



Brief

The FY-2022 Economic Development Impacts of the Institute for Commercialization of Florida Technology

Submitted to:

Rafael Lohner, Executive Director



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2655 LeJeune Road, Suite 541, Coral Gables, FL 33134
T: 305-461-3811 – F: 305-461-3822 | E: info@weg.com | W: www.weg.com

Overview and Methodology

The Institute for Commercialization of Florida Technology (the Institute) generates significant and quantifiable ongoing impacts that benefit the economic development of the State of Florida each year, demonstrating the ongoing need for funding of emerging growth companies.

This Brief estimates the comprehensive economic development impacts over a 12-year period (FY-2011 to FY-2022) to the State of Florida from the Institute’s activities, and updates the previously presented economic impacts through FY-2022.

The Institute is a key contributor to Florida’s economic development, as evidenced by the quantifiable economic impacts presented in this update. The Washington Economics Group (WEG) analyzed the growing economic impacts over the past 12 years arising from the Institute’s activities utilizing the professionally accepted and widely used IMPLAN *input-output* methodology. These impacts are presented in the form of Employment (Jobs), Household Income, Gross Domestic Product (GDP), Total Economic Impact and Fiscal Revenues.

The Institute supports innovation-based companies throughout Florida. These ongoing activities, along with the Institute’s operational activities, result in positive and increasing economic impacts to Florida while strengthening the State of Florida’s Strategic Plan for Economic Development. **The Institute generates economic impacts that extend well beyond those *directly* related to these ongoing activities.** These “spillover” or multiplier impacts are the result of each business’ supply relationships with other firms operating within Florida, the proportion of business value added¹ that accrues to households in the form of labor and capital income, and the propensity of households to spend income on goods produced within the state.

Methodology

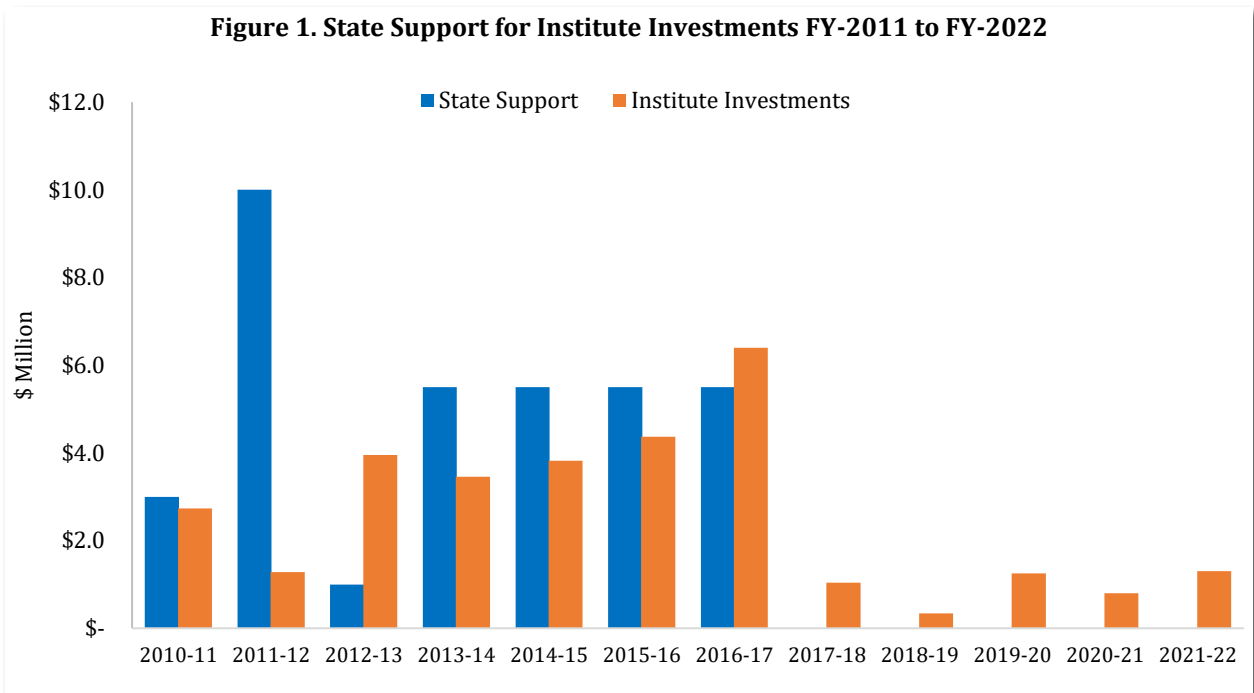
Economic models that explicitly account for inter-industry linkages (supply relationships), the generation of labor and capital income and the spending of household income have been used since the 1960’s to estimate the contribution that a particular business or industry makes to the general economy. These “input-output” models recognize that as an industry experiences an increase in the demand for its products or services, it in turn needs more goods and services from its suppliers and must increase its purchases from other industries in the economy. The effect on regional production resulting from successive rounds of inter-industry linkages is referred to as the *indirect effects*. The

¹“Value Added” refers to the difference between business revenues and the cost of non-labor and non-capital inputs to produce goods and/or services.

resulting increases in regional production also lead to expansions in employment and Household Income, and the increases in Household Income lead to increases in consumer spending, further expanding sales and production throughout the regional economy. The latter economic impacts are referred to as the *induced effects*. The successive waves of production, spending and more production result in *economic multiplier effects*, where the final or total increase in regional production, income and employment, respectively, is larger than the initial (or “*direct*”) increase in production, income and employment. The total quantitative economic contribution of these activities, therefore, is comprised of a *direct effect*, an *indirect effect* and an *induced effect*.

The Institute provided information on its total expenditures as well as employment data for firms to whom the organization provided initial funding and subsequent assistance to support their ongoing growth. Utilizing the *direct* economic impacts from each operating year from FY-2011 to FY-2022, the *indirect* and *induced* economic impacts of these recurring activities were calculated using an extended *input-output (I/O)* model of the State of Florida economy. These comprehensive economic impacts were then totaled and are presented in the sections that follow.

A substantial portion of the State appropriations has been invested in high-tech startup companies. It is important to note that the Institute has not received State support in the last five fiscal years but has continued to make investments in these companies from other funds. Figure 1 below shows the historical pattern of State support and Institute investment activities.

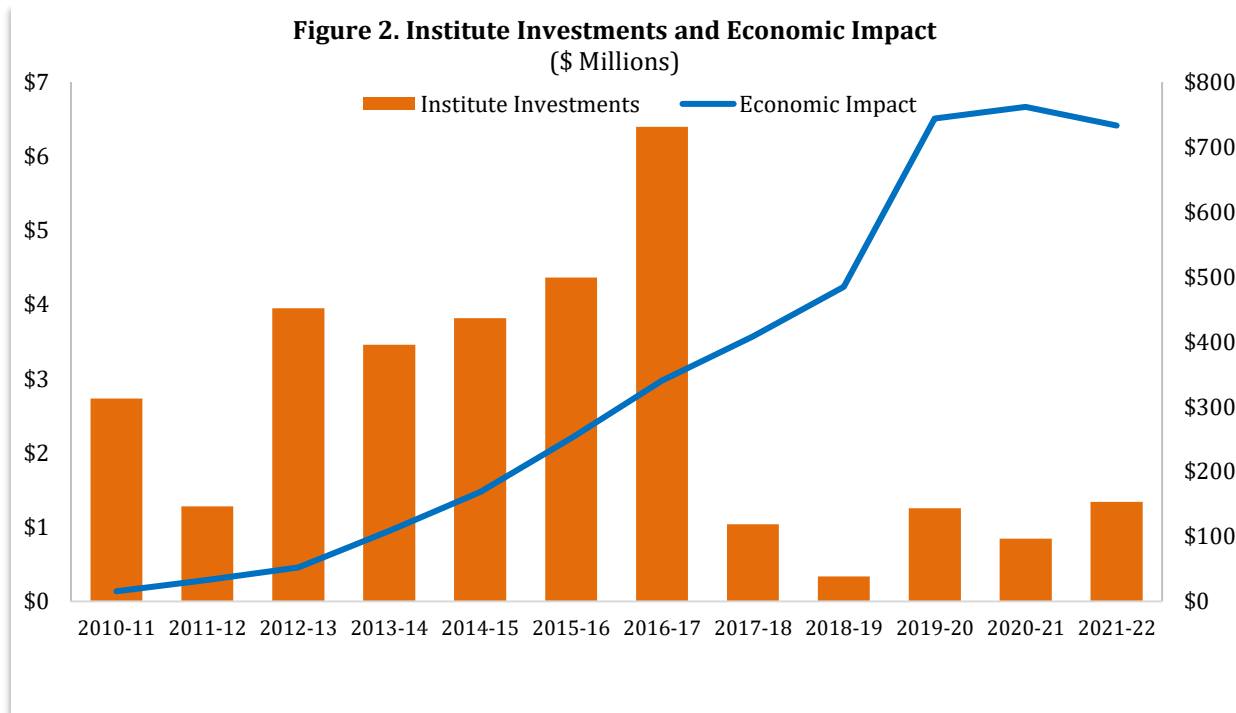


Source: The Washington Economics Group (WEG)

Summary of the Economic Impacts

The Institute and funded companies’ operations supported 91 jobs throughout the State in its first year (FY-2011). Since then, funded companies have grown with many generating significant revenues, especially within the high-wage, high-skill Knowledge-Based Services² sector of the Florida economy. This has resulted in an annual Total Economic Impact, which has been steadily increasing since FY-2011, due to the Institute’s efforts in selecting and supporting companies established through the commercialization of public research and Florida technology. Funded companies raised in excess of \$520 million of capital between FY-2011 and FY-2022, with almost \$67 million in private funding being raised in FY-2022 alone.

By showcasing investment opportunities that were previously “below the radar”, Institute programs have increased the amount of capital flowing to Florida businesses, with many of the successful funded companies attracting investment from global strategic partners.



Source: The Washington Economics Group (WEG)

With no State funding in the last five fiscal years, Institute-funded companies continue to hire additional staff and raise private capital each year, underlining the

²Major industries under this category are Software, Information Technologies, Life Sciences, Professional Administrative Services and Arts, Entertainment & Recreation, among others.

importance of State appropriations for matching seed-stage capital. In FY 2021-22 the Total Economic Impact of these companies is \$733 million, over 20 times the 11-year cumulative State support of \$36 million for the Institute's activities. This benefit is shown in Figure 2 on the previous page.

The Total Economic Impact of the Institute's operations and growth of funded companies in FY 2021 is **\$733 million**, a **\$ 28 million decrease** from the Total Economic Impact of \$761 million in FY-2021. This is largely due to the adverse impacts of COVID-19 on the Florida and Global economies. Prior to COVID, the Total Economic Impact has been steadily increasing since FY-2011. As economies emerge from the pandemic the upward trend is likely to resume.

Throughout the 12-year period from FY-2011 to FY-2022, the Institute has contributed a cumulative total of over \$4 billion in Total Economic Impact to the State of Florida. Of this \$4 billion Total Economic Impact, almost 18 percent was generated in FY-2022 alone, demonstrating the continuing success of the Institute in selecting startup firms for funding. These results are summarized in Table 1 below and Table 2 on the following page.

Table 1. Summary of the Total Recurring Economic Impacts on Florida Arising from Institute Operations and the Funded Companies (FY-2011 to FY-2022)

Fiscal Years	Impact on:				
	Employment (Jobs)	Household Income (\$ Million)	GDP (Value-Added) (\$ Million)	Federal, State & Fiscal Revenues (\$ Million)	Total Economic Impact (\$ Million)
2011	91	\$5	\$8	\$2	\$16
2012	211	\$13	\$19	\$4	\$33
2013	343	\$20	\$30	\$6	\$52
2014	683	\$41	\$61	\$12	\$109
2015	1,144	\$66	\$88	\$20	\$168
2016	1,618	\$95	\$129	\$29	\$251
2017	2,214	\$132	\$176	\$40	\$340
2018	2,636	\$159	\$214	\$49	\$408
2019	3,136	\$192	\$257	\$59	\$485
2020	3,994	\$250	\$397	\$77	\$744
2021	4,065	\$260	\$419	\$86	\$761
2022	4,253	\$277	\$388	\$71	\$733
12-Year Total	24,388	\$1,510	\$2,186	\$455	\$4,100

Note: Totals may not equal sum of all due to rounding.

Source: The Washington Economics Group (WEG)

Table 2. Summary of the Total Recurring Economic Impacts on Florida Arising from Institute Operations and the Funded Companies (FY-2011 to FY-2021 and FY-2022)

Impact on:	FY-2011 to FY-2021	FY-2022	12-Year Total
Employment (Jobs)	20,137	4,253	24,390
Household Income (\$ Million)	\$1,232	\$277	\$1,509
GDP (Value Added \$ Million)	\$1,797	\$388	\$2,185
Federal, State & Local Fiscal Revenues (\$ Million)	\$382	\$71	\$453
Total Economic Impact (\$ Million)	\$3,369	\$733	\$4,102

Note: Total may not equal the sum of all due to rounding.

Source: The Washington Economics Group (WEG)

Companies Funded by the Institute Have Created Economic Opportunities for Many Groups in Florida

For this update the Institute provided socio-economic and demographic information on the founders of the companies that they have funded. This information enabled the analysis of the economic impacts of the company's activities utilizing this information. The data shows that over one quarter of the overall economic impact, or just over \$197 million per annum is attributable to companies founded by individuals identified as socially, and economically disadvantaged. Making this program a significant opportunity for upward mobility in Florida as is shown Table 3 below and in Figure 3 on the next page.

Table 3. Summary of the Economic Impacts on Florida Arising from Institute Operations and the Funded Companies by Company Founder Status

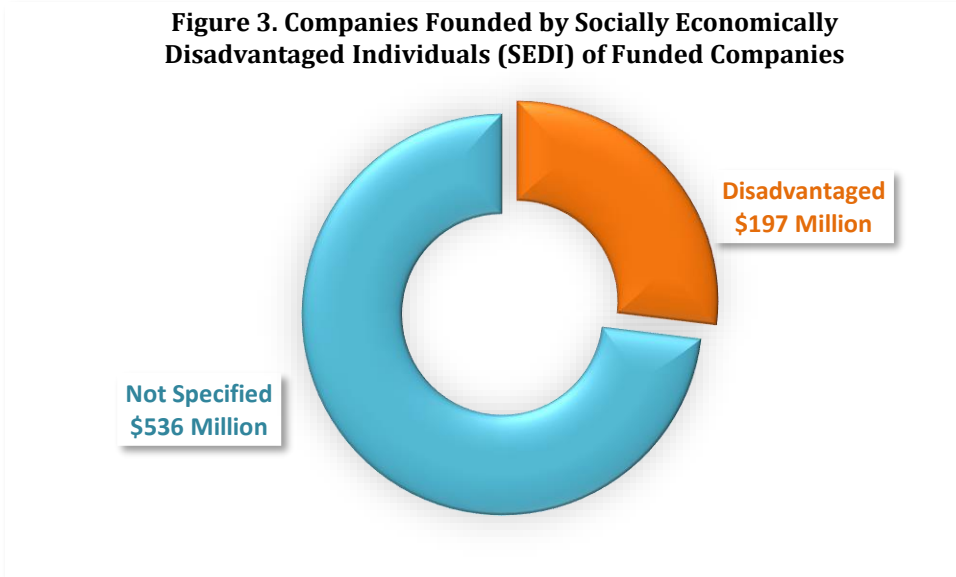
Impact on:	SEDI* Founder	Not Specified	Total Impact
Employment (Jobs)	1,145	3,108	4,253
Household Income (\$ Million)	\$75	\$202	\$277
GDP (Value Added \$ Million)	\$104	\$284	\$388
Federal, State & Local Fiscal Revenues (\$ Million)	\$19	\$52	\$71
Total Economic Impact (\$ Million)	\$197	\$536	\$733

Notes: *Socially Economically Disadvantaged Individuals.

Total may not equal the sum of all due to rounding.

Source: The Washington Economics Group (WEG)

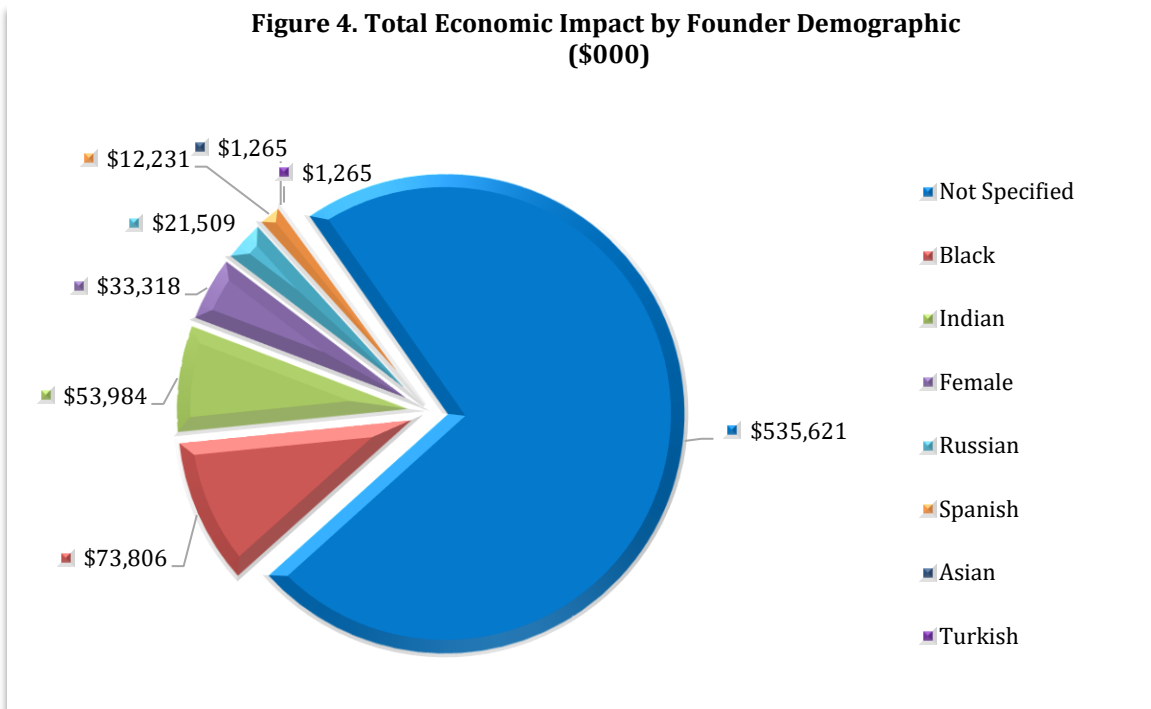
Figure 3. Companies Founded by Socially Economically Disadvantaged Individuals (SEDI) of Funded Companies



Source: The Washington Economics Group (WEG)

Founder demographic data further shows that almost 27 percent of the company founders are from groups traditionally identified as minorities or came from other nations. As a group these individuals account for almost \$200 million of the annual economic impact as is shown in Figure 4 below.

Figure 4. Total Economic Impact by Founder Demographic (\$000)



Source: The Washington Economics Group (WEG)

The Institute Contributes Significantly to Employment, Household Income and Gross Domestic Product (GDP) in the State of Florida

The Institute has a significant impact on Employment, Household Income and GDP (Value-Added) throughout the State. A majority of these impacts are created in the Knowledge-Based Services sector, which includes Software, Information Technologies and Life Sciences. The jobs created in the Knowledge-Based Services sector³ have higher wages than the statewide average (\$74,121 a year versus a statewide average of \$63,296⁴), which supports Florida’s Strategic Plan for Economic Development.

As detailed in Table 4 below, of the **4,253 jobs created** by the operations of firms supported by the Institute in FY-2022, a significant 3,249 or over 76 percent of the total are created in the Knowledge-Based Services sector, followed by the Manufacturing and the Retail Trade sectors.

**Table 4. Total Annual Employment Supported by Institute Operations and the Funded Companies
FY-2011 to FY-2022**

Fiscal Years	Knowledge-Based Services	Manufacturing	Visitor Industry	Wholesale Trade & Transportation Services	Retail Trade	Government & Other	Construction	Total All Industries
2011	62	10	4	5	6	3	1	91
2012	153	18	10	10	13	5	2	211
2013	258	23	16	14	21	8	4	344
2014	495	57	33	31	42	18	8	684
2015	822	95	67	63	58	31	8	1,144
2016	1,133	151	93	95	84	49	12	1,617
2017	1,568	194	129	124	116	67	17	2,215
2018	1,889	220	153	142	137	75	20	2,636
2019	2,273	246	182	160	163	89	23	3,136
2020	2,985	262	212	166	209	138	22	3,994
2021	3,033	261	214	199	206	132	20	4,065
2022	3,249	268	178	197	201	140	20	4,253
12-Year Total	17,920	1,805	1,291	1,206	1,256	755	157	24,390

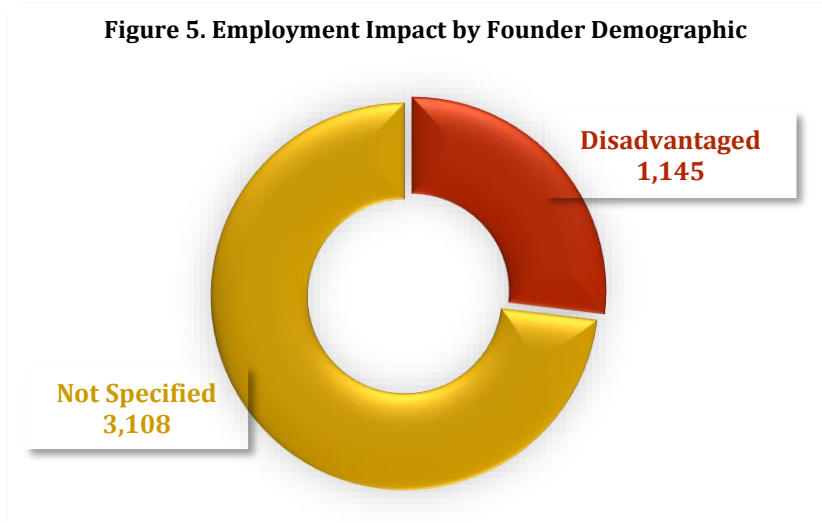
Note: Total may not equal sum of all due to rounding.

Source: The Washington Economics Group (WEG)

Table 3 on page 5 shows that over one quarter of the employment impact, or 1,145 permanent jobs are attributable to companies founded by individuals identified as socially, and economically disadvantaged. Making this program a significant component for employment diversification in Florida as is shown in the Figure 5 on the next page.

³Major industries under this category are Software, Information Technology, Life Sciences, Professional Administrative Services and Arts, Entertainment & Recreation, among others.

⁴<https://www.floridajobs.org/workforce-statistics/data-center/statistical-programs/quarterly-census-of-employment-and-wages-10-2022>.



Source: The Washington Economics Group (WEG)

In FY-2022, of the **over \$277 million generated in Household Income**, almost \$221 million or 80 percent is created in the Knowledge-Based Services sector⁵, followed by the Manufacturing and Wholesale & Transportation Services sectors as shown in Table 5 below.

**Table 5. Household Income Created by Institute Operations and the Funded Companies
FY-2011 to FY-2022 (\$ Thousands)**

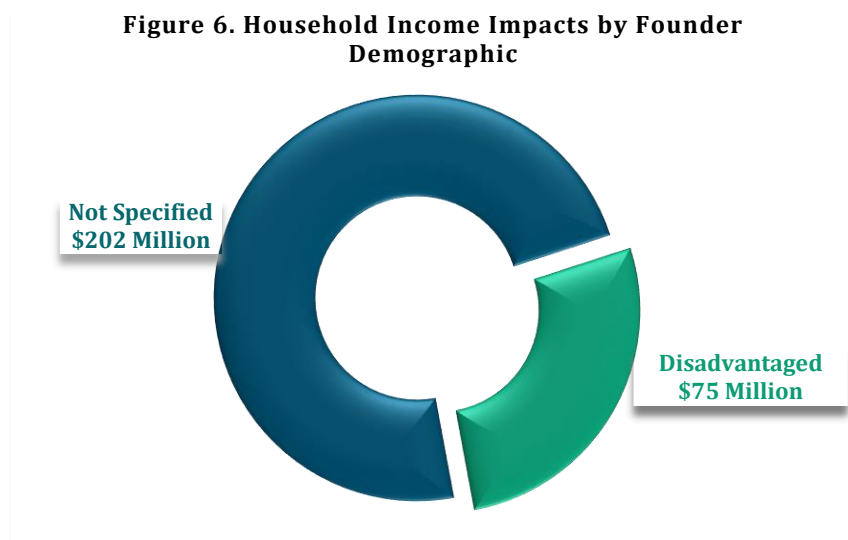
Fiscal Years	Knowledge-Based Services	Manufacturing	Visitor Industry	Wholesale Trade & Transportation Services	Retail Trade	Government & Other	Construction	Total All Industries
2011	\$3,661	\$826	\$323	\$268	\$193	\$108	\$65	\$5,444
2012	\$9,141	\$1,509	\$621	\$496	\$439	\$254	\$120	\$12,580
2013	\$15,261	\$1,918	\$905	\$716	\$695	\$409	\$186	\$20,090
2014	\$29,450	\$4,797	\$2,029	\$1,636	\$1,417	\$817	\$408	\$40,554
2015	\$49,352	\$6,186	\$4,097	\$2,662	\$1,832	\$1,753	\$424	\$66,306
2016	\$68,448	\$9,990	\$6,251	\$4,329	\$2,675	\$2,366	\$608	\$94,667
2017	\$97,119	\$12,848	\$8,130	\$5,719	\$3,712	\$3,202	\$791	\$131,521
2018	\$119,062	\$14,805	\$9,307	\$6,436	\$4,470	\$3,821	\$924	\$158,825
2019	\$146,627	\$16,442	\$10,546	\$7,310	\$5,369	\$4,567	\$1,074	\$191,935
2020	\$200,008	\$14,013	\$10,770	\$11,529	\$6,919	\$5,457	\$1,194	\$249,890
2021	\$206,304	\$17,101	\$11,315	\$11,620	\$6,922	\$5,499	\$1,045	\$259,806
2022	\$220,935	\$17,949	\$12,188	\$13,282	\$7,337	\$4,549	\$1,022	\$277,262
12-Year Total	\$1,165,368	\$118,384	\$76,482	\$66,003	\$41,980	\$32,802	\$7,861	\$1,508,880

Note: Total may not equal sum of all due to rounding.
Source: The Washington Economics Group (WEG)

Additionally, as is shown in Figure 6 that follows, over one quarter of the Household Income impact, or just over \$202 million per annum (see Table 3, page 5) is attributable to

⁵Ibid.

companies founded by individuals identified as socially, and economically disadvantaged. Making this program a significant opportunity for family income in Florida.



Source: The Washington Economics Group (WEG)

Of the **almost \$388 million of GDP impacts** arising in FY-2022, more than \$306 million or 79 percent are generated in the Knowledge-Based Services sector⁶. This is followed by the Manufacturing, Wholesale Trade & Transportation Services and Government & Other sectors. (See Table 6 below.)

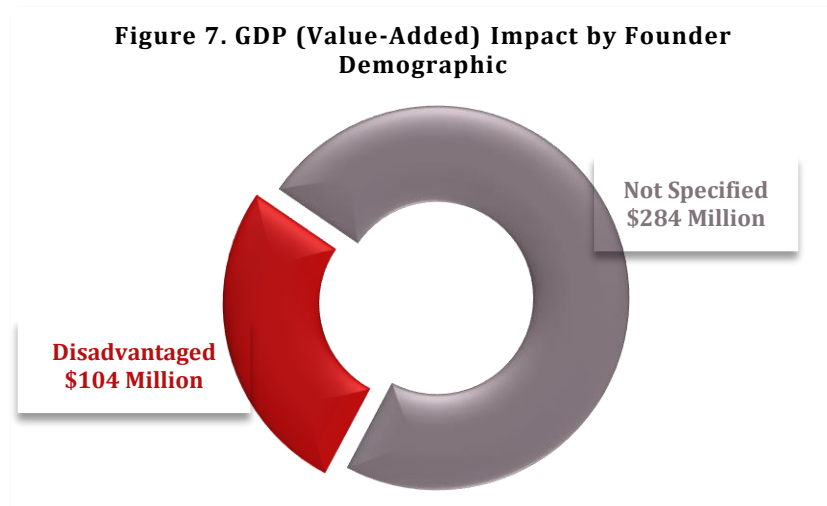
**Table 6. GDP (Value-Added) Impacts Created by Institute Operations and the Funded Companies
FY-2011 to FY-2022 (\$ Thousands)**

Fiscal Years	Knowledge-Based Services	Manufacturing	Visitor Industry	Wholesale Trade & Transportation Services	Retail Trade	Government & Other	Construction	Total All Industries
2011	\$5,464	\$1,286	\$548	\$420	\$302	\$158	\$92	\$8,270
2012	\$13,173	\$2,449	\$1,042	\$796	\$688	\$374	\$170	\$18,692
2013	\$22,573	\$3,129	\$1,510	\$1,175	\$1,091	\$602	\$265	\$30,345
2014	\$43,000	\$7,710	\$3,410	\$2,629	\$2,221	\$1,203	\$580	\$60,753
2015	\$61,962	\$9,273	\$6,642	\$4,032	\$2,875	\$2,541	\$444	\$87,769
2016	\$86,901	\$16,208	\$10,377	\$6,585	\$4,228	\$3,481	\$735	\$128,515
2017	\$120,961	\$21,355	\$13,557	\$8,868	\$5,877	\$4,760	\$1,024	\$176,402
2018	\$149,274	\$24,741	\$15,495	\$10,082	\$7,079	\$5,710	\$1,235	\$213,616
2019	\$183,281	\$27,229	\$17,505	\$11,732	\$8,501	\$6,851	\$1,473	\$256,572
2020	\$321,599	\$16,881	\$19,835	\$17,407	\$11,321	\$8,396	\$1,876	\$397,315
2021	\$336,391	\$21,252	\$20,786	\$18,082	\$11,475	\$8,667	\$1,958	\$418,611
2022	\$306,515	\$24,154	\$18,407	\$18,048	\$11,969	\$7,038	\$1,755	\$387,886
12-Year Total	\$1,651,094	\$175,667	\$129,114	\$99,856	\$67,627	\$49,781	\$11,607	\$2,184,746

Note: Total may not equal sum of all due to rounding.
Source: The Washington Economics Group (WEG)

⁶Major industries under this category are Software, Information Technology, Life Sciences, Professional Administrative Services and Arts, Entertainment & Recreation, among others.

As with other impact measures, Figure 7 below shows that over one quarter of the GDP (Value-Added) impact, or just over \$284 million annually is attributable to companies founded by individuals identified as socially, and economically disadvantaged. This underlines the program's economic value added by SEDI founders across a diverse set of industries.



Source: The Washington Economics Group (WEG)

The Total Economic Impact of the Institute Remained Strong in the Face of the COVID-19 Global Pandemic: A Positive Outcome without State Fiscal Support for Five Consecutive Years

A comprehensive measure of the Total Economic Impact of the Institute's ongoing operations and commercialization of public research is *Gross Economic Output* representing the sum of gross revenues (receipts) of private firms plus the value of government services (valued at cost).

Over the past 12 years, the cumulative Total Economic Impact for the Institute and its funded companies totaled \$4.1 billion, providing important contributions to the creation of an innovation and knowledge-intensive economy, and underscoring the need for seed-stage funding for emerging growth companies.

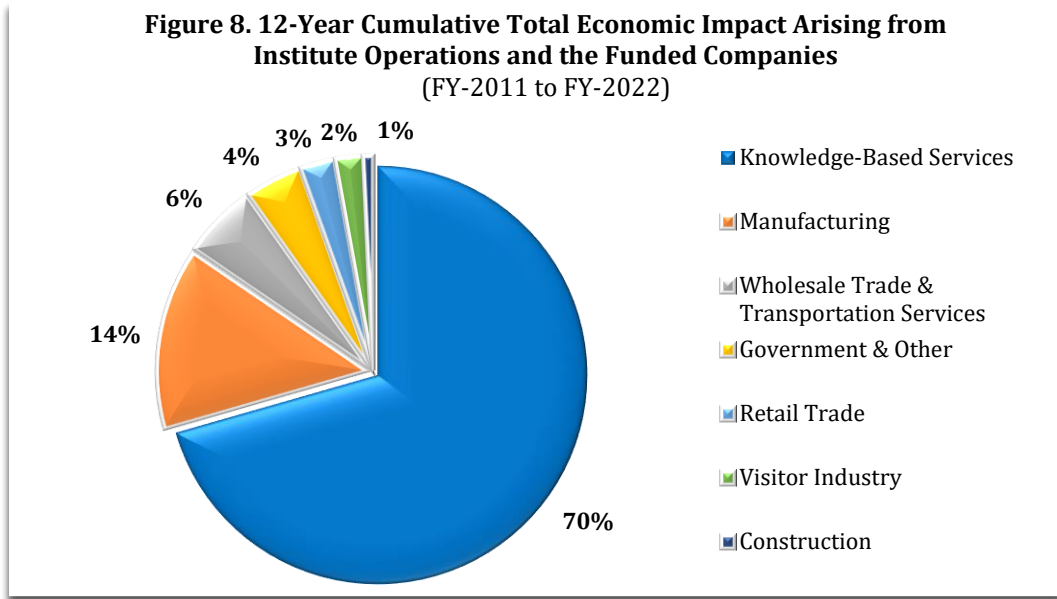
In FY-2022 alone, \$733 million of Total Economic Impact was generated by the ongoing activities of the Institute and funded companies. This is down from \$762 million in FY-2021 (a \$28 million decrease) and is largely attributable to the dislocations caused by the COVID-19 pandemic. These total economic impacts have increased strongly since the Institute started deploying seed capital and advisory services in FY-2011. (See Table 7.)

**Table 7. Total Annual Economic Impact Arising from Institute Operations and the Funded Companies
FY-2011 to FY-2022 (\$ Thousands)**

Fiscal Years	Knowledge-Based Services	Manufacturing	Visitor Industry	Wholesale Trade & Transportation Services	Retail Trade	Government & Other	Construction	Total All Industries
2011	\$8,638	\$4,596	\$876	\$669	\$406	\$268	\$194	\$15,647
2012	\$20,457	\$7,965	\$1,678	\$1,266	\$924	\$634	\$359	\$33,283
2013	\$35,005	\$10,094	\$2,442	\$1,866	\$1,464	\$1,019	\$560	\$52,450
2014	\$67,149	\$25,671	\$5,489	\$4,182	\$2,981	\$2,037	\$1,223	\$108,732
2015	\$103,597	\$34,174	\$12,829	\$7,749	\$4,515	\$4,319	\$1,315	\$168,498
2016	\$146,255	\$58,712	\$19,275	\$12,673	\$6,578	\$5,916	\$2,035	\$251,444
2017	\$202,212	\$76,159	\$24,762	\$17,036	\$9,090	\$8,092	\$2,752	\$340,103
2018	\$250,837	\$85,899	\$28,085	\$19,530	\$10,843	\$9,727	\$3,288	\$408,209
2019	\$308,562	\$93,360	\$31,545	\$22,691	\$12,895	\$11,698	\$3,894	\$484,645
2020	\$592,901	\$48,320	\$35,443	\$29,496	\$18,595	\$14,773	\$4,459	\$743,987
2021	\$592,724	\$61,327	\$37,725	\$31,421	\$19,110	\$15,273	\$4,227	\$761,807
2022	\$565,867	\$66,570	\$32,482	\$31,572	\$19,699	\$12,703	\$4,263	\$733,156
12-Year Total	\$2,894,204	\$572,847	\$232,631	\$180,151	\$107,100	\$86,459	\$28,569	\$4,101,961

Note: Total may not equal sum of all due to rounding.
Source: The Washington Economics Group (WEG)

Figure 8. 12-Year Cumulative Total Economic Impact Arising from Institute Operations and the Funded Companies (FY-2011 to FY-2022)



Source: The Washington Economics Group (WEG)

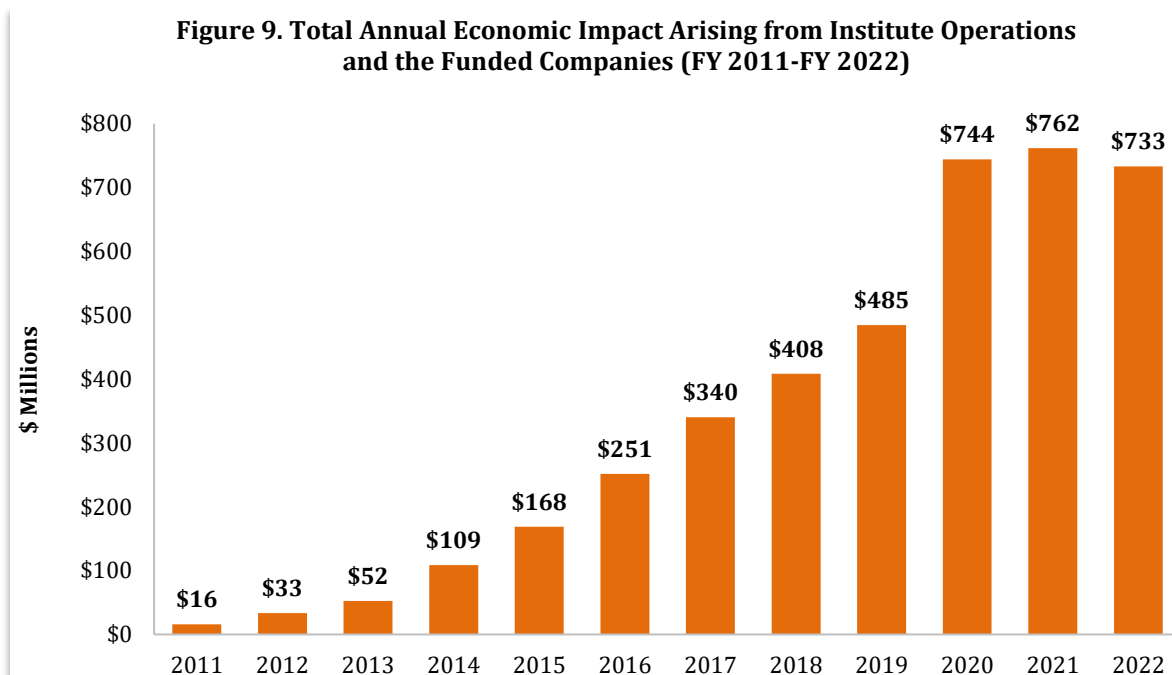
Table 7 and Figure 8 above show the industry distribution of the Total Economic Impact between FY-2011 and FY-2022, with the Knowledge-Based Services⁷ and the Manufacturing sectors being the top economic impact generators. **These two high-wage, high-skill sectors are emphasized by the Economic Development Strategy of the State.** In FY-2022

⁷Major industries under this category are Software, Information Technology, Life Sciences, Professional Administrative Services and Arts, Entertainment & Recreation, among others.

alone, the Total Economic Impact of the ongoing operations of the Institute on the Florida economy was over \$733 million

At the outset of the Institute’s seed funding activities, in FY-2011, the Total Economic Impact of the Institute and the funded companies was a modest \$16 million. Since then, the Total Economic Impact has grown substantially as many companies supported by the Institute have grown, continue to raise capital, launch products, generate revenues and increase their payrolls.

As shown in Figure 9 below, the Total Economic Impact of the ongoing operations of the Institute on the Florida economy was over \$733 million in FY-2022 alone. This is almost a **47-fold increase** in annual Total Economic Impact since the onset of the Institute’s activities in FY-2011.



Source: The Washington Economics Group (WEG)

The Institute’s Funded Companies Generate Significant Contributions to Federal, State and Local Fiscal Revenues

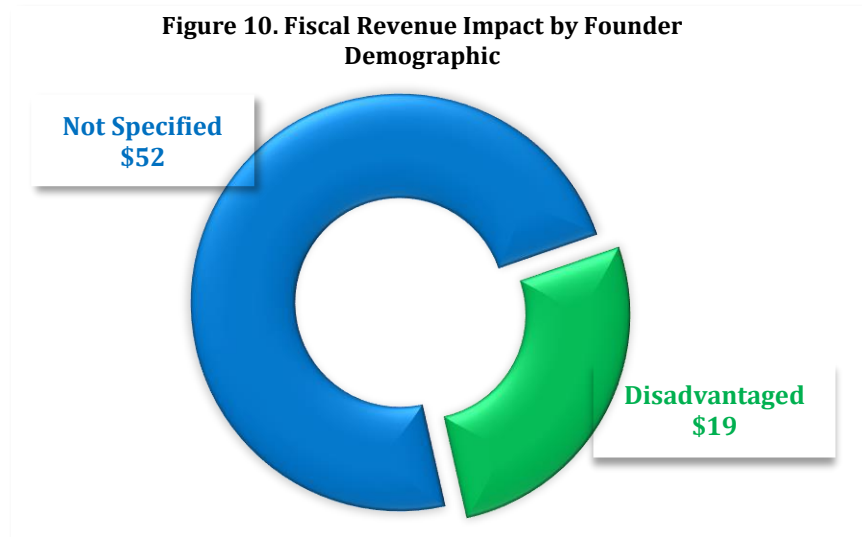
The Institute’s funded companies have generated growing Fiscal Revenues for Federal, State and Local governments as shown in Table 8 that follows. At the start of the Institute’s seed funding activities in FY-2011, the operations and funding activities generated slightly over \$1.6 million in total Fiscal Revenues. In FY-2022, the annual total Fiscal Revenue impacts increased to almost \$71 million, down from \$86 million in FY-2021. The cumulative 12-year Fiscal Revenue impacts total is over \$453 million.

**Table 8. Fiscal Contributions Arising from Institute Operations and the Funded Companies
FY-2011 to FY-2022 (\$ Thousands)**

Fiscal Years	Taxes Paid By:					Total All Activities
	Labor	Capital	Indirect Business Taxes	Households	Corporations	
2011	\$511	\$24	\$490	\$429	\$169	\$1,623
2012	\$1,188	\$53	\$1,077	\$990	\$364	\$3,672
2013	\$1,903	\$83	\$1,714	\$1,582	\$617	\$5,899
2014	\$3,842	\$168	\$3,509	\$3,193	\$1,206	\$11,918
2015	\$7,269	\$331	\$5,310	\$5,697	\$1,086	\$19,693
2016	\$10,484	\$439	\$7,974	\$8,345	\$1,854	\$29,096
2017	\$14,646	\$586	\$10,758	\$11,786	\$2,507	\$40,283
2018	\$17,739	\$691	\$12,852	\$14,335	\$3,125	\$48,742
2019	\$21,466	\$827	\$15,207	\$17,427	\$3,717	\$58,644
2020	\$27,670	\$971	\$21,970	\$23,147	\$3,357	\$77,115
2021	\$30,025	\$594	\$21,956	\$28,534	\$4,446	\$85,555
2022	\$33,420	\$661	\$7,680	\$26,283	\$2,851	\$70,895
12-Year Total	\$170,163	\$5,428	\$110,497	\$141,748	\$25,299	\$453,135

Note: Totals may not equal sum of all due to rounding.
Source: The Washington Economics Group, Inc. (WEG)

As with other measures of economic activity, the data shows that over one quarter of the fiscal revenues arising from these companies, or just over \$19 million per annum is attributable to companies founded by individuals identified as socially, and economically disadvantaged. Making this program a significant opportunity for capital formation in Florida as is shown in Figure 10 below.



Source: The Washington Economics Group (WEG)

Appendix I: Methodology

IMPLAN Model

The multiplier impacts calculated by the IMPLAN model are based on input-output methodology, which explicitly considers the inter-industry linkages that exist within an economy. Each industry needs labor and inputs from other industries in order to produce economic output. Whenever an industry experiences an increase in the demand for its output, many other industries within that economy *indirectly* experience an increase in demand as well because of these inter-industry linkages. This increase in demand that results from the need for material inputs is called the *indirect effects*. In addition, an increase in production within a region also leads to an increase in household income through the hiring of workers, which in turn generates further demands for goods and services within the region. Firms also need to expand their base of physical capital to meet higher levels of demand, and this too stimulates regional economic growth. The latter effects are referred to as *induced effects*. The inter-industry linkages and the *induced* effects on consumer and capital spending lead to successive rounds of production, and this process results in an increase in output that exceeds the initial change in demand, or a *multiplier effect*. Similarly, the increase in household income will exceed the initial payroll increase encountered in the industry that experienced the original increase in demand. The total change in employment in the regional economy is a multiple of the *direct* change in employment.

The following represents the system of equations that comprise the regional economy in an extended input-output model like IMPLAN:

$$\begin{aligned}
 x_1 &= a_{11}x_1 + a_{12}x_2 + a_{13}x_3 + \cdots + a_{1k}x_k + a_{1h}x_h + a_{1i}x_i + f_1 \\
 x_2 &= a_{21}x_1 + a_{22}x_2 + a_{23}x_3 + \cdots + a_{2k}x_k + a_{2h}x_h + a_{2i}x_i + f_2 \\
 x_3 &= a_{31}x_1 + a_{32}x_2 + a_{33}x_3 + \cdots + a_{3k}x_k + a_{3h}x_h + a_{3i}x_i + f_3 \\
 &\vdots \\
 x_k &= a_{k1}x_1 + a_{k2}x_2 + a_{k3}x_3 + \cdots + a_{kk}x_k + a_{kh}x_h + a_{ki}x_i + f_k \\
 x_h &= a_{h1}x_1 + a_{h2}x_2 + a_{h3}x_h + \cdots + a_{hk}x_k + a_{hh}x_h + a_{hi}x_i + f_h \\
 x_i &= a_{i1}x_1 + a_{i2}x_2 + a_{i3}x_h + \cdots + a_{ik}x_k + a_{ih}x_h + a_{ii}x_i + f_i
 \end{aligned}$$

The variables x_1 to x_k represent total production of output in each industry. The coefficients a_{ij} represent the purchases from industry “i” that are needed to produce a dollar of output in industry “j”. These are known as the *direct requirement* coefficients. The variable x_h refers to household income and the coefficients a_{ih} refer to the average amount of household income spent on purchases from industry “i”, or the *average propensities to consume*. The coefficients a_{hi} are similar to the

inter-industry purchases (a_{ij} 's), but they represent the household income that is generated from each dollar of output produced in industry "i". Similarly the variable x_I represents regional spending on capital goods, and the coefficients a_{ij} represents the spending on capital goods for each dollar of output produced in industry "j". The coefficients a_{ji} represent the amount purchased from industry "j" for each dollar spent on capital goods within the region. The variables f_j represent the exogenous final demand faced by each industry, respectively.

This system of equation reduces, using matrix notation, to the following solution for industry output and household income:

$$X = (I - A)^{-1} F$$

X is the vector of industry outputs plus household income, and F is a vector of exogenous final demands. The "output multipliers" (i.e., the change in industry output and household income that results from a change in final demand for the output of a particular industry) are given in the columns of the $(I-A)^{-1}$ matrix. The IMPLAN software calculates these multipliers for counties, states and other sub-state regions. These multipliers can be used to provide a sense of the economic importance of an industry or an economic activity in a given region. The multipliers impacts for gross state product, labor and capital income and the government revenue impacts are derived from the basic output multipliers given by $(I-A)^{-1}$.

The IMPLAN model uses historical relationships between public-sector revenues and regional economic output in order to estimate the public-sector revenue impact resulting from the establishment of a new, or expansion of an existing economic activity.

Appendix II: Economic Glossary

Definitions of Economic Terms Used in the Analysis

Terms	Definitions
<i>Employment (Jobs)</i>	Total of full-time or part-time jobs.
<i>Household (Labor) Income</i>	All forms of employment income, including Employee Compensation (wages and benefits) and Proprietor Income.
<i>Gross Domestic Product (GDP)/Value Added</i>	The increased value of a product as a result of the economic inputs (labor and capital) expended at a given stage. In the IMPLAN Model, GDP is the sum of: Employee Compensation, Proprietor Income, Other Property Type Income (Interest) and <i>Indirect</i> Business Taxes.
<i>Economic Impact</i>	Total value of all transactions attributed to an activity.
<i>Direct Effects</i>	The set of expenditures applied to the predictive model (i.e., I/O multipliers) for impact analysis. It is a series (or single) of production changes or expenditures made by producers/consumers as a result of an activity or policy. These initial changes are determined by an analyst to be a result of this activity or policy. Applying these initial changes to the multipliers in an IMPLAN model will then display how the region will respond, economically to these initial changes.
<i>Indirect Effects</i>	The impact of local industries buying goods and services from other local industries. The cycle of spending works its way backward through the supply chain until all money leaks from the local economy, either through imports or by payments to value added. The impacts are calculated by applying <i>Direct</i> Effects to the Type I Multipliers.
<i>Induced Effects</i>	The response by an economy to an initial change (<i>direct</i> effect) that occurs through re-spending of income received by a component of value added. IMPLAN's default multiplier recognizes that labor income (employee compensation and proprietor income components of value added) is not a leakage to the regional economy. This money is re-circulated through the household spending patterns causing further local economic activity.

**Appendix III:
The Washington Economics Group (WEG)
Project Team and Qualifications**



J. Antonio Villamil
Founder and Senior Advisor

Tony Villamil is a nationally recognized economist, with over thirty-five years of a successful career as a business economist, university educator, corporate Board Director and high-level policymaker for both federal and state governments. Tony was selected in 2008 as the founding Dean of the School of Business of St. Thomas University, serving successfully until the end of 2013 at which time he resigned to return as senior advisor to the growing economic consulting practice that he founded, The Washington Economics Group, Inc. (WEG), a Florida-based firm established in 1993 upon returning to the State from his public service in Washington, D.C.

Tony is the immediate past Chairman of the Governor's Council of Economic Advisors of Florida, and during 1999-2000, he was selected by Governor Jeb Bush as his first Director for Tourism, Trade and Economic Development. Previously, he was appointed by President George H. W. Bush as U.S. Undersecretary of Commerce for Economic Affairs, receiving unanimous U.S. Senate confirmation. Presently he is active on Corporate Board of Directors, including Pan American Life Insurance Group (PALIG) and Spanish Broadcasting System (SBS). At PALIG he serves as Chair of the Governance and Nominating Committee of the Board. Tony is currently Chair of the Board Compensation Committee at SBS. He also served in multiple bank boards for over 20 years.

Among civic and professional leadership positions, he is currently a member of the Board of Directors of the Miami-Dade Beacon Council, the official economic development organization of the County. He is also on the Board of Directors of the Greater Miami Chamber of Commerce. He serves as Senior Fellow of the James Madison Institute (JMI) of Tallahassee, Florida.

He earned Bachelor and Master Degrees in Economics from Louisiana State University (LSU), where he also completed coursework for the Ph.D. Degree. In 1991, Florida International University (FIU) awarded Tony a Doctoral Degree in Economics (hc), for "distinguished contributions to the Nation in the field of economics." He frequently speaks to business, government and university audiences on the Florida economy, U.S. trade policy and economic development issues.



Charles K. Yaros

Associate Consultant for Economics

Chuck Yaros is an Associate Consultant for Economics at The Washington Economics Group, Inc. (WEG). He serves as economic consultant in the areas of financial economics and economic impact studies. Prior to joining WEG he was a Vice President and Portfolio Strategist at Shay Financial Services in Miami where he specialized in developing, implementing and managing interest rate risk and capital optimization strategies for financial institutions.

Mr. Yaros has over 20 years of experience as a business and financial economist, having worked in a number of positions of progressive responsibility in the South Florida business community. Additionally, he has spoken and taught courses on financial risk management.

Chuck received his undergraduate degree in Economics with Honors from Trinity College and his Master's degree in Economics from Duke University, where he also completed course work for the Ph.D. degree. Chuck and his family are residents of Coral Gables, Florida.



Haydee M. Carrion
Senior Research Assistant

Haydee M. Carrion has been Executive Assistant to Dr. Villamil since the firm's founding in 1993. She has senior level expertise in multi-media presentations and in the preparation and design of complex reports and documents for clients, utilizing the latest technologies.

In 2012, WEG promoted her to Senior and Project Research Assistant to the firm, given outstanding performance in web-based research and in assistance to the firm's Principal in the preparation of audio-visual presentations for clients and in desktop publishing. Ms. Carrion is fluent in Spanish, with experience in the preparation of economics and business documents in the language.

Ms. Carrion has been with WEG for 28 years. Ms. Carrion holds AA degrees in Business Administration and AS Office System Technologies from Miami-Dade College.

The Washington Economics Group® has been successfully meeting client objectives since 1993 through economic consulting services for corporations, institutions and governments of the Americas. We have the expertise, high-level contacts, and business alliances to strengthen your competitive positioning in the growing marketplaces of Florida, Latin America and the Caribbean.

Our roster of satisfied clients, over the past 28 years, includes corporations, financial institutions, public entities, and non-profit associations expanding their operations in the Americas.

Exclusive Consulting Approach:

Each client is unique to us. We spend considerable time and effort in understanding the operations, goals, and objectives of clients as they seek our consulting and strategic advice. We are not a mass-production consulting entity nor do we accept every project that comes to us. We engage a limited number of clients each year that require customized consulting services in our premier areas of specialization. These premier and exclusive services are headed by Founder and Senior Advisor J. Antonio (Tony) Villamil. Tony is a former U.S. Under Secretary of Commerce with over thirty-five years of experience as a business executive and as a senior public official of the U.S. and most recently of Florida.

Premier Consulting Services:

Economic Impact Studies highlight the importance of a client's activities in the generation of income, output and employment in the market area serviced by the entity. These studies are also utilized to analyze the impact of public policies on key factors that may affect a client's activities such as tax changes, zoning, environmental permits and others.

Strategic Business Development Services are customized to meet client objectives. Recent consulting assignments include customized marketing strategies, country risk assessments for investment decisions and corporate spokesperson activities and speeches on behalf of the client at public or private meetings.

Economic Development Strategies. The firm supports cities, counties and states in developing targeted economic development plans and strategies to attract, retain and expand high-wage industries. Each plan is based on the factor endowments of the area, and in close coordination with public officials in charge of economic development.

**For a full description of WEG capabilities and services,
please visit our website at:
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Representative Client List 1993-2022

Multinational Corporations

ALSTOM	Lockheed Martin
Ameritech International	Lucent Technologies
Bureau Veritas (BIVAC)	MasterCard International
Carrier	MediaOne/AT&T
Carnival Corp.	Medtronic
Esso Inter-America	Merck Latin America
FedEx Latin America	Microsoft Latin America
Genting Group	Motorola
Hyatt	Phelps Dodge
IBM	SBC Communications
Joseph E. Seagram & Sons, Inc. (Vivendi)	Telefonica Data Systems
KPMG	Visa International

Construction and Real Estate Development Firms

Areas USA, Inc.	Inland Port Systems, LLC
Barron Collier Companies	Landstar Development
Berkowitz Development Group	LXR Luxury Resorts
Boca Developers	Miami Asset Management Company, Inc.
CDS International	Miapolis, LLC
Century Homebuilders	Odebrecht Construction, Inc.
Codina Realty	Palazzo Las Olas Group, LLC
Chateau Group	Tate Capital
Empire World Towers, LLC	The Allen Morris Company
ESJ Capital Partners	The Related Group, Inc.
Ferro Investment Group, LLC	The Rouse Company
Flagler Development	The St. Joe Company
Florida East Coast Realty Inc.	Trammel Crow Company
Florida Realtors	WCI Development Companies

Engineering, Planning and Design Firms

AECOM (DMJM Harris)	HNTB
Atkins (PBSJ)	Kimley-Horn and Associates
CDM Smith (Wilbur Smith Associates)	Parsons Brincherhoff
Golder Associates	Redevelopment Management Associates (RMA)
	Business Flare

Colleges and Universities

Alabama State University	Rocky Mountain College of Art and Design
Barry University	San Ignacio College
Eckerd College	Sistema Universitario Ana G. Méndez
Embry-Riddle Aeronautical University	St. Thomas University
Florida Agricultural & Mechanical University	University of Central Florida
Florida International University	Universidad Politécnica de Puerto Rico
Full Sail University	University of Florida
Keiser University	University of Miami
Los Angeles Film School	UM's Rosenstiel School of Marine and Atmospheric Science
Miami-Dade College	University of South Florida/ENLACE
Northeastern University (NEU)	University of South Florida
Palm Beach Medical Education Corporation	

Law Firms

Becker & Poliakoff	Gloria Roa Bodin, Esq.
Bilzin Sumberg	Greenberg Traurig, LLP
Carlton Fields	Holland & Knight, LLP
Colson Hicks Eidson	Steel Hector & Davis
DLA Piper	Tew Cardenas, LLP
Dunbar & Dunbar	

Financial Institutions

ABN-AMRO Bank	Fiduciary Trust International
Advantage Capital	First Union National Bank (Wells Fargo)
AMERANT (former Mercantil Bank N.A.)	Hemisphere National Bank
Allen & Company	HSBC/Marine Midland
BNP Paribas	International Bank of Miami (First United Bank)
BAC Florida	Lazard Freres & Co.
Bank Atlantic Corp.	Pan American Life Insurance Group (PALIG)
BankUnited, FSB	PointeBank, N.A.
Barclays Bank	Seitlin Insurance
Century Bank	Sun Trust Corporation
ESJ Capital Partners	The Equitable/AXA Advisors
Espirito Santo Bank	TD Bank, N.A.
FBA	Union Planters Bank of Florida (Regions)
FIBA	

Florida-Based Companies

AmericanAirlines Arena	Iberia Tiles
Atlantic Sapphire	International Speedway Corporation (ISC)
BMI Companies	Jungle Island
Brightline (former All Aboard Florida)	Lake Nona
Communikatz	Mercy Hospital
CoreMessages	Miami Dolphins
Daytona International Speedway	Nopetro LLC
Dosal Tobacco	Palm Beach Premier
Drivers Club Miami	Resorts World Miami (RWM)
Farm Stores	Ron Sachs Communications
Fishkind & Associates	Rolling Loud
Florida Hospital	Sprint of Florida
Florida Marlins	eMerge Americas
Florida Power & Light	The Biltmore Hotel
Flo-Sun Sugar Corp.	The Heat Group
Greater Miami Convention & Visitors Bureau	Ultimate Software
Greater Ft. Lauderdale Alliance	Ultra-Music Festival
Homestead-Miami Speedway	VICTUS

Non-Florida-Based Institutions

Darlington Raceway	Richmond International Raceway
Georgia Retail Federation	RoadAmerica
Illinois Retail Merchant Association	Talladega Superspeedway
Indiana Retail Council	The Seed Foundation
Kansas Speedway	United States Tennis Association (USTA)
Martinsville Speedway	Virginia International Raceway
New Jersey Motorsports Park (NJMP)	Washington Retail Association
Progress Energy	Watkins Glen International

Public Institutions and Non-Profit Organizations

Baptist Health South Florida	Independent Colleges and Universities of Florida (ICUF)
BayCare Health System	Indian River County Chamber of Commerce
Broward County Public Schools	Inter-American Development Bank
Career Source North Central Florida	Jackson Health Systems
Chapman Partnership	Jacksonville Chamber of Commerce
Citizens of Clean Energy	Jewish Community Services
City of Boca Raton	Lakeland Regional
City of Coral Gables	Louisiana Committee for Economic Development
City of Doral	Miami Marine Stadium
City of Plantation	Miami Museum of Science
City of West Palm Beach	Miami-Dade County Public Schools
Conservatives of Clean Energy	Miami-Dade Expressway Authority
Economic Development Commission of Collier County	Miami Downtown Development Authority
Economic Development Commission of Lee County	Nicklaus Children's Health System
Economic Development Commission of Mid-Florida	Palm Beach International Agricultural Summit
Enterprise Florida, Inc.	Port of Miami
Farm Share, Inc.	SEIU Florida
Florida Bankers Association	South Florida Progress Foundation
Florida Citrus Mutual	Space Florida
Florida Chamber of Commerce	St. Mary's Medical Center
Florida International Bankers Association	State of Florida
Florida Institute for Commercialization of Florida Technology	SW Florida Regional Chamber of Commerce
Florida League of Cities	Sylvester Comprehensive Cancer Center
Florida Nursing Homes Alliance	Tampa-Hillsborough Expressway Authority
Florida Outdoor Advertising Association	Tampa General
Florida Ports Council	The Beacon Council
Florida Retail Association	The Florida Bar
Florida Sports Foundation	The Florida Chamber Foundation
Florida Venture Forum	The Florida Coalition for Capital
Friends of Miami Marine Stadium	United Nations Economic Development Program
Tampa Bay Chamber (former Greater Tampa Chamber of Commerce)	United Teachers of Dade
Greater Tallahassee Chamber of Commerce	Visit Florida
	Zoological Society of Florida

Latin America-Based Institutions

Allied-Domecq, Mexico	<i>Mercantil Servicios Financieros, Venezuela</i>
Association of Peruvian Banks	Peruvian Management Institute (IPAE)
Federation of Inter-American Financial Institutions (FIBAFIN)	The Brunetta Group of Argentina
Fonalledas Enterprises, Puerto Rico	