FIU
FLORIDA INTERNATIONAL UNIVERSITY
Miami's public research university

ECONOMIC IMPACT STATEMENT

FLORIDA INTERNATIONAL UNIVERSITY SCHOOL OF MEDICINE
2008, 2010, 2015 & 2025

February 20, 2006

TrippUmbach
research ■ strategy ■ impact

EXECUTIVE SUMMARY

Tripp Umbach was retained by Florida International University to conduct a comprehensive economic impact study of the proposed School of Medicine on the State of Florida and South Florida. Tripp Umbach calculated both direct and indirect impact numbers for the Florida International University School of Medicine in all benchmark years (2008, 2010, 2015 and 2025)[1].

Tripp Umbach developed customized models that calculate the economic, employment, and government revenue impacts associated with the proposed school of medicine at Florida International University. Data used by Tripp Umbach was provided by Florida International University and from Tripp Umbach's previous research with 125 medical schools and more than 400 teaching hospitals. It is important to note that much of the data included in Tripp Umbach's models are based on actual historical data from similar sized medical schools as the one proposed at Florida International University.

From 2008 until 2015, the scenarios modeled include the following entities: Florida International University School of Medicine, FIU Research, and FIU Clinical Practice**.** In 2025, Tripp Umbach assumes that a 150-bed clinical facility will be present on the FIU campus in addition to the entities already present in 2015. Furthermore, the economic impact findings also include impacts related to the commercialization of research activities in Florida and South Florida in both 2015 and 2025. The report also includes the economic impacts associated with physicians who graduated from the Florida International School of Medicine and remain in Florida and South Florida to practice medicine. Finally the report quantifies other ancillary impacts such as associated healthcare cost savings attributable to primary care physicians who practice in underserved communities.

To calculate the economic impact of the Florida International University School of Medicine and research commercialization in the state of Florida, Tripp Umbach used a methodology derived from the original set of research tools and techniques developed for the American Council on Education (ACE).[2] The ACE-based methodology employs linear cash flow modeling to track the flow of institution-originated funds through a delineated spatial area. In addition, Tripp Umbach utilized a forward-linkage modeling methodology to measure the potential impact of the School of Medicine and research commercialization in the state of Florida.

Traditional economic impact studies are based on direct spending and re-spending within the economy (multiplier effect) driven from the institution itself. Forward-linkage models measure the broader impacts that occur or may occur in the economy as a result of the research and development activities of an institution – beyond the traditional direct and indirect impact. Examples of forward-linkage impacts include businesses that spin-off from research activities, to new and existing businesses, and sponsored research relationships.

[1] All models are based upon 2005 dollars.

[2] Caffrey, John and Isaacs, Herbert, "Estimating the Impact of a College or University on the Local Economy," American Council on Education, 1971.

Tripp Umbach is the national leader in providing economic impact analysis to leading health care organizations and academic health centers. The firm has completed more than 100 economic impact studies over the past 10 years for clients such as the Mayo Clinic Rochester, The Cleveland Clinic, University of Florida, University of Arizona College of Medicine and the Ohio State University Medical Center. In addition to work on multiple occasions for the six allopathic medical schools and academic medical centers in Pennsylvania, Tripp Umbach has completed statewide studies for multiple institutions in Ohio, Virginia, South Carolina, Wisconsin and Minnesota.

Tripp Umbach recently began its third national study of all 125 medical schools and 450 teaching hospital affiliates for the Association of American Medical Colleges. Tripp Umbach has also completed economic impact studies for medical schools such as the University of North Carolina, Ohio State University, The Ohio State University, Milton S. Hershey Penn State University Medical Center, University of Pittsburgh, University of Pennsylvania, Michigan State University and for proposed medical schools in Phoenix, Arizona, Grand Rapids Michigan, and Scranton, Pennsylvania.

STATE OF FLORIDA FINDINGS

STATE OF FLORIDA ECONOMIC IMPACT FINDINGS

- Tripp Umbach estimates that the Florida International University School of Medicine will become a leading economic engine in Florida by 2025; the School of Medicine operational impact is expected to generate $624 million.

- In addition to the University's operational impact, the commercialization of research (conservative) is projected to generate up to $248 million in the state's economy. While new companies will be formed from research activities, the majority of economic, employment, and government revenue impacts will be attributable to growth of existing companies in the established biomedical sector.

- Tripp Umbach estimates that the total combined economic impact of the school of medicine, physicians who remain to practice in Florida and the commercialization of research will result in a total economic impact greater than $1 billion by 2025.

- By 2025, for every State tax dollar invested in the Florida International University School of Medicine more than $30.00 will be added to the State's economy.

STATE OF FLORIDA EMPLOYMENT IMPACT FINDINGS

- The Florida International University School of Medicine operations are estimated to generate between 5,386 jobs (2015) and 8,272 jobs for Florida residents (2025)[3].

- The commercialization of research will result in the creation of an additional 1,213 jobs (2015) and 1,819 jobs for Florida residents (2025)

- Tripp Umbach estimates that the total employment impact of the school of medicine, physicians who remain to practice in Florida and the commercialization of research will result in a total economic impact of 12,491 jobs by 2025.

STATE OF FLORIDA GOVERNMENT REVENUE FINDINGS

- The Florida International University School of Medicine will generate significant tax revenue for the State of Florida. Operational activities of the new medical school will generate more than $10.5 million annually in 2015 and more than $19.1 million annually by 2025.

- Additional tax revenue of $8 million by 2015 and $13 million by 2025 will be generated by the commercialization of research. Further tax revenues will accumulate from

[3] Tripp Umbach estimates that the average salary of direct and indirect employment will be $68,000 annually which is significantly higher than the average wage in the Sate of Florida for all jobs. The mean wage in the State of Florida is $34,720 (www.floridawages.com).

physicians graduating from the University who remain in Florida to practice ($30 million by 2025).

- By 2015, for every State tax dollar invested in the Florida International University School of Medicine ($20 million) approximately one dollar in State tax revenue will be generated ($19.1 million).

- By 2025, the State of Florida will receive $62 million in total state taxes as a result of the medical school, research commercialization and physicians who remain to practice in Florida; thereby receiving approximately $3.00 in taxes for every dollar invested.

STATE OF FLORIDA				
Economic Impacts (in millions)	**2008**	**2010**	**2015**	**2025**
Medical School Operations	$58	$110	$323	$624
FIU School of Medicine Graduates who practice in Florida	$0	$0	$0	$288
Commercialization of Research (conservative)	$0	$0	$165	$248
Total Impact (in millions)	**$58**	**$110**	**$488**	**$1,160**
Employment Impacts (jobs)	**2008**	**2010**	**2015**	**2025**
Medical School Operations	447	1,188	5,386	8,272
FIU School of Medicine Graduates who practice in Florida	0	0	0	2,400
Commercialization of Research (conservative)	0	0	1,213	1,819
Total Jobs (jobs)	**447**	**1,188**	**6,599**	**12,491**
Government Revenue (in millions)	**2008**	**2010**	**2015**	**2025**
Medical School Operations	$2	$4	$11	$19
FIU School of Medicine Graduates who practice in Florida	$0	$0	$0	$30
Commercialization of Research (conservative)	$0	$0	$8	$13
Total Taxes (in millions)	**$2**	**$4**	**$19**	**$62**

SOUTH FLORIDA FINDINGS

SOUTH FLORIDA ECONOMIC IMPACT FINDINGS

- The Florida International University School of Medicine operations are expected to generate $499 million in annual economic impact for South Florida by 2025.

- In addition to the University's operational impact, the commercialization of research (conservative) is proposed to generate up to $191 million in the regional economy by 2025.

- Tripp Umbach estimates that the total combined economic impact of the medical school, physicians who remain to practice in Florida and the commercialization of research will result in a total economic impact greater than $911 million by 2025.

SOUTH FLORIDA EMPLOYMENT IMPACT FINDINGS

- The Florida International University School of Medicine operations are estimated to generate between 4,308 jobs (2015) and 6,618 jobs (2025) for South Florida residents.

- The commercialization of research (conservative) will result in the creation of 933 jobs by 2015 and 1,399 jobs by 2025 within the South Florida region.

- Tripp Umbach estimates that the total employment impact of the school of medicine, physicians who remain practice in Florida and the commercialization of research will result in a total economic impact of 10,217 jobs by 2025.

SOUTH FLORIDA GOVERNMENT REVENUE FINDINGS

- The Florida International University School of Medicine operations will generate significant tax revenue for South Florida. Operational activities of the new medical school will generate more than $8 million annually in 2015 and more than $15 million annually by 2025.

- Additional tax revenue will be generated by commercialization of research ($6 million in 2015) and from physicians who graduate from the University and remain in South Florida to practice ($10 million in 2025).

- By 2025, South Florida governmental entities will receive $49 million in regional revenues as a result of the School of Medicine operations, research commercialization and physicians who remain to practice in Florida.

SOUTH FLORIDA				
Economic Impacts (in millions)	2008	2010	2015	2025
Medical School Operations	$46	$88	$258	$499
FIU School of Medicine Graduates who practice in South Florida	$0	$0	$0	$221
Commercialization of Research (conservative)	$0	$0	$127	$191
Total Impact (in millions)	**$46**	**$88**	**$385**	**$911**
Employment Impacts (jobs)	**2008**	**2010**	**2015**	**2025**
Medical School Operations	357	950	4,308	6,618
FIU School of Medicine Graduates who practice in South Florida	0	0	0	2,200
Commercialization of Research (conservative)	0	0	933	1,399
Total Jobs (in millions)	**357**	**950**	**5,241**	**10,217**
Government Revenue (in millions)	**2008**	**2010**	**2015**	**2025**
Medical School Operations	$1	$3	$8	$15
FIU School of Medicine Graduates who practice in South Florida	$0	$0	$0	$24
Commercialization of Research (conservative)	$0	$0	$6	$10
Total Taxes (in millions)	**$1**	**$3**	**$14**	**$49**

INTRODUCTION

With a population of over 17 million residents, Florida is the fourth most populous and the third fastest growing state in the nation[4]. The State of Florida is in a unique position to become a national center for advanced healthcare research, teaching and clinical care through the development of a new medical school in South Florida. Such a school will incorporate and build upon the existing academic and research strengths of Florida International University while improving overall health and research within South Florida and the State. Currently, the university's Biomedical Engineering program offers a combined Bachelor of Science/Master of Science (BS/MS) five-year program that is designed by, and for, the biomedical industry. It also offers Ph.D. programs in chemistry and biology and a clinical rotation. Through the university's partnership with Baptist Health Systems of South Florida, Inc. and the Miami Cardiac and Vascular Institute, students are introduced to applications and real life situations associated with the use of medical devices and instruments in clinical medicine. The new School of Medicine at Florida International University will become an important economic engine for the entire State of Florida, as well as a magnet in South Florida for local, regional, national, and international healthcare research and clinical organizations. In addition to training additional physicians, the Florida International University School of Medicine will also foster the development of biomedical start-ups and further attract research dollars to the state and region.

Academic medical centers are among the most important contributors to a state's economy. Research conducted in 2003 by Tripp Umbach for the Association of American Medical Colleges indicates that medical schools and their affiliated teaching hospitals account for more than $320 billion annually. While Florida ranks fourth in population, it ranks 10th in the total economic impact from medical education, research, and academic clinical enterprises. States with far fewer residents such as Massachusetts and Pennsylvania have academic medical industries that are more than $10 billion larger than that of Florida. The proposed School of Medicine and Florida International University will help the State of Florida grow its existing $14 billion academic medical industry over the next 20 years.

According to a 2005 study completed by Ernst and Young[5], Florida is ranked the 11th largest biotechnology center in the nation. Florida is on the verge of becoming a major player in the biotechnology industry. With the announcement of Scripps Florida, and Governor Bush and the Florida Legislature's establishment of Florida's Centers of Excellence in Biomedical and Marine Biotechnology and Regenerative Health Biotechnology, Florida will be a hotbed for technological advancement in the biotechnology industry. So far, the greatest impact of Florida's biotechnology activities has been in the discovery and production of new pharmaceuticals, safer vaccines, and faster and more reliable diagnostic tests. Florida university research topped $1.4 billion in 2004, according to a Florida State University survey. Researchers submitted 616 invention disclosures in 2004 (vs. 552 in 2003) and received 127 U.S. patents last year (vs. 119 in 2003). Also last year, 270 licenses generated revenue for Florida universities (vs. 236 in

[4] Population Division, U.S. Census Bureau (2004, December 22), "Cumulative Estimates of Population Change for the United States and States, and for Puerto Rico and State Rankings: April 1, 2000 to July 1, 2004" (NST-EST2004-02), retrieved February 4, 2005 from http://eire.census.gov/popeststates/tables/NST-EST2004-02.xls.
[5] Ernst & Young., "Global Biotechnology Report.". 2005.

2003), with total revenues topping $53 million. Florida ranks among the top five states in university-generated licensing and royalty income[6]. Although the volume of university-wide licenses rank the State of Florida in the top five nationally, the State of Florida ranks 10th in the number of healthcare licenses.

The Milken Institute's 2004 study, America's Biotech and Life Science Clusters: San Diego's Position and Economic Contributions, states that regional leaders across the United States are "fighting hard to lure what they believe is the economic growth industry of the 21st century – biotechnology". Florida has a significant role to play in this emerging high-tech economy. "Hospitals and clinics are the primary sources of clinical trials and much innovation. However, there is an important race underway – the one to determine where the dominant health care centers will be located."[7]

The Florida International University School of Medicine will do more than train the physicians Florida needs for the future, it will attract industries that will help build economic infrastructure, develop medical research and improve the health of its citizens.

NATIONAL GROWTH IN BIOMEDICAL DEVELOPMENT

Healthcare and the life sciences comprise one of the largest sectors of the United States' $12 trillion economy: comprising a total of 13 percent. This $1.8 trillion slice spent on health care is only expected to grow, reaching 17 percent by 2010 and more than 20 percent by 2040. This will continue a decades-long trend; in 1945 health care spending was only 4 percent of the U.S. economy. The rising cost of health care will be one of the greatest economic challenges in our current century.

The scientific promise of biotechnology and genomics will change medicine forever, in ways that were previously inconceivable. The field's potential for early diagnosis and treatment of diseases could reduce the suffering of patients, resulting in a significant cost savings not only in the U.S. but throughout the world. Important medical discoveries already have been made by research institutions and private business in the biotechnology sector. Annually, $11 billion is invested in research and development, not including funds expended on higher education and other nonprofit organizations. In fact, between 1993 and 1999, the biotech industry doubled in size, producing revenues of $20 billion directly and $27 billion indirectly. Today the $40 billion bioscience industry represents one of the most important growth sectors of the US economy.

ECONOMIC IMPACT QUANTIFICATION STUDY OBJECTIVES

It is within this framework that Tripp Umbach was retained to quantify the potential range of economic impact of the Florida International University School of Medicine on the State of

[6]Business Florida, 2006. A Climate of Success. http://www.businessflorida.com/advantages/01.asp
[7] Ross DeVol and Rob Koepp (August 2003). America's Healthcare Economy, Milken Institute

Florida and the South Florida region.[8] This report represents an Executive Summary of economic, employment and government revenue impacts of the Florida International University School of Medicine. The report also quantifies the potential range of impact of research commercialization in South Florida resulting from the interaction of the broader biotechnology research and business community and the presence of Florida International University School of Medicine.

The goals of this study included:

- To estimate the economic impact of the Florida International University School of Medicine in 2008 (fiscal year), when the first class of medical students from the Florida International University School of Medicine is admitted;

- To project the economic impact of the Florida International University School of Medicine in 2010, 2015 and 2025; and

  - In 2010 and 2015, the campus will include the following entities Florida International University School of Medicine, FIU Research, FIU Clinical Practice, and other research partners.

  - In 2025 the campus will include the following entities Florida International University School of Medicine, FIU Research, FIU Clinical Practice, a 150-bed clinical facility and other research partners.

- To project the economic impact of commercialized research as a result of the presence of a new medical school in South Florida.

- To quantify other ancillary benefits such as cost savings, and charitable contributions and voluntary services.

[8] For the purposes of this study, the economic impact of biotechnology research generated by the Florida International University School of Medicine includes the following entities: Florida International University School of Medicine, and other research and clinical entities yet to be defined.

PROJECT OVERVIEW

Tripp Umbach calculated both direct and indirect employment numbers for the Florida International University School of Medicine in all benchmark years[9]. It is projected that as the Florida International University School of Medicine continues to grow and increase the number of students on campus, that staffing levels will increase incrementally. The models are predicated upon specific assumptions which were necessary to project the range of possibilities for the economic, employment and government revenue impacts out into the future. The final impact of research is based upon the underlying assumption that the Florida International University School of Medicine ultimately grows its student body to a capacity of 120 students per class.

The models developed for this report assume that the Florida International University Medical School will not have an integrated clinical facility on the campus until 2025. From 2008 until 2015, the scenarios modeled include the following entities: Florida International University School of Medicine, FIU Research, FIU Clinical Practice and other research partners**.** In 2025, Tripp Umbach assumes that a 150-bed clinical facility will be present on the FIU campus in addition to partner hospitals.

The economic impact of biotech research is based on scenarios and assumptions from previous reports completed by/for Florida International University, data collected from FIU directly and industry research. Tripp Umbach facilitated the creation of a project development strategy for the FIU Medical School that provides an overview of timeframes and campus participants (See Figure 1).

FIGURE 1: DESCRIPTION OF MODELS AND TIMETABLE FOR FLORIDA INTERNATIONAL UNIVERSITY SCHOOL OF MEDICINE

2008 (Opening)	2010 (Dispersed)[10]	2015 (Dispersed)	2025 (Integrated)
• School of Medicine • FIU Research	• School of Medicine • FIU Research • FIU Clinical Practice • Other Research Partners	• School of Medicine • FIU Research • FIU Clinical Practice • Other Research Partners	• School of Medicine • FIU Research • FIU Clinical Practice • 150-Bed Clinical Facility • Other Research Partners
		Research Commercialization	Research Commercialization

[9] All models are based upon 2005 dollars.

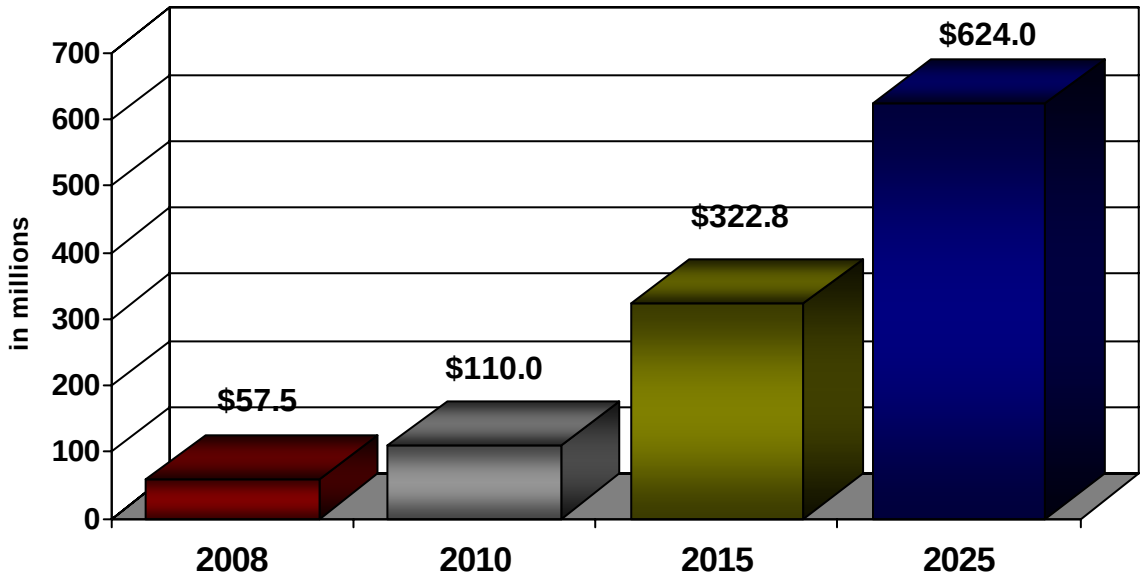
[10] Tripp Umbach does not project that a 150-bed clinical facility be present on the campus until 2025. It is assumed that the campus will pursue a dispersed model approach.

FLORIDA INTERNATIONAL UNIVERSITY SCHOOL OF MEDICINE
STATE OF FLORIDA OPERATIONAL IMPACT FINDINGS

STATE OF FLORIDA OPERATIONAL ECONOMIC IMPACT

The net operational economic impact[11] of the Florida International University School of Medicine in 2008 on the state of Florida is expected to equal $57.5 million. By 2010, the operational impact is projected to be $110.0 million. In 2015, the overall impact is expected to reach $322.8 million. The operational economic impact of the Florida International University School of Medicine in 2025 is expected to equal $624 million. (See Figure 2)

FIGURE 2: STATE OF FLORIDA OPERATIONAL ECONOMIC IMPACT (DIRECT AND INDIRECT)

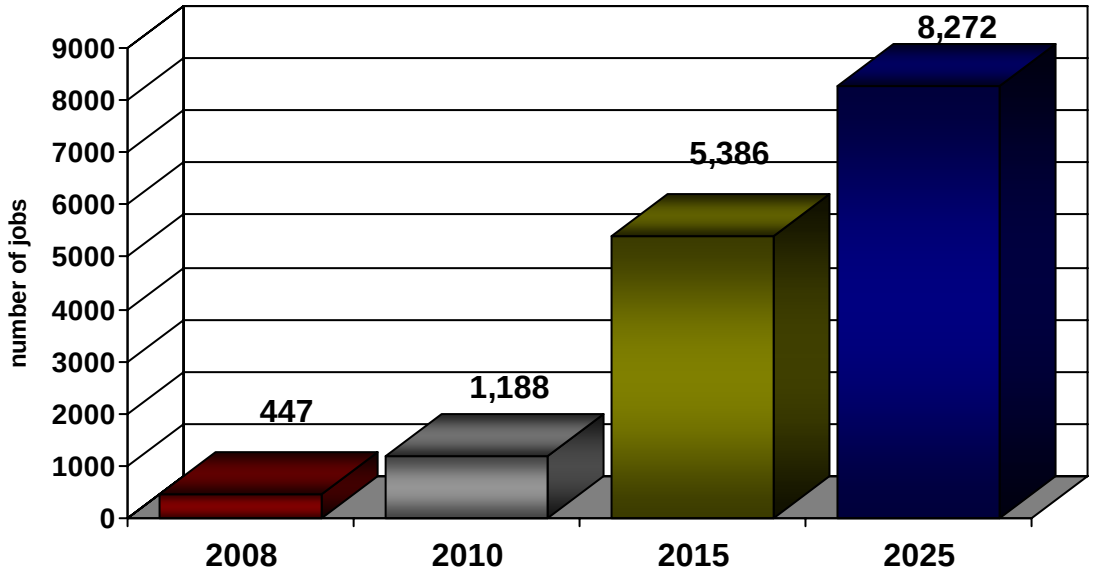


[11] The operational economic impact of the Florida International University School of Medicine equals both direct and indirect business volume. Direct impact is defined as the sum of total expenditures for capital, goods and services, and staff spending within the study area. It also includes out-of area spending from patients and visitors. Indirect impact is defined as the standard multiplier as recommended by American Council on Education representing the re-spending taking place in the study area.

STATE OF FLORIDA OPERATIONAL EMPLOYMENT IMPACT

In 2008, the operational impact of employment at the Florida International University School of Medicine will be 447 new direct and indirect jobs. The operational impact of employment generated by the Florida International University School of Medicine in 2010, is projected to be 1,188 jobs. In 2015, the Florida International University School of Medicine is expected to support 5,386 new jobs. In 2025, the Florida International University School of Medicine is expected to support 8,272 new direct and indirect jobs in the state of Florida (See Figure 3).

FIGURE 3: STATE OF FLORIDA OPERATIONAL EMPLOYMENT IMPACT[12] (DIRECT AND INDIRECT)



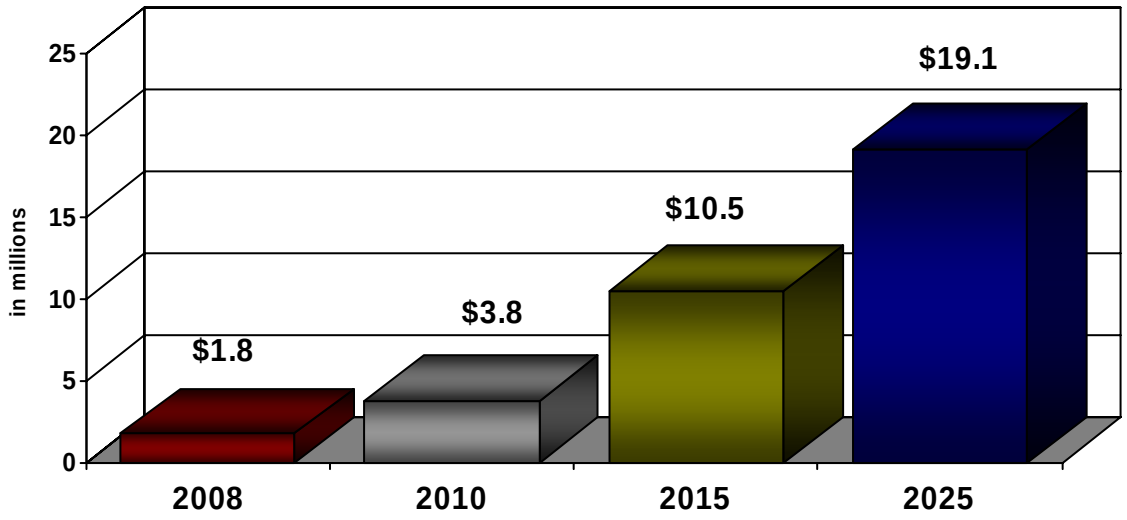
	2008	2010	2015	2025
DIRECT EMPLOYMENT	203 JOBS	540 JOBS	2,448 JOBS	3,760 JOBS
INDIRECT EMPLOYMENT	244 JOBS	648 JOBS	2,938 JOBS	4,512 JOBS
TOTAL EMPLOYMENT	447 JOBS	1,188 JOBS	5,386 JOBS	8,272 JOBS

[12] Employment projections presented in this report are based on the experience of actual medical schools that match the profile of the proposed School of Medicine and Florida International University.

STATE OF FLORIDA OPERATIONAL GOVERNMENT REVENUE IMPACT

In order to quantify the financial returns to the State of Florida, the models include a government revenue impact component, which calculates the total state tax revenue generated by Florida International University School of Medicine operations. Upon its opening in 2008, Florida International School of Medicine will generate approximately $1.8 million in tax revenue for the State of Florida. In 2010, Tripp Umbach projects that the state is projected to receive $3.8 million in state tax revenues from the Florida International University School of Medicine, $10.5 million in 2015 and by 2025 is projected to receive $19.1 million (See Figure 4).

FIGURE 4: STATE OF FLORIDA OPERATIONAL GOVERNMENT REVENUE IMPACT

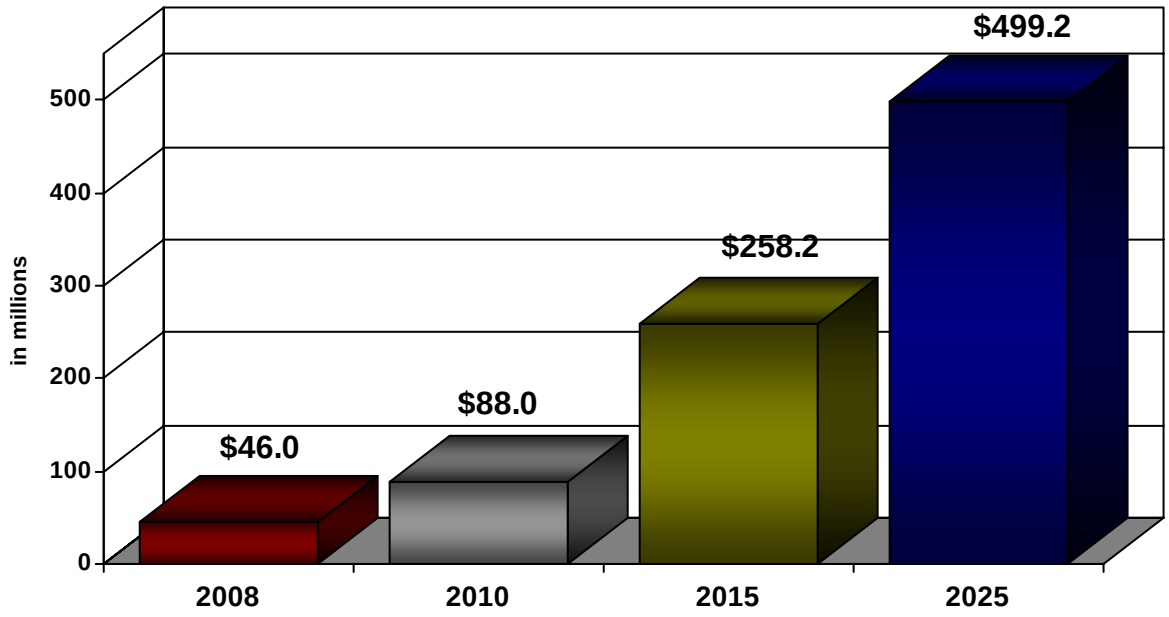


FLORIDA INTERNATIONAL UNIVERSITY SCHOOL OF MEDICINE SOUTH FLORIDA OPERATIONAL IMPACT FINDINGS

SOUTH FLORIDA OPERATIONAL ECONOMIC IMPACT

The economic impact of the School of Medicine operations is expected to be $46 million in 2008. The operational economic impact[13] of the Florida International University School of Medicine on South Florida[14] is estimated to range from $88 million in 2010 to $499.2 in 2025 (See Figure 5). .

FIGURE 5: SOUTH FLORIDA OPERATIONAL ECONOMIC IMPACT (DIRECT AND INDIRECT)



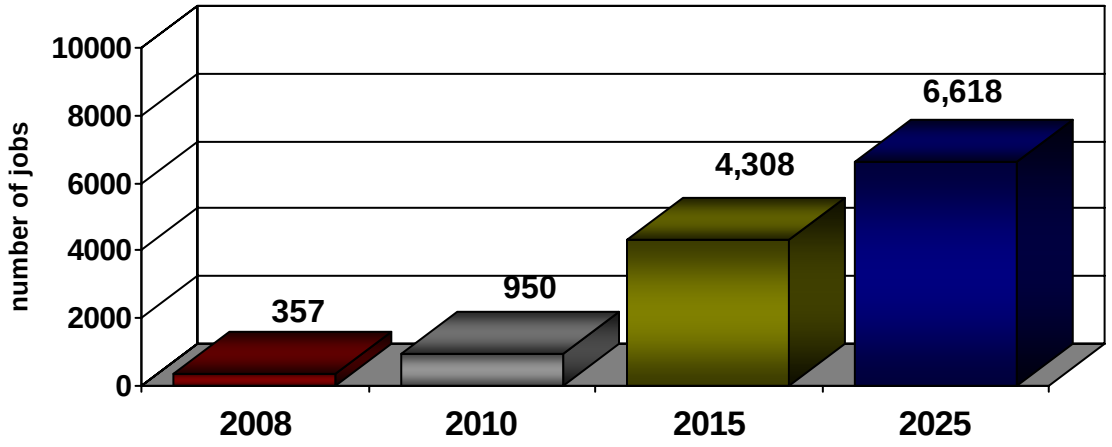
[13] The operational economic impact of the Florida International University School of Medicine equals both direct and indirect business volume. Direct impact is defined as the sum of total expenditures for capital, goods and services, and staff spending within the study area. It also includes out-of area spending from patients and visitors. Indirect impact is defined as the standard multiplier as recommended by American Council on Education representing the re-spending taking place in the study area.

[14] South Florida in this study includes the following geographic areas: Broward County, Miami-Dade County, Monroe County and Palm Beach County.

SOUTH FLORIDA OPERATIONAL EMPLOYMENT IMPACT

In 2008, the employment impact of operations at the Florida International University School of Medicine will be 357 new direct and indirect jobs. The operational employment generated by the Florida International University School of Medicine in 2010, is projected to be 950 jobs. In 2015, the Florida International University School of Medicine is expected to create 4,308 new jobs. In 2025, the Florida International University School of Medicine will potentially generate 6,618 new direct and indirect jobs for the South Florida region (See Figure 6).

FIGURE 6: SOUTH FLORIDA OPERATIONAL EMPLOYMENT IMPACT (DIRECT AND INDIRECT)

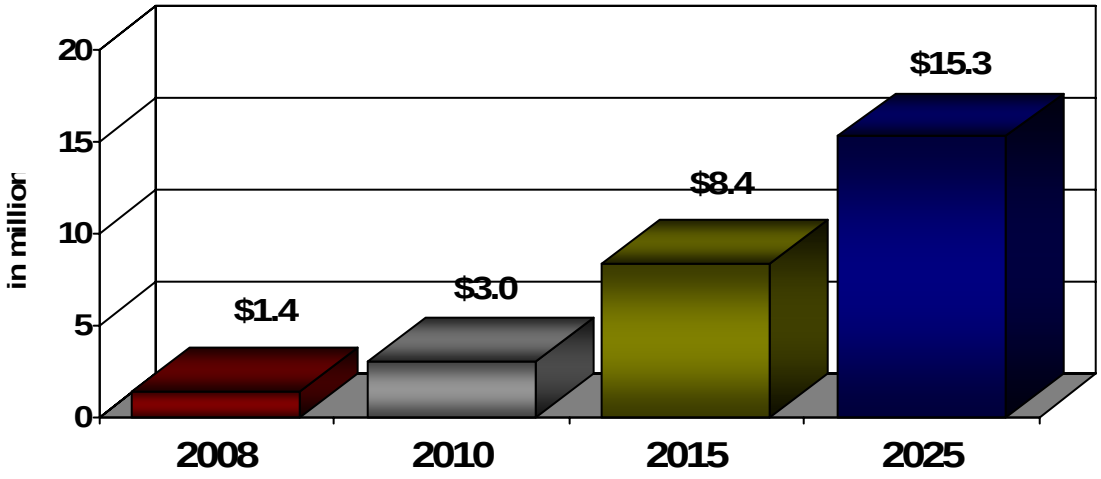


	2008	2010	2015	2025
DIRECT EMPLOYMENT	162 JOBS	432 JOBS	1,958 JOBS	3,008 JOBS
INDIRECT EMPLOYMENT	195 JOBS	518 JOBS	2,350 JOBS	3,610 JOBS
SOUTH FLORIDA TOTAL EMPLOYMENT	357 JOBS	950 JOBS	4,308 JOBS	6,618 JOBS

SOUTH FLORIDA OPERATIONAL GOVERNMENT REVENUE IMPACT

In 2008, the total government revenue generated by the operations of the Florida International University School of Medicine is projected to be $1.4 million. In 2010, units of local government in South Florida are expected to receive $3.0 million in revenue from the operations of Florida International University School of Medicine and by 2025 could receive $15.3 million (See Figure 7).

FIGURE 7: SOUTH FLORIDA OPERATIONAL GOVERNMENT REVENUE IMPACT



FLORIDA INTERNATIONAL UNIVERSITY SCHOOL OF MEDICINE GRADUATES WHO PRACTICE IN FLORIDA AND SOUTH FLORIDA

IMPACT ON STATE OF FLORIDA AND SOUTH FLORIDA

The U.S. healthcare system, with its model of medical education led by a faculty deeply involved in research and clinical practice, has created a national resource of healthcare practitioners with skills and training that can truly be called the best in the world. Medical professionals trained at Florida International University will have the opportunity to learn from some of the nation's most renowned surgeons and medical researchers. This depth of teaching excellence will have a real effect on the caliber of medical students attracted to train in the state, and the physicians and other healthcare professionals who graduate from Florida International School of Medicine beginning in 2016 (after completing residencies) will be ready to serve the people of Florida.

By 2025, Tripp Umbach estimates that 450 Florida International University School of Medicine graduates will be working in communities throughout South Florida, and nearly 600 graduates throughout Florida. Tripp Umbach estimates that Florida International University School of Medicine graduates who practice in Florida will generate $221 million annually in the South Florida economy by 2025 and $288 million annually in the State of Florida[15]. Tripp Umbach estimates that by 2025, the physician "community" of nearly 600 graduates from the new medical school statewide, will generate sustainable employment for 2,400 Floridians and will generate more than $30 million in state tax revenue. It is important to note that the economic, employment, and government revenue impacts related to Florida International University medical school graduates is in addition to operational and research impacts presented in earlier sections of this report.

STATE OF FLORIDA IMPACTS

Economic Impacts (in millions)	2008	2010	2015	2025
FIU School of Medicine Graduates who practice in Florida	$0	$0	$0	$288
Employment Impacts (jobs)	**2008**	**2010**	**2015**	**2025**
FIU School of Medicine Graduates who practice in Florida	0	0	0	2,400
Government Revenue (in millions)	**2008**	**2010**	**2015**	**2025**
FIU School of Medicine Graduates who practice in Florida	$0	$0	$0	$30

[15] Tripp Umbach estimates from national benchmarks that 50% of all graduates from Florida International University will practice medicine in the State of Florida, with the majority of these graduates practicing in South Florida. The CEPRI, "Medical Education Needs Analysis," November 2004 p.18 indicates that 49% of all medical students practice in the state of Florida. This is considered a conservative estimate since Florida International University will have programs specifically designed to retain minority graduates in the South Florida community.

SOUTH FLORIDA IMPACTS

Economic Impacts (in millions)	2008	2010	2015	2025
Total from FIU School of Medicine Graduates who practice in South Florida	$0	$0	$0	$221
Employment Impacts (jobs)	**2008**	**2010**	**2015**	**2025**
Total from FIU School of Medicine Graduates who practice in South Florida	0	0	0	2,200
Government Revenue (in millions)	**2008**	**2010**	**2015**	**2025**
Total from FIU School of Medicine Graduates who practice in South Florida	$0	$0	$0	$24

IMPACT OF RESEARCH COMMERCIALIZATION

Research and medical innovation provides multiple benefits beyond pure economics and employment. Research undertaken at Florida International University, biotechnology firms and academic health centers throughout the United States is widely considered to be responsible for the preponderance of major advances in medical knowledge. Research at academic health centers is fundamental to the future health status of Florida residents. Research is already an important part of Florida International University's contribution to the South Florida economy. In 2005, Florida International University annually attracted $19 million to the state of Florida for its biomedical research activities; $17.5 million was attracted from outside the state of Florida. Tripp Umbach estimates that more than $10 million of this support remains in the state's economy and that the spending of external research dollars generates an additional $25 million in economic expansion annually. Florida International University is currently engaged in numerous collaborative partnerships with companies and hospitals located in and out of South Florida[16]. To date, FIU research has resulted in the issuance of 12 patents, filed applications for 13 more patents, and has been granted one license agreement.

The development of a medical school and academic health center in South Florida is critical to the growth of future biomedical research in the region and the state. The economic impacts of research go beyond the prevention of future disease-related costs. Research at academic health centers has a substantial and measurable effect on business formation and economic development. Surveys of research managers, conducted as early as 1985, found that university-based research is an important source of innovation for industry, especially for those industries in the biological sciences[17]. Research performed at the Harvard University Department of Economics has confirmed the relevance and importance of academic health centers and general university-based research in the generation of spin-off businesses[18]. The Harvard research, performed by Adam Jaffe, concluded, "university research causes industry R&D and not vice versa. Thus, a state that improves its university research system will increase local innovation both by attracting industrial R&D and augmenting its productivity." The findings were particularly strong in spin-off effects for the drug industry, and the researchers concluded that the spin-off effects "appear to be large." In fact, a wide spectrum of research since the 1980s indicates that the strength of the university-to-business spin-off relationship is even stronger than Jaffe originally reported, and geographic proximity to the university or academic health center performing the research is an important driver of the location of these business spin-offs.

These and other path-breaking research projects have proven the strong and measurable impacts that academic health centers have on new business ventures and the commercialization of innovations in the states in which these institutions are located. The State of Florida and

[16] Partnerships include the following: Bioheart, DuPont, SMLX Technologies, Boston Scientific, Cordis Corporation, IDEXX Labs, 3D Imaging, Beckman Coulter, Nanomat, Heartware, Mt. Sinai, Innovia, Cyberknife, and Miami Children's Hospital.

[17] Nelson, Richard R., "Institutions Supporting Technical Advance in Industry," *American Economic Review*, May 1986, pp. 186-189.

[18] Jaffe, Adam B., "Real Effects of Academic Research," *American Economic Review*, December 1989, pp. 957-970.

Southern Florida's biotechnology, medical technology and biomedical companies will undoubtedly benefit from the development of a medical school with a rigorous academic research component. According to research completed by Tripp Umbach with regional economic development officials in major biomedical centers around the country, research is an important factor in the attraction of biomedical businesses.

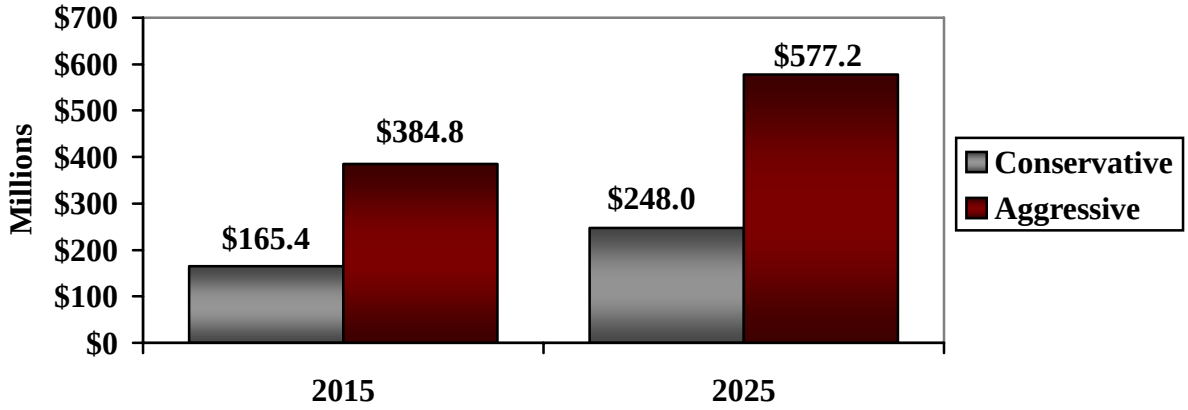
Research activities within the State of Florida and South Florida region by Florida International University, the employment of world-class researchers, and the attraction of additional federal research funding represent only the starting point for future economic expansion and employment. This section of the report explores projected economic impacts associated with the commercial transfer of research funding and projected healthcare cost savings that may be achieved as these discoveries are fully incorporated into medical practices by 2015 and 2025 (See Appendix B for Methodology).

ECONOMIC IMPACT OF RESEARCH COMMERCIALIZATION ON THE STATE OF FLORIDA

Florida International University is already an important research organization, with more than $11.5 million in NIH research awards in 2005, and over $19 million in revenue awarded to research related to the Medical/Biomedical and Other Life Sciences. The University's total research awarded in 2005 was $78.9 million. The University has an aggressive research agenda that will be enhanced significantly by the addition of the new medical school. Tripp Umbach is currently completing primary research for the Association of American Medical Colleges on the economic impact of research activities as the 125 allopathic medical schools. Based on a review of research levels at peer medical schools, Tripp Umbach estimates that the new medical school at Florida International University will be able to attract $20 million in external research funding by 2010, $40 million in external research funding by 2015 and $60 million in external research funding by 2025. Tripp Umbach used a conservative approach by using the average of existing research funding at peer institutions and the growth of research funding at such institutions over the past 20 years. It is important to note that only the universities with established medical schools (University of Florida, the University of South Florida, and the University of Miami) perform more NIH sponsored research than Florida International University.

Tripp Umbach developed original economic impact models in 2003 for the Mayo Clinic and the University of Minnesota that project the total economic, employment, and government revenue impacts attributable to external research activities. Models used by the Minnesota Partnership on Biotechnology were customized by Tripp Umbach to reflect the unique qualities of the Florida economy (See Appendix B). Tripp Umbach estimates that the total annual economic impact attributable to commercial applications, start-up companies, attraction of new companies to the State of Florida economy, and growth within existing Florida-based companies will be between $165.4 million (conservative) and $384.8 million (aggressive) by 2015 and up to $577.2 million annually in 2025 in the aggressive scenario (See Figure 8). It is important to note that these numbers are in addition to operational economic impact numbers presented in the previous section.

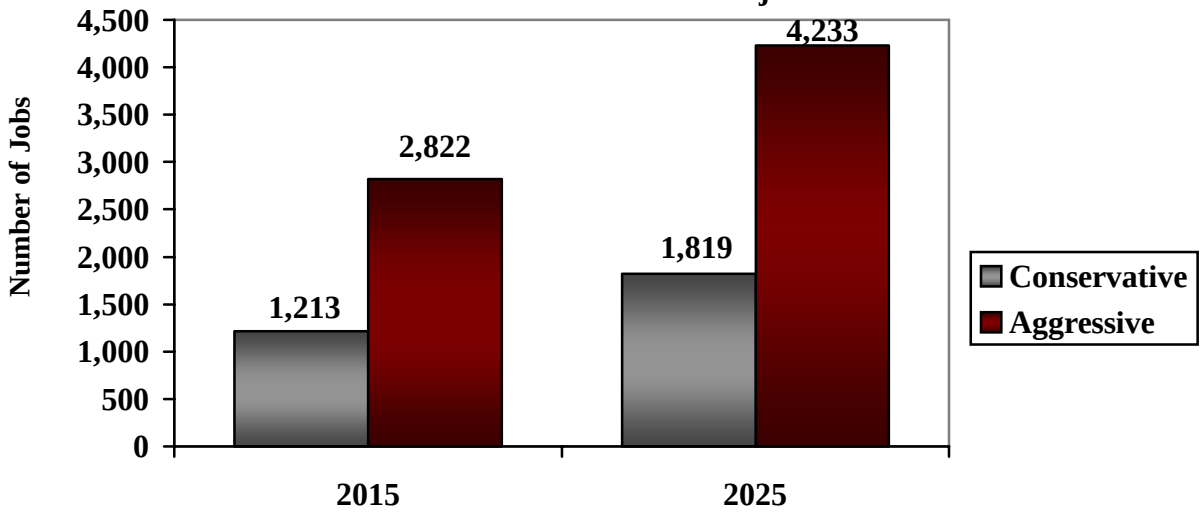
Figure 8: Economic Impact of Research Commercialization on the State of Florida: 2015 and 2025 Projections



EMPLOYMENT IMPACT OF RESEARCH COMMERCIALIZATION ON THE STATE OF FLORIDA

Tripp Umbach estimates that total created and sustained employment within the State of Florida attributable to commercial applications, start-up companies, attraction of new companies to the State, and growth within existing Florida based companies, will be between 1,213 (conservative) and 2,822 (aggressive) jobs by 2015. By 2025, Tripp Umbach projects that 1,819 jobs will be created (conservative) and 4,233 jobs will be created if the state pursues an aggressive approach (See Figure 9). It is important to note that these numbers are in addition to operational employment numbers presented in the previous section.

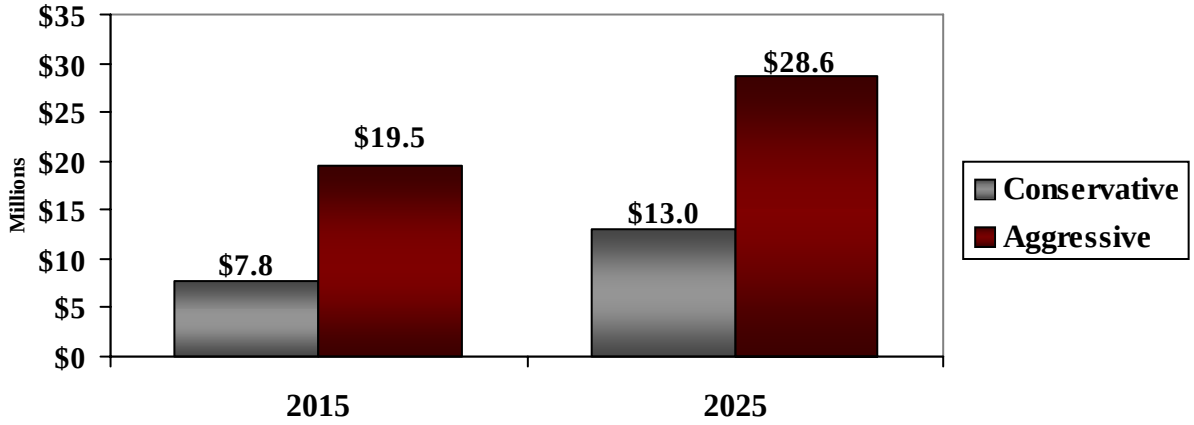
Figure 9: Employment Impact of Commercialization on the State of Florida: 2015 and 2025 Projections



GOVERNMENT REVENUE IMPACT RELATED TO RESEARCH COMMERCIALIZATION IN THE STATE OF FLORIDA

Future taxes to be generated as a result of commercialization of research are expected to equal between $7.8 million and $19.5 million annually by 2015 and between $13 million and $28.6 million annually by 2025 (See Figure 10). It is important to note that these numbers are in addition to government revenue from operations presented in the previous section.

Figure 10: Government Revenue Impact Related to Commercialization on the State of Florida: 2015 and 2025



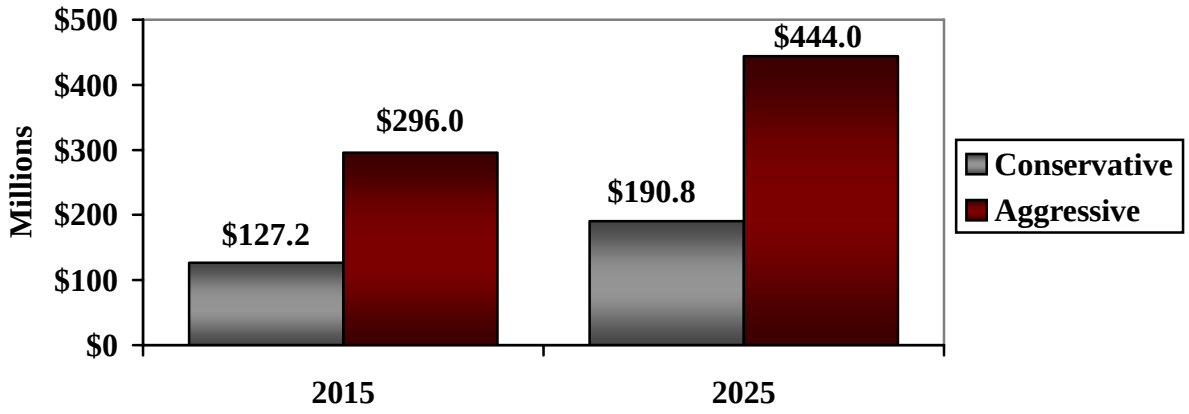
The table below summarizes the projected outcomes of the commercialization of research in the State of Florida by scenario and by year:

CONSERVATIVE SCENARIO		
	2015	**2025**
Projected External Research Total (School of Medicine)	$40 million	$60 million
Economic Impact of Research Commercialization	$165 million	$248 million
Number of Companies	17	26
Number of Jobs (Direct)	551 jobs	827 jobs
Number of Jobs (Direct and Indirect)	1,213 jobs	1,819 jobs
Percentage of Existing Life Sciences Industry in the State of Florida	1.3%	3.3%
AGGRESSIVE SCENARIO		
	2015	**2025**
Projected External Research Total (School of Medicine)	$40 million	$60 million
Economic Impact of Research Commercialization	$385 million	$577 million
Number of Companies	40	60
Number of Jobs (Direct)	1,283 jobs	1,924 jobs
Number of Jobs (Direct and Indirect)	2,822 jobs	4,233 jobs
Percentage of Existing Life Sciences Industry in the State of Florida	5.2%	6.5%

ECONOMIC IMPACT OF RESEARCH COMMERCIALIZATION ON SOUTH FLORIDA

Tripp Umbach estimates that the total annual economic impact attributable to commercial applications, start-up companies, attraction of new companies to the South Florida economy, and growth within existing South Florida-based companies will be between $127.2 million (conservative) and $296.0 million (aggressive) by 2015 and up to $444 million annually in 2015[19] (See Figure 11).

Figure 11: Economic Impact of Research Commercialization on South Florida: 2015 and 2025 Projections

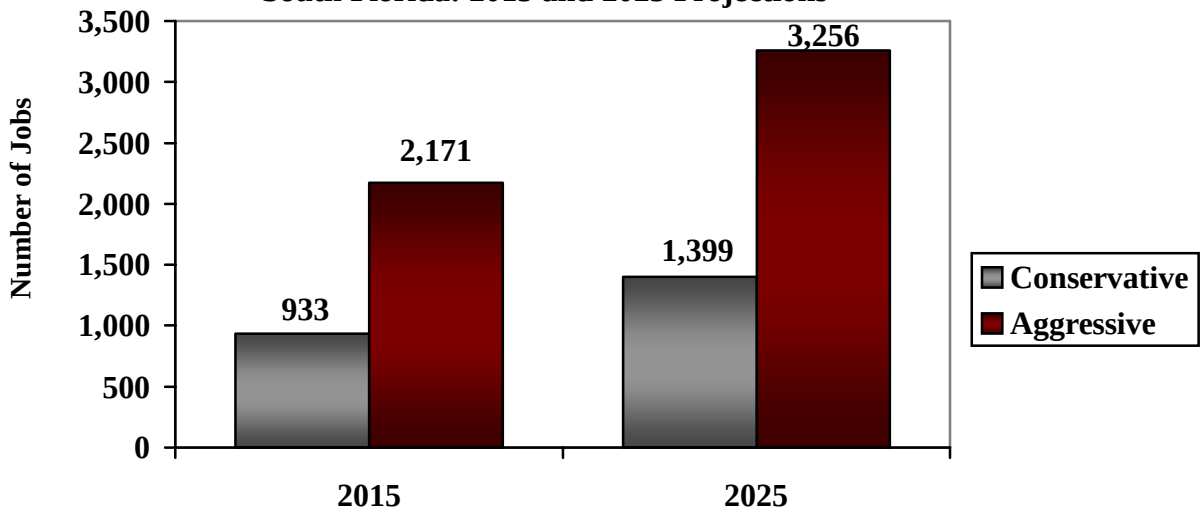


[19] It is important to note that these numbers are in addition to operational economic impact numbers presented in the previous section.

EMPLOYMENT IMPACT OF RESEARCH COMMERCIALIZATION ON SOUTH FLORIDA

Tripp Umbach estimates that total created and sustained employment within the state of Florida attributable to commercial applications, start-up companies, attraction of new companies to the State, and growth within existing South Florida based companies, will be between 933 (conservative) and 2,171 (aggressive) jobs by 2015. By 2025, Tripp Umbach projects that 1,399 jobs will be created (conservative) and 3,256 jobs will be created if the state pursues an aggressive approach[20] (See Figure 12).

Figure 12: Employment Impact of Commercialization on South Florida: 2015 and 2025 Projections

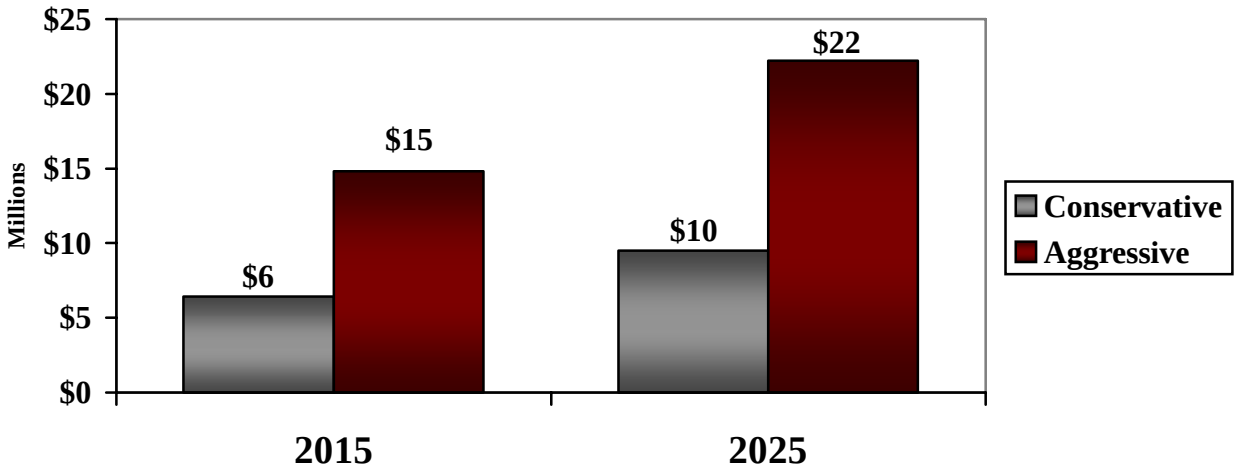


[20] It is important to note that these numbers are in addition to operational employment numbers presented in the previous section.

GOVERNMENT REVENUE IMPACT RELATED TO RESEARCH COMMERCIALIZATION IN SOUTH FLORIDA

Future taxes to be generated as a result of commercialization of research are expected to equal between $6 million and $15 million annually by 2015 and between $10 million and $22 million annually by 2025[21] (See Figure 13).

Figure 13: Government Revenue Impact Related to Commercialization on South Florida: 2015 and 2025



The table below summarizes the projected outcomes of the commercialization of research in South Florida by scenario and by year:

CONSERVATIVE SCENARIO		
	2015	**2025**
Projected External Research Total (School of Medicine)	$40 million	$60 million
Economic Impact of Research Commercialization	$127 million	$191 million
Number of Companies	13	20
Number of Jobs (Direct)	424 jobs	636 jobs
Number of Jobs (Direct and Indirect)	933 jobs	1,399 jobs
Percentage of Existing Life Sciences Industry in South Florida	1%	2.5%
AGGRESSIVE SCENARIO		
	2015	**2025**
Projected External Research Total (School of Medicine)	$40 million	$60 million
Economic Impact of Research Commercialization	$296 million	$444 million
Number of Companies	31	46
Number of Jobs (Direct)	987 jobs	1,480 jobs
Number of Jobs (Direct and Indirect)	2,171 jobs	3,256 jobs
Percentage of Existing Life Sciences Industry in South Florida	4%	5%

[21] It is important to note that these numbers are in addition to government revenue from operations presented in the previous section.

CONCLUSIONS

In summary, by 2025 the proposed School of Medicine at Florida International University is expected to generate the following for the State of Florida:

- $1.16 billion in annual total economic impact
- 12,491 total jobs
- $62 million in total tax revenue
- $420 million in annual cost savings from associated research
- $200 million in cost savings from medical school graduates practicing in underserved areas.

The proposed School of Medicine at Florida International is expected to generate the following for South Florida:

- $911 million in annual total economic impact
- 10,217 total jobs
- $49 million in total local tax revenue
- $12 million in associated community benefits

RETURN ON INVESTMENT

- By 2025, for every State tax dollar invested in the Florida International University School of Medicine more than $30.00 will be added to the State's economy.

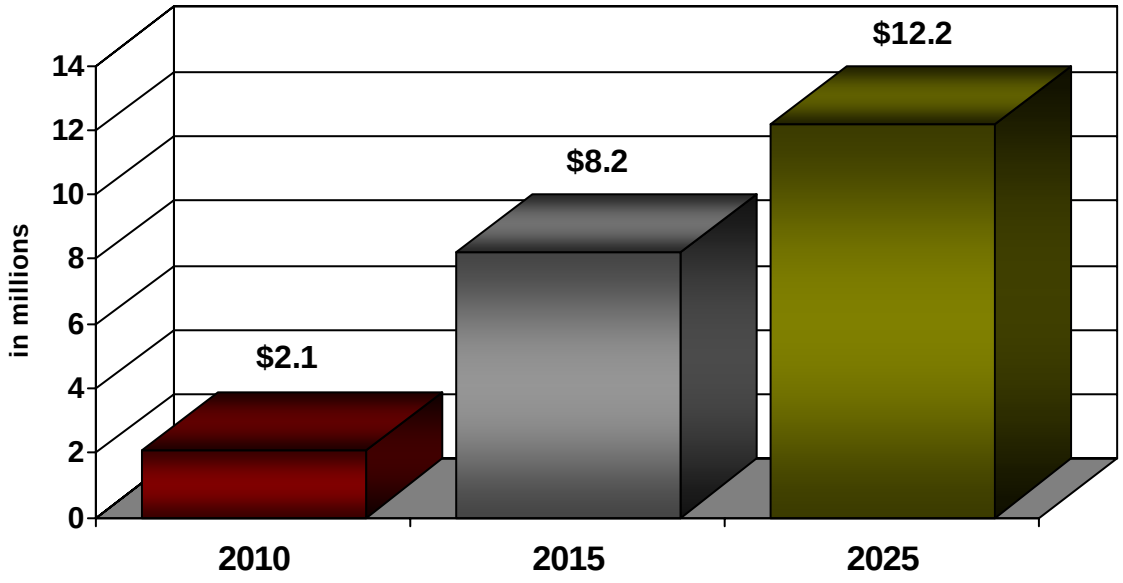
- By 2025, the State of Florida will receive $62 million in total state taxes as a result of the medical school, research commercialization and Florida International University trained physicians who remain to practice in Florida; thereby receiving approximately $3.00 in taxes for every dollar invested.

APPENDIX A: ANCILLARY BENEFITS

COMMUNITY BENEFITS RELATED TO FLORIDA INTERNATIONAL UNIVERSITY SCHOOL OF MEDICINE STUDENTS, RESIDENTS, STAFF AND FACULTY

The members of the Florida International School of Medicine will do more than spend money locally and attract visitors to the region. By 2010, Tripp Umbach projects that more than $2.1 million dollars will be contributed annually to the South Florida region through volunteerism and direct donations provided by School of Medicine students, faculty and employees. In 2015, the number increases to over $8.2 million and by 2025 is in excess of $12 million dollars (See Figure 1).

FIGURE 1: TOTAL DONATIONS AND VOLUNTARY SERVICES OF FIU SCHOOL OF MEDICINE STUDENTS, RESIDENTS, STAFF AND FACULTY



In 2010, Tripp Umbach estimates that students, staff and faculty will provide 64,705 hours of volunteer services to South Florida communities. The economic value of such services is more than $ 1.1 million. Tripp Umbach also projects that School of Medicine students, staff and faculty will donate over $1 million to South Florida residents.

2010 Florida International University Community Benefits			
Type	**Donations**	**Value of Voluntary Services**	**Total**
Students	**$90,000**	**$180,000**	**$270,000**
Staff	**$450,000**	**$450,000**	**$900,000**
Faculty	**$480,000**	**$480,000**	**$960,000**
Total	**$1,020,000**	**$1,110,000**	**$2,130,000**

In 2015, Tripp Umbach estimates that students, staff and faculty will provide 240,500 hours of volunteer services to South Florida communities. The economic value of such services is projected to be more than $4.2 million. Tripp Umbach also projects that School of Medicine students, staff and faculty will donate over $3.9 million to South Florida residents.

2015 Florida International University School of Medicine Community Benefits			
Type	**Donations**	**Value of Voluntary Services**	**Total**
Students	**$240,000**	**$480,000**	**$720,000**
Residents	**$510,000**	**$510,000**	**$1,020,000**
Staff	**$1,950,000**	**$1,950,000**	**$3,900,000**
Faculty	**$1,276,000**	**$1,276,000**	**$2,552,000**
Total	**$3,976,000**	**$4,216,000**	**$8,192,000**

In 2025, Tripp Umbach projects that the School of Medicine students, residents, staff and faculty will donate $6.0 million to South Florida charities and organizations, representing more than 350,000 hours of volunteer services to South Florida communities. In addition, they will provide over $6.2 million of voluntary services to benefit residents of South Florida.

2025 Florida International University School of Medicine Community Benefits			
Type	**Donations**	**Value of Voluntary Services**	**Total**
Students	**$240,000**	**$480,000**	**$720,000**
Residents	**$510,000**	**$510,000**	**$1,020,000**
Staff	**$3,750,000**	**$3,750,000**	**$7,500,000**
Faculty	**$1,500,000**	**$1,500,000**	**$3,000,000**
Total	**$6,000,000**	**$6,240,000**	**$12,240,000**

HEALTH CARE COST SAVINGS

Significantly, healthcare research that results in innovative tools for earlier, more accurate disease diagnoses and novel, more effective treatment options likely will reduce healthcare cost expenditures while improving the overall health of Floridians. The cost of healthcare is a critical issue facing the state of Florida.

While this study does not include detailed economic impact models that calculate the potential cost savings attributable to research activities, a growing body of literature provides some potential insights. Breakthrough research by Silverstein et al. (1995) documented $69 billion in annual economic savings resulted from NIH-supported research. The return on investment calculated by Silverstein was $7 in healthcare cost savings for every dollar invested in NIH sponsored research[22]. Based on this study, Tripp Umbach estimates that the State of Florida could achieve $420 million in healthcare cost savings by 2025, attributable to research completed by Florida International University between 2010 and 2015.

[22] Cost Savings Resulting from NIH Research Support, NIH Publication No. 93. Silverstein, H.H. Garrison and S.J. Heinig, 1995.

It is noteworthy that increasing medical education through the addition of a new medical school at Florida International University will also provide significant medical cost savings to the state of Florida. In addition to providing health care services to thousands of Floridians, Tripp Umbach projects that each future graduate of Florida International University School of Medicine who remain in Florida after graduation and who engages in primary care services in medically underserved areas, will save the state nearly $200 million in unnecessary medical costs by 2025[23].

Cost Savings (in millions)	2008	2010	2015	2025
Cost Savings for the State of Florida as a result of research completed at FIU	$0	$0	$0	$420
Cost Savings for the State of Florida of FIU graduates practicing in underserved areas	$0	$0	$0	$200

CONCLUSIONS

- Medical students who remain in Florida after graduation and who engage in primary care services in medically underserved area will save the state approximately $200 million in unnecessary medical costs by 2025.

- By 2010, more than $2.1 million dollars will be contributed annually to the South Florida region through volunteerism and direct donations provided by School of Medicine students, faculty and employees. In 2015, the number increases to over $8.1 million and by 2025, participants will provide more than $12 million dollars in voluntary services and charitable donations.

- By 2025, cost savings to the State of Florida as a result of research completed at Florida International University School of Medicine will equal $420 million dollars. Furthermore, cost savings to the State of Florida related to Florida International University School of Medicine graduates practicing in underserved areas will generate approximately $200 million dollars annually.

[23] Each graduate who provides Primary Care services in underserved areas within South Florida will save the state $1.8 million. Therefore, Tripp Umbach estimates that by 2025, a total of 109 physicians trained FIUSOM will be providing primary care services in underserved communities in South Florida, thereby saving the State an estimated $196.2 million annually. Tripp Umbach's model assumes that 50% of all graduates will remain in the State of Florida and that 20% of all graduates will be engaged in the provision of primary care in underserved areas.

Ancillary Impacts (in millions)	2008	2010	2015	2025
Community Benefits[24]	$0	$2	$8	$12
Cost Savings for the State of Florida as a result of research completed at FIU	$0	$0	$0	$420
Cost Savings for the State of Florida of FIU graduates practicing in underserved areas	$0	$0	$0	$200

[24] Does not include charity care or uncompensated care.

APPENDIX B: METHODOLOGY EMPLOYED IN THE ECONOMIC QUANTIFICATION STUDY

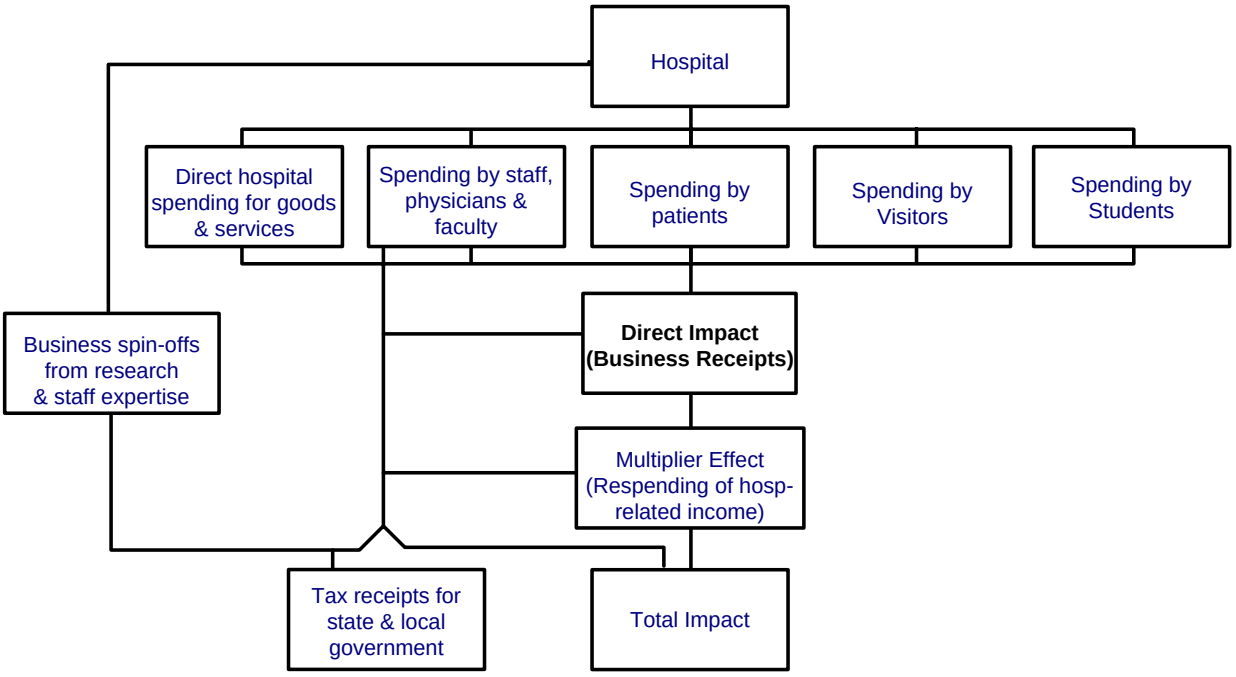
Tripp Umbach has performed more than 100 economic impact studies for both academic institutions and large health care systems, including the Mayo Clinic Rochester, Mayo Clinic – Florida entities, UPMC Health System, and North Mississippi Health System. The methodology generally employed in these studies was originally derived from a set of research tools and techniques developed for the American Council on Education (ACE).[25] The ACE-based methodology employs linear cash flow modeling to track the flow of institution-originated funds through a delineated spatial area. While this methodology is generally well suited to evaluate a hospital's impact on its local service area, it tends to be too limiting for a project with the complexity of a medical school with integrated systems.

Based on previous economic impact studies performed for academic health centers in Pennsylvania and Virginia, Tripp Umbach recommended that the traditional model of economic impact for hospitals *(see Figure 1)*, based on the ACE model, be modified for the purposes of this research.

Figure 1

Hospital Economic Impact

(A Traditional Model)



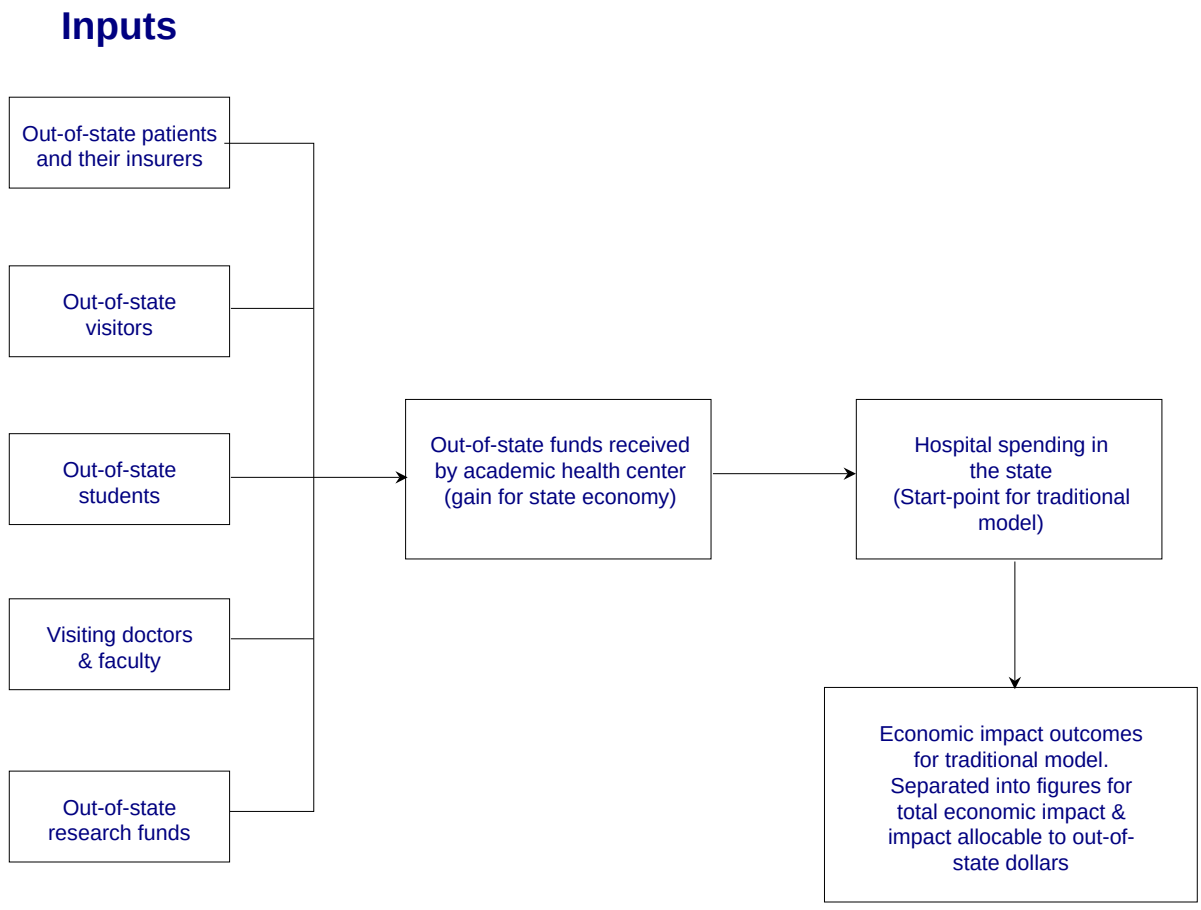
The "traditional" model of hospital economic impact provides a good measure of the impact of hospital expenditures and their flow within an economy. However, the model does not account

[25] Caffrey, John and Isaacs, Herbert, "Estimating the Impact of a College or University on the Local Economy," American Council on Education, 1971.

for the origination of hospital revenues, and thus counts the spending of revenues received by the hospital from in-state sources. The traditional model counts some of the spending of dollars that already existed in the Florida economy.

The Tripp Umbach research team felt it important to distinguish the economic impact of the individual entities who will occupy the Florida International University School of Medicine that are attributable to funds brought into the state from out-of-state sources. The application of this "fresh dollar" model provides a first-line measure of the initial direct expansion in the state economy caused by the Florida International University School of Medicine. The final model concept evolved into a hybrid model including a fresh-dollar approach feeding into a traditional model which tracks in-state spending. Thus the final model used for this research (See Figure 2) measures funds brought into the state together with the ultimate flow of these funds through the Florida economy and the effect on economic expansion, job growth and enterprise development. The final methodology closely matches the impact study methodology recommended for individual medical schools by the Association of American Medical Schools.

Figure 2: Florida International University School of Medicine Economic Impact Model



Tripp Umbach Healthcare researchers worked closely with representatives from Florida International University to acquire the primary data utilized in this study.

Tripp Umbach utilized a forward-linkage modeling methodology to measure the potential impact of the commercialization of research and related commercial spin-offs in Florida and South Florida. Traditional economic impact studies are based on direct spending and re-spending within the economy (multiplier effect) driven from the institution itself. Forward-linkage models measure the broader impacts that occur or may occur in the economy as a result of the research and development activities of an institution – beyond the traditional direct and indirect impacts. Examples of forward-linkage impacts include new businesses based on academic research discoveries, academic intellectual property licensed to existing businesses for development, and sponsored research relationships.

Original research conducted by Tripp Umbach for the Mayo Clinic and the University of Minnesota was used as a starting point for customized analysis. The Mayo Clinic and University of Minnesota research involved the creation of a series of 36 customized economic impact models based upon numerous assumptions. The basic architecture of these models is the methodology most widely accepted within the industry. Due to the complexity of measuring the impact of biotechnology and medical research, Tripp Umbach researchers developed a series of customized economic impact models showing the economic, employment and government revenue impacts of both the recipient institutions and potential business spin-offs in the calendar year 2015. Economic impact projections were calculated for 2015 in two distinct scenarios: conservative and aggressive. The linear cash flow models developed for this project represent annual, point-in-time economic impact projections.

Economic projections for each scenario are based upon a specific and detailed set of assumptions. Each assumption is based upon secondary data research, primary research and Tripp Umbach industry expertise[26].

Key Assumptions for Research Commercialization Models:

- Each scenario is based on $40 million in funding provided in 2015 and $60 million in 2025.

- Each scenario assumes that research funds will be leveraged to generate research funding from other sources (leveraged funding), primarily by the attraction of National Institutes of Health (NIH) research support.

- Each scenario assumes that other state and private programs designed to assist life science companies will continue through 2015.

[26] Tripp Umbach is confident in the model construction and projections presented herein; however, shifts in the overall economic climate in the state and nation and changes in state governmental policy toward biomedical science and medical research are not calculated or accounted for in this study. The projections presented in this study are based upon the state moving forward to make medical research and healthcare services an increasingly important industry sector in the South Florida region.

Model Summary for Projecting Economic Value of Commercialization by 2025

Conservative	Aggressive
Moderate Level New Successful Company Start-Ups (5-15) [27]	High Level of New Successful Company Start-Ups (>15)
Moderate Expansion of Venture Capital $8 -$13 million (annually/ per company)	High Level Expansion of Venture Capital $12 -$23.6 million (annually/ per company)
$1 State (2001-05), $0 State (2015): $0.50 Additional Funding: $1 Leveraged Funding	$1 State (2001-05), $0 State (2015): $1.00 Additional Funding: $1 Leveraged Funding
Tax Benefit to Biotechnology Companies Beyond Other Companies	Direct Capital and Training Grants in Addition to Tax Benefits for Biotechnology Companies
State in Medium-Risk Environment Basic Incentive Package to New and Existing Biotech Businesses	State in High-Risk Environment Expanded Incentive Package to Attract and Retain Biotech Businesses
Florida has Medium-Range Success in Biotech and Life Sciences compared with other states	Florida is a recognized Leader in Biotech and Life Sciences

[27] Tripp Umbach assumed an 85% failure rate based on the following factors: 1) Post-genomic sciences R&D start-ups are more science driven and precise than other types of business start-ups, thus they are less prone to failure; and 2) Source: *Biotechnology Industry Survey*. Standard & Poor, January 2004.

APPENDIX C: DEFINITION OF TERMS

TOTAL ECONOMIC IMPACT	The total economic impact of an institution includes both the direct economic impact and the indirect economic impact, generated in the economy as a result of the direct impact. Direct impact includes items such as institutional spending, employee spending, and spending by out-of-area visitors to the institution. Indirect economic impact, also known as the multiplier effect, includes the re-spending of dollars within the local economy.
TOTAL STATE BUSINESS VOLUME	Total sales receipts generated within a given geographic area (State of Florida and South Florida – Broward County, Miami-Dade County, Monroe County and Palm Beach County). Business volume includes wholesale, retail, service sector spending as well as value added in the manufacturing process.
MULTIPLIER EFFECT	The multiplier effect is the additional economic impact created as a result of the institution's direct economic impact. Local companies that provide goods and services to an institution increase their purchasing, creating a multiplier.
INDIRECT TAX PAYMENTS	Government revenue that is collected by governmental units in addition to those paid direct by an institution, including taxes paid directly by employees of the institution, visitors to the institution, and vendors who sell products to the institution.
DIRECT EMPLOYMENT	Total Employees based on Full-Time Equivalents (FTEs).
INDIRECT EMPLOYMENT	Indirect employment is the additional jobs created as a result of the institution's economic impact. Local companies that provide goods and services to an institution increase their number of employees as purchasing increases, creating an employment multiplier.