Research Report

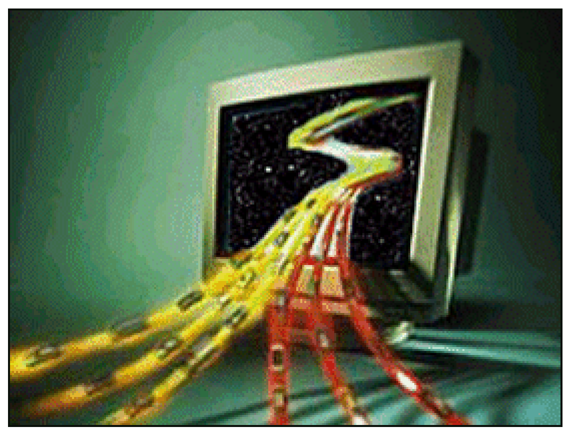
September 2000

Florida's High Tech Corridor: Opening the Door to Florida's Future

Interim Report to the Florida Office of Tourism, Trade and Economic Development (OTTED)

by
The Florida Cluster Metrics Task Force

Executive Summary



In 1999, the Florida Cluster Metrics Task Force was convened by request of the Florida Office of Tourism, Trade and Economic Development. The goal of the Task Force was to develop methods for evaluating the costs and benefits of a new class of Florida investment programs that support the development of high-tech industry clusters. A "cluster" is a set of companies that share common geography, specialized industries and common needs, markets, obstacles, and technologies (examples include Silicon Valley, Boston's Route 128, and the Research Triangle area). A clear illustration of a Florida industry cluster is the Florida High Tech Corridor, which spans from the Space Coast to the Tampa Bay region.

First, the Task Force developed a set of eligibility guidelines for identifying and funding regional industry clusters in Florida. In general, a region with growth potential as an industry cluster and compatibility with Florida strengths is characterized by at least the following:

Sufficient infrastructure. This includes a concentration of companies within one or more of Enterprise Florida's targeted industry sectors, participation in strong research, education and technology resources, and an infrastructure capacity that includes transportation, environmental and other resources.

Organization. An existing organization and partnerships that transcend geographic and political boundaries should exist, including participation from

industry leaders, economic development groups and universities.

"Seed" project. A significant corporate expansion or relocation project in the targeted industry should be identified to give momentum and visibility to cluster development activities.

The Task Force also produced a set of guidelines for measuring the impact of Florida's cluster investments to include both long-term methods (documenting cluster growth) and short-term methods (justifying annual appropriations). Because the targets of cluster investments are in fact companies and workers that receive no direct funding, the success of cluster development efforts cannot be fully documented in the short term. Historically, cluster development efforts in other states have taken 10 to 20 years to reach fruition. Nonetheless, certain cluster characteristics can be captured in standard impact forecasting models, which can help ensure that short-term investments of public funds have been effectively used:

Long-term benchmarking. At least every ten years, a study benchmarking growth of Florida clusters compared to national averages, national ranking or predicted growth rates should be undertaken to capture the collective benefit of cluster development efforts.

Short-term impacts. For every major cluster investment program, a standard econometric impact study should be undertaken. Although specific categories of input variables are recommended, results should be provided in a format compatible with other impact studies. This may be performed for each annual appropriation, or as necessary.

In addition to the development of these guidelines, the Task Force performed a set of impact studies to test its recommendations and to evaluate the benefits of State investments in the Florida High Tech Corridor initiative. The initial results support cluster investment concepts as effective public policy.

University infrastructure. Investments in central Florida research universities (USF and UCF) have at least a 2.3 to 1 multiplier. In 1998, $6.8 million was invested in the University of South Florida and the University of Central Florida (via the Board of Regents) to support technology transfer and growth of the Florida High Tech Corridor. This produced a one-year impact of over $15.7 million and at least 155 jobs, raising $9.5 million of private sector matching investment. Over $630,000 of additional state revenue is projected from increased economic activity as a result of these investments. At least 36 companies were assisted with product and process improvement through industrial partnership activities.

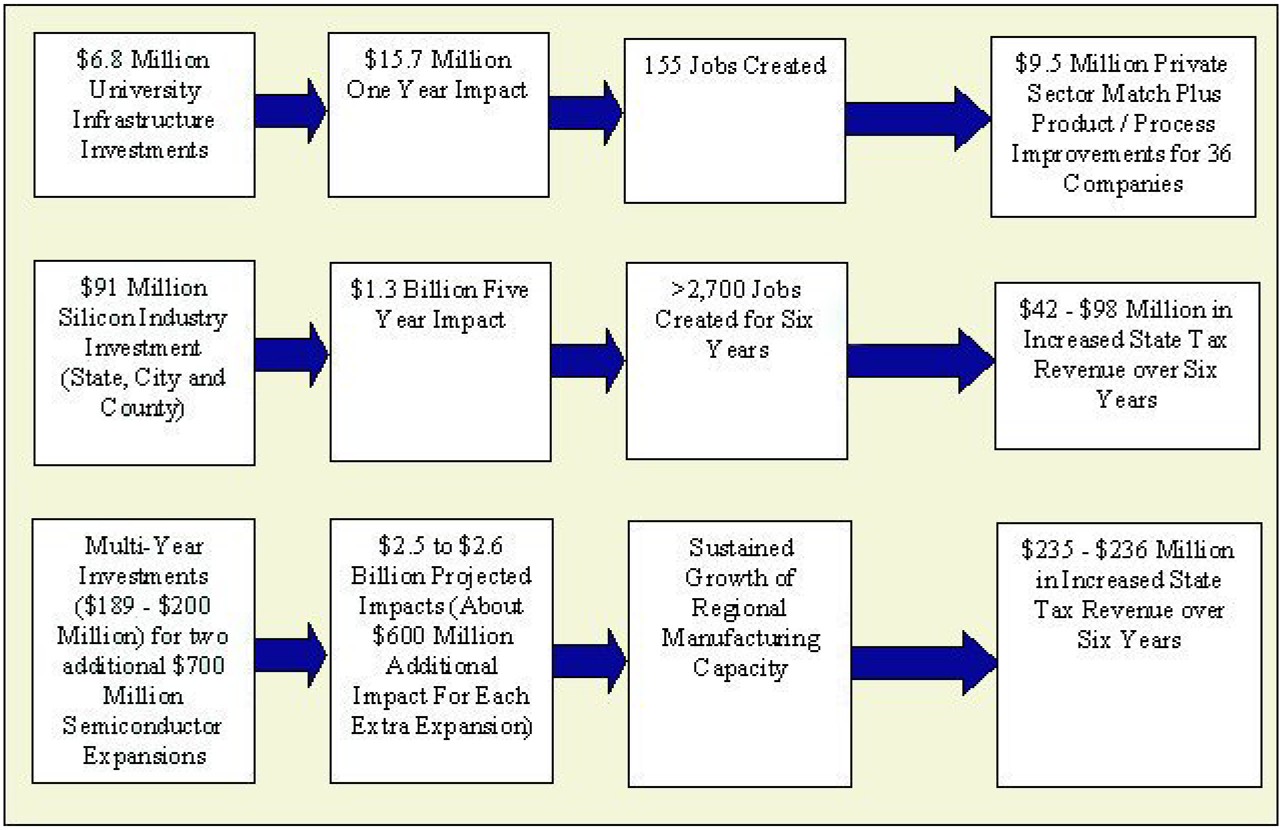
Silicon industry investments. This economic development investment was a much higher investment but also had an even higher multiplier. For the Cirent

Semiconductor/Bell Laboratories silicon technology expansions, approximately $91 million will be invested by Florida city, state and county governments. This will result in a 6-year impact on Florida's economy of over $1.3 billion (a multiplier of almost 15 to 1). This includes the creation of over 2,700 jobs over six years. Most of the government investment in the silicon industry will be recouped within six years, through state revenue resulting from increased economic activity.

Multiple expansions. Initial studies performed by the Task Force revealed that targeted industry expansions, performed in isolation, have a 3 to 5-year period of growth impact followed by a similar period of slight negative impact as manufacturers build capacity that exceeds initial demand. The sum impact is very positive, but if government and public leaders wish to make a change in Florida's manufacturing infrastructure, they must commit to providing sustained support to encourage continued industry relocations and expansions in each targeted cluster. A conjectural impact study shows that an additional silicon technology expansion/relocation every three to five years not only eliminates negative manufacturing "rebounding," but increases overall manufacturing capacity and supply within the study period. Based upon the Cirent Semiconductor 1999 expansion, every additional facility expansion could provide an additional impact of $600 million and have an economic multiplier between 12.9 and 13.2 to 1 (for every government dollar invested, about 13 dollars could be generated in the economy). Furthermore, increased state economic activity would be expected to "pay back" government investment over the study period through increased state revenues from taxes and other sources.

Tax Costs. On average, the cost of raising taxes in 1998 to pay for Florida investments (such as the investments for the Silicon Industry Investments and University Infrastructure investments) had an estimated negative impact on Florida's economy of between $1.11 and $1.83 for every $1 of taxes raised. This estimate would apply to general revenue investment in any Florida program.

The following diagram captures the results of the Task Force's analysis of estimated and projected returns in the three discrete areas of investment:



About the Study

The Florida Cluster Metrics Task Force was created in 1999 by Florida TaxWatch and the Florida High Tech Corridor Council, at the request of the Office of Tourism, Trade and Economic Development (OTTED), to develop a rigorous and objective methodology for evaluating the results of a new kind of Florida government investment--investment in regional technology "clusters." A "cluster" is a set of companies that share common geography, specialized industries and common needs, markets, obstacles, and technologies (examples include Silicon Valley, Boston's Route 128 and the Research Triangle area).

Beginning in 1996, the Florida High Tech Corridor initiative was established with funding from the State to nurture a high-tech cluster in central Florida. However, the purpose of cluster development is to encourage indirect benefits (increased competition, productivity, national visibility) and knowledge transfer between companies, most of which are not direct recipients of State funding. Indirect benefits even include the development of capacity to generate new revenue-generating technology enterprises and spin-off companies. The goal of the Task Force was to identify both long-term and short-term guidelines for evaluating State investment in clusters that would capture as many of these "indirect" benefits, and costs, as possible so that they may help direct future State funding in Florida's clusters.

The Task Force was co-chaired by Guy Hagen (Assistant Director of the University of South Florida Office of Economic Development) and Dr. Keith G. Baker (Senior Vice President and Chief Operating Officer of Florida TaxWatch). The Task Force members included representatives from Florida TaxWatch, the University of South Florida, the University of Central Florida, the Florida High Tech Corridor Council, members of the Florida Legislature, the Office of Tourism, Trade and Economic Development, the Department of Revenue, the Office of Policy and Budget, and Enterprise Florida Inc. A full listing of the Task Force membership is included in Appendix I.

The Task Force met bimonthly via teleconference between September 1999 and March 2000. Additional correspondence and participation was submitted via email, an online discussion forum and direct communication between members.

"Cluster" development concepts best capture the furious growth nature of technology-based industries and how they congregate together to create "hotspots" of economic activity. Well-organized and well-directed cluster initiatives can generate real results even in the short-term. If Florida is to secure a leading role in the new manufacturing economy, state policy-makers must re-evaluate their perspective regarding economic investment programs to encourage nurturing Florida's research and technology strengths into clusters of excellence.

This report will make reference to several legislative programs, technical terms and methods common to the economic analysis literature. The reader can find a brief glossary and explanation of these terms at the end of this report in Appendix III.

Background

It has become a maxim that the technology underlying computers and information technology "turns over" every 18 months (Moore's Law), and this speed is increasing. It came as no surprise in 1996, then, that the Cirent Semiconductor wafer fabrication facility in Orlando, Florida, was facing reinvestment levels of nearly $2 billion to refit to the next generation of silicon technology (the facility was formerly operated by Lucent, which formed Cirent Semiconductor with partnership from Cirrus Logic). Such a complete change in production technology and workforce needs would be involved that Cirent Semiconductor could very possibly be enticed to locate its new facility to another community, state or even country. With annual revenue approaching $1 billion, such relocation would be an economic "gem" for the new location and a terrible loss to Florida.

With competitors such as Madrid, Spain offering incentives of $90 million <u>cash</u> to lure the new facility away, central Florida leaders banded together to offer Cirent Semiconductor a different deal: a combination of state investment through the Qualified Target Industry Tax Refund (and later, the High Impact Performance Initiative which was developed specifically to deal with high impact expansions such as Bell Laboratories), university research and training support (through the University of Central Florida and the University of South Florida) and a partnership of economic development leaders dedicated to attracting high-tech companies to the region. In 1997, Cirent Semiconductor committed to expand its Florida facility, and the Florida High Tech Corridor initiative was founded. In fact, Cirent Semiconductor found the partnerships so valuable that it established a second expansion of its facility in 1999 and even established a new Bell Labs research facility on the same property (in 1998-1999), for which it received the High Impact Performance Initiative (HIPI) award.

Aside from preserving the existing level of activity, these expansions resulted in a new combined Cirent Semiconductor/Bell Labs investment of nearly $1.7 billion in construction and equipment. As its share, Florida's city, county and state governments, over five years, will have invested over $91 million directly toward the expansions, through real estate tax rebates, cash economic incentives and through the state's HIPI and QTI programs. The majority of public investment was through the Silicon Sales Tax Rebate program, specifically established for this purpose, which rebated Cirent Semiconductor's sales tax exemption on equipment expenditures. This money could then be kept by Cirent or invested in central Florida's universities (which would then be matched dollar-for-dollar by the State for product and process research and equipment).

Separate from the expansions, the State also initiated a new program in 1997 funding the University of South Florida (USF) and the University of Central Florida (UCF) to support economic development partnerships, especially with Cirent Semiconductor/Bell Labs, and to encourage development of all technology clusters in central Florida. To date, state investment in USF and UCF via this program has totaled $15 million to support partnerships with local manufacturers and "infrastructure" investments to increase capacity in high-tech research and education.

These programs, however, supported only central Florida's regions. As there are strong manufacturing economies in other Florida regions that may benefit from cluster development funding, the Governor's Office called for an objective look at the costs, benefits and transferability of the High Tech Corridor programs.

Consideration of Impact Models

REMI, Implan and RIMS are all input-output econometric impact models; they each try to estimate the economy's reaction to well-identified changes. All three models are generally recognized by professionals and academics as valid for their intended purpose, which is primarily helping guide policy and investment decision-making.

To further discuss their similarities, all three models (given identical inputs) ideally should generate roughly similar results, at least within the same order of magnitude. When they don't, further investigation into methods may be warranted. Although there appears to be no clear consensus as to "how much" difference between Implan and REMI results should be considered too much, we would recommend, other things being equal, that differences in impacts greater than 20% require further exploration as to the models' integrity.

No model should be particularly biased to show higher or lower impact results than the others, given that sufficient thought has gone into their usage. However, like any computer program all three models are characterized by "garbage in = garbage out"; predicted impacts will probably vary more due to the assumptions used than which model was used. It is always possible to paint rosy pictures when only positive data are fed in to the models (e.g., few to no imports, taxes, or other leakages, very large impact geography, no public costs); similarly, any impact study can be negatively influenced by extensive inclusion of cost data. Further, the greater the region incorporated into the study, the greater the measured impact is likely to be. Given a comprehensive and objective assessment of cost and benefit input data, many economists believe that few public investments generate an impact multiplier much greater than 2 to 1 (for every dollar invested, two are generated as additional revenue in the overall economy). Significant multipliers are still possible, however.

Given these considerations, the best recommendations to ensure comparable, accurate, and understandable impact results include the creation of a standard list of input variables that should be included in any study, or to appoint a consistent review procedure (i.e., preferred staff, academic, or other economic experts) to examine impact studies and figures for information bias. This report will help identify some preferred guidelines which can help this process. Without a consistent approach, even well-intended impact studies can be difficult to consider without making "apples to oranges" comparisons.

Please note that there is a limit to the comparability of these models; although they often predict impacts that are similar in many ways, and are in fact based on much of the same underlying data (the federal economic census), there are differences in how the models are structured to particular geographic regions and how certain economic variables are defined and manipulated.

RIMS

The Regional Industrial Multiplier System (RIMS) is an "Input-Output" model produced by the Federal Department of Commerce Bureau of Economic Analysis, and consists of a set of multiplier tables that are applied directly to input data. Resulting outputs are then tabulated to generate a net impact. According to the Bureau's web site, RIMS data is based upon 1997 federal performance data for each industry sector. RIMS is particularly popular for its availability and low cost, and for its ease in generating quick impact estimates.

Implan

Micro Implan is produced and licensed by the Minnesota Implan Group, and is perhaps the most common and well-recognized model, especially as users can customize it to any arbitrary geographic region. Implan is similar to RIMS in that it too is an "input-output" model; however, Implan is currently based upon 1996 data. Implan contains an internal database on dozens of internal variables that essentially models the existing economy without any changes. By introducing changes to the model, Implan calculates the relationships between its economic variables (e.g., increasing sales requires a proportional increase in employment) to identify how its model of the economy changed. The effect of a change in output or employment is primarily measured in terms of output (the value of goods and service produced), employment (jobs), and personal income. Implan is a "static" input-output model; the model is not adjusted for following years by each year's output.

REMI

REMI Policy Insight is produced and licensed by Regional Economic Models, Inc. Policy Insight (often referred to simply as "REMI") is considered the most complex of the models, and measures more economic variables and the relations between them than the other models. Most importantly, REMI is "dynamic." The model simulates "feedback" reactions to new data. For example, the addition of increased sales may generate increased manufacturing, which may generate increased employment and construction, which, in turn, may spur immigration and increased production capacity, etc.. The latter, however, would not be modeled in Implan or RIMS. REMI is perhaps not as widely used as Implan due to its higher licensing fees, and the fact that each model is limited by geographic region. Whereas REMI has an internal database and model of the economy (detailed to the national, state, county or regional level), current year data are actually forecasted from the most recent federal population and industry statistics (one or two years previous).

All three models are available to the Florida Legislature and government agencies through the Florida Office of the Governor. Additional details and descriptions for each model are included in Appendix III.

For the purposes of this entire report and for testing the recommendations of the Task Force, static input/output results (roughly similar to Implan) were simulated using REMI's "input/output only including endogenous consumption" alternate control method. This will be referred to throughout this report as "Remi Static" or just "Static;" the standard Remi model will be referred to as "Remi Dynamic."

Task Force Recommendations

The Task Force surveyed academic literature, published reports and best practices from government and development organizations across the U.S. With this data at hand, the Task Force developed a set of guidelines and recommendations for evaluating investment in regional industry clusters. These recommendations should create a consistent and fair environment for demonstrating the impact of public spending.

The guidelines will be provided under the following format: (1) criteria for qualification as a regional industry cluster; (2) guidelines for evaluating long-term growth; (3) guidelines for evaluating short-term growth or annual investments; and (4) recommendations and considerations for usage of the results.

Each subject is organized to present considerations important for any group or individual interested in either evaluating or developing industry clusters in Florida. Material of a technical or operational nature is presented separately in gray tables.

Regional Cluster Criteria

Cluster development efforts are based upon the general process of identifying and fostering local strengths in a given industry. Appropriate use of public funding for cluster development requires enhancing those existing strengths, while not attempting to create new industry strength from scratch.

Theoretically, every region has some economic advantage that could be nurtured into a cluster. With this in mind, a second consideration is the determination of which potential clusters will have the most growth potential and the most desirable characteristics. To clarify, a given region might indeed have the potential to become a leading national cluster in a given industry, but this might not be a desirable goal if that industry is characterized by low wages, increasing technical obsolescence or has negative attributes (such as high pollution).

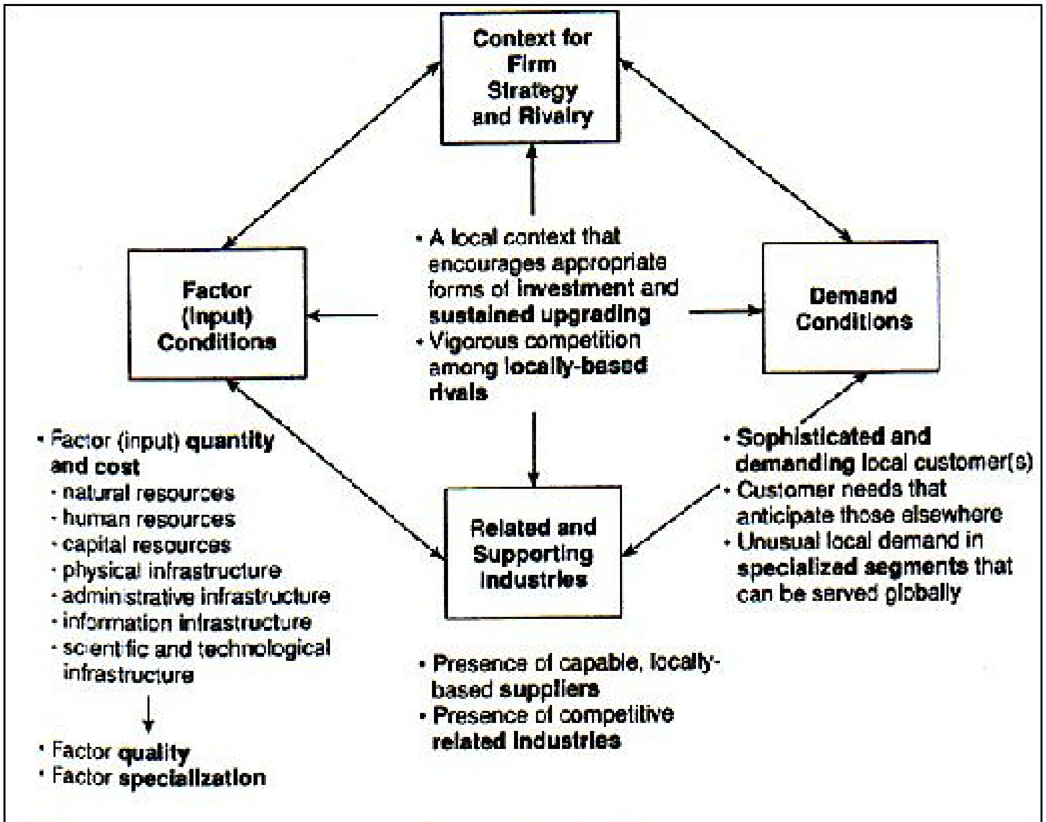


Figure 7-4 Sources of Locational Competitive Advantage

Source: "On Competition" by Mike Porter, Harvard Business School

As much as supporting existing industrial strength, cluster development efforts should be prioritized in regions with the greatest overall potential. Following the example of the Florida High Tech Corridor and Michael Porter ("On Competition," 1999), specific guidelines are recommended for public investment in Florida clusters. These guidelines emphasize existing organizational capacity that transcends political and geographic boundaries, technological capacity through active research university and laboratories and a large-scale industrial expansion project to "seed" cluster efforts and to give momentum and national recognition to change within the targeted industry.

Criteria for a Regional Industrial Cluster

1. **Strong industrial leadership.** A "voice" for the industry must exist, in the form of a local industrial association or partnership. This association must include representation by whatever organization or resource "seeded" the industry (for example, a university research center or government institution). It is preferable that this association has an ongoing, continuing mission to support its region and industry separate from any state cluster initiative.

2. **Established organization, with connection to science and technology resources.** A public/private partnership with representation from academic, private and government sectors must exist to support development of the cluster, with a clear mission and objectives. This differentiates from an industrial association if the cluster contains more than one industry type. Active, explicit support and participation from specialized faculty, laboratories, research centers and other research activity at universities and/or educational institutions must be present within the organization.

3. **Strong "core" industrial presence.** This is defined as the presence of the majority of the firms within at least one specific industry sector within a particular region, compared to the entire state. In other words, a prospective region must be one of the leading regions for the state in the targeted industry, as indicated by the number and size of companies. Industry members may be identified by Standard Industry Codes, industry surveys, or commercially available databases such as CorpTech, Dun and Bradstreet business directories, and/or recent federal and state government business directories. It should be understood that implicit preference will be given to industrial leadership that includes major international companies or employers.

4. **Capacity for growth.** It is important that the candidate region demonstrate development of sufficient resources (including workforce, transportation, power, water, housing, etc.) to support continued growth of the identified industry cluster. Alternately, the region must provide a feasible plan for how such capacity can be increased to meet growth needs.

5. **Related industries.** It is recommended that industries complementary to the target cluster also be documented within the region. For example, "optics" and "telecommunications" or "microelectronics" and "medical" industries can be demonstrated as complementary industries due to major overlapping product categories

(i.e., fiber-optic communications devices or microelectronic medical analytical devices). Regions that contain "superclusters" of multiple, complementary target industries should be given preference due to increased growth potential and resistance to industry-specific recessions.

6. **Targeted sectors.** The candidate region's spotlight industry must correlate to one or more of Enterprise Florida's targeted industry sectors. Further priority will be given to targeted industries with desirable wage, environmental impact, export, and other economic characteristics.

Measuring Long-Term Impacts

The primary purpose of cluster-based development initiatives is the long-term growth of specialized (usually high-tech) industries within a region, to increase the number of high-paying jobs and high-revenue companies. Such efforts require nurturing local resources into recognized world-class centers of excellence. However, as shown by cluster development efforts in Texas, Massachusetts and others (SRI International,1986), more than 20 years may be required before such cluster efforts reach full fruition.

It is difficult to effectively and quantitatively evaluate the success of cluster development efforts on a short-term basis. Attempts at short-term evaluation are likely to miss the "core" benefits of cluster-based efforts which are not intended to build direct economic growth through consecutive business expansions, but rather to coax the complex, indirect interplay between participants in a cluster through strategic investments and sustained partnership building. Cluster growth occurs when companies are attracted to a region to take advantage of research, technology transfer, sales and cooperative venture opportunities, and when workers immigrate to capitalize on recruiting competition from similar companies. As a result, the true targets of cluster development efforts are the companies and workforce members that never actually receive any direct public funding or incentives.

While this demonstrates the advantage of cluster development investment strategies over traditional methods, it also illuminates how difficult it is to document such economic growth as resulting from any particular program or funding. Furthermore, cluster growth relies on successful partnerships on many levels. Relocation/expansion successes may be claimed by many organizations, or even by agencies not directly participating in cluster development programs (for example, a local chamber landing a company relocation, which succeeded because the company valued cluster activity in neighboring communities).

Fortunately, the Task Force identified a variety of methods that have been developed in regions with mature clusters for measuring long-term growth. It is reasonable to recommend an objective evaluation of a regional cluster, using methods such as the ones listed below, at least every ten years to determine the overall efficacy of public funding and cluster partnerships.

Methods for Documenting Long-Term Economic Growth

Business indicators. Company profitability growth or industry production capacity growth, over time, compared to industry standards or other regions.

Increased performance. Company growth or startup rates, compared to industry standards or other regions (the Ben Franklin Partnership Economic Impact report is a prime example).

National benchmarking. Regional macroeconomic growth indicators compared to national benchmarks.

Innovation. Increased levels of university technology transfer or sponsored research.

Industry benchmarking. National standing by company count or industrial revenue (i.e., rising from a ranking of 8th in computer manufacturing in the U.S. to 3rd). CorpTech listings are good examples.

Measuring Short-Term Impacts

Notwithstanding the difficulties for documenting short-term cluster growth, there remains a need to justify continued public investment on an annual basis. Every state or regional organization contacted by the Task Force acknowledged this as a critical need. Ironically, however, no identified agency had developed an objective methodology to address it. In many states, public funding in technology-based economic development appears to be primarily defended in state legislatures and budget committees via "gut feeling" and "sales pitch" approaches. Since government leaders often intuit that strategic technology and cluster-based approaches are good public policy, they might be persuaded with anecdotal success stories and heartfelt testimonials from industry leaders.

Despite success stories, however, cluster investments are not immune to accusations of "corporate welfare," and additional quantifiable measures should also be used. Annual measures may not capture long-term goals but can ensure that each individual investment is an appropriate use of public funds. The most commonly used methods for "cost-benefit" measurement of public investments are econometric input-output "impact" models such as Regional Economic Models Inc. (REMI) Policy Insight, Micro Implan or the Regional Industrial Multiplier System (RIMS). All three are complex databases and forecasting packages that can estimate the economic ramifications for policy changes, especially those that involve taxes, expenditures or investment of funds.

The Task Force recommends econometric impact models for short-term evaluation of cluster investments. The following specific recommendations are suggested for using impact models in this context.

General Recommendations

1. Separate studies for separate programs. State University System Recurring Budgets and Sales Tax Exemption Program exemptions should be evaluated separately, as the investments have been allocated in distinctly different manners.

2. Recommended models. Where possible, more than one impact model should be used in any impact study. Preferably, each study should be performed on REMI as well as Implan, using the same input information and output categories. This should help legislators establish a realistic "range" of results, and serve as a simple "reality check." This should also help legislators compare different programs (who may have used different impact models) without making "apples-to-oranges" comparisons.

3. Terminology. "Economic impact" models differ in methodology from financial "return-on-investment" or financial cost/benefit formulations. Although each of these project the benefit of investments, impact models are conceptually different and should not be confused with methods such as return-on-investment (ROI) models, which estimate risks and actual revenue returned as a result of investment.

The next series of recommendations focus on how data should be organized and included into the econometric models. This was the most difficult challenge of the Task Force, once it was decided that standard econometric models should be used, it was necessary to find ways to "plug in" cluster-relevant information in a useful way. As stated earlier, cluster indicators may not readily translate into directly measurable economic categories that are used by REMI or Implan.

The resulting recommendations emphasize two guiding concepts developed by the Task Force: (1) capture as many appropriate costs, investments and benefits to input as possible, but (2) count only such inputs that can be translated into standard econometric categories as "direct" inputs.

Although the input recommendations were developed specifically for evaluating cluster investments, their discussion revealed a number of shortcomings common to many impact studies. For the most part, these recommendations are valid for any impact study, especially studies of programs tied to state funding.

Recommendations Regarding Inputs

1. Counting government costs. All relevant public investments should be included as inputs. Specifically, QTI/HIPI investment metrics should be recalculated in conjunction with the SUS Recurring/Sales Tax Exemption investments. This is very important to avoid double-counting impacts and benefits among various state investment programs (such as Silicon Sales Tax Program, HIPI and QTI). Government costs should be incorporated into a study in two ways:

A. First, government investments should be included as a reduction in the appropriate budget (e.g., state investment of $100 million should be incorporated as an input by reduction of available state budget by the same amount). This will ensure that the impact of spending the money elsewhere is removed from the output. If this is *not* done, the alternate assumption should be explained. Definition of how state investment costs are measured against benefits should be made explicit (e.g., as "pennies from heaven") as weighted input with some standard multiplier to reflect administrative burden or as input categories with their own economic impacts added to the model.

B. Second, *a separate impact study* should be performed, using the government investment as sole input data. This information should be input as a *reduction in statewide purchase capacity or consumer price index*. In other words, a separate study should be performed to calculate the impact of assessing the taxes necessary to pay for the program. Although the results should not be integrated into the output of the primary study, it will serve to demonstrate to the public and legislative body a program's benefit compared to *returning the same amount of government money to the taxpayers' pockets*.

2. Use of standard categories. Standard econometric impact categories are recommended for consideration. In general, these categories include: local construction investments, equipment investments, operating costs and government expenditures. Standard econometric impact categories should also be calculated for indirect industrial participants under SUS Recurring Budget programs. In other words, industrial partners for USF/UCF External Matching Partnership Grants should also calculate contributions as inputs in terms of construction, equipment, payroll, etc.

3. Counting private sector inputs. It is appropriate to document the impact of State investments for participating private sector companies' product and process improvement and especially "increased company activity." This documentation is specifically relevant to University Infrastructure investments that involve many industrial partners.

4. Counting lost revenue. Under existing regulations, a new or expanded silicon technology facility could generate between $10 to $40 million in sales tax revenue on equipment purchases. Under the Silicon Sales Tax Rebate program, however, all sales tax on qualified equipment purchases is returned to the company. This should not be considered a "loss of revenue" to the state, because without the Silicon Sales Tax Rebate program those equipment purchases (and the associated expansion/relocation) would never have been made. Loss of estimated sales tax revenue under the Sales Tax Exemption Program should not be considered as an input.

5. Counting infrastructure costs. When they can be quantified, environmental and resource costs should be considered as inputs. Increased demand on water, transportation and other infrastructures effectively translates into a cost to state and local government that should be included as a factor.

6. Counting university inputs. Direct State investments into the educational sector (e.g., SUS Recurring Budget investments) should be considered as inputs. Similarly, private sector investment into the education sector that is tied to State investment should also be considered (e.g., private sector match investments into universities that are directly tied to State investment programs).

7. Counting Federal inputs. External funding (e.g., Federal grants) attracted or generated as a result of funded programs should be considered as inputs. This includes funded research grants awarded to faculty hired under State program funding.

8. Counting indirect inputs. Although recognized as important, "spill-over" and other difficult-to-quantify benefits from cluster-based economic development should not be used as inputs, but documented separately to support and explain the benefits identified by an econometric study. Company case studies, benefits from name branding and recognition, cooperative marketing, economies of scale and other benefits received from non- participating organizations fall into this category and should only be included for anecdotal support purposes.

The final set of recommendations is in regards to organization and use of the outputs of cluster impact studies.

Recommendations Regarding Outputs

1. Categorization of results by industry. Where possible, impacts from SUS Recurring Budget Categories should be categorized by industrial sector (e.g., microelectronics, information technology, optics, etc.). This will help provide data for long-term analysis.

2. Output categories. Standard econometric impact categories are recommended. These categories include increased employment, increased economic output (revenue) and increased demand and exports.

3. Categorization of results by investment. Results maybe used to measure the respective benefit of each individual State investment program (i.e., by removing each investment from the evaluation in turn and examining the net change). However, this should be undertaken only with caution, as it may not capture economies-of-scale and other shared factors.

4. Time limit. Impacts should not be calculated for more than five years. It is the expectation that econometric studies often project impacts for longer periods to magnify results. In other words, a study that demonstrates the total impact for the combined 15 years following an investment may seem to have a greater benefit than a study that only calculates for three or four years. Whether or not this is the case, legislators are often wary of studies that project impact beyond a realistic time-frame. Furthermore, the rate of technology change is increasing so quickly that impact studies of high-tech industries lose credibility after a few years; "all things being equal" long-range forecasting is not very useful in technology-driven industries.

5. Multipliers. A multiplier should be calculated for every impact study of public investment programs. The multiplier should use the simple formula of total increased economic output (revenue)/total direct government investment. In other words, economic impact divided by government spending, or the "cost-impact" multiplier. Multipliers for both gross and net government investment (if direct government revenue was included as inputs) should be provided.

6. Rule-of-thumb estimates. Impact multipliers identified for a given expansion or study should not be used for other expansions without additional economic analysis. Impact results and multipliers generated for a particular expansion are probably not accurate in other cases, as actual impact can vary greatly by geography, population, and the industrial makeup of regions at the sub-state level.

7. Financial return-on-investment on government spending. In addition to estimates of economic impacts and multipliers, tools are available for projecting actual returns on state investment (ROI). Although they should not replace impact assessment as a tool for measuring the "worth" of a State investment, they can provide very useful supplemental information regarding the level of additional taxes that may be raised over time as the result of a given program. For example, it may be useful to know how much of a program's costs can be recouped from any increased economic activity that results. The Task Force has identified three methods for developing revenue projections that result from a state investment.

Florida Economic and Demographic Research. The Office of Economic and Demographic Research has the ability to review or generate revenue estimates for the State of Florida. Staff experts have developed revenue models that can be utilized independently of an impact study. However, standard economic impact categories used by Implan and REMI may not be readily useable by EDR's models.

Using Micro IMPLAN. In June, 1999, the Minnesota Implan Group Inc. released "Using Social Accounts to estimate Tax Impacts" to address how the information generated by Implan can be used to estimate taxes and other payments received by governments. Using Implan and the report guidelines, a Tax Impact Report can be generated based on the assumptions that impacts will be proportional to baseline economy and revenue without program changes, as well as baseline private sector expenditures by industry. Implan's tax revenue projections, like the rest of Implan's data, relies on federal datasets such as the Bureau of Economic Analysis' National Income and Product Accounts (NIPA) and Regional Economic Information System (REIS), and the Bureau of the Census' Consumer Expenditure Survey (CES) and Annual Survey of State and Local Government Finances (SLGF).

Using REMI Policy Insight. As of January, 2000, REMI Inc. has updated Policy Insight to incorporate a new output category, "Fiscal". As with Implan, this category is based on average state revenues documented by the federal government - specifically, the State and Local Government Finance estimates. Revenues are estimated at the aggregate state level or local/intrastate level. Further, revenue can be estimated by source (e.g., property tax, general sales tax, individual or corporate income tax, worker's compensation, etc.).

As REMI is the standard model used in this report, all projected state revenues will be based upon the Policy Insight Fiscal estimates.

If Implan or REMI are used to generate revenue impact projections, the same caveats and guidelines suggested in this report should be taken into consideration. Revenue projections will be subject to the same factors that can increase or decrease their projected impact and credibility as any other economic impact variable.

Task Force Findings

To test recommendations and to provide initial feedback as to the effectiveness of the investments under consideration, a number of econometric impact studies were conducted. These studies were performed by Guy Hagen, and followed the recommendations as the Task Force developed them. Input data was collected directly from the agencies and organizations involved (e.g., USF and UCF, Cirent Semiconductors, and city, state, and county economic development agencies).

Impact of State Cluster Investments in University Infrastructure

The first category of State cluster investments included annual, recurring infrastructure investments into the University of Central Florida (UCF) and the University of South Florida (USF) via the Florida Board of Regents budget. These investments were intended to provide support for the Florida High Tech Corridor initiative, to develop partnerships with technology-based industries, to increase workforce training, research, and education capacity and to encourage research for product and process improvement. To document the scope and benefits of university investments, an econometric study was performed for the two universities' 1998-1999 High Tech Corridor expenditures. These data were selected as they were expected to be representative of the previous year's expenditures, and were readily available through the Florida High Tech Corridor Annual Report and university records.

Input. In 1998-1999, $6.84 million was appropriated for USF and UCF High Tech Corridor activities. This was spent on university infrastructure and industry partnerships with at least 36 companies. $9.5 million private sector cash, equipment and in-kind match were contributed to these partnerships (input data is detailed in Appendix IV).

Output. The impact studies show that, although these funds were for "infrastructure building" (developing resources that will pay off in the long term), the program resulted in immediate return to the economy. In just the single year following the investment, between $15.7 and $18.1 million impact was generated, including an additional 155 to 180 jobs statewide (see Figures 1 and 2). This results in a multiplier of between 2.3 to 1 and 2.6 to 1 (for every state dollar invested, between two and three dollars were generated in Florida's economy that year).

There are a wide variety of multipliers in common usage, varying by input/output model, available data, and analytical focus. In this study, we calculate multipliers based upon the formula presented on Page 15, which compares net government investment to increased economic output.

Figure 1. Impact of University Investments on Statewide Revenue

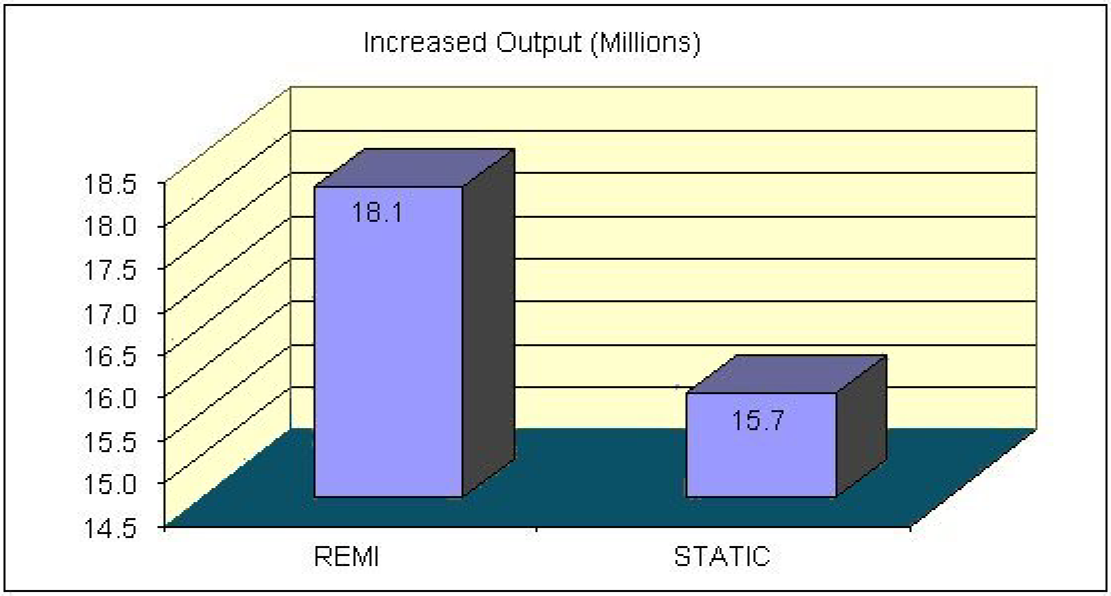
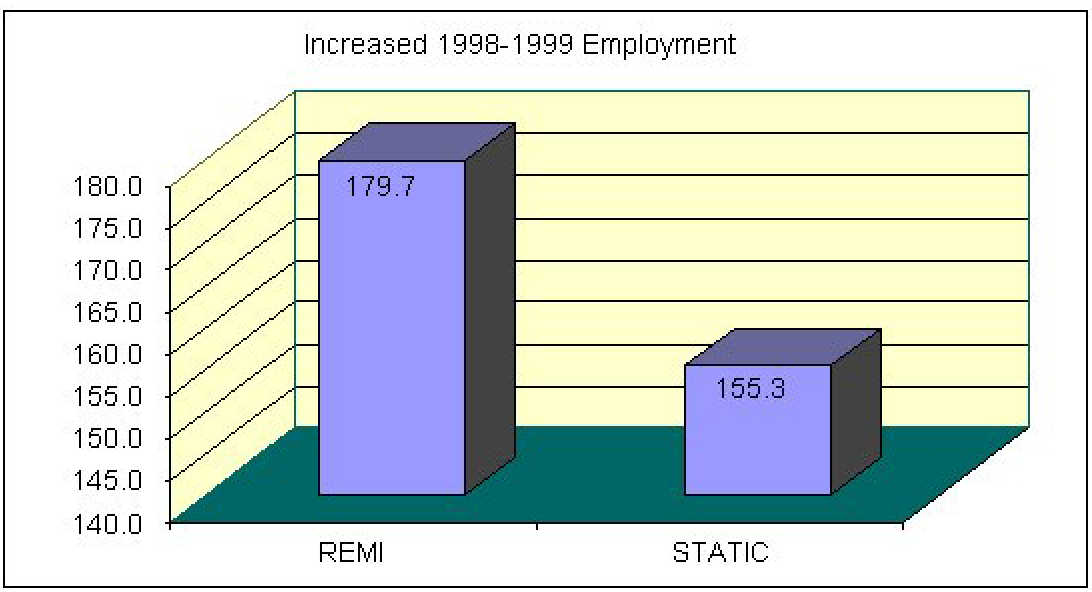


Figure 2. Impact of University Investments on Statewide Employment



Legislators and academics often discuss the merits of a government program versus returning the money to the taxpayers. The taxes assessed to fund a program have their own impact if returned to the economy, the resulting increased purchasing power will have a positive effect in terms of statewide revenue. We have modeled the taxes as a cost by increasing the consumer expenditure price index by the amount that the universities were funded ($6.84 million) in 1998-99, as the primary source of State revenue is consumer sales tax. As a result, we estimate that the impact of returning the taxes to the State's economy would be between $7.6 and $12.5 million, including between 109 and 165 jobs (between $1.11 and $1.83 per tax dollar). These figures are shown as negative impacts in Figures 3 and 4.

Figure 3. Assessed Tax for SUS Investment: Impact on Statewide Revenue

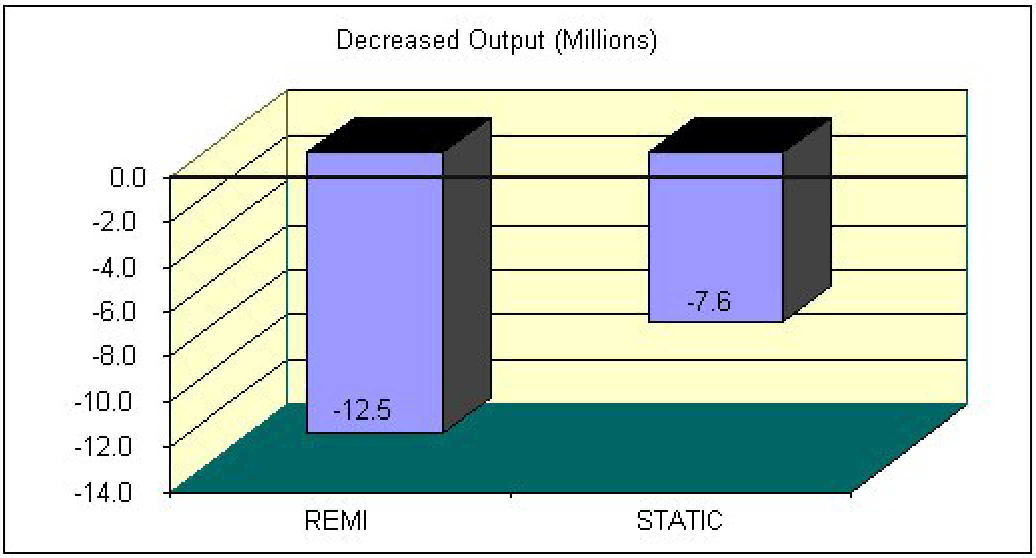
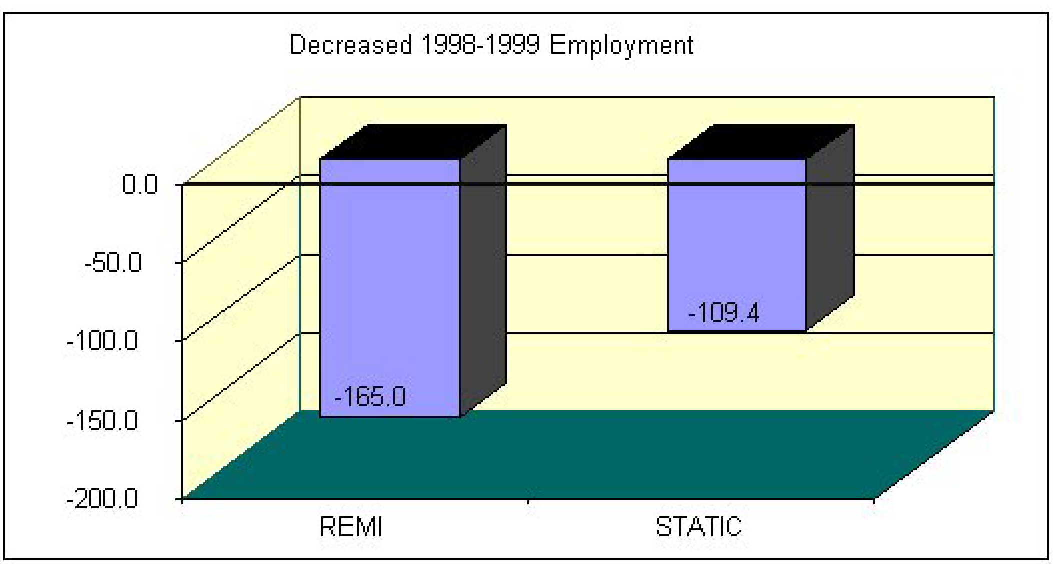
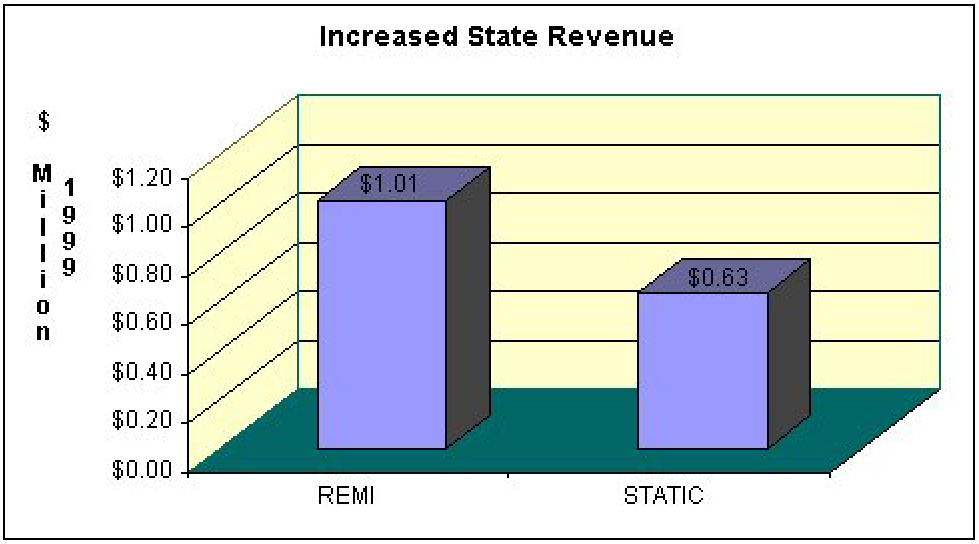


Figure 4. Assessed Tax for SUS Investment: Impact on Statewide Employment



State Revenue. Although the previous figures demonstrate the act of assessing taxes to pay for the university infrastructure investments has an economic cost of its own, the act of investing in the universities creates a positive economic impact that in turn, increases state revenue. Within one year of investment, REMI Policy Insight projects that between $600,000 and $1 million in additional state revenue will be generated to offset investment costs.

Figure 5. Increased State Revenue From University Infrastructure Investments



Impact of Cirent/Bell Labs Expansions under the Florida Silicon Sales Tax Program

The second State cluster investment program is the Silicon Sales Tax exemption program. As of the date of this report, only the Cirent Semiconductor and Bell Laboratories facility expansions have qualified under this program and opted to reinvest in university research. However, these expansions also received State support under other programs (specifically, the HIPI and QTI programs, as well as city and county programs). To accurately attribute the impacts as shared between the programs a single impact study was performed including all government investments for all three expansions, combined.

Input. The selected study period included in the years 1997 to 2003, which included the year of first Cirent Semiconductors/Bell Labs expansion investment until four years following the last investment (1999). The total government investment during this period is approximately $91 million. In addition, this will result in a combined private sector investment of $1.66 billion ($80 million construction, $1.58 billion equipment) by Cirent Semiconductors /Bell Labs. Finally, this will also result in $60 million invested into central Florida universities by Cirent Semiconductors /Bell Labs through the Silicon Sales Tax rebate program. Details of input data are listed in Appendix IV.

Figure 6. Combined Silicon Technology Economic Development Investments

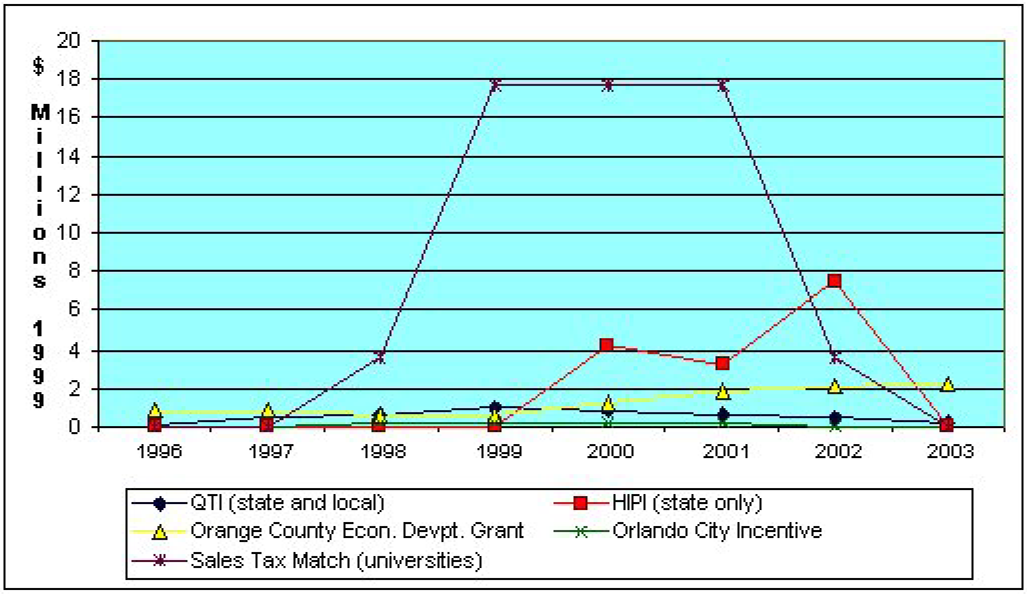
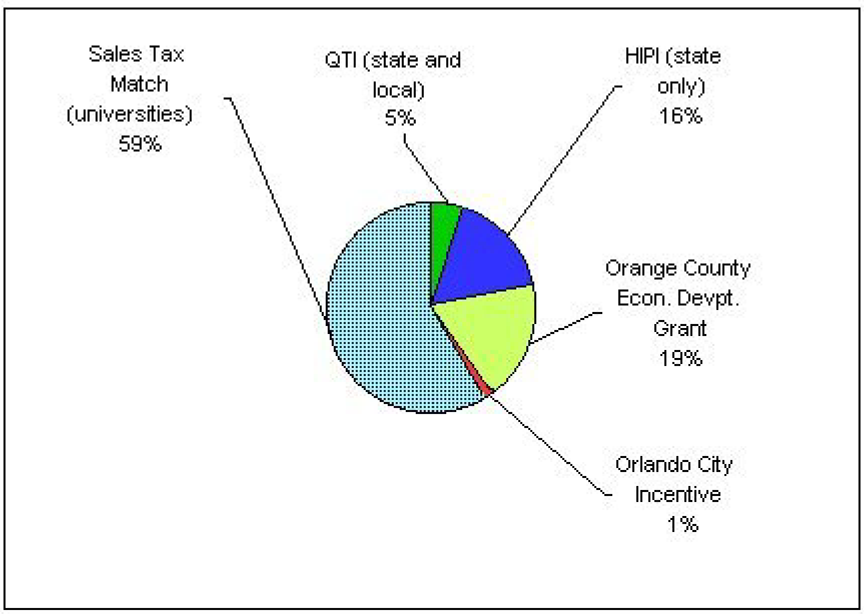


Figure 7. Relative Investment By Each Economic Development Program



Output. Investments during the project period result in a combined impact of between $1.3 and $1.4 billion in additional revenue for Florida's economy, including the creation of an additional 2,700 (REMI Static) to 3,100 (REMI Standard) jobs over the study period. This creates a multiplier between 14.3 to1 and 15.4 to 1 (for every government dollar invested, $14 to $15 will be generated in Florida's economy).

Figures 7 and 8 demonstrate the economic impacts on a year-by-year basis. As would be expected, the majority of the impact shows as a "spike" during the initial years wherein the majority of the Cirent Semiconductors/Bell Laboratories construction and equipment expenditures were made (1998-2000).

Discussion. Why are the multipliers for these expansions so high? After stating early in this report that investments rarely generate multipliers more than 2 to 1, the dramatic 14 to 1 multiplier resulting from Cirent Semiconductor / Bell Laboratories expansions may be difficult to believe. The exact same methodology used to generate the SUS Infrastructure Investment impacts was used to analyze the Cirent Semiconductor / Bell Laboratories expansions; however, the Cirent / Bell Labs projects had strikingly different inputs.

1. In this study, less than $100 million gross government investment resulted in over $1.4 billion in private sector capital investment in construction and equipment. Without any additional econometric analysis or indirect benefits, simple math shows this to be about a 14 to 1 multiplier.

2. Although the REMI model predicts that around half of the equipment expenditures made by Cirent Semiconductors / Bell Laboratories would be made out-of-state (imported due to lack of local manufacturing capacity, referred to as the Regional Purchase Coefficient), the remaining amount generates a strong economic impact.

Figure 8. Impact of Silicon Technology Investments on Statewide Economy

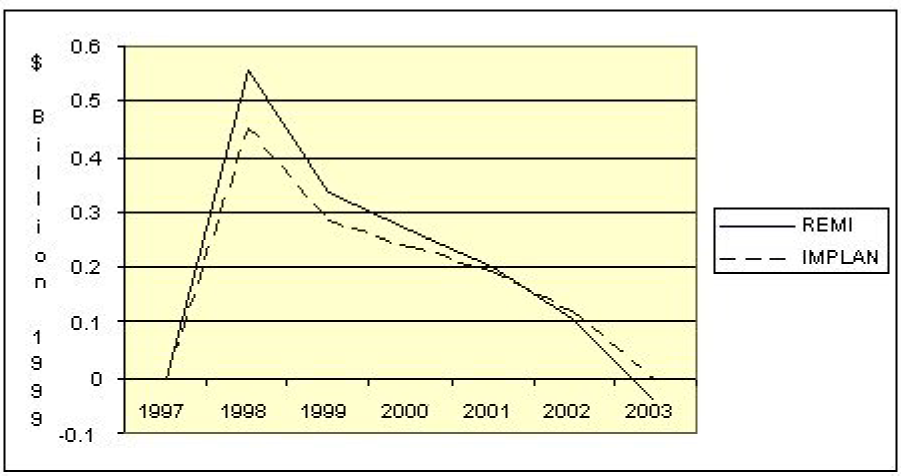
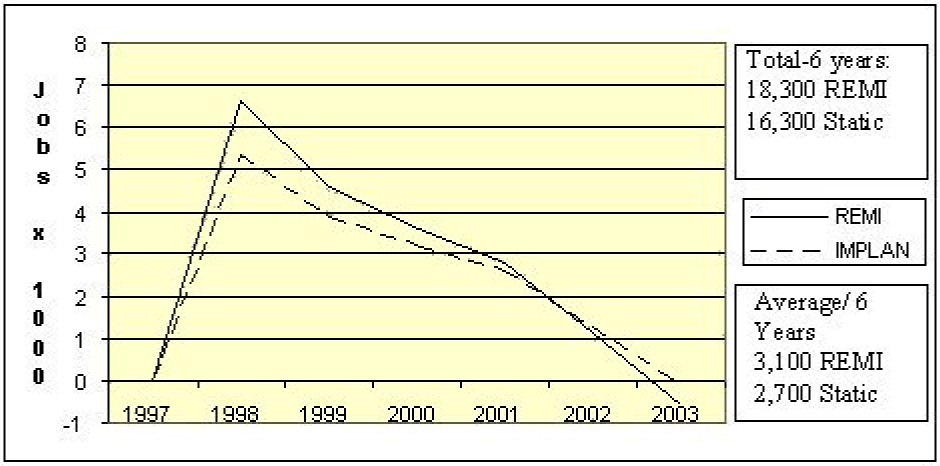


Figure 9. Impact of Silicon Technology Investments on Statewide Employment



As discussed for the State University System investments, the government funds that were invested in the Silicon technology programs were generated by various taxes imposed on Florida's economy. These taxes (as with any tax) have an economic impact of their own which can also be calculated (to answer the question, "What would be the effect of returning the cost of the programs to the taxpayers?"). The negative impact of the taxes raised to pay the combined $91 million invested in silicon technology expansions was between $100.5 million (REMI Static) and $166 million (REMI Dynamic), including a cost of 236.7 (REMI Static) to 378 (REMI Dynamic) jobs over six years, statewide. Figures 9 and 10 show the impacts of the assessed taxes by year.

Figure 10. Assessed Tax for Sales Tax Program: Impact on Statewide Economy

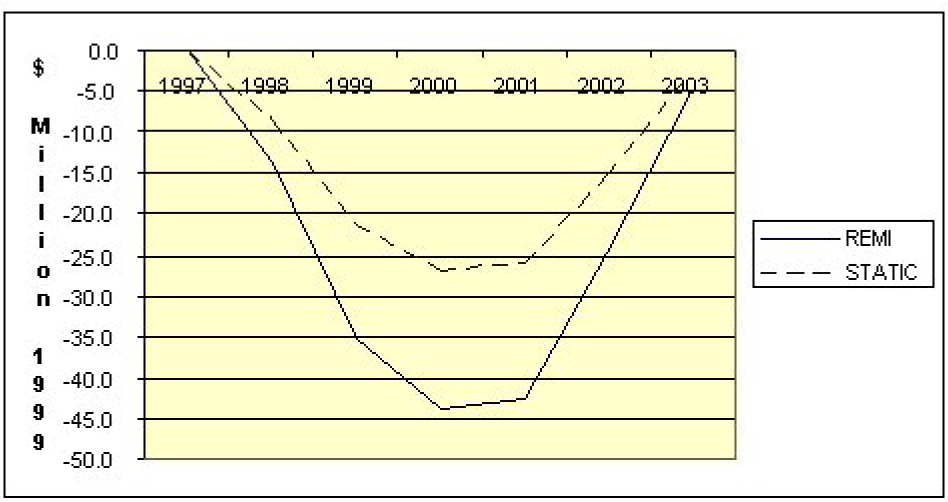
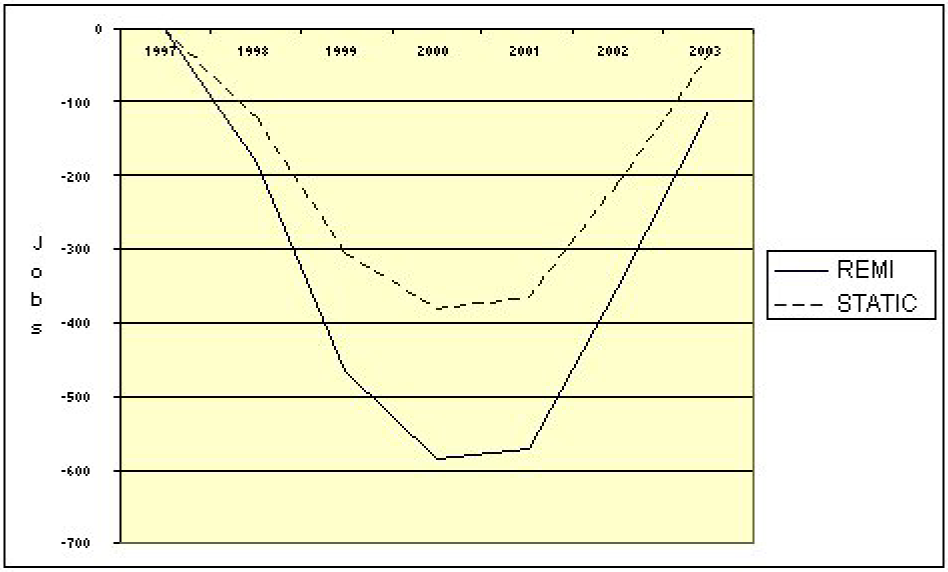
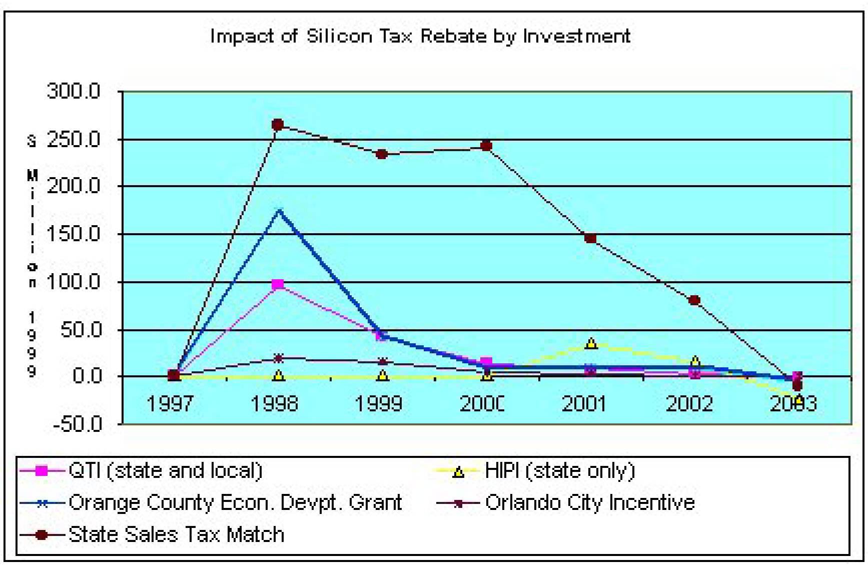


Figure 11. Assessed Tax for Sales Tax Program: Impact on State Employment



As demonstrated by Figure 5 and Figure 6, multiple government programs contributed to the Cirent Semiconductor / Bell Laboratories expansions. These programs were invested in different amounts over different schedules within the expansion time-frame. Assuming that the economic impact of an expansion can be divided proportionally among the programs that invested in it for each individual year, Figure 11 illustrates how different economic development investments have contributed to the impacts. (Please note that additional research may be required to determine if industry values one program more than another for its contribution to expansion / relocation efforts.)

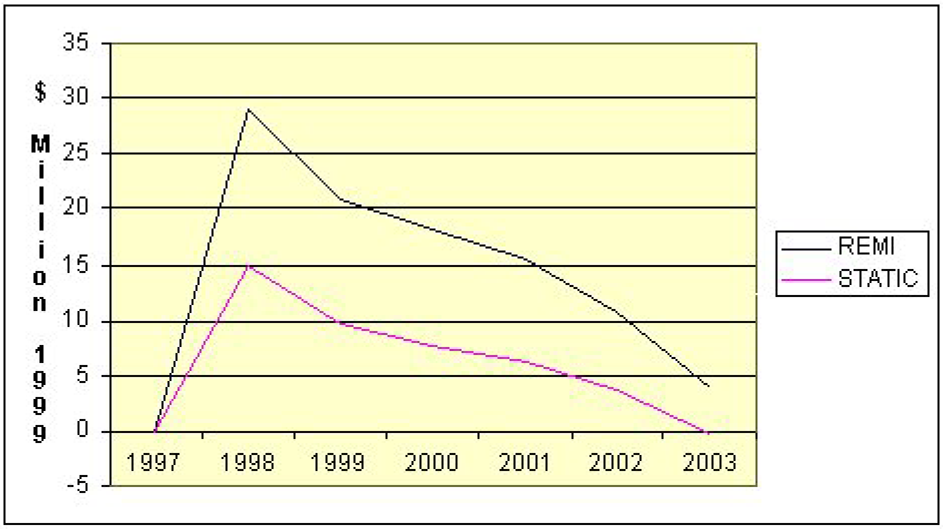
Figure 12. Impact of Each Government Silicon Technology Investment



State Revenue. Again, although the previous figures demonstrate the negative impact of assessing taxes, a considerable return on state investment for the Silicon Sales Tax

Rebate program can be shown. As a result of increased economic and industrial activity spurred by state investments in silicon technology, an increase in State tax revenue between $42.1 (Static) and $98.2 million (REMI) is projected between 1998 and 2003. In other words, state and local investments in this program can be projected to be almost "repaid" in six years. Given that Orange County alone projected that an approximate $49 million in additional property tax revenue (including depreciation) would be claimed as a direct result of the Lucent expansions, the $98 million figure does not seem extraordinary.

Figure 13. Increased State Revenue From Silicon Sales Tax Rebate Investments



Impact of Multiple Silicon Facility Expansions

The final impact study generated by the task force was to determine the effect of multiple, consecutive expansions within an industry sector and region, as compared to a single expansion in isolation. As noted earlier in this report, a single expansion may result in a slight overcompensation effect that has negative impact in outgoing years (although overall impact is very positive).

This study presents the results of conjectural, multiple silicon industry expansions modeled after the previous study. The Cirent Semiconductors/Bell Labs expansions through 1999 were taken as a baseline, but impacts were projected for an additional seven years to demonstrate economic overcompensation and rebound. Then, three impact methods were overlaid; in each method, two additional silicon-manufacturing facilities were projected in sequence. This conjectural impact study was conducted using REMI standard / dynamic model only. Please note that neither REMI nor any other input/output impact model can completely predict the availability of resources such as labor, water, or other infrastructure requirements; this study was conducted to highlight economic reactions and presumes that such resources would be available.

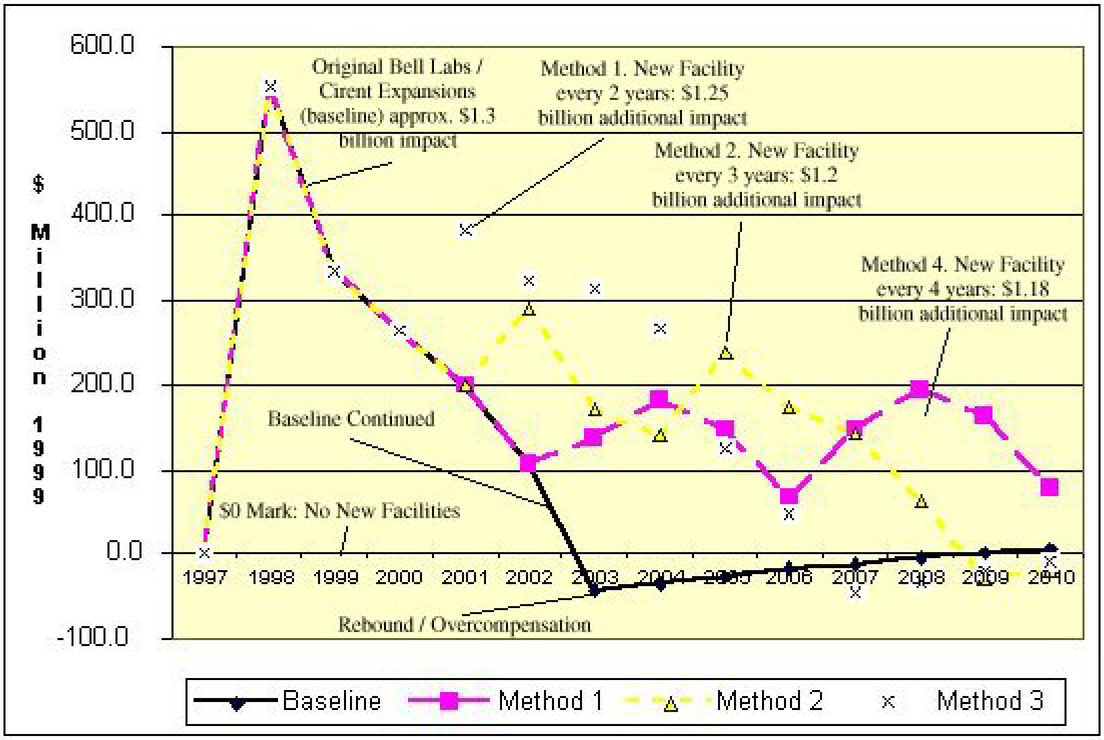
Input. The 1999 Cirent Semiconductor expansion was used as a model for each additional expansion, including private sector investment and government investment. The investment for each individual expansion was only calculated for five years, although the combined impacts (both positive and negative) were allowed to accrue for the entire study period. Investment projections longer than five years were deemed unpredictable due to the volatile growth rate of high-technology industries. The investment categories are detailed in Appendix IV, but are equivalent to Figure 5 between 1996 and 2003. Each overlaid impact study used the same input data, but input them at different rates.

Baseline: Initial Cirent / Bell Labs investments only

Method 1:
One additional $700 million facility every two years (combined government investment of $200 million)
Method 2:
One additional $700 million facility every three years (combined government investment of $200 million)
Method 3:
One additional $700 million facility every four years (combined government investment of $189 million)

Output. Figure 13 shows the resulting impacts under each study method. Although impact levels of the additional facilities during the study period are approximately equal (between $2.5 and $2.57 billion), the year-by-year consequences differ noticeably. In particular, the baseline impact (Cirent/Bell Labs original expansions only) is shown to have a slight negative "rebound" effect near 2002 if no other expansions occur. Any new expansion or investment, in isolation, will probably have this overcompensation effect as the economy builds capacity and then adjusts to demand that is no longer there (even if the net impact is very positive). However, the establishment of additional silicon facilities help to "ride the wave"" of original impacts, countering any negative economic reaction for an additional 3-4 years. Most importantly, however, Method 3 (new facility every four years) shows that a steadier rate of expansion will result in a more stable level of overall economic growth during the study period.

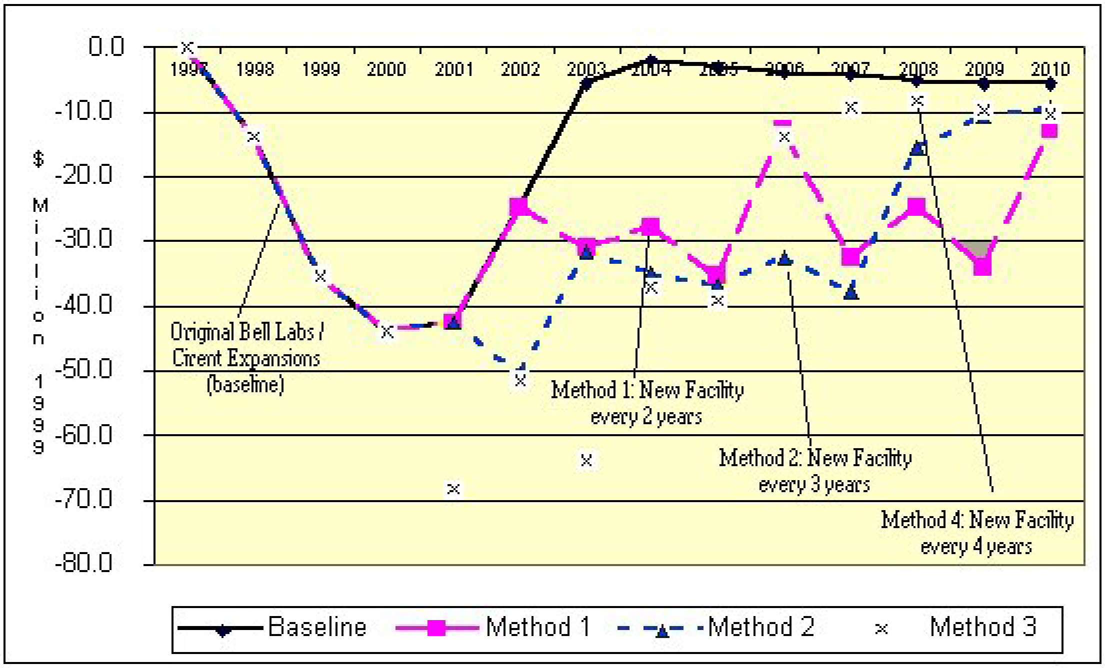
Figure 14. Impact of Multiple Silicon Technology Expansions



All impact above the $0 graph line is positive; by pacing continued expansion/development efforts within a cluster or industry, it should be possible to raise overall economic activity to a new level. Of course, economic impact models cannot predict any new business startups / relocations that may occur as the result of the semiconductor expansion activity ("indirect cluster activity") which may further counter any negative adjustments. The resulting impact multiplier based on these figures is between 12.9 and 13.2 to 1 (impact per government dollar invested).

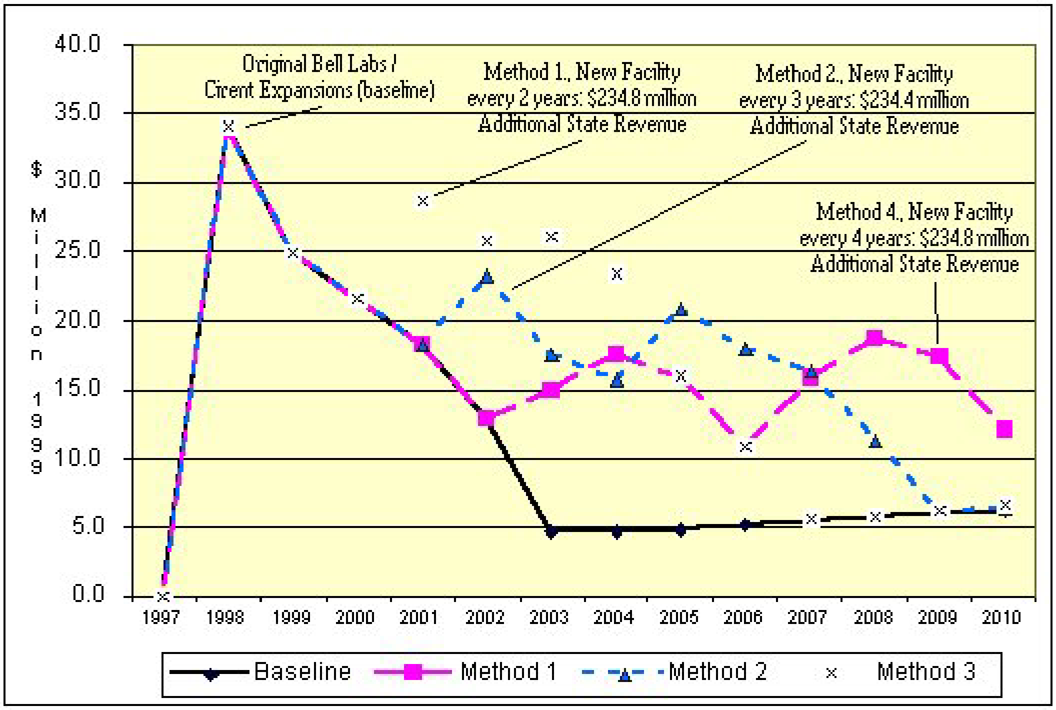
Figure 14 shows the estimated negative impact of the taxes necessary to fund the various economic development programs underlying the multiple expansions. As with Figure 13, multi-year impact is calculated for each method (one additional facility every two years, three years or four years). Total impacts of assessed taxes ($189-$200 million) would be expected to be between $371 and $404 million.

Figure 15. Assessed Tax for Multiple Silicon Expansions: Impact on Statewide Revenue and Jobs



Finally, we use REMI to project the amount of increased state revenue that would be collected from the economic activity resulting from the multiple facility expansions. As shown in Figure 15, the projected increased state revenue ("return on investment") would be between $234 and $236 million over the study period. In other words, it is expected that the establishment of multiple semiconductor facilities would more than pay back the state investment (between $189 and $200 million) within the study period.

Figure 16. Increased State Revenue From Multiple Semiconductor Facility Expansions



Concluding Remarks

Increasing technical complexity, emerging developments in international trade, the information age and other global challenges are transforming the nature of economic competition throughout the world and having untold consequences on the economic viability of Florida and its ability to promote and sustain economic growth and development. If left unattended, the economic health, well-being and prosperity of Florida and its citizens could be at risk. That risk is growing each year as global, state and substate-regional competition intensify.

It is not unusual for states to invest millions of dollars-some spend hundreds of millions-each year on economic incentives that are designed to spur economic growth and development. Many claim that they do so to enhance their competitive advantage vis-…-vis that of other states in today's global economy.

Governors and state legislators frequently are faced with undocumented claims regarding whether economic development incentives work. Seldom do they have scientific/empirical knowledge about the nominal or actual impacts-positive or negative-that such incentives will have on their states' economies or competitive positions vis-…-vis other states. To complicate matters further, election cycles do not coincide with the longer-term returns, if any, that could result from economic development investments.

This study represents an objective first effort by the Florida Cluster Metrics Task Force to comprehensively examine the past, present and probable future returns on economic investments by the State of Florida in the regional high technology industry cluster extending from the Space Coast to Tampa Bay. The Task Force developed guidelines whereby Florida can better (1) identify and fund regional industry clusters in Florida and (2) measure with more confidence than presently exists returns on both Florida's long- and short-term (or annual) cluster investments as compared to that obtained by cluster investments in other states.

In assessing long-term cluster growth and returns on investment, it is important for Florida to recognize that neither growth nor cluster investment impacts can occur nor be sustained unless companies are attracted to a region and take advantage of research, technology transfer, sales and cooperative venture opportunities. Ironically, the true targets of cluster development are the companies and workforce members that never actually receive any direct public funding or incentives. It is important too that migrating workers capitalizing on competitive recruitment opportunities bring with them viable social and economic capital.

In order for Florida to validly and reliably assess, capitalize on and sustain long-term returns on cluster investments, it is imperative that it adopt a multifaceted approach which periodically (1) incorporates business indicators that measure company profitability growth or industry production capacity growth over time in comparison to industry standards in other states or regions; (2) measures performance by comparing company growth or startup rates to industry standards or other regions; (3) compares regional macroeconomic growth indicators with national benchmarks; (4) takes into account increases in university technology transfers or sponsored research; and (5) recognizes national standing by company count or industrial revenues. Periodically-preferably on a decennial basis-Florida also should objectively benchmark the returns of its cluster investments and compare them with returns on investments made by other states.

Valid and reliable assessment of short-term returns on cluster investments is difficult albeit surmountable, despite the vicissitudes of election cycles. Notwithstanding certain methodological difficulties associated with documenting short-term cluster growth, the Task Force recommends that Florida henceforth periodically perform econometric impact analyses of cluster growth and returns on annual Florida cluster investments. For comparative purposes, this should be done utilizing REMI and Micro Implan econometric models. Short-term economic impact analysis should be methodologically compatible with the models used by other states.

The Task Force applied two economic impact models-REMI Dynamic and Static models-to determine the effectiveness of Florida's economic development cluster investments in the three areas subjected to analysis:

1. infrastructure investments in the University of Central Florida (UCF) and the University of South Florida (USF) in support of technology transfer and growth in the Florida High Tech Corridor;

2. investments by The State of Florida, city and county governments in Cirent

Semiconductor/Bell Laboratories silicon technology expansions; and

3. multiple facility investment return projections in silicon technology expansions utilizing the Cirent Semiconductor 1999 expansion as a baseline.

The Task Force estimates that the returns on the infrastructure investment resulted in a one-year impact of $15.7 million from $6.8 million invested in the University of Central Florida and the University of South Florida, plus 155 or more jobs and $9.5 million in private sector matching vestment. It is estimated that a $91 million silicon technology expansion invested by Florida, city and county governments as of 1999 will result in a $1.3 billion impact on Florida's economy over five years, including $.6 to $1 million to be recovered by state government in increased tax (and other) revenue and 2,700 new jobs created.

The Task Force noted that a state's economy will likely eventually overcompensate-the so-called negative rebound effect-in response to diminishing demands resulting from any singular new cluster expansion/investment such as the $91 million invested as of 1999 in the silicon technology expansions. Intentional investment efforts to build an industrial sector will probably not remain stable unless the initial expansion is accompanied by additional cluster expansions which, in turn, raise, sustain or surpass the initial level of economic activity.

REMI projections show that additional $700 million increments invested every two, three or four years beyond the $91 million gross initial investment would result in *additional* returns of $1.25, $1.20 and $1.18 billions, respectfully, thereby ameliorating the negative rebound effect.

Appendices

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