



# THE ECONOMIC VALUE OF CareerSource Tampa Bay

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# Executive summary

*This report assesses the impact of CareerSource Tampa Bay (Tampa Bay)<sup>1</sup> on the county's economy and the benefits generated by the organization for the region's taxpayers. The results of this study reflect Program Year (PY) 2019 and shows the net impact Tampa Bay has on the region's economy and its return on investment for taxpayers. The year 2019 was chosen to analyse the post program earnings and benefits obtained by the participants and better reflect the pre-Covid conditions. However, it is important to take into account that results were directly affected by COVID, especially when it comes to employment numbers. Tampa Bay service region, for this economic impact analysis, refers to the 56 ZIPs that compose the Tampa Bay area.*

<sup>1</sup> For simplicity purposes, we will refer to the CareerSource Tampa Bay as Tampa Bay for the rest of the report.



# INVESTMENT ANALYSIS



Investment analysis is the practice of comparing the costs and benefits of an investment to determine whether it is profitable or not. This study considers Tampa Bay as an investment from the perspective of the county's taxpayers.

Tampa Bay's programs are fully supported via federal government funding that is passed through the State of Florida as well as the state government, competitive grants, and philanthropic endeavors. Tampa Bay received **\$17.5 million** in funding during CY 2019. Approximately **\$7.2 million** from Workforce Innovation and Opportunity Act (WIOA) funding and the remaining **\$10.3 million** from non-WIOA competitive grants.

As a result of Tampa Bay programs, participants receive the training and support they need to become gainfully employed or to increase their earnings. As participants earn more, the region's economy—and consequently Florida's economy—experiences increased tax revenues and public sector savings. Across all Tampa Bay's WIOA programs, the region's taxpayers will see a benefit-cost ratio of **0.85**. For the Non-WIOA program looked at in this report, Wagner-Peyser, the benefit cost ratio is 6.83. On the WIOA programs, the highest benefit-cost ratio comes from the Dislocated Worker program, equaling 0.89.

The table below provides the benefit-cost ratios at the individual type of program level. Note that program-to-program comparisons should not be made based

As participants earn more, the region's economy—and consequently Florida's economy—experiences **increased tax revenues and public sector savings**.

solely on benefit-cost ratios—a myriad of factors result in the variance between programs. Differentiating factors include, but are not limited to:

- unique target populations facing barriers to employment,
- amount of funding,
- services and trainings provided
- point-of-time in contract, particularly for non-WIOA programs (first year, middle years, last year)

Youth programs and programs from competitive grant funding typically see lower ratios because they tend to serve populations with more barriers to employment compared to the broader Adult and Dislocated Worker service populations or may have non-employment-based outcomes (in particular for Youth). In the case of Tampa Bay, the benefit-cost ratios for the programs remain below 1, indicating a net-negative benefit-cost ratio.

For the programs with a net-negative (less than 1) benefit-cost ratio, it is important to consider that the benefits to program participants and society cannot be understated despite not being quantified in the analysis. As an example, the expected tax benefits from a Youth program participant re-enrolling in school are only represented as government savings, and their increased income-potential (assuming completing school) is not readily apparent.

Nonetheless, it is important to understand that a net-negative benefit-cost ratio for youth-related programs and Dislocated Worker is not unique to Tampa Bay. In analysis of other workforce boards throughout the country, a ratio of less than 1 is common for these programs. This can be attributed to a series of factors, including lower wages and lower employment percentages once leaving the program when compared to participants in other programs.

## Important note

When reviewing the impacts estimated in this study, it is important to note that it reports impacts in the form of added income rather than sales. Sales includes all of the intermediary costs associated with producing goods and services. Income, on the other hand, is a net measure that excludes these intermediary costs and is synonymous with gross regional product (GRP) and value added. For this reason, it is a more meaningful measure of new economic activity than sales.

BENEFIT-COST RATIO OF WIOA PROGRAMS, INDIVIDUALLY AND COMBINED, CY 2019

Program	Benefit-Cost Ratio
WIOA Programs combined	0.85
Adult/Dislocated Workers combined	0.88
Adult	0.89
Dislocated Worker	0.86
Youth	0.77
Non-WIOA Program	
WP	6.83

Source: Emsi Impact Model.

# ECONOMIC IMPACT ANALYSIS

During CY 2019, Tampa Bay spent \$10.07 million on payroll and benefits for 117 full-time and 1 part-time employee. This initial round of spending creates more spending across other businesses throughout the regional economy, resulting in the commonly referred to multiplier effects. This analysis estimates the net economic impact of Tampa Bay that directly considers the fact that local dollars spent on Tampa Bay could have been spent elsewhere in the region if not directed towards the organization and would have created impacts regardless. We account for this by estimating the impacts that would have been created from the alternative spending and subtracting the alternative impacts from the spending impacts of Tampa Bay.

This analysis shows that in CY 2019, the day-to-day operations spending of Tampa Bay generated **\$16.5 million** in added income to the county's economy. This is equivalent to creating approximately 192 jobs.



## ACKNOWLEDGMENTS

Emsi gratefully acknowledges the excellent support of the staff at CareerSource Tampa Bay in making this study possible. Special thanks go to John Flanagan, Executive Director of CareerSource Tampa Bay for approving this study, as well as Chad Kunerth, Director of MS and Data Services and Sheila Doyle, Chief Financial Officer, who assisted in providing the necessary information so this study could be conducted.

CHAPTER 1:

# Introduction





**T**AMPA BAY FUNDS SERVICES that can be measured in clear economic terms and generates a wide array of benefits through its programs and its own day-to-day operations. Individuals benefit from workshops, career planning services, and job training programs. Employers benefit from consultation services, customized and on-the-job training programs, and a readily accessible pool of potential job candidates. Furthermore, as more jobseekers find in-demand jobs, the public benefits from higher regional earnings and lower unemployment rates. Section 1 outlines the various programs funded by Tampa Bay. Tampa Bay service region refers to the 56 ZIPs that compose the Tampa Bay area, located in the state of Florida.

This report assesses the impact of Tampa Bay on the local economy and the benefits generated by the organization for taxpayers. The approach is twofold. We first analyze the results obtained through each one of the programs. The second component of the study measures the benefits generated by Tampa Bay for state taxpayers. We start by measuring participants' increased earnings as a result of the services they received from Tampa Bay's programs. This leads to increased state tax revenues and public sector savings stemming from a reduced demand for social services. We compare these benefits to the taxpayer-based funding Tampa Bay received for its programs. The end result is a benefit-cost ratio.

Section 3 provides the methodology and results combined across all programs, whereas Section 4 breaks down the results by program. Finally, Section 5 provides a sensitivity analysis and Section 6 analyzes the impacts of Tampa Bay. To derive results for Section 6, we rely on a specialized Multi-Regional Social Accounting Matrix (MR-SAM) model to calculate the added income created in Florida's economy as a result of Tampa Bay's day-to-day operations spending.

Tampa Bay benefits the region beyond influencing the lives of participants in its programs.

The study uses a wide array of data that are based on several sources, including the CY 2019 participant and financial reports from Tampa Bay; industry and employment data from the Bureau of Labor Statistics and Census Bureau; outputs of Emsi's impact model and MR-SAM model; and a variety of published materials relating training to social behavior. See the Resources and References section and the appendices for more information on these sources and models.



CHAPTER 2:

# Profile of Tampa Bay and the Regional Economy





## About Tampa Bay

Gainful employment is the key element in economic success for any region; individuals require it in order to support themselves and businesses need the skilled workforce it creates in order to grow and thrive. But work isn't simply an economic necessity—it is also essential to people's overall well-being to find purpose in their lives. To these ends, Tampa Bay strives to support individual and business prosperity in the county and Florida. There were three types of services funded by Tampa Bay in CY 2019:

- **Training services**—includes Occupational Skills Training through qualified training providers, Individual Training Accounts, and On-The-Job training provided by employers.
- **Non-training services**—those services that do not include a formal training service.
  - **Individualized services**—includes more comprehensive assessment; one-on-one counseling; basic skills education; workshop education such as interview skills, resume development, career exploration; career plan development; and other staff assisted help.
  - **Basic career services**—includes outreach, basic workshops, and job interview assistance.



Tampa Bay operates as a division of a state agency. In order to fulfill its mission, Tampa Bay coordinates grants and funding from a variety of federal, state, local, and private sources, and partners with stakeholders like businesses, labor groups, government, and all levels of educational institutions.

In any year, Tampa Bay supports a wide variety of programs and initiatives. These primarily consist of its core programs, funded through the Workforce Innovation and Opportunity Act (WIOA) programs: Adult Worker, Dislocated Worker and Youth as well as non-WIOA programs such as TAA, SNAP, WT and WP. For the purposes of this study, we will look at WP.

The following subsections provide a summary of each of these programs and their participation statistics for CY 2019. All data in these subsections were reported by Tampa Bay. All data in these subsections was reported by Tampa Bay.

## Adult Worker

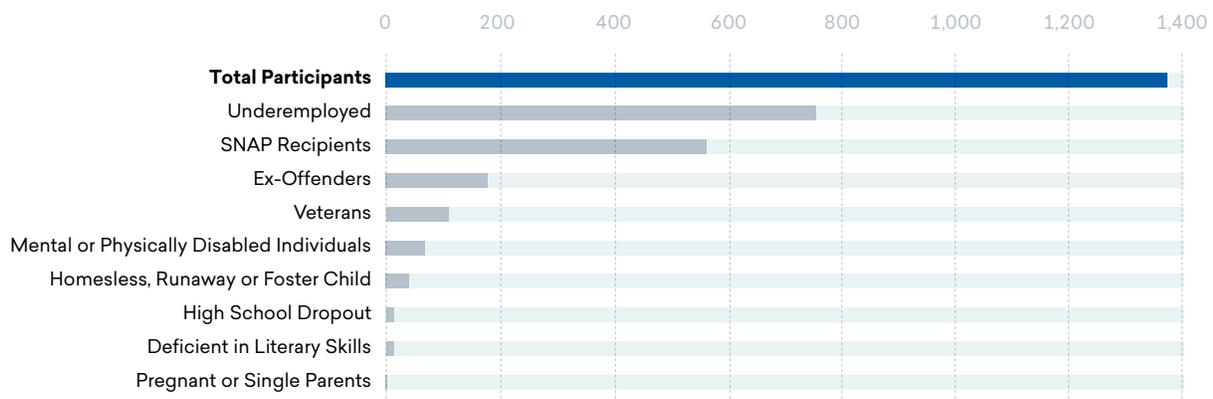
A substantial share of Tampa Bay's operations center on assisting adult workers throughout the region in a variety of services. Assisting adult workers is a twofold benefit to the region and the state; as it improves the lives of the individuals who use Tampa Bay supported services, and it helps local businesses thrive by meeting their staffing needs.

Tampa Bay's Adult Worker program includes services like adult basic education, career planning, and other occupational and on-the-job training.

### PARTICIPANT STATISTICS

In CY 2019, Tampa Bay's Adult Worker program served a total of 1,383 enrolled participants. Of those enrolled in the program, 973 participants exited the during the program year. On average, it was reported that participants spent 694 days in the program. Of exited participants, 208 were employed before entering the program.

Figure 2.1: TYPES OF PARTICIPANTS IN THE ADULT WORKER PROGRAM

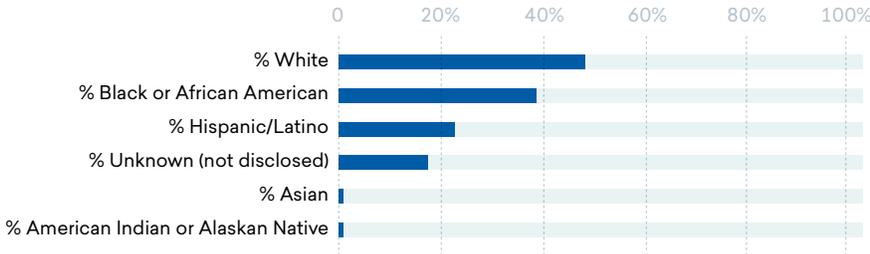


Note: participants had the option to select more than one category  
Source: Tampa Bay



Demographically, participants were on average **35** years old and **42.2%** female. The following figures provide a demographic breakdown by race and ethnicity. White, non-Hispanic/Latino individuals represented **34%** of participants while **50%** were participants of color.

Figure 2.2: RACE/ETHNICITY OF PARTICIPANTS IN THE ADULT WORKER PROGRAM



Source: Tampa Bay

About 60% of Adult Worker participants had a high school diploma (includes equivalency) or less. On the other end of the education spectrum, 14% have a bachelor's degree or above.

## OUTCOMES

Of those who participated in the Adult Worker program, 973 participants exited in CY 2019. Of the 1,383 enrolled participants, 1,229 were receiving training and 154 received non-training individualized services. We must keep in mind that some of the participants are duplicated in within programs. Upon exiting the program, 209 participants had found employment. This number increased to 245 by Q4. Of those participants, the reported average hourly salary was \$19.5.

## Dislocated Worker

The Dislocated Worker program attempts to mitigate the negative effects of layoffs either by getting laid off individuals back to work as quickly as possible or by finding a way to support the employer to avoid the layoff altogether.

Dislocated workers include those whose job loss is due to a permanent business closure, a substantial layoff, foreign competition, or lack of demand for particular skills. They also include those who have exhausted their unemployment benefits and are unlikely able to return to their previous occupation, as well as a number of other categories.

## PARTICIPANT STATISTICS

In CY 2019, Tampa Bay's Dislocated Worker program served a total of 788 enrolled participants. Of those enrolled, 532 participants exited the program during the program year. On average, it was reported that participants spent 789 days in the program. Of exited participants, 109 were employed before entering the program.

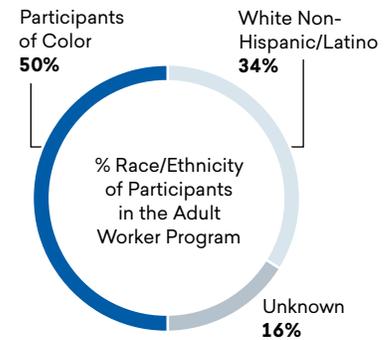
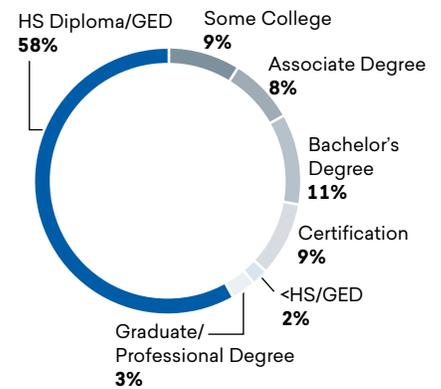


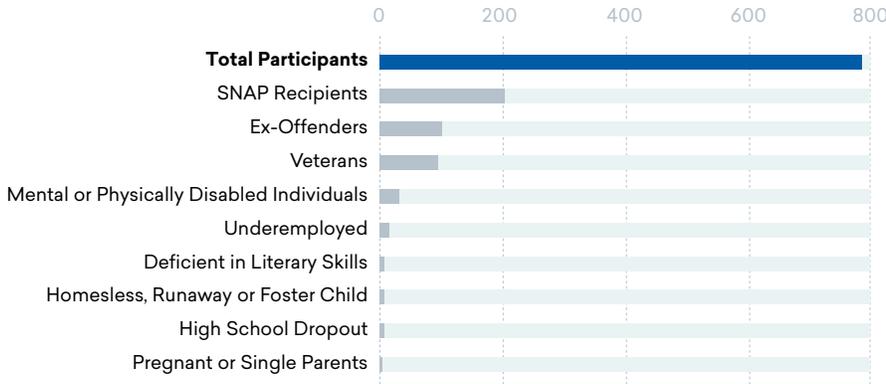
Figure 2.3: LEVEL OF EDUCATION OF PARTICIPANTS IN THE ADULT WORKER PROGRAM



Source: Tampa Bay

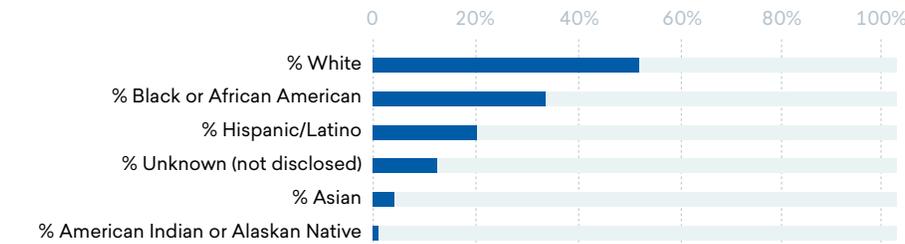


Figure 2.4: TYPES OF PARTICIPANTS IN THE DISLOCATED WORKER PROGRAM

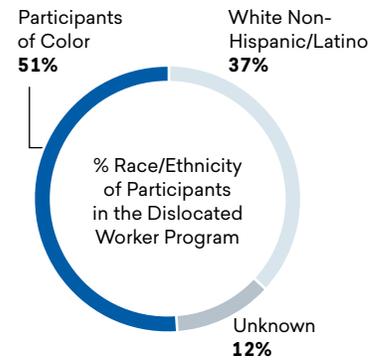


Note: participants had the option to select more than one category  
Source: Tampa Bay

Figure 2.5: RACE/ETHNICITY OF PARTICIPANTS IN THE DISLOCATED WORKER PROGRAM



Source: Tampa Bay



Of the participants, **93** indicated they were Veterans. Participants were on average **44** years old and **50.9%** were female. The following figures provide demographic breakdowns by race and ethnicity. White, non-Hispanic/Latino individuals represent **37%** of participants while **51%** are participants of color.

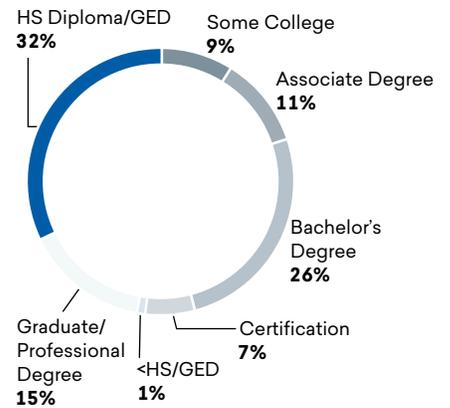
## OUTCOMES

Of those who participated in the Dislocated Worker program, 109 participants exited in CY 2019. Of the 773 participants, 672 received training-related services and 116 received non-training related services. Upon exiting the program, 61 participants had found employment, a value that increase to 120 by Q4. Of those participants, the reported average hourly salary was \$27.

## Youth

Tampa Bay oversees the administration of WIOA funds designated to increase employment and career readiness among Florida’s youth, or those aged 14 to 24 years old. The Youth network supports Florida’s young workers, especially low-income youth and those with obstacles to employment. It offers work readiness training and counseling, as well as supports certificate and degree attainment.

Figure 2.6: LEVEL OF EDUCATION OF PARTICIPANTS IN THE DISLOCATED WORKER PROGRAM

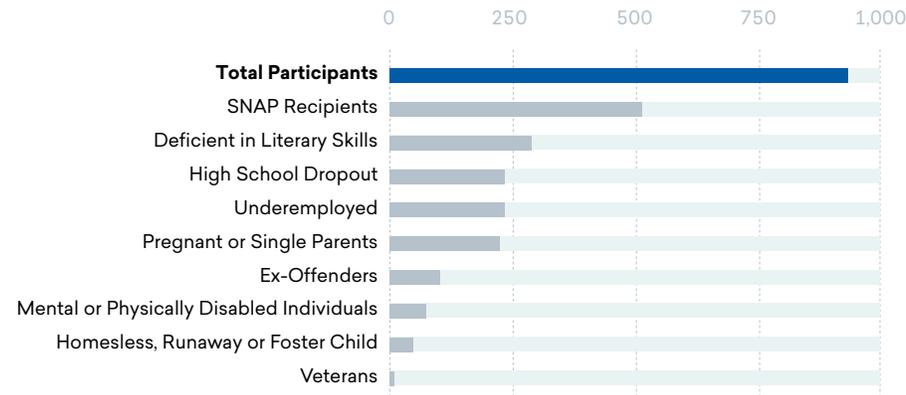


Source: Tampa Bay

## PARTICIPANT STATISTICS

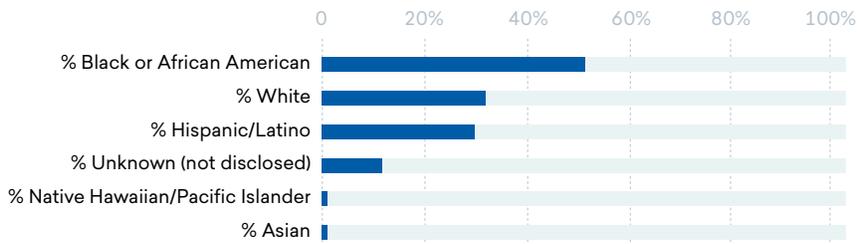
In CY 2019, Tampa Bay's Youth program served a total of 911 enrolled participants. Of those enrolled, 551 participants exited the program during the program year. On average, it was reported that participants spent 1,367 days in the program. Of exited participants, 233 were employed before entering the program.

Figure 2.7: TYPES OF PARTICIPANTS IN THE YOUTH PROGRAM



Note: participants had the option to select more than one category  
Source: Tampa Bay

Figure 2.8: RACE/ETHNICITY OF PARTICIPANTS IN THE YOUTH PROGRAM



Source: Tampa Bay

Demographically, participants were on average **20** years old and **56.5%** female. Of the Youth participants, **75%** were people of color, while **14%** identified as White Non-Hispanic/Latino. The image below shows the demographic breakdown of participants.

## OUTCOMES

Of those who participated in the Youth program in CY 2019, 551 participants exited the program in CY 2019. From the participants, 7 enrolled in higher education, while 59 achieved high school diploma or GED. In a sample of 196 Youth participants with records indicating employment at exit, average hourly wages were \$13.86.

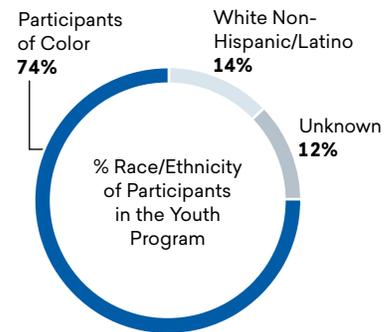
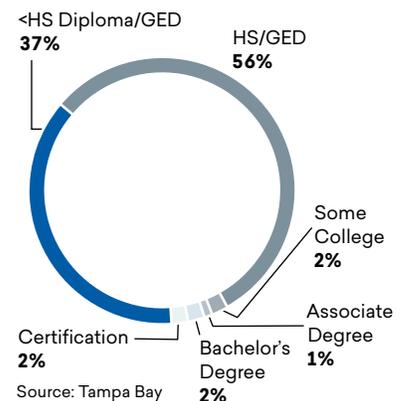


Figure 2.9: LEVEL OF EDUCATION OF PARTICIPANTS IN THE YOUTH PROGRAM

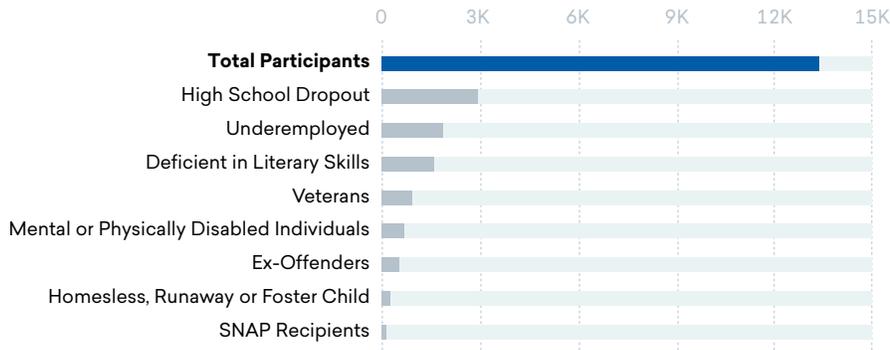


Source: Tampa Bay

## WP Program

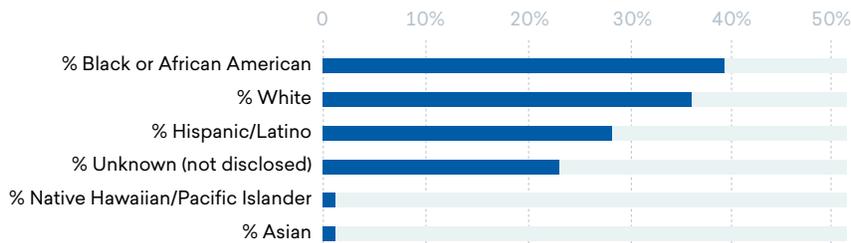
The Wagner-Peyser program seeks to improve the functioning of the nation's labor market by connecting individuals seeking employment and employers seeking workers.

Figure 2.7: TYPES OF PARTICIPANTS IN THE WP PROGRAM

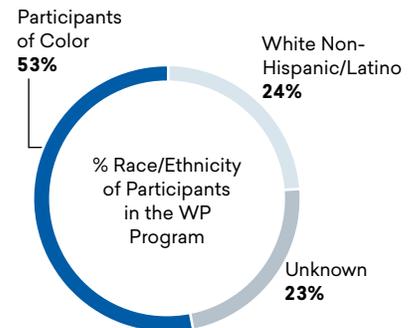


Note: participants had the option to select more than one category  
Source: Tampa Bay

Figure 2.8: RACE/ETHNICITY OF PARTICIPANTS IN THE WP PROGRAM



Source: Tampa Bay



## PARTICIPANT STATISTICS

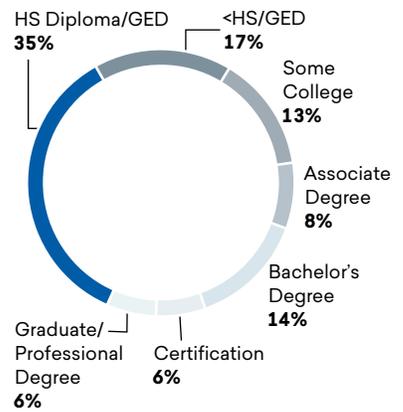
In CY 2019, Tampa Bay's WP program served a total of 13,572 enrolled participants. Of those enrolled, 11,913 participants exited the program during the program year. On average, it was reported that participants spent 200 days in the program. Of exited participants, 509 were employed before entering the program.

Demographically, participants were on average **39** years old and **48.9%** female. Of the WP participants, **53%** were people of color, while **24%** identified as White Non-Hispanic/Latino. The image below shows the demographic breakdown of participants.

## OUTCOMES

Of those who participated in the WP program, 11,913 participants exited in CY 2019. Of the 13,572 participants, all participants received non-training related

Figure 2.9: LEVEL OF EDUCATION OF PARTICIPANTS IN THE WP PROGRAM



Source: Tampa Bay

services. Upon exiting the program, 1,173 participants had found employment. Of those participants, the reported average hourly salary was \$9.3.

PROGRAM PARTICIPANT OVERVIEW	WIOA			Non-WIOA
	Adult Worker	Dislocated Worker	Youth	WP
Avg. length of program (days)	87	215	720	200
Participants who exited the program	2,020	532	750	11,913
Average age	39	44	21	39
% Female	53%	56%	63%	48.9%
% Black or African American	21%	13%	17%	35.5%
# pregnant or single parent	0	0	192	0
# deficient in basic literacy skills	114	51	838	1,620
# ex-offenders	283	58	43	574
# mental or physically disabled	242	37	175	1,767
# underemployed	9	7	4	1,890
# SNAP recipients	608	116	195	32
# employed prior to entering program (of exits)	445	17	153	509
# school dropout	201	79	218	2,935
# achieved professional, industry, or other recognized certificate	246	307	304	0
<b>Total PY 19 Participants</b>	<b>2,259</b>	<b>773</b>	<b>931</b>	<b>13,572</b>



# TAMPA BAY'S ECONOMY



Tampa Bay serves the Tampa Bay area and from early on, it has been pursuing and investing resources to improve the quality of the workforce in the region as well as the state as a whole. Before we look at the impacts and benefits created by Tampa Bay on the regional economy, it is important to gain context on the regional industry composition.

Table 2.1 provides the breakdown of jobs by industry in the region. Among the region's non-government industry sectors, the Professional and Technical Services sector is the largest employer, supporting 69,095 jobs or 10.4% of total employment in the region. The second largest employer is the Finance & Insurance sector, supporting 66,623 jobs or 10.0% of the region's total employment. Altogether, the region supports nearly 666.8 thousand jobs.<sup>2</sup>

*Table 2.1:* JOBS BY MAJOR INDUSTRY SECTOR IN TAMPA BAY, 2021

Industry sector	Total jobs	% of Total
Agriculture, Forestry, Fishing, & Hunting	5,387	0.8%
Mining, Quarrying, & Oil and Gas Extraction	96	<0.1%
Utilities	1,560	0.2%
Construction	40,017	6.0%
Manufacturing	21,840	3.3%
Wholesale Trade	28,163	4.2%
Retail Trade	51,929	7.8%
Transportation & Warehousing	27,033	4.1%
Information	13,631	2.0%
Finance & Insurance	66,623	10.0%
Real Estate & Rental & Leasing	36,416	5.5%
Professional & Technical Services	69,095	10.4%
Management of Companies & Enterprises	10,025	1.5%
Administrative & Waste Services	58,196	8.7%
Educational Services	14,543	2.2%
Health Care & Social Assistance	66,120	9.9%
Arts, Entertainment, & Recreation	16,497	2.5%
Accommodation & Food Services	38,587	5.8%
Other Services (except Public Administration)	37,261	5.6%
Government, Non-Education	27,344	4.1%
Government, Education	36,391	5.5%
<b>Total</b>	<b>666,756</b>	<b>100.0%</b>

Source: Emsi industry data.

<sup>2</sup> Job numbers reflect Emsi's complete employment data, which includes the following four job classes: 1) employees that are counted in the Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW), 2) employees that are not covered by the federal or state unemployment insurance (UI) system and are thus excluded from QCEW, 3) self-employed workers, and 4) extended proprietors.



Table 2.2: LABOR AND NON-LABOR INCOME BY MAJOR INDUSTRY SECTOR IN TAMPA BAY, 2021\*

Industry sector	Labor income (millions)	Non-labor income (millions)	GRP (millions)**	% of total income
Agriculture, Forestry, Fishing & Hunting	\$179	-\$43	\$135	0.2%
Mining, Quarrying, & Oil and Gas Extraction	\$5	\$4	\$8	<0.1%
Utilities	\$230	\$626	\$856	1.3%
Construction	\$2,570	\$536	\$3,106	4.5%
Manufacturing	\$1,652	\$1,618	\$3,271	4.8%
Wholesale Trade	\$2,672	\$2,921	\$5,593	8.2%
Retail Trade	\$2,205	\$1,406	\$3,610	5.3%
Transportation & Warehousing	\$1,111	\$230	\$1,341	2.0%
Information	\$1,271	\$3,025	\$4,297	6.3%
Finance & Insurance	\$6,398	\$5,919	\$12,316	18.0%
Real Estate & Rental & Leasing	\$1,761	\$1,595	\$3,356	4.9%
Professional & Technical Services	\$6,013	\$1,468	\$7,481	10.9%
Management of Companies & Enterprises	\$1,185	\$94	\$1,279	1.9%
Administrative & Waste Services	\$2,592	\$529	\$3,121	4.6%
Educational Services	\$595	\$94	\$689	1.0%
Health Care & Social Assistance	\$4,170	\$618	\$4,788	7.0%
Arts, Entertainment, & Recreation	\$553	\$258	\$811	1.2%
Accommodation & Food Services	\$949	\$500	\$1,449	2.1%
Other Services (except Public Administration)	\$1,126	\$4,070	\$5,196	7.6%
Government, Non-Education	\$2,363	\$944	\$3,307	4.8%
Government, Education	\$2,372	\$0	\$2,372	3.5%
<b>Total</b>	<b>\$41,972</b>	<b>\$26,410</b>	<b>\$68,382</b>	<b>100.0%</b>

\* Data reflect the most recent year for which data are available. Emsi data are updated quarterly.

\*\* Numbers may not add due to rounding.

Source: Emsi industry data.

Table 2.2 summarizes the breakdown of the regional economy by major industrial sector, with details on labor and non-labor income. Labor income refers to wages, salaries, and proprietors' income. Non-labor income refers to profits, rents, and other forms of investment income. Together, labor and non-labor income comprise the region's total income, which can also be considered as the region's gross regional product (GRP).

As shown in Table 2.2, the total income, or GRP, of Tampa Bay is approximately \$68.4 billion, equal to the sum of labor income (\$42.0 billion) and non-labor income (\$26.4 billion). In Section 2, we use the total added income as the measure of the relative impacts of Tampa Bay on the state economy.

## CHAPTER 3:

# Combined Investment Analysis Results for WIOA and Wagner-Peyser



*This chapter outlines the methodology for determining the return on investment of Tampa Bay's programs. We present the methodology by looking at the collective return on investment for the WIOA and non-WIOA programs. Return on investment is reported as a benefit-cost ratio in the following section.*





**T**HE BENEFITS GENERATED by Tampa Bay affect the lives of many people. Participants receive the training and support they need to become gainfully employed or to increase their earnings. As participants earn more, communities and citizens throughout the region benefit from an enlarged economy and a reduced demand for social services. For the purpose of this report, benefits primarily consisted of increased income tax revenues for the region.

Investment analysis is the process of evaluating total costs and measuring these against total benefits to determine whether or not a proposed venture will be profitable. If benefits outweigh costs, then the investment is worthwhile. If costs outweigh benefits, then the investment will lose money and is, thus, considered infeasible. In this case, costs are equal to the contribution of federal government funding passed through the State of Florida to Tampa Bay for each program along with any state and local funding. Benefits consist of increased state tax revenues and public sector savings.

The pivotal step here will be to hone in on the public benefits that specifically translate into higher tax revenues. For example, benefits resulting from earnings growth are limited to tax payments within the state. Similarly, savings related to improved health, reduced crime, and fewer welfare and unemployment claims are limited to those received strictly by state and local government. In all instances, benefits to private residents, local businesses, or the federal government are excluded.

As participants **earn more**, communities and citizens throughout the region **benefit** from an enlarged economy and a reduced demand for social services.

# PARTICIPANT HIGHER EARNINGS

As a Workforce Development Board, Tampa Bay provides services and training that lead to employment outcomes from program participants, as well as funding, oversight, and management of contracted programs through third-party vendors that directly assist program participants. In the state of Florida, contracted programs are most often run through American Job Centers but, in certain instances, can also be ran through other public-private partnerships or community-based organizations.

The first step in measuring the return on investment of Tampa Bay's programs is to determine participant earnings outcomes. For the purpose of this analysis, the return-on-investment analysis considers the participants of each program, not just the exits. We are particularly interested in the change in earnings for participants before and after they entered a program, as these represent the marginal benefit from participating in the program. Thankfully, Tampa Bay was able to provide the average wages prior to participation in a program. Additionally, Tampa Bay was able to provide post-program earnings for all the programs included in this analysis, along with the estimated number of participants employed at exit, Q2 after exit, Q3 and Q4 after completing a program.<sup>3</sup> Consequently, we are able to directly analyze pre—and post-program earnings.

In order to calculate pre-program earnings, the participants were split into two categories: employed and unemployed.<sup>4</sup> Approximately 18% of participants were employed prior to entering a program funded by Tampa Bay. To estimate pre-program earnings for employed participants at enrollment, the Florida living wage (an hourly rate an individual must earn to support themselves) of \$14.82 per hour was used.<sup>5</sup> This hourly rate was then converted to annual earnings using the average hours worked per week for each program. Thus, we arrive at the pre-program earnings for those participants employed before entering Tampa Bay program.

For the 82% of participants that were unemployed at enrollment, an estimated 10% of them received unemployment insurance (UI).<sup>6</sup> Multiplying the maximum weekly benefit amount for Florida (\$243) by the maximum number of weeks people can receive UI in Florida (14 weeks), we arrive at the annual earnings the unemployed participants receive from UI (\$3300). Those unemployed participants



3 For all programs, Tampa Bay provided the hourly wages along with the average hours worked per week for each program, which allowed Emsi to calculate the average annual earnings for these programs.  
4 Employment data supplied by CareerSource Tampa Bay.  
5 Living wage data for Florida was supplied by the Massachusetts Institute of Technology and adjusted for inflation (<http://livingwage.mit.edu/states/41>). The living wage for one adult was used for the purpose of this report.  
6 Unemployment insurance rates supplied by the National Employment Law Project (<https://waysandmeans.house.gov/wp-content/uploads/2016/09/20160907HR-Testimony-Conti.pdf>).



who receive no unemployment insurance are assumed to have \$0 in annual income. Table 3.1 displays the pre-program earnings across the pre-program employment status categories.

Table 3.1: PRE-PROGRAM EARNINGS, CY 2019

ADJUSTING FOR UNEMPLOYMENT	Percent	Participants	Earnings
Employed	18%	550	\$34,864
Unemployed	82%	2,532	\$330
Unemployed with UI benefits	10%	253	\$3,300
Unemployed without UI benefits	90%	2,279	\$0
<b>Total weighted average*</b>	<b>82%</b>	<b>3,082</b>	<b>\$5,994</b>

Source: Tampa Bay and Emsi impact model  
 \* Numbers may not add due to rounding

This process was then repeated for calculating the average earnings after completing Tampa Bay’s programs. Recall that Tampa Bay provided the earnings for those participants employed after completing the programs, so the living wage data was not needed for post-program earnings. Tampa Bay also provided the number of participants employed after exiting a program. Table 3.2 provides the post-program earnings across the post-program employment status categories.

Table 3.2: POST-PROGRAM EARNINGS, CY 2019

ADJUSTING FOR UNEMPLOYMENT	Percent	Participants	Earnings
Employed	27%	841	\$39,260
Unemployed	73%	2,241	\$330
Unemployed with UI benefits	10%	224	\$3,300
Unemployed without UI benefits	90%	2,017	\$0
<b>Total weighted average*</b>	<b>27%</b>	<b>3,082</b>	<b>\$10,499</b>

Source: Tampa Bay and Emsi impact model  
 \* Numbers may not add due to rounding

Comparing the total weighted average pre-program annual earnings to the total weighted average post-program annual earnings, we arrive at an annual increase of \$4,505 (\$10,499—\$5,994) or an increased hourly rate of approximately \$2.30. However, there are other factors beyond participating in a Tampa Bay’s program that may have led to the participants’ increased earnings. We want to hone in on the increased earnings solely attributable to services provided by Tampa Bay. We, therefore, apply an attribution factor, which dampens the results, depending upon the type of service the participant received (training, non-training individualized, non-training basic).



For the WP, approximately 4% of participants were unemployed at enrollment and approximately 10% of them received unemployment insurance. We use the same metrics to calculate the annual earnings of unemployed participants as we did for the WIOA programs and the unemployed participants who receive no unemployment insurance are assumed to have a \$0 annual income. Table 3.3 displays the pre-program earnings across the pre-program employment status categories for WP.

Table 3.3: PRE-PROGRAM EARNINGS, CY 2019

ADJUSTING FOR UNEMPLOYMENT	Percent	Participants	Earnings
Employed	4%	509	\$27,905
Unemployed	96%	13,063	\$330
Unemployed with UI benefits	10%	1,306	\$3,300
Unemployed without UI benefits	90%	11,757	\$0
<b>Total weighted average*</b>	<b>96%</b>	<b>13,572</b>	<b>\$1,364</b>

Source: Tampa Bay and Emsi impact model

\* Numbers may not add due to rounding

Once again, this process was repeated for calculating the average earnings after the completion of Tampa Bay’s programs. This was possible given that CareerSource Tampa Bay provided the earnings for the participants employed after completing the programs, so the living wage data was not used for the post-program earnings. Table 3.4 provides the post-program earnings across the post-program employment status categories. As can be seen, for WP, there was an increase in participant earnings. The overall increase was of about \$0.68 in the hourly rate. This is due to the percentage increase in employment.

Table 3.4: POST-PROGRAM EARNINGS, CY 2019

ADJUSTING FOR UNEMPLOYMENT	Percent	Participants	Earnings
Employed	13%	1,773	\$18,860
Unemployed	87%	11,808	\$330
Unemployed with UI benefits	10%	1,181	\$3,300
Unemployed without UI benefits	90%	10,627	\$0
<b>Total weighted average*</b>	<b>13%</b>	<b>13,581</b>	<b>\$2,749</b>

Source: Tampa Bay and Emsi impact model

\* Numbers may not add due to rounding

Each of the types of services require a different level of involvement from Tampa Bay –funded contractors, so the increase in participant earnings attributable to Tampa Bay differs depending on the type of service received. We apply



conservative attribution factors, which dampen each of the types of services provided to arrive at an adjusted increase in earnings.<sup>7</sup> Table 3.5 provides a breakdown of the number of participants in each type of service, the attribution factor applied to the earnings, and the adjusted increase in earnings.

Table 3.5: ADJUSTED INCREASED EARNINGS BY TYPE OF SERVICE, CY 2019

	Base	Training	Individualized Services	Total Weighted average	WP
Number of participants	3,082	2,210	872		13,572
<b>Average hourly increase in wages</b>	<b>\$12.70</b>				<b>\$0.68</b>
Attribution Factor	100%	90%	75%	78%	100%
Adjusted annual increase earnings	\$4,505	\$4,054	\$3,378	\$3,863	\$1,385
Adjusted hourly increase earnings	\$2.30	\$2.07	\$1.73	\$1.97	\$0.68
<b>Total Adjusted Increase in Earnings</b>	<b>\$13,883,160</b>	<b>\$8,959,638</b>	<b>\$2,946,005</b>	<b>\$11,905,643</b>	<b>\$18,797,680</b>

Source: Tampa Bay and Emsi impact model

The first column in Table 3.5 represents the base case, where no dampening has been applied. Without applying attribution factors, the total increase in annual earnings for all CY 2019 participants comes to approximately \$13.8 million. After applying the attribution factor to the different types of services and summing the total adjusted increase in earnings for each service, we arrive at a total increase in annual earnings of \$11.9 million.

<sup>7</sup> Given data limitations, the attribution factors are based on Emsi assumptions. See Section 5 for a sensitivity analysis on how altering the attribution factor adjustments affect results.

# GROWTH IN REGIONAL TAX REVENUES



As a result of their time in programs administered by Tampa Bay in CY 2019, participants earn more because of the skills they gained making them more employable. These increased earnings will continue to accrue into the future as long as the participants remain employed.<sup>8</sup> This, in turn, increases tax revenues since the state is able to apply state tax rates to higher earnings. The increased tax revenues have been projected 10 years into the future and are limited to the participants who remain in the region.

Estimating the effect of Tampa Bay on increased tax revenues begins with the present value of the participants' future 10-year earnings stream. For each year, we apply the prevailing tax rates, so we capture only the increased state tax revenues from the higher earnings. Not all of these tax revenues may be counted as benefits to the state, however. Some participants leave the state during the



## Discount rate

The discount rate is a rate of interest that converts future costs and benefits to present values. For example, \$1,000 in higher earnings realized 10 years in the future is worth much less than \$1,000 in the present. All future values must therefore be expressed in present value terms in order to compare them with investments (i.e., costs) made today. The selection of an appropriate discount rate, however, can become an arbitrary and controversial undertaking. As suggested in economic theory, the discount rate should reflect the investor's opportunity cost of capital, i.e., the rate of return one could reasonably expect to obtain from alternative investment schemes. In this study we assume a 0.1% discount rate.

<sup>8</sup> Earnings are projected into the future using the Mincer function. See Appendix 4 for more information on the Mincer function and how it is used to predict future earnings growth.

course of their careers, and the higher earnings they receive as a result of their training leaves the state with them. To account for this dynamic, we combine participant settlement data from Tampa Bay with data on migration patterns from the Census Bureau to estimate the number of participants who will leave the state workforce over time.<sup>9</sup>

After adjusting for attrition, we calculate the present value of the future added tax revenues that occur in the region as a result of participants served in CY 2019, equal to approximately \$5.8 million for the WIOA programs. The present value represents the sum of the future benefits that accrue each year over the course of the time horizon, discounted to current year dollars to account for the time value of money. Given that the stakeholder in this case is the public sector, we use the discount rate of 0.1%. This is the real treasury interest rate recommended by the Office of Management and Budget (OMB) for 10-year investments, and in Section 5, we conduct a sensitivity analysis of this discount rate.<sup>10</sup>



<sup>9</sup> Tampa Bay provided an estimation of the percentage of participants who remain in the region upon program completion.

<sup>10</sup> Office of Management and Budget. "Circular A-94 Appendix C." *Real Interest Rates on Treasury Notes and Bonds of Specified Maturities (in Percent)*. <https://www.whitehouse.gov/wp-content/uploads/2017/11/DISCHIST-2018-1.pdf>.

# GOVERNMENT SAVINGS

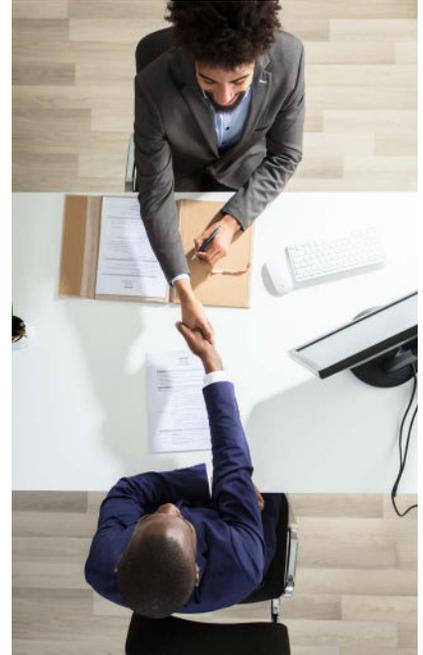


In addition to the creation of higher regional tax revenues, training is statistically associated with a variety of lifestyle changes that generate social savings, also known as external or incidental benefits of training. These represent the avoided costs to the government that otherwise would have been drawn from public resources absent the training made possible by Tampa Bay. For every program, we apply savings from avoided costs on the reduced number of unemployment insurance claims. However, because the majority of these programs serve people that are approaching middle age, the participants are most likely already committed to their social behaviors, such as smoking, alcohol consumption, obesity, mental health, drug abuse, and criminal activities. Thus, we do not assume that participants will change these social behaviors because of their experience at Tampa Bay, resulting in minimal additional government savings.

With that said, there is one program in which the participants are impressionable—the Youth program. The participants in the Youth program are an average of 21 years old and their exposure to Tampa Bay can influence their social behaviors. As these participants become more educated and earn their GED or continue on to higher education, they are less likely to consume alcohol, develop a mental illness, use drugs, commit crimes, or require the benefits of welfare. Interestingly, as participants earn their GED or high school diploma, research shows that they are actually more likely to smoke and become obese, negating potential government savings. However, in total, the government savings associated with the Youth program are positive.

The model quantifies government savings by calculating the probability at the less than high school and high school education levels that individuals will have poor health, commit crimes, or claim welfare and unemployment benefits. Deriving the probabilities involves assembling data from a variety of studies and surveys analyzing the correlation between training and health, crime, welfare, and unemployment at the national and state levels. We dampen these results by the ability bias adjustment to account for factors (besides training) that influence individual behavior. We then multiply the marginal effects of training times the associated costs of health, crime, welfare, and unemployment.<sup>11</sup> Finally, we apply the same adjustments for attrition to derive the net savings to the government.

Table 3.6 displays the present value of all benefits to taxpayers in CY 2019 coming from the WIOA programs. The first row shows the added tax revenues created in the region, equal to \$5.8 million, from participants' higher earnings. A breakdown in



<sup>11</sup> For a full list of the data sources used to calculate the social externalities, see the Resources and References section.



government savings by health, crime, and welfare/unemployment-related savings appears next. These total to \$268 thousand. The sum of the government savings and the added income in the region is \$6.1 million, as shown in the bottom row of Table 3.6. These savings continue to accrue in the future as long as the CY 2019 participants remain in the workforce.

*Table 3.6:* PRESENT VALUE OF ADDED TAX REVENUE AND GOVERNMENT SAVINGS (THOUSANDS), CY 2019

<b>Added Tax Revenue</b>	<b>\$5,877</b>
<b>Government Savings</b>	
Health Related Savings	-\$313
Crime Related Savings	\$551
Welfare/Unemployment Related Savings	\$30
<b>Total Government Savings</b>	<b>\$268</b>
<b>Total Taxpayer Benefits</b>	<b>\$6,146</b>

Source: Emsi impact model.

For WP, the added income is negative, totaling approximately—\$5.1 million. However, the total government savings that originate from the support of these programs, which total \$12.05 million, leads to a positive value for taxpayer benefits of \$6.9 million, as can be seen in table 3.7 below. This is one further example on how the gains that come from these programs extends from the monetary gains directly but through the social benefits that come from the support of these participants.

*Table 3.7:* PRESENT VALUE OF ADDED TAX REVENUE AND GOVERNMENT SAVINGS (THOUSANDS), CY 2019

<b>Added Tax Revenue</b>	<b>-\$5,110</b>
<b>Government Savings</b>	
Health Related Savings	-\$4,223
Crime Related Savings	\$15,759
Welfare/Unemployment Related Savings	\$520
<b>Total Government Savings</b>	<b>\$12,056</b>
<b>Total Taxpayer Benefits</b>	<b>\$6,946</b>

Source: Emsi impact model.

# RETURN ON INVESTMENT TO REGIONAL TAXPAYERS



Taxpayer costs for CY 2019 are reported in Table 3.8 and come to \$7.2 million<sup>12</sup>, equal to the contribution of federal government funding passed through the State of Florida to the Tampa Bay County. Regional taxpayers are rewarded with an investment benefit-cost ratio of 0.85 (= \$6.1 million ÷ \$7.2 million), indicating a loss in profit.<sup>13</sup> In other words, for every dollar spent funding the WIOA programs at Tampa Bay, Florida's taxpayers will see a loss of \$0.15 over the next 10 years.

Considering the WP program, we see a positive cost-ratio. For this program, regional taxpayers are rewarded with an investment benefit-cost ratio of 6.83 (= \$6.9 million ÷ \$1 million), indicating that for every dollar spent, taxpayers will experience a benefit of \$5.83 over the next 10 years per dollar invested. Table 3.9 shows the breakdown of the taxpayer benefits and the net cash flow referent to these programs.

Table 3.8: PROJECTED BENEFITS AND COSTS, TAXPAYER PERSPECTIVE, CY 2019

	1	2	3	4
Year	Benefits to taxpayers (millions)	Program funding costs (millions)	Net cash flow (millions)	
0	\$0.5	\$7.2	-\$6.7	
1	\$0.7	\$0.0	\$0.7	
2	\$0.7	\$0.0	\$0.7	
3	\$0.7	\$0.0	\$0.7	
4	\$0.7	\$0.0	\$0.7	
5	\$0.7	\$0.0	\$0.7	
6	\$0.6	\$0.0	\$0.6	
7	\$0.6	\$0.0	\$0.6	
8	\$0.6	\$0.0	\$0.6	
9	\$0.6	\$0.0	\$0.6	
<b>Present value</b>	<b>\$6.1</b>	<b>\$7.2</b>	<b>-\$1.1</b>	

	<b>Benefit-cost ratio</b>	<b>.85</b>
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Source: Emsi impact model.

Table 3.9: PROJECTED BENEFITS AND COSTS, TAXPAYER PERSPECTIVE, CY 2019, NON-WIOA PROGRAMS

	1	2	3	4
Year	Benefits to taxpayers (millions)	Program funding costs (millions)	Net cash flow (millions)	
0	\$0.7	\$1.0	-\$0.3	
1	\$0.8	\$0.0	\$0.8	
2	\$0.8	\$0.0	\$0.8	
3	\$0.8	\$0.0	\$0.8	
4	\$0.7	\$0.0	\$0.7	
5	\$0.7	\$0.0	\$0.7	
6	\$0.7	\$0.0	\$0.7	
7	\$0.7	\$0.0	\$0.7	
8	\$0.7	\$0.0	\$0.7	
9	\$0.6	\$0.0	\$0.6	
<b>Present value</b>	<b>\$6.9</b>	<b>\$1.0</b>	<b>\$5.9</b>	

	<b>Benefit-cost ratio</b>	<b>6.83</b>
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Source: Emsi impact model.

<sup>12</sup> Only funding directly related to the programs analyzed were included for taxpayer costs.

<sup>13</sup> Note that the beneficiaries are not necessarily the same as the original investors. Nonetheless, the benefit-cost ratio provides an indicator on the return on investment of the programs provided by CareerSource Tampa Bay.

## CHAPTER 4:

# Individual Investment Analysis Results Across All Programs



*This section provides the CY 2019 results for WIOA Adult Worker and Dislocated Worker programs combined, all the WIOA programs combined, non-WIOA programs combined, and the individual programs. All results presented below follow a similar methodology outlined in the previous section.*



# INVESTMENT ANALYSIS RESULTS



Table 4.1 presents the CY 2019 results of each of the following:

- Each WIOA program
- Adult and Dislocated Worker combined
- WIOA programs combined
- Each non-WIOA (competitive grant) program
- Wagner-Peyser

Youth-related programs typically see lower ratios because they tend to serve populations with more barriers to employment while also providing more cost-intensive services compared to the broader Adult and Dislocated Worker service populations. In Tampa Bay, this remained true, with both WIOA Youth and Dislocated Worker presenting a negative cost ratio—driving the overall aggregate result down. The Dislocated Worker program had the highest benefit-cost ratio of 0.86. Meanwhile, the Adult and Youth programs had benefit-cost ratios of 0.89 and 0.77, respectively.

The WP program experience a ratio of 6.86. These results was driven mainly by the high success rate post-program, where a considerable percentage of



Table 4.1: TAMPA BAY-FUNDED PROGRAMS INVESTMENT ANALYSIS RESULTS, CY 2019

Program Profile	Adult	Dislocated Worker	Youth	Adult/Dislocated Worker combined	WIOA combined	WP
# of total participants	1,383	788	911	2,171	3,082	13,572
# of training	1,229	672	309	1,901	2,210	0
# of non-training, individualized service	154	116	602	197	872	13,572
<b>Increased Earnings</b>						
Increase in earnings, annual	4,323	4,828	2,444	4,531	3,863	-776
Increase in earnings, hourly	\$2.13	\$2.36	\$1.39	\$2.22	\$1.97	-\$0.38
Total increased earnings across participants (thousands)	\$5,979,087	\$3,804,584	\$2,226,814	\$9,505,236	\$11,905,643	\$10,526,863
<b>Investment Results (thousands)</b>						
Total costs of program	\$3,284,384	\$2,250,865	\$1,670,209	\$5,535,249	\$7,205,458	\$1,034,234
Total benefits, NPV	-\$357,762	-\$319,689	-\$650,790	-\$677,451	-\$1,328,241	-\$6,237,305
Total added taxes, NPV	\$2,926,622	\$1,931,176	\$1,019,419	\$4,857,798	\$5,877,217	-\$5,203,071
Total government savings, NPV	\$4,393	\$3,714	\$260,345	\$8,107	\$268,452	\$12,269,891
<b>Benefit-Cost Ratio</b>	<b>0.89</b>	<b>0.86</b>	<b>0.77</b>	<b>0.88</b>	<b>0.85</b>	<b>6.83</b>

Source: Emsi Impact Model.

participants were able to be reintegrated in the workforce thanks to the program as well as the cost of the program and the number of participants Tampa Bay was able to serve.

A very important factor that might help explain the WIOA results is the small difference pre-program and post-program earnings for the participants. Nonetheless, it is important to keep in mind that a variety of successful outcomes that exist in these programs do not include gainful employment—enrolling into post-secondary education and entering the job-market after searching for a while are examples of successful outcomes that cannot be quantified. Therefore, despite the benefit-cost ratio being lower than 1, the region and the state experience a gain in other ways, as we were able to see in the previous section, where government savings and taxpayer benefits were positive for the region.



CHAPTER 5:

# Sensitivity Analysis



*Sensitivity analysis measures the extent to which a model's outputs are affected by hypothetical changes in the background data and assumptions. This is especially important when those variables are inherently uncertain. This analysis allows us to identify a plausible range of potential results that would occur if the value of any of the variables is in fact different from what was expected. In this section we test the sensitivity of the model to the following input factors: 1) the discount rate and 2) the attribution factors.*





## Discount Rate

The discount rate is a rate of interest that converts future monies to their present value. In investment analysis, the discount rate accounts for two fundamental principles: 1) the time value of money, and 2) the level of risk that an investor is willing to accept. Time value of money refers to the value of money after interest or inflation has accrued over a given length of time. An investor must be willing to forego the use of money in the present to receive compensation for it in the future. The discount rate also addresses the investors' risk preferences by serving as a proxy for the minimum rate of return that the proposed risky asset must be expected to yield before the investors will be persuaded to invest in it. Typically, this minimum rate of return is determined by the known returns of less risky assets where the investors might alternatively consider placing their money.

In this study, we assume a 0.1% discount rate.<sup>14</sup> We vary the base case discount rates for participants, taxpayers, and society on either side by increasing the discount rate by 10%, 25%, and 50%, and then reducing it by 10%, 25%, and 50%.

**Table 5.1:** SENSITIVITY ANALYSIS OF DISCOUNT RATE

% variation in assumption	-50%	-25%	-10%	Base case	10%	25%	50%
Discount rate	0.50%	0.75%	0.90%	1.00%	1.10%	1.25%	1.50%
PV of benefits (millions)	\$6.3	\$6.2	\$6.2	\$6.1	\$6.1	\$6.1	\$6.0
NPV (millions)	-\$0.9	-\$1.0	-\$1.0	-\$1.1	-\$1.1	-\$1.1	-\$1.2
<b>Benefit-cost ratio</b>	<b>0.87</b>	<b>0.86</b>	<b>0.86</b>	<b>0.85</b>	<b>0.85</b>	<b>0.84</b>	<b>0.83</b>

As demonstrated in Table 5.1, an increase in the discount rate leads to a corresponding decrease in the expected returns, and vice versa. For example, reducing the discount rate by 50% (from 0.1% to 0.05%) increases the benefit-cost ratio from 0.85 to 0.87.

For the WP program, we can see the results are similar to the WIOA programs, where a decrease in the discount rates lead to an increase in the expected returns. In this case, reducing the discount rate by 50% increases the benefit-cost ratio from 6.83 to 6.90, as can be seen in Table 5.2.

**Table 5.2:** SENSITIVITY ANALYSIS OF DISCOUNT RATE FOR WP

% variation in assumption	-50%	-25%	-10%	Base case	10%	25%	50%
Discount rate	0.77%	0.75%	0.90%	1.00%	1.10%	1.25%	1.50%
PV of benefits (millions)	\$7.1	\$7.0	\$7.0	\$6.9	\$6.9	\$6.9	\$6.8
NPV (millions)	\$6.1	\$6.0	\$5.9	\$5.9	\$5.9	\$5.8	\$5.8
<b>Benefit-cost ratio</b>	<b>6.90</b>	<b>6.86</b>	<b>6.85</b>	<b>6.83</b>	<b>6.69</b>	<b>6.65</b>	<b>6.58</b>

<sup>14</sup> These values are based on the baseline forecasts for the 10-year Treasury rate published by the Congressional Budget Office and the real treasury interest rates recommended by the Office of Management and Budget for 10-year investments. See the Congressional Budget Office "Table 4. Projection of Borrower Interest Rates: CBO's June 2017 Baseline" and the Office of Management and Budget "Circular A-94 Appendix C."

## Attribution Factors

The attribution factors for each type of service are some of the most difficult assumptions to calculate. The attribution factors determine how much of the increased earnings participants experience after exiting a program can be attributed to Tampa Bay's programs. There are other factors beyond the services offered by the organization that may lead to a participants' increased earnings or new job. For example, participants receiving basic career services may attend a workshop to improve their interviewing capabilities but may in fact be offered a job mainly because of their work experience and skills. Thus, we apply attribution factors to each type of service. However, because no one really knows for certain how much of their increased earnings is attributable to the organization, we conduct a sensitivity analysis around each of the attribution factors. Each attribution factor is adjusted independently of the others; in other words, all other factors are held constant.

**Table 5.3: SENSITIVITY ANALYSIS OF ATTRIBUTION FACTORS BY SERVICE**

<b>% variation in assumption</b>	<b>-50%</b>	<b>-25%</b>	<b>-10%</b>	<b>Base case</b>	<b>10%</b>	<b>25%</b>	<b>50%</b>
<b>Training Services</b>							
Attribution factor	45%	67.5%	81%	90%	99%	112.5%	135%
Net present value (millions)	-\$6.9	-\$6.9	-\$6.9	-\$1.1	-\$6.9	-\$6.9	-\$6.9
Benefit-cost ratio	0.0	0.0	0.0	0.9	0.0	0.0	0.0
<b>Non-training, Individualized Services</b>							
Attribution factor	37.5%	56.3%	67.5%	75%	82.5%	93.8%	112.5%
Net present value (millions)	-\$6.9	-\$6.9	-\$6.9	-\$1.1	-\$1.1	-\$6.9	-\$6.9
Benefit-cost ratio	0.0	0.0	0.0	0.9	0.9	0.0	0.0

Source: Emsi Impact Model

Based on this sensitivity analysis, the conclusion can be drawn that Tampa Bay investment analysis results are fairly sensitive to relatively large variations in the attribution factors, regardless of the service. For both training services and non-training services, if we decrease the attribution factors, the benefit cost-ratios decrease. The conclusion is that although the assumptions are difficult to specify, their effects on investment analysis results are fairly sensitive.



# Regional Economic Impact of Tampa Bay's Operations



*Tampa Bay impacts the county's economy and consequently Florida's economy in a variety of ways. The organization is an employer and buyer of goods and services. It brings new money into the region through its operations that otherwise would not have entered the regional economy, with its program-specific funding stemming from federal sources. This section provides an overview of economic impact terminology and then discusses the economic impact of Tampa Bay's operations.*



## Economic Impact Terminology

For this analysis, we consider the following hypothetical question:

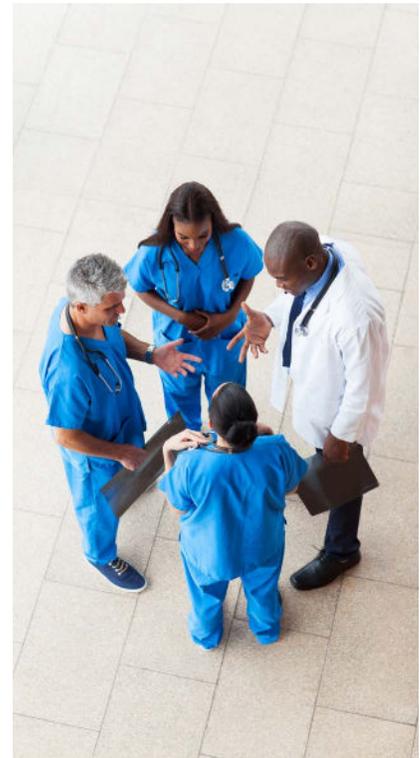
**How would economic activity change in the region if Tampa Bay did not exist in CY 2019?**

To answer this question, we measure net impacts, not gross impacts. Gross impacts represent an upper-bound estimate in terms of capturing all activity stemming from the organization; however, net impacts reflect a truer measure since they demonstrate what would not have existed in the regional economy if not for the organization.

Economic impact analyses use different types of impacts to estimate the results. The impact focused on in this study assesses the change in income; however, multiple measures of impact are calculated. This measure is similar to the commonly used gross regional product (GRP). Income may be further broken out into the **labor income impact**, also known as earnings, which assesses the change in employee compensation; and the **non-labor income impact**, which assesses the change in business profits. Together, labor income and non-labor income sum to total income.

Another way to state the impact is in terms of **jobs**, a measure of the number of full—and part-time jobs that would be required to support the change in income. Finally, a frequently used measure is the **sales impact**, which comprises the change in business sales revenue in the economy as a result of increased economic activity. It is important to bear in mind, however, that much of this sales revenue leaves the regional economy through intermediary transactions and costs.<sup>15</sup> All of these measures—added labor and non-labor income, total income, jobs, and sales—are used to estimate the economic impact results presented in this section. The analysis breaks out the impact measures into different components, each based on the economic effect that caused the impact. The following is a list of each type of effect presented in this analysis:

- The **initial effect** is the exogenous shock to the economy caused by the initial spending of money, whether to pay for salaries and wages, purchase goods or services, or cover operating expenses.
- The initial round of spending creates more spending in the economy, resulting in what is commonly known as the **multiplier effect**. The multiplier effect comprises the additional activity that occurs across all industries in the economy and may be further decomposed into the following three types of effects:



**Net impacts** reflect a truer measure since they demonstrate what would not have existed in the regional economy if not for the organization.

<sup>15</sup> See Appendix 2 for an example of the intermediary costs included in the sales impact but not in the income impact.

- The **direct effect** refers to the additional economic activity that occurs as the industries affected by the initial effect spend money to purchase goods and services from their supply chain industries.
- The **indirect effect** occurs as the supply chain of the initial industries creates even more activity in the economy through their own inter-industry spending.
- The **induced effect** refers to the economic activity created by the household sector as the businesses affected by the initial, direct, and indirect effects raise salaries or hire more people.

The terminology used to describe the economic effects listed above differs slightly from that of other commonly used input-output models, such as IMPLAN. For example, the initial effect in this study is called the “direct effect” by IMPLAN, as shown in the table below. Further, the term “indirect effect” as used by IMPLAN refers to the combined direct and indirect effects defined in this study. To avoid confusion, readers are encouraged to interpret the results presented in this section in the context of the terms and definitions listed above. Note that, regardless of the effects used to decompose the results, the total impact measures are analogous.

Multiplier effects in this analysis are derived using Emsi’s Multi-Regional Social Accounting Matrix (MR-SAM), which is an input-output model that captures the

<b>Emsi</b>	Initial	Direct	Indirect	Induced
<b>IMPLAN</b>	Direct	Indirect		Induced

interconnection of industries, government, and households in the region. The Emsi MR-SAM contains approximately 1,000 industry sectors at the highest level of detail available in the North American Industry Classification System (NAICS) and supplies the industry-specific multipliers required to determine the impacts associated with increased activity within a given economy. For more information on the Emsi MR-SAM model and its data sources, see Appendix 3.

## Economic Impact of Tampa Bay’s Operations

Employee payroll is part of the region’s total earnings, and the spending of employees for groceries, apparel, and other household expenditures helps support regional businesses. In CY 2019, Tampa Bay employed 118 people. All of these employees lived in the region (Table 6.1). The organization itself also purchases supplies and services for its daily operations, and many of its vendors are located within the county. These expenditures create a ripple effect that generates more jobs and income throughout the economy.

Table 6.2 presents Tampa Bay’s expenditures broken down across a variety of categories. The first step in estimating the multiplier effects of the organization’s operational expenditures is to map these categories of expenditures to the

*Table 6.1:* TAMPA BAY’S EMPLOYEE DATA, CY 2019

Full-time employees	117
Part-time employees	1
<b>Total employees</b>	<b>118</b>
% of employees that work in region	67%
% of employees that live in region	99%





approximately 1,000 industries of the Emsi MR-SAM model. Assuming that the spending patterns of the organization personnel approximately match those of the average consumer, we map salaries, wages, and benefits to spending on industry outputs using national household expenditure coefficients supplied by Emsi’s MR-SAM. For the other expenditure categories, we map the spending patterns to the appropriate industry sectors. For example, the professional services category is mapped to travel-related industries as well as professional-related industries such as the Payroll Services industry.

**Table 6.2:** TAMPA BAY’S OPERATIONAL EXPENSES BY FUNCTION, CY 2019

Function	In-region/state expenditures (thousands)	Outside region/state expenditures (thousands)	Total (thousands)
Payroll	\$6,747	\$3,323	\$10,071
Non-pay expenditures	\$6,590	\$1,158	\$7,748
Professional services (including travel)	\$629	\$84	\$713
Office expense & supplies (including telephone & communications)	\$311	\$173	\$483
Depreciation and interest and facilities	\$1,391	\$175	\$1,567
Payments to third-party contractors & program operators	\$571	\$63	\$634
Training services	\$2,913	\$324	\$3,237
All other expenditures	\$775	\$338	\$1,114
<b>Grand Total</b>	<b>\$13,338</b>	<b>\$4,481</b>	<b>\$17,819</b>

Source: Data supplied by Tampa Bay and the Emsi impact model

We now have seven vectors of expenditures for Tampa Bay. The next step is to estimate the portion of these expenditures that occur inside the region. The expenditures occurring outside the region are known as leakages. All Tampa Bay’s employees work within the state, and therefore we consider 100% of the expenditures for employee salaries, wages, and benefits as being initially spent in the region. We estimate in-region expenditures for the non-pay categories using regional purchase coefficients (RPCs), a measure of the overall demand for the commodities produced by each sector that is satisfied by regional suppliers for each of the approximately 1,000 industries in the MR-SAM model.<sup>16</sup>

For example, if 40% of the demand for NAICS 541211 (Offices of Certified Public Accountants) is satisfied by regional suppliers, the RPC for that industry is 40%. The remaining 60% of the demand for NAICS 541211 is provided by suppliers located outside the region. The seven vectors of expenditures are multiplied, industry by industry, by the corresponding RPC to arrive at the in-region expenditures associated with the organization. See Table 6.2 for a break-out of the expenditures that occur in-region. Finally, in-region spending is entered, industry by industry, into the MR-SAM model’s multiplier matrix, which in turn provides an

<sup>16</sup> See Appendix 3 for a description of Emsi’s MR-SAM model.



estimate of the associated multiplier effects on regional labor income, non-labor income, total income, sales, and jobs.

Table 6.3 presents the economic impact of the organization’s operations spending. The people employed by Tampa Bay and their salaries, wages, and benefits comprise the initial effect, shown in the top row of the table in terms of labor income, non-labor income, total added income, sales, and jobs. The additional impacts created by the initial effect appear in the next four rows under the section labeled *multiplier effect*. Summing the initial and multiplier effects, the gross impacts are \$13.1 million in labor income and \$3.3 million in non-labor income. This comes to a total impact of \$16.5 million in total added income associated with the spending of Tampa Bay and its employees in the region.

**Table 6.3:** OPERATIONS SPENDING IMPACT OF TAMPA BAY, CY 2019

	Labor income (thousands)	Non-labor income (thousands)	Total income (thousands)	% of Total	Jobs supported
<b>Total income in region</b>	<b>\$41,971,829</b>	<b>\$26,409,756</b>	<b>\$68,381,532</b>	<b>100.0%</b>	<b>666,756</b>
<b>Initial effect</b>	<b>\$6,747</b>	<b>\$0</b>	<b>\$6,747</b>	<b>&lt;0.1%</b>	<b>79</b>
<b>Multiplier effect</b>					
Direct effect	\$2,562	\$682	\$3,244	<0.1%	41
Indirect effect	\$783	\$188	\$971	<0.1%	13
Induced effect	\$3,100	\$2,470	\$5,570	<0.1%	59
<b>Total multiplier effect</b>	<b>\$6,445</b>	<b>\$3,341</b>	<b>\$9,785</b>	<b>&lt;0.1%</b>	<b>113</b>
<b>Gross impact (initial + multiplier)</b>	<b>\$13,192</b>	<b>\$3,341</b>	<b>\$16,533</b>	<b>&lt;0.1%</b>	<b>192</b>
Less alternative uses of funds	\$0	\$0	\$0	<0.1%	0
<b>Net impact</b>	<b>\$13,192</b>	<b>\$3,341</b>	<b>\$16,533</b>	<b>&lt;0.1%</b>	<b>192</b>

Source: Emsi impact model.

CHAPTER 7:

# Conclusion





**W**HILE TAMPA BAY'S VALUE to both the Tampa Bay area and Florida is larger than simply its economic impact, understanding the dollars and cents value is an important asset to understanding the organization's value as a whole. This report has evaluated the organization from the perspectives of economic impact analysis and investment analysis.

From an economic impact perspective, we calculated that Tampa Bay generates a total economic impact of \$16.5 million in total added income for the regional economy. This is equivalent to supporting the creation of 192 jobs. The \$16.5 million in total added income stems from the payroll for Tampa Bay employees and other expenditures toward non-payroll activities. This spending then ripples throughout the regional economy, for example towards groceries, apparel, and housing, to generate the additional income and supporting jobs.

Modeling the benefits of the organization is subject to many factors, the variability of which we considered in our sensitivity analysis. With this variability accounted for, we present the findings of this study as a robust picture of the economic value of Tampa Bay. An important factor to take into account in this study is the conjecture under which these results occurred. The post-program results were strongly influenced by COVID 19 and the impact it had on the employment conditions.

These impacts not only serve the local economy, through the employees and the added tax revenue, but create a ripple effect throughout the economy and the state that would have otherwise not occurred in the same proportion as it did. The better placement of these workers in the workforce leads to higher wages which in turn leads to consumption and an improvement of the overall economy, thus bringing even more value to CareerSource Tampa Bay.

Tampa Bay generates a total economic impact of **\$16.5 million** in total added income for the regional economy.

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**Alternative use of funds** A measure of how monies that are currently used to fund the organization might otherwise have been used if the organization did not exist.

**Asset value** Capitalized value of a stream of future returns. Asset value measures what someone would have to pay today for an instrument that provides the same stream of future revenues.

**Attrition rate** Rate at which participants leave the workforce due to out-migration, unemployment, retirement, or death.

**Benefit-cost ratio** Present value of benefits divided by present value of costs. If the benefit-cost ratio is greater than 1, then benefits exceed costs, and the investment is feasible.

**Discounting** Expressing future revenues and costs in present value terms.

**Earnings (labor income)** Income that is received as a result of labor; i.e., wages.

**Economics** Study of the allocation of scarce resources among alternative and competing ends. Economics is not normative (what ought to be done), but positive (describes what is, or how people are likely to behave in response to economic changes).

**Externalities** Impacts (positive and negative) for which there is no compensation. Positive externalities of training include improved social behaviors such as lower crime, reduced welfare and unemployment, and improved health. Educational institutions do not receive compensation for these benefits, but benefits still occur because training is statistically proven to lead to improved social behaviors.

**Gross Regional Product** Measure of the final value of all goods and services produced in a region after netting out the cost of goods used in production. Alternatively, Gross Regional Product (GRP) equals the combined incomes of all factors of production; i.e., labor, land and capital. These include wages, salaries, proprietors' incomes, profits, rents, and other. GRP is also sometimes called value added or added income.

**Initial effect** Income generated by the initial injection of monies into the economy through the payroll of Tampa Bay.

**Input-output analysis** Relationship between a given set of demands for final goods and services and the implied amounts of manufactured inputs, raw materials, and labor that this requires. When institutions pay wages and salaries and spend money for supplies in the region, they also generate earnings in all sectors of the economy, thereby increasing the demand for goods and services and jobs.

**Multiplier effect** Additional income created in the economy as Tampa Bay spends money in the region. It consists of the income created by the supply chain of the industries initially affected by the spending of Tampa Bay (i.e., the direct effect), income created by the supply chain of the initial supply chain (i.e., the indirect effect), and the income created by the increased spending of the household sector (i.e., the induced effect).

**NAICS** The North American Industry Classification System (NAICS) classifies North American business establishment in order to better collect, analyze, and publish statistical data related to the business economy.

**Net cash flow** Benefits minus costs, i.e., the sum of revenues accruing from an investment minus costs incurred.

**Net present value** Net cash flow discounted to the present. All future cash flows are collapsed into one number, which, if positive, indicates feasibility. The result is expressed as a monetary measure.

**Non-labor income** Income received from investments, such as rent, interest, and dividends.

**Opportunity cost** Benefits Florida from alternative B once a decision is made to allocate resources to alternative A. Or, if individuals choose to attend college, they forego earnings that they would have received had they chose instead to work full-time. Florida earnings, therefore, are the “price tag” of choosing to attend college.

## APPENDIX 2: EXAMPLE OF SALES VERSUS INCOME

Emsi's economic impact study differs from many other studies because we prefer to report the impacts in terms of income rather than sales (or output). Income is synonymous with value added Gross Regional Product (GRP). Sales include all the intermediary costs associated with producing goods and services. Income is a net measure that excludes these intermediary costs:

$$\text{Income} = \text{Sales} - \text{Intermediary Costs}$$

For this reason, income is a more meaningful measure of new economic activity than reporting sales. This is evidenced by the use of gross domestic product (GDP)—a measure of income—by economists when considering the economic growth or size of a country. The difference is GRP reflects a region and GDP a country.

To demonstrate the difference between income and sales, let us consider an example of a baker's production of a loaf of bread. The baker buys the ingredients such as eggs, flour, and yeast for \$2.00. He uses capital such as a mixer to combine the ingredients and an oven to bake the bread and convert it into a final product. Overhead costs for these steps are \$1.00. Total intermediary costs are \$3.00. The baker then sells the loaf of bread for \$5.00.

The sales amount of the loaf of bread is \$5.00. The income from the loaf of bread is equal to the sales amount less the intermediary costs:

$$\text{Income} = \$5.00 - \$3.00 = \$2.00$$

In our analysis, we provide context behind the income figures by also reporting the associated number of jobs. The impacts are also reported in sales and earnings terms for reference.

Emsi's MR-SAM represents the flow of all economic transactions in a given region. It replaces Emsi's previous input-output (IO) model, which operated with some 1,000 industries, four layers of government, a single household consumption sector, and an investment sector. The old IO model was used to simulate the ripple effects (*i.e.*, multipliers) in the regional economy as a result of industries entering or exiting the region. The MR-SAM model performs the same tasks as the old IO model, but it also does much more. Along with the same 1,000 industries, government, household and investment sectors embedded in the old IO tool, the MR-SAM exhibits much more functionality, a greater amount of data, and a higher level of detail on the demographic and occupational components of jobs (16 demographic cohorts and about 750 occupations are characterized).

This appendix presents a high-level overview of the MR-SAM. Additional documentation on the technical aspects of the model is available upon request.

### Data sources for the model

The Emsi MR-SAM model relies on a number of internal and external data sources, mostly compiled by the federal government. What follows is a listing and short explanation of our sources. The use of these data will be covered in more detail later in this appendix.

**Emsi Data** are produced from many data sources to produce detailed industry, occupation, and demographic jobs and earnings data at the local level. This information (especially sales-to-jobs ratios derived from jobs and earnings-to-sales ratios) is used to help regionalize the national matrices as well as to disaggregate them into more detailed industries than are normally available.

**BEA Make and Use Tables** (MUT) are the basis for input-output models in the U.S. The *make* table is a matrix that describes the amount of each commodity made by each industry in a given year. Industries are placed in the rows and commodities in the columns. The *use* table is a matrix that describes the amount of each commodity used by each industry in a given year. In the use table, commodities are placed in the rows and industries in the columns. The BEA produces two different sets of MUTs, the benchmark and the summary. The benchmark set contains about 500 sectors and is released every five years, with a five-year lag time (e.g., 2002 benchmark MUTs were released in 2007). The summary set contains about 80 sectors and is released every year, with a two-year lag (e.g., 2010 summary MUTs were released in late 2011/early 2012). The MUTs are used in

the Emsi MR-SAM model to produce an industry-by-industry matrix describing all industry purchases from all industries.

**BEA Gross Domestic Product by State** (GSP) describes gross domestic product from the value added (also known as added income) perspective. Value added is equal to employee compensation, gross operating surplus, and taxes on production and imports, less subsidies. Each of these components is reported for each state and an aggregate group of industries. This dataset is updated once per year, with a one-year lag. The Emsi MR-SAM model makes use of this data as a control and pegs certain pieces of the model to values from this dataset.

**BEA National Income and Product Accounts** (NIPA) cover a wide variety of economic measures for the nation, including gross domestic product (GDP), sources of output, and distribution of income. This dataset is updated periodically throughout the year and can be between a month and several years old depending on the specific account. NIPA data are used in many of the Emsi MR-SAM processes as both controls and seeds.

**BEA Local Area Income** (LPI) encapsulates multiple tables with geographies down to the county level. The following two tables are specifically used: CA05 (Personal income and earnings by industry) and CA91 (Gross flow of earnings). CA91 is used when creating the commuting submodel and CA05 is used in several processes to help with place-of-work and place-of-residence differences, as well as to calculate personal income, transfers, dividends, interest, and rent.

**Bureau of Labor Statistics Consumer Expenditure Survey** (CEX) reports on the buying habits of consumers along with some information as to their income, consumer unit, and demographics. Emsi utilizes this data heavily in the creation of the national demographic by income type consumption on industries.

**Census of Government's** (CoG) state and local government finance dataset is used specifically to aid breaking out state and local data that is reported in the MUTs. This allows Emsi to have unique production functions for each of its state and local government sectors.

**Census' OnTheMap** (OTM) is a collection of three datasets for the census block level for multiple years. **Origin-Destination** (OD) offers job totals associated with both home census blocks and a work census block. **Residence Area Characteristics** (RAC) offers jobs totaled by home census block. **Workplace Area Characteristics** (WAC) offers jobs totaled by work census block. All three of these are used in the commuting submodel to gain better estimates of earnings by industry that may be counted as commuting. This dataset has holes for specific years and regions. These holes are filled with Census' Journey-to-Work described later.

**Census' Current Population Survey** (CPS) is used as the basis for the demographic breakout data of the MR-SAM model. This set is used to estimate the

ratios of demographic cohorts and their income for the three different income categories (i.e., wages, property income, and transfers).

**Census' Journey-to-Work (JtW)** is part of the 2000 Census and describes the amount of commuting jobs between counties. This set is used to fill in the areas where OTM does not have data.

**Census' American Community Survey (ACS) Public Use Microdata Sample (PUMS)** is the replacement for Census' long form and is used by Emsi to fill the holes in the CPS data.

**Oak Ridge National Lab (ORNL) County-to-County Distance Matrix (Skim Tree)** contains a matrix of distances and network impedances between each county via various modes of transportation such as highway, railroad, water, and combined highway-rail. Also included in this set are minimum impedances utilizing the best combination of paths. The ORNL distance matrix is used in Emsi's gravitational flows model that estimates the amount of trade between counties in the country.

## Overview of the MR-SAM model

Emsi's MR-SAM modeling system is a comparative static model in the same general class as RIMS II (Bureau of Economic Analysis) and IMPLAN (Minnesota Implan Group). The MR-SAM model is thus not an econometric model, the primary example of which is PolicyInsight by REMI. It relies on a matrix representation of industry-to-industry purchasing patterns originally based on national data which are regionalized with the use of local data and mathematical manipulation (i.e., non-survey methods). Models of this type estimate the ripple effects of changes in jobs, earnings, or sales in one or more industries upon other industries in a region.

The Emsi MR-SAM model shows final equilibrium impacts—that is, the user enters a change that perturbs the economy and the model shows the changes required to establish a new equilibrium. As such, it is not a dynamic model that shows year-by-year changes over time (as REMI's does).

## NATIONAL SAM

Following standard practice, the SAM model appears as a square matrix, with each row sum exactly equaling the corresponding column sum. Reflecting its kinship with the standard Leontief input-output framework, individual SAM elements show accounting flows between row and column sectors during a chosen base year. Read across rows, SAM entries show the flow of funds into column accounts (also known as receipts or the appropriation of funds by those column accounts). Read down columns, SAM entries show the flow of funds into row accounts (also known as expenditures or the dispersal of funds to those row accounts).

The SAM may be broken into three different aggregation layers: broad accounts, sub-accounts, and detailed accounts. The broad layer is the most aggregate and will be covered first. Broad accounts cover between one and four sub-accounts,

which in turn cover many detailed accounts. This appendix will not discuss detailed accounts directly because of their number. For example, in the industry broad account, there are two sub-accounts and over 1,000 detailed accounts.

## MULTI-REGIONAL ASPECT OF THE MR-SAM

Multi-regional (MR) describes a non-survey model that has the ability to analyze the transactions and ripple effects (i.e., multipliers) of not just a single region, but multiple regions interacting with each other. Regions in this case are made up of a collection of counties.

Emsi's multi-regional model is built off of gravitational flows, assuming that the larger a county's economy, the more influence it will have on the surrounding counties' purchases and sales. The equation behind this model is essentially the same that Isaac Newton used to calculate the gravitational pull between planets and stars. In Newton's equation, the masses of both objects are multiplied, then divided by the distance separating them and multiplied by a constant. In Emsi's model, the masses are replaced with the supply of a sector for one county and the demand for that same sector from another county. The distance is replaced with an impedance value that takes into account the distance, type of roads, rail lines, and other modes of transportation. Once this is calculated for every county-to-county pair, a set of mathematical operations is performed to make sure all counties absorb the correct amount of supply from every county and the correct amount of demand from every county. These operations produce more than 200 million data points.

## Components of the Emsi MR-SAM model

The Emsi MR-SAM is built from a number of different components that are gathered together to display information whenever a user selects a region. What follows is a description of each of these components and how each is created. Emsi's internally created data are used to a great extent throughout the processes described below, but its creation is not described in this appendix.

## COUNTY EARNINGS DISTRIBUTION MATRIX

The county earnings distribution matrices describe the earnings spent by every industry on every occupation for a year—i.e., earnings by occupation. The matrices are built utilizing Emsi's industry earnings, occupational average earnings, and staffing patterns.

Each matrix starts with a region's staffing pattern matrix which is multiplied by the industry jobs vector. This produces the number of occupational jobs in each industry for the region. Next, the occupational average hourly earnings per job are multiplied by 2,080 hours, which converts the average hourly earnings into a yearly estimate. Then the matrix of occupational jobs is multiplied by the occupational annual earnings per job, converting it into earnings values. Last, all

earnings are adjusted to match the known industry totals. This is a fairly simple process, but one that is very important. These matrices describe the place-of-work earnings used by the MR-SAM.

## COMMUTING MODEL

The commuting sub-model is an integral part of Emsi's MR-SAM model. It allows the regional and multi-regional models to know what amount of the earnings can be attributed to place-of-residence vs. place-of-work. The commuting data describe the flow of earnings from any county to any other county (including within the counties themselves). For this situation, the commuted earnings are not just a single value describing total earnings flows over a complete year, but are broken out by occupation and demographic. Breaking out the earnings allows for analysis of place-of-residence and place-of-work earnings. These data are created using Bureau of Labor Statistics' OnTheMap dataset, Census' Journey-to-Work, BEA's LPI CA91 and CA05 tables, and some of Emsi's data. The process incorporates the cleanup and disaggregation of the OnTheMap data, the estimation of a closed system of county inflows and outflows of earnings, and the creation of finalized commuting data.

## NATIONAL SAM

The national SAM as described above is made up of several different components. Many of the elements discussed are filled in with values from the national Z matrix—or industry-to-industry transaction matrix. This matrix is built from BEA data that describe which industries make and use what commodities at the national level. These data are manipulated with some industry standard equations to produce the national Z matrix. The data in the Z matrix act as the basis for the majority of the data in the national SAM. The rest of the values are filled in with data from the county earnings distribution matrices, the commuting data, and the BEA's National Income and Product Accounts.

One of the major issues that affect any SAM project is the combination of data from multiple sources that may not be consistent with one another. Matrix balancing is the broad name for the techniques used to correct this problem. Emsi uses a modification of the “diagonal similarity scaling” algorithm to balance the national SAM.

## GRAVITATIONAL FLOWS MODEL

The most important piece of the Emsi MR-SAM model is the gravitational flows model that produces county-by-county regional purchasing coefficients (RPCs). RPCs estimate how much an industry purchases from other industries inside and outside of the defined region. This information is critical for calculating all IO models.

Gravity modeling starts with the creation of an impedance matrix that values the difficulty of moving a product from county to county. For each sector, an impedance matrix is created based on a set of distance impedance methods for that sector. A distance impedance method is one of the measurements reported in the Oak Ridge National Laboratory's County-to-County Distance Matrix. In this matrix, every county-to-county relationship is accounted for in six measures: great-circle distance, highway impedance, rail miles, rail impedance, water impedance, and highway-rail-highway impedance. Next, using the impedance information, the trade flows for each industry in every county are solved for. The result is an estimate of multi-regional flows from every county to every county. These flows are divided by each respective county's demand to produce multi-regional RPCs.

Human capital theory holds that earnings levels do not remain constant; rather, they start relatively low and gradually increase as the worker gains more experience. Research also shows that the earnings increment between educated and non-educated workers grows through time. These basic patterns in earnings over time were originally identified by Jacob Mincer, who viewed the lifecycle earnings distribution as a function with the key elements being earnings, years of training, and work experience, with age serving as a proxy for experience.<sup>17</sup> While some have criticized Mincer’s earnings function, it is still upheld in recent data and has served as the foundation for a variety of research pertaining to labor economics. Those critical of the Mincer function point to several unobserved factors such as ability, socioeconomic status, and family background that also help explain higher earnings. Failure to account for these factors results in what is known as an “ability bias.” Research by Card (1999 and 2001) suggests that the benefits estimated using Mincer’s function are biased upwards by 10% or less. As such, we reduce the estimated benefits by 10%. We use state-specific and education-level-specific Mincer coefficients.

Figure A4.1: LIFECYCLE CHANGE IN EARNINGS, 12 YEARS VERSUS 14 YEARS OF TRAINING

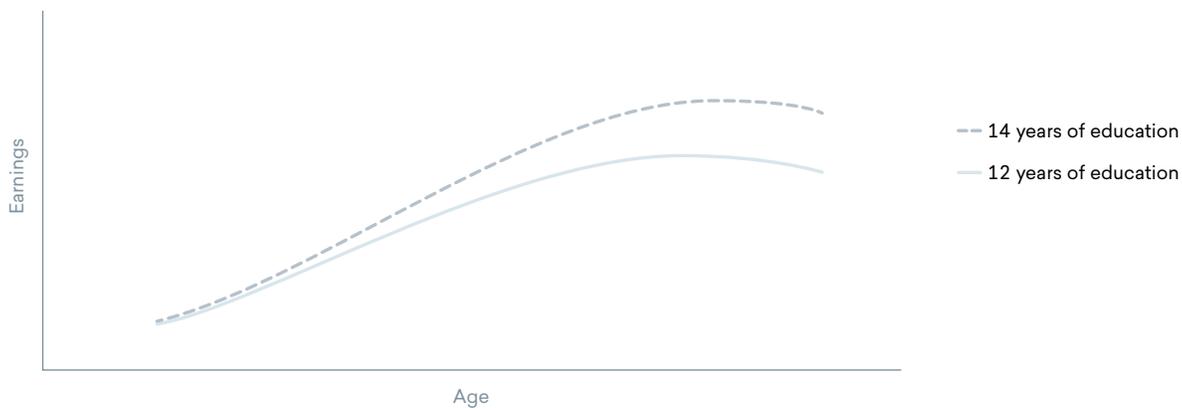


Figure A4.1 illustrates several important points about the Mincer function. First, as demonstrated by the shape of the curves, an individual’s earnings initially increase at an increasing rate, then increase at a decreasing rate, reach a maximum somewhere well after the midpoint of the working career, and then decline in

17 See Mincer (1958 and 1974).

later years. Second, individuals with higher levels of training reach their maximum earnings at an older age compared to individuals with lower levels of training (recall that age serves as a proxy for years of experience). And third, the benefits of training, as measured by the difference in earnings between education levels, increase with age.