FLORIDA TAXWATCH
BRIEFING

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Building Florida's High-Tech Manufacturing Sector

Analysis of Public Industry Infrastructure Investment Projects In the Advanced Manufacturing Sector

As the global manufacturing industry shifts away from classically portrayed steel and car plants to a modernized approach of high-tech manufacturing; companies, countries, and states find themselves looking for a way to best position themselves to benefit from the future of manufacturing. Florida finds itself in a unique position to capitalize on an existing project that could help the state become a world leader in high-tech manufacturing for years to come.

The International Consortium for Advanced Manufacturing Research (ICAMR) is a public- private partnership that looks to expand Florida's high-tech manufacturing sector. ICAMR recently broke ground on a location in the Florida Advanced Manufacturing Research Center (FAMRC) in Osceola County. The location will allow ICAMR to expand and create the opportunity for private business to locate research centers in the same area, creating a cluster effect. ICAMR plans to "develop innovative manufacturing processes, materials, and equipment for advanced sensors and other future high-tech products."[1] The project currently partners local governments, state universities, and the private sector (with plans to include state investment) creating an early entrance into the budding field of high-tech manufacturing.

IMPORTANCE OF HIGH-TECH MANUFACTURING

With constant improvements in technology, high-tech manufacturing is an ever expanding industry. Currently, Florida is home to more than 18,000 manufacturers who employ roughly 317,000 people.[2] Florida has also positioned itself well in terms of manufacturing sectors, as four of the top five manufacturing industries in the state are considered advanced or high-tech manufacturing fields.[3]

While this news seems to tell a positive story for Florida's manufacturing industry, the state has fallen behind the rest of the nation in the manufacturing sector. Manufacturing jobs makes up only 4.2% of Florida jobs, placing the state at the 7th lowest percentage in the nation.[4] Improvement in this field is necessary to:

- Help diversify Florida's economy;
- Create job growth in a relatively untapped sector; and
- Bring high wages and stable incomes to the state.

Fostering the growth of high-tech and advanced manufacturing in Florida will create positive and sustainable economic growth for years to come.

1 "About ICAMR." International Consortium for Advanced Manufacturing Research. 2015. www.icamr.net/about.html Jan 25, 2016.

2 "Could Florida Be the Next High-Tech Hub?" Florida TaxWatch. May 2015.

3 Ibid.

4 "Manufacturing Employment by State." National Association of Manufacturers. 2014. www.nam.org/Data-and-Reports/State-Manufacturing-Data/2014-State-Manufacturing-Data/Manufacturing-Employment-by-State---2014/

HOW FLORIDA CAN FACILITATE THE GROWTH OF HIGH-TECH ADVANCED MANUFACTURING

Historically, Florida's business and tax environments have not been favorable to the growth of the manufacturing industry.[5] A 2015 report by Florida TaxWatch found that Florida lags behind its competitor states in terms of capital investment into the field.[6] While Florida has worked to change this perception by implementing a broad tax exemption for manufacturing equipment, the exemption is set to sunset in 2017.

Since Florida is already at a competitive disadvantage in the manufacturing industry,[7] the best way to gain momentum in the field of manufacturing is to create an opportunity that is only available in a few states. The International Consortium for Advanced Manufacturing Research (ICAMR) grants Florida the unique opportunity to invest in an emerging manufacturing market that has great potential economic benefits for the state. With a facility under construction, a plan already in place, and private partners already committed to the ICAMR mission, the primary task left is to build-out the facilities and outfit the center that could house a world leader in advanced manufacturing.

IF YOU BUILD IT THEY WILL COME

Public industry infrastructure investment projects in the field of research and development (R&D) and high-tech manufacturing have been extraordinarily successful in a variety of locations. Those states and countries that have invested in building world class manufacturing facilities have benefited from boosts to their economies, emergence in relatively untapped markets, and have become clusters for groundbreaking research and development in their respective fields.

A key to the success of these public industry infrastructure investment projects is that they incentivize collaborations. The collaboration from the private and public sectors, as well as cooperation within different arenas of the private sector allows for increased efficiencies. Enabling the entire supply chain to manufacturers, and so on. This collaboration results in unprecedented advancements in technology.

THE NATIONAL GRAPHENE INSTITUTE

One highly relevant example of a successful public industry infrastructure investment project that is similar to ICAMR is the National Graphene Institute (NGI) in Manchester, England. Now considered the world leader in graphene (a substance that is 100 times stronger than steel but is significantly lighter)[8] research and development, NGI was simply a concept just a few short years ago; the United Kingdom saw an opportunity to gain a strong foothold in an emerging market. With the help of a 38 million pound investment from the U.K. government and an additional 23 million pound investment by the European Union's European Regional Development Fund (ERDF), the NGI was founded on the campus of the University of Manchester.[9]

While the 82,000 square foot facility has only recently opened its doors, it has already drawn the attention of some of the world's leaders in technology and manufacturing. The NGI already boasts more than 40 private partnerships, including Airbus, Dyson, Lockheed Martin, Sharp, Siemens, and many more.[10] Furthermore, the institute has drawn praise from world leaders, including Chinese President Xi Jinping, who toured the facility in October of 2015. President Xi's visit also came with an investment from telecommunications equipment giant Huawei

5 Sutton, James. 2013. "FL Sales & Use Tax Machinery & Equipment Exemption Signed into Law – Finally!" *Florida Tax Law Blog*. 21 May 2013. www.floridasalestax.com/Florida-Tax-Law-Blog/2013/May/FL-SALES-USE-TAX-MACHINERY-EQUIPMENT-EXEMPTION-S.aspx. (Jan 25, 2016).

6 "Extending the Manufacturing Machinery & Equipment Sales Tax Exemption." Florida TaxWatch. November 2015.

7 Ibid.

8 De La Fuente, Jesus. "Graphene, What Is It?" *Graphene Publications*. www.graphenea.com/pages/graphene#.VqqNlSorLIV. (Jan 25, 2016).

9 European Commission: Regional and Urban Policy. 2012. "National Graphene Institute Quick Appraisal Report; Project Application CCI No 2012UK162PR003." November.

10 "Partnerships." The University of Manchester: National Graphene Institute. www.graphene.manchester.ac.uk/collaborate/partnerships/. (Jan 25, 2016).

worth millions of pounds.[11] With private investments flowing into the NGI, the local economy, as well as Manchester's research and development field, have seen great growth; in fact, Manchester was named the European City of Science for 2016,[12] in large part due to the presence of the NGI.

While the positive economic of scientific impacts in Manchester have already begun to be realized, the potential impact was well known going into the project. The European Commission offered an appraisal of the NGI's application for funding from the ERDF. The appraisal report is used by the ERDF to verify whether a project is worth co-financing and whether a public contribution is justified.

The European Commission's appraisal addressed the economic impact studies laid out in the application for funding. Among the claims made were:

- 10 new "spin out" companies were to be created in the first 10 years of the NGI;
- By 2018, 75 gross jobs will have been created by "spin out" projects;
- By 2024 the NGI will employ 105 research and technical staff;
- The marketplace for graphene applications would impact more than 9,000 companies in the Northwest; and
- The number of patents issued would increase.[13]

After review, the European Commission found the application's claims to be justified. The commission went on to find a benefit to cost ratio (sometimes referred to as a return on investment) of 3.76, meaning that for every pound in cost, the expected benefit in return would be equal to 3.76 pounds.[14]

The analysis also found a high gross value added per job of 329,333 pounds,[15] a measure that helps explain the contribution added to the economy by each individual.

After a favorable analysis of the application, the European Commission recommended the application be approved. The appraisal states that the project is "key to EU and National policies in developing regeneration and economic growth,"[16] and goes on to state that the project could bring significant economic benefits to the region, as well as allowing the EU to compete on the global scale in the research and development of graphene.[17]

SEMATECH

One great example of a successful domestic public industry infrastructure investment project in the field of advanced manufacturing is SEMATECH, or Semiconductor Manufacturing Technology. Established in 1987, SEMATECH was jointly funded by the federal government and semiconductor manufacturing companies,[18] originally for defense and economic development reasons.[19] By the mid 1980's, the U.S. had fallen behind relative to competitor nations in the manufacturing of semiconductors, and SEMATECH was formed as a way to allow the U.S. to compete in the field.

11 *SkyNews.* 2015. "Chinese Giant Huawei Backs 'Wonder Material'." 18 October. news.sky.com/story/1571725/chinese-giant-huawei-backs-wonder-material. (accessed Jan 25, 2016).

12 *The University of Manchester News*. 2013. "Manchester named European City of Science for 2016." 30 September. www.manchester.ac.uk/discover/news/manchester-named-european-city-of-science-for-2016. (accessed Jan 25, 2016).

13 European Commission: Regional and Urban Policy. 2012. "National Graphene Institute Quick Appraisal Report; Project Application CCI No 2012UK162PR003." November.

14 European Commission: Regional and Urban Policy. 2012. "National Graphene Institute Quick Appraisal Report; Project Application CCI No 2012UK162PR003." November.

15 Ibid.

16 Ibid.

17 Ibid.

18 *The SEMATECH-Sandia National Laboratories Partnership: a case study.* 2001

19 *Ibid.*

While most federal support for SEMATECH ended in 1994, the government had done enough to get the project rolling, as evidence by the continued support from the private sector.[20]

Headquartered in Albany, New York, SEMATECH lends a great amount of insight into how a project, city, and state can develop economically after partnering with the private sector to create a world-class manufacturing hub. Through advancements in technology and sustained support from private entities, which include companies like Hewlett Packard, IBM, and Panasonic, SEMATECH has become a world leader in the manufacturing of computer chips. Furthermore, the presence of SEMATECH has led to a clustering effect that has brought in hundreds of millions of dollars in private support for other advanced manufacturing and R&D projects.

In April 2001, IBM pledged $100 million to help construct the nation's first university-based facility that supports R&D as well as the manufacturing of ultrathin silicon wafers.[21] A year later, semiconductor manufacturing equipment giant Tokyo Electron Limited announced that it would create a $300 million R&D center in Albany, New York.[22] In the year that followed, investments like these became commonplace in the Albany area, with total investments well into the billions of dollars. In fact, in 2008, IBM agreed to a $1.6 billion investment with the state of New York to establish a 120,000 square foot facility that would be owned and operated by the State University of New York System's College of Nanoscale Science and Engineering in Albany.

20 National Research Council (US) Committee on Competing in the 21st Century: Best Practice in State and Regional Innovation Initiatives; Wessner CW, editor. Washington (DC): National Academies Press (US); 2013. 7, The New York Nanotechnology Initiative.

21 IBM Executive Shares Vision of High Tech Future. The Times Union. Feb 23, 2003.

22 Site Selection. 2002. "Tokyo Electron Plugging $300M R&D Center into Albany, NY." December 2. siteselection.com/ssinsider/bbdeal/bd021202.htm. (accessed Jan 25, 2016).

The facility employs a staff of 675 and is a world leader in the R&D of semiconductor packaging and technology.[23] While these projects were in part incentivized by the state of New York, the primary investors in all of these cases were private partners.

The success of SEMATECH went much further than allowing the U.S. to regain competitiveness in the field of semiconductor manufacturing; SEMATECH allowed Albany, New York, or as it's now called, "Tech Valley,"[24] to become a leader in R&D as well as advanced manufacturing.

While Albany has been a shining example of the positive impact public industry infrastructure investment projects can have on a city's and state's government, not all states showed the same ambition and support for SEMATECH. The consortium also had a location in Austin, Texas; however, in 2010, after Texas failed to raise $120 million dollars that was part of a pact made in 2004,[25] SEMATECH made the decision to move its operations to the Albany campus, severing ties with the state of Texas.[26]

President and CEO of SEMATECH, Daniel Armbrust, would say of the decision:

> *We came to Albany because of shared investments. We share the infrastructure that's been put in here. In Texas we were on our own. At $13 billion and counting, there was no way to do it on our own. R&D costs would have consumed all of our revenue. Most jurisdictions—except*

23 National Research Council (US) Committee on Competing in the 21st Century: Best Practice in State and Regional Innovation Initiatives; Wessner CW, editor. Washington (DC): National Academies Press (US); 2013. 7, The New York Nanotechnology Initiative.

24 New York's Tech Valley." www.techvalley.org/. (Jan 25, 2016).

25 Statesman. 2010. "Is Austin in Sematech's rear-view mirror?" 22 May. www.statesman.com/news/technology/is-austin-in-sematechs-rear-view-mirror-1/nRs4q/. (accessed Jan 25, 2016).

26 Times Union. 2010. "Sematech says goodbye to Austin." 12 October. (accessed Jan 25, 2016).

New York State and a little bit of federal—have concluded this industry is mature, let's just let it run.[27]

Armbrust would go on in his presentation to note that there are a few keys to a successful venture like SEMATECH, the main one being public industry infrastructure investments. When the public invests in infrastructure, it is able to concentrate all of the R&D into one area or region. This allows for increased collaboration and partnerships with some of the private sector leaders in innovation and R&D. The ability to house all of the R&D under one roof allows for increased efficiency in all phases of the research, development, and manufacturing process. Or, as the last bullet point of Armbrust's presentation states, "it's all about shared public and private investments in infrastructure and ecosystems."[28]

While SEMATECH moved its R&D and manufacturing out of Austin, a positive impact on the regions high-tech sector remains. Today Austin remains one of the high-tech capitals of the United States, with the area expected to create 9,000 new high-tech jobs by 2017.[29]

The presence of high-tech job growth landed Austin second of Forbes list of the "Best U.S. Cities for Future Job Growth."[30] It is true that Austin's failure to invest consistently in SEMATECH led to the consortium's relocation to Albany, however, the city is still benefiting today from the cluster created by SEMATECH's presence in Austin.[31]

27 Presentation by Daniel Armbrust, National Research Council symposium, "New York's Nanotechnology Model: Building the Innovation Economy," Troy, New York, April 4, 2013.

28 Armburt, Daniel. 2013. "The SEMATECH New York Experience – Growing the Semiconductor Industry in New York: Challenge and Opportunities." Powerpoint presentation. 4 April. Troy, New York.

29 "5 Cities Poised To Be The Next Silicon Valley Tech Hub." Forbes. February 12, 2015. Accessed February 2, 2016.

30 Ibid.

31 "Florida Advanced Manufacturing Research Center." International Consortium for advanced Manufacturing Research.

HOW FLORIDA BENEFITS FROM A HIGH-TECH MANUFACTURING HUB

With a high-tech manufacturing consortium, International Consortium for Advanced Manufacturing Research (ICAMR), already planned out and just waiting to be built, Florida has a unique opportunity to gain an advantage in the ever expanding market of high-tech R&D and manufacturing. With the success stories of Albany, New York and Manchester, England, the blue print on how to create a successful high-tech hub has already been drawn. In terms of the potential impact on the state of Florida, the benefits are significant and far-reaching.

ECONOMIC IMPACT OF ICAMR

The establishment of ICAMR in Osceola County could have a significant economic impact on the region and state. As stated, ICAMR plans to focus on high-tech manufacturing of sensors. The growing demand for sensors is a side effect of the rapid advancements in technology (today's average smartphone contains approximately 24 sensors), and overall market demand is expected to increase.[32] This rapid increase will have a significant impact on the world's economy; in fact, GE predicts that the global GDP impact driven by the "sensor era" will be $32.5 trillion by 2025.[33] Forecasts also show an increase in high-tech jobs. Between 2012 and 2020, the high-tech sector is expected to add 1.3 million jobs, according to the Brookings Institute.[34]

How does ICAMR position Florida to take advantage of this booming industry? To analyze this question, it is prudent to look at the forecasts that replicate an existing development. For example, if a potential investment into ICAMR were to have the same cluster effect that was experienced in Albany over the first 10 years of SEMATCH, the results would certainly justify the investment.

32 ICAMR: Capturing the Sensor Economy for Florida. www.icamr.net/documents/SensorPen_final.pdf

33 Ibid.

34 "Florida Advanced Manufacturing Research Center." International Consortium for advanced Manufacturing Research.

Forecasts show that under this scenario, more than 4,600 new high-tech jobs would be created, resulting in $403 million in earnings, and a total of nearly 20,000 new jobs would be created, resulting in $1.1 billion in earnings.[35] The region and state would also benefit from the job creation, as it is forecasted that $106 million in state and local taxes would be collected over that time span.[36]

IMPACT ON EDUCATION

ICAMR would also be closely tied with the state university system, providing the opportunity for both Florida universities and ICAMR to benefit from the relationship. The University of Central Florida, University of South Florida, University of Florida, and Florida International University have all pledged funding to partner with ICAMR.[37] This relationship will benefit the universities by allowing the faculty and students access to cutting edge research and development, creating a unique educational experience. The relationship is also likely to boost the schools' science programs, as was the case of the University of Albany and the University of Manchester. With collaborative efforts, universities will be able to continually adapt their teachings to keep up with cutting edge advancements in technology, allowing Florida's university graduates to be trained properly to work in high-tech facilities.

ICAMR will also be able to benefit from the partnership with Florida universities. The universities will be able to work as a feeder system for the facilities, training educated and skilled workers that are ready to contribute to the high-tech field. ICAMR can also capitalize on the assets available to Florida universities; for example, the University of Central Florida is renowned for its expertise in sensor technology, solar energy, and Optics & Photonics.[38] The ability for researchers and professors to collaborate on studies will allow for a streamlined development process that could potentially lead to groundbreaking discoveries, which will benefit Florida's economy.

TURNING FLORIDA INTO THE NEXT HIGH-TECH HUB

The greatest benefit that could come from the investment in ICAMR is opening the door for Osceola County and Florida to become the next world-renowned high-tech hub. The evidence of clustering has been noted in many areas where the public sector takes the initiative to create unique high-tech infrastructure opportunities.

The successes of Manchester, England and Albany, New York's partnerships with some of the most well-known brands in the world[39] have led to expansions and private investments worth billions.[40] Even Texas, which lost SEMATECH to Albany, has seen some positive residual effects from its previous investments in the consortium.[41]

The potential to create a successful cluster in Florida is strong. With ICAMR's location in the Florida Advanced Manufacturing Research Center (FAMRC), private entities will have a chance to collaborate and expand on the facilities set to be put in place. Having a location like FAMRC in central Florida, close to world-class research universities, will incentivize partnerships with leading private sector R&D and

35 "Florida Advanced Manufacturing Research Center." International Consortium for advanced Manufacturing Research.

36 Ibid.

37 ICAMR: Capturing the Sensor Economy for Florida. www.icamr.net/documents/SensorPen_final.pdf

38 "Florida Advanced Manufacturing Research Center." International Consortium for advanced Manufacturing Research.

39 "Partnerships." The University of Manchester: National Graphene Institute. www.graphene.manchester.ac.uk/collaborate/partnerships/. (Jan 25, 2016).

40 National Research Council (US) Committee on Competing in the 21st Century: Best Practice in State and Regional Innovation Initiatives; Wessner CW, editor. Washington (DC): National Academies Press (US); 2013. 7, The New York Nanotechnology Initiative.

41 "Florida Advanced Manufacturing Research Center." International Consortium for advanced Manufacturing Research.

manufacturing firms. The state is also strategically located and has many Deepwater seaports that can be used to ship goods. Florida is also home to world-class universities that would be able to train the talent needed to allow private entities to compete in the high-tech industry. Furthermore, Florida's lack of a personal state income tax can be used as an attractive recruiting tool when trying to entice outside talent to come work in the state.

CONCLUSION & RECOMMENDATIONS

While Florida boasts a strong economy, the state has a unique opportunity to diversify its "portfolio" by investing in the ever-growing high-tech advanced manufacturing industry. In doing so, the state could take what is a relatively small sector in the overall Florida economy, manufacturing, and make it a strength by investing early and becoming a world leader in the manufacturing of high-tech sensors.

FLORIDA TAXWATCH RECOMMENDS THAT FLORIDA:

Invest public funding in high-tech manufacturing infrastructure. One such project is ICAMR, which is unique in that it is a "ready to go project" that has already received the support of many of the state universities and various private industry leaders. The development has already begun construction in the Florida Advanced Manufacturing Research Center. However, state support is needed to finish construction and outfit the center with the necessary equipment needed to compete on the global scale. With characteristics that are similar to those projects that have been successful in Albany and Manchester, the development has the potential to have a major impact on Florida's economy and manufacturing sector.

Foster the growth of public/private partnership. Albany's continued support of SEMATECH has turned the city into one of the scientific R&D capitals of the world. Its continued support of the industry has led to billions of dollars in private investment flooding into the city, which has had a significant positive impact on not only the economy, but also the educational and scientific fields in the area. If the state follows the successful models like these and others from around the world, Florida will have a chance to drastically strengthen the state's manufacturing sector and turn Florida into a high-tech manufacturing hub.

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