not previously participated in the federal procurement process.

### **Trade Adjustment Assistance**

When a firm suffers from increased foreign competition, it may need assistance to make the appropriate adjustments to meet that competition. Smaller firms especially can find it difficult to analyze their situation and marshal the necessary resources. The Southeastern Trade Adjustment Assistance Center (SETAAC) in GTRI provides the objective appraisal small firms require to, in many cases, remain solvent. For example, a women's wear manufacturing company had lost enough sales to imports to push its revenues below the break-even point. Production output was about 40 percent of plant capacity, and labor excess (a measure of efficiency) was about 75 percent of standard. Within 18 months of initial intervention by SETAAC, labor excess had dropped to 24 percent, turnover and absenteeism were in decline, and cash flows turned positive for the first time in several years. Employment for 60 Georgians and annual economic inflows of over \$1.5 million were retained.

### **Economic Development Administration Center Program**

Many small and medium-sized firms lack access to business consultants available to larger firms, and all firms occasionally can benefit from an objective appraisal. A small firm that cannot obtain such assistance often simply disappears, taking with it jobs and its opportunity to grow. Also, a new venture start-up will require many skills, and while the initiators of the venture may be highly skilled in a few areas it is rare to find all of the skills in one or two persons. The EDA Center provides assistance in these instances. During fiscal year 1989, it was estimated that this assistance saved or created 213 jobs and resulted in \$575,000 in additional investment in Georgia.



## Environmental Science and Technology

A wide range of GTRI programs assists Georgians in dealing with many aspects of the increasingly important environmental factors in their businesses and homes. For example:

- Minimizing the generation of hazardous wastes saved Georgia manufacturers an estimated \$270,000 in processing costs, in fiscal year 1989; reduced worker exposure to hazardous materials, thereby preventing an estimated 200 to 500 accidents with a cost saving of \$800,000 to \$2 million; reduced material costs; and provided income to material recyclers.
- Providing technical assistance to the asbestos abatement industry through training programs attracts approximately 1,500 participants per year. This training helps ensure the safe removal of asbestos from our businesses, schools, homes, and public buildings.
- Environmental monitoring assists in improving the indoor air quality of homes and workplaces. Eliminating contaminants improves worker health, increases productivity, reduces insurance costs, and reduces absenteeism. The GTRI program to monitor and recommend mitigating actions is estimated to save Georgia businesses \$1.5 million per year.

## Industrial Education

The ever-changing workplace requires frequent updating of management skills to maintain competitiveness. GTRI's role here has involved offering an array of short courses in human resource topics such as communications and motivational leadership, and technical topics such as statistical quality control and materials resource planning. More than 2,600 supervisory and middle management personnel received training in over 178 course presentations. This training increased their productivity and effectiveness as managers and provided them with the latest management tools.

## Energy Conservation

The high energy prices of recent times have provided impetus to energy conservation programs which, because of the large potential savings, continue to interest Georgia manufacturers. Over 140 technical assists were provided in fiscal year 1989 in addition to workshops, seminars, and short courses. One company



requesting technical assistance will save about \$180,000 per year in energy costs while making negligible investments in time and/or equipment.

#### **Agricultural Technology Research Program**

The poultry industry is one of the state's largest of the agriculturally based industries, making Georgia the second largest poultry producer in the U.S. GTRI's assistance to the poultry industry, through improved technology and improved processing methods has reduced worker injuries as well as increased productivity; it's estimated costs have been cut \$.5 to \$2 million per year.

Average Annual  
Growth Rate

1970-1982

1983-1987

1988-1992

1993-1997

1998-2002

2003-2007

2008-2012

2013-2017

2018-2022

2023-2027

2028-2032

2033-2037

2038-2042

2043-2047

2048-2052

2053-2057

2058-2062

2063-2067

2068-2072

2073-2077

## APPENDIX I

### Historical Comparison of GTRI Impacts

Table A-1

## Economic Impact and Tax Revenue Impact of GTRI Operations

	Fiscal Year (millions of dollars)											Average Annual Growth Rate *	
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979 2	1981	1982	1970-1982
GTRI Operations Income Impact:													
Research programs (direct)	4.0	4.1	4.7	4.6	4.8	5.6	10.4	14.0	15.7	22.5	31.6	31.7	18.8%
Research programs (indirect)	8.4	8.6	9.9	9.7	10.1	11.8	21.8	29.4	33.0	47.2	66.3	66.6	18.8%
TOTAL GTRI OPERATIONS	12.4	12.7	14.6	13.3	14.9	17.4	32.2	43.4	48.7	69.7	97.9	98.3	18.8%
GTRI Tax Revenue Impact:													
Directly by research programs <sup>1</sup>	0.30	0.31	0.30	0.32	0.36	0.38	0.49	0.57	0.73	0.92	1.39	1.52	14.5%
Indirectly by research programs	0.34	0.33	0.40	0.39	0.40	0.47	0.87	1.18	1.32	1.89	2.65	2.66	18.8%
TOTAL TAX REVENUE	0.64	0.65	0.70	0.71	0.76	0.85	1.36	1.75	2.05	2.80	4.04	4.18	16.9%
State Appropriations	2.52	2.41	1.62	1.82	2.06	2.20	2.30	2.32	2.49	3.07	4.24	4.65	5.20%

<sup>1</sup>As a state agency, GTRI does not pay taxes. Calculations of tax revenues produced directly by research programs represent personal taxes paid by GTRI employees."

<sup>2</sup>The impact for the year 1980 was excluded from the 1982 update and is therefore not available for reporting here.



Table A-2

Economic Impact and Tax Revenue Impact of GTRI Operations  
Estimated for the Period 1985 to 1989

	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	Average Annual Growth (%) <u>1983-1989</u>
GTRI Operations Income Impact:								
Research programs (direct)	45.1	49.2	49.2	54.2	61.1	71.3	85.2	
Research programs (indirect)	48.3	52.8	52.8	58.1	65.6	76.4	91.3	
TOTAL GTRI OPERATIONS	93.4	102.0	102.0	112.4	126.7	147.8	176.5	11.2%
GTRI Tax Revenue Impact:								
State Appropriations	3.6	3.9	3.9	4.3	4.9	5.7	6.8	11.2%
	4.7	6.0	7.3	8.4	9.8	10.6	10.8	14.9%