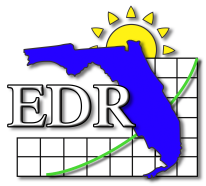

Return on Investment for the Department of Transportation's Work Program

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OFFICE OF ECONOMIC & DEMOGRAPHIC RESEARCH

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Contents

EXECUTIVE SUMMARY

Background and Purpose...

During the 2016 Session, the Florida Legislature passed CS/CS/HB 7061 (Chapter 2016-239, LOF), requiring the Office of Demographic Research (EDR) to evaluate and determine the economic benefits, as defined in s. 288.005(1), F.S., of the state's investment in the Department of Transportation's adopted work program. This evaluation effectively provides two analyses. The first analysis examines the historical economic benefits of the implemented work program over the previous three fiscal years. The second analysis examines the forecasted economic benefits of the adopted work program for FY 2016-17 and the following four fiscal years. At a minimum, the analysis must provide a separate return on investment for each of the following areas:

- Roads and Highways
- Rails
- Public Transit
- Aviation
- Seaports

For the purpose of this evaluation, determining the state's economic benefits is the same as calculating the state's return on investment, and the terms are used interchangeably. Both include all direct, indirect and induced effects of the state's investment in the program. Neither measure addresses issues of overall effectiveness or societal benefit; instead, they focus on tangible financial gains or losses to state revenues. The results are ultimately conditioned by the state's overall tax policy.

The return on investment (ROI) is developed by summing state revenues generated by a program less state expenditures invested in the program, and dividing that calculation by the state's investment. It is most often used when a project is to be evaluated strictly on a monetary basis, and externalities and social costs and benefits—to the extent they exist—are excluded from the evaluation. The basic formula is:

$$\frac{\text{(Increase in State Revenue – State Investment)}}{\text{State Investment}}$$

Since EDR's Statewide Model[1] is used to develop these computations and to model the induced and indirect effects, EDR is able to simultaneously generate "State Revenue" and "State Investment" from the model so all feedback effects mirror reality. The result (a net number) is used in the final ROI calculation.

As used by EDR for this analysis, the return can be categorized as follows:

- **Greater Than One (>1.0)**…the program more than breaks even; the return to the state produces more revenues than the total cost of the program.
- **Equal To One (=1.0)**…the program breaks even; the return to the state in additional revenues equals the total cost of the program.

[1] See section on Methodology for more details.
[2] The Florida Department of Transportation, "The 2015 Florida Seaport System Plan", (July 2016): 2-8.

- **Less Than One, But Positive (+, <1)**…the program does not break even; however, the state generates enough revenues to recover a portion of its cost for the program.
- **Less Than Zero (-, <0)**…the program does not recover any portion of the program cost, and state revenues are less than they would have been in the absence of the program because taxable activity is shifted to non-taxable activity.

The numerical ROI can be interpreted as return in tax revenues for each dollar spent by the state. For example, an ROI of 2.5 would mean that $2.50 in tax revenues is received back from each dollar spent by the state.

Overall Results and Conclusions...

WORK PROGRAM RETURN-ON-INVESTMENT		
PROGRAM	FY 2013/14 - FY 2015/16	FY 2016/17 - FY 2020/21
ROADS & HIGHWAYS	0.19	0.19
RAILS	0.02	0.02
PUBLIC TRANSIT	0.04	0.05
AVIATION	1.37	1.72
SEAPORTS	1.76	2.71

As the Table above shows, the results were mixed. Two of the program areas (Aviation and Seaports) generated ROIs that were greater than one in both the historical and forecasted periods. The remaining program areas (Roads and Highways, Rails, and Public Transit) returned ROIs that were less than one, but positive for each time period.

Two factors were ultimately responsible for the strong ROIs associated with Seaports and Aviation. The first factor was their distinct contributions to Florida's tourism industry. Florida's seaports provide a home to the cruise industry. In 2015, the Florida-based cruise industry accounted for 62% of all U.S. cruise traffic and embarked over 15.5 million passengers.[2] Similarly, Florida's airports act as a gateway for the tourists visiting Florida. As indicated by data collected by VISIT FLORIDA for the 2011, 2012, 2013, 2014 and 2015 calendar years, about half of all tourists arrive through the state's airports.[3] Because tourists generate considerable new revenue for the state from their purchases of taxable products, the direct, indirect and induced effects of their spending are amplified relative to similar spending by residents. As a result, EDR's analysis attributed a share of the spending by tourists to both the Seaports and Aviation program areas.

The second factor is that both the aviation and seaport industries generate a considerable amount of economic activity. Economic activity generates jobs and profits, benefits local suppliers and retailers, and leads to revenue generation for the state. The analysis attributed a sizeable share of economic activity to both program areas. For airports, the activity consists of general airport operations and support, air cargo activity and aviation-related businesses. A 2014 Florida Department of Transportation

[2] The Florida Department of Transportation, "The 2015 Florida Seaport System Plan", (July 2016): 2-8.
[3] VISIT FLORIDA research and reports on visitor estimates and travel industry trend indicators.

report estimated that these activities generate over 300,000 jobs.[4] Seaports also generate considerable output. This activity includes navigation of the cargo ships; the handling and storing of the freight, and the transportation of the goods to and from the seaport. A 2012 report estimated that the seaports generate over 57,000 jobs.[5]

While Roads and Highways, Rails, and Public Transit also generate economic activity, they are more easily substitutable and—in part—have non-taxable direct effects. For example, the primary benefit of both the Public Transit and Rails program areas is cost savings to consumers and businesses. Both programs offer a cheaper alternative than commuting by personal automobile. These cost savings translate into income gains. Additionally, both program areas help relieve traffic congestion and lead to productivity improvements as job access increases.

Unfortunately, these benefits do not translate well into state revenue. The cost savings is due to a reduction in purchases of automobile-related goods and services. Since Florida receives a considerable amount of revenue from the taxation of automobile-related goods and services, this reduction negatively impacts the collection of state revenue. While the income gains from the two program areas stimulate enough economic activity to offset part of the loss, it is not enough for the program areas to fully pay for themselves. In this type of situation, it is ultimately up to the legislature to decide the policy question of whether the positive externalities and public preferences warrant future investments that essentially subsidize the two program areas.

The Roads and Highways program area is the largest in the Florida Department of Transportation's adopted work program. EDR's analysis grouped 14 Work Program Budget Categories (see the section for the Roads and Highways program area for a detailed list) that support the planning, maintenance, and new construction of the State Highway System. The State Highway System (SHS) is comprised of roads maintained by the Florida Department of Transportation (DOT). In 2015, the SHS represented 10% of Florida's roadway network and carries 54% of all daily traffic.[6] Additionally, the analysis included work program funding of DOT-owned bridges and roads not part of the SHS.

Florida's reliance on the SHS led EDR to attribute a percentage of Florida's total economic output to its existence. The highway system is linked to private economic output by its impact on productivity—whether private capital or labor. Productivity is an economic measure of output given a specified volume of inputs (capital and labor). Greater productivity means more output given the same level of labor and private capital inputs. Based on academic research, an output elasticity of 0.15 was applied. This can be defined as follows: for every 1% increase of highway infrastructure, total private output increases by 0.15%.

The output elasticity attributed a sizeable amount of Florida's GDP, Personal Income and Employment to the Roads and Highways program area. However, the ROI for the Roads and Highways program area was less than 1.0. This result is partially explained by the substantial state cost to operate the highway system. In total, the 14 budgetary categories cost the state, on average, about $4.3 billion per year in the historical analysis and about $4.8 billion per year in the forecasted analysis. The program returned

[4] The Florida Department of Transportation, "FDOT Aviation Economic Impact Study Update", (August 2014).
[5] Please see Martin Associates, "2012 Statewide Economic Impact of Florida Seaports", *Florida Seaport Transportation and Economic Development Council.* (March 2013).
[6] The Florida Department of Transportation, "Florida Transportation Trends & Conditions", 2015: 14.

approximately $1 billion in tax revenue every year to the state. While this is a sizeable contribution to the state's revenues, it is not enough to offset the state's expense.

Another reason for the Roads and Highways program area's low ROI arises from the wide array of benefitting industries. The value of the Roads and Highways program area is spread across all industries in Florida. Some of these industries produce a sizable amount of taxable output; other industries generate a sizeable amount of non-taxable activity. For example, an output increase related to an agricultural commodity will not lead to a large increase in state revenue. Most food products are exempted from state sales tax or are exported out of Florida.

A final reason is associated with the nature of the benefit, itself. One of the greatest benefits from the Roads and Highways program area is travel time savings. Travel time savings is the value consumers place on the reduction of travel time between two distinct points. In a cost-benefit analysis, personal time travel savings would be measured and captured, but since this evaluation is limited to the tangible economic impact of the Roads and Highways program area, it is not included.

OVERVIEW OF THE STUDY

Each year, the commitment to fund the Department of Transportation's adopted work program represents the state's single greatest expenditure on infrastructure projects. Every legislative session, the Department of Transportation submits a tentative work program to the Florida Legislature that includes all transportation projects planned for the next five fiscal years. The actual work program listing is continuously evolving as each year, new projects are added and other projects are removed due to completion.

As required by section 55 of CS for CS for HB 6071 which passed during the 2016 Session, this study measures the economic benefits of five transportation areas funded through the work program. The five program areas are Roads and Highways, Rails, Public Transit, Aviation, and Seaports. A separate analysis is provided for each of the program areas, with the calculation of two distinct returns on investment (ROI). The first ROI covers the historical time period beginning FY 2013-14 and ending FY 2015-16. The second analysis covers the five years in the forecasted time period between FY 2016-17 and FY 2020-21.

Four out of the five listed program areas are funded by one product category within the total budget for the work program. The Table below shows the budget for each of these program areas from FY 2013-14 through FY 2020-2021.

PARTIAL WORK PROGRAM BUDGET FY 2013-14 TO FY 2020-21								
(MILLIONS OF $)	1ST ANALYSIS			2ND ANALYSIS				
Program Area	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
RAILS	89.66	109.97	76.64	379.14	192.40	154.15	171.86	116.27
PUBLIC TRANSIT	205.02	214.44	271.51	407.96	274.03	253.22	267.83	262.25
AVIATION	178.28	320.94	347.41	262.23	225.33	213.61	210.27	256.15
SEAPORTS	259.90	112.21	94.18	141.25	111.19	109.51	131.75	108.86

The Roads and Highways program area is the largest component of the work program and consists of multiple product categories. This analysis grouped 14 product categories into the Roads and Highways program area. The Table below lists the budgeted amount associated with each of the product categories from FY 2013-14 through FY 2020-21. A more detailed description of each product category can be found in the Roads and Highways Program Area Section.

PARTIAL WORK PROGRAM BUDGET FY 2013-14 TO FY 2020-21								
(MILLIONS OF $)	1ST ANALYSIS			2ND ANALYSIS				
Program Area	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
STATE HIGHWAY SYSTEM (SHS)	1542.45	1911.11	1596.30	2566.05	1663.76	1897.59	1367.84	1545.68
OTHER ROADS	228.19	232.86	171.16	232.83	171.62	166.32	161.89	165.67
RIGHT OF WAY LAND	103.26	126.97	157.48	450.97	351.35	172.97	202.26	203.24
SAFETY	7.10	4.64	28.29	10.55	1.28	3.17	0.84	0.25
BRIDGES	111.53	98.68	115.61	373.80	137.07	144.08	160.36	128.03
RESURFACING	194.92	217.86	279.28	312.39	302.00	316.30	309.06	340.77
PRELIMINARY ENGINEERING	497.21	644.92	697.92	695.88	492.66	511.36	463.77	526.87
CONSTRUCTION & ENG. INSPECTION	225.09	212.97	292.28	314.96	229.84	205.32	196.88	134.98
RIGHT OF WAY SUPPORT	50.91	54.71	77.47	92.88	62.62	59.53	55.29	53.40
ENVIRONMENTAL MITIGATION	32.22	22.50	15.12	37.17	3.48	1.56	3.26	0.41
MATERIALS & RESEARCH	33.63	33.28	34.89	35.47	35.80	36.92	38.20	39.53
OPERATIONS & MAINTENANCE	620.64	671.49	701.70	701.50	757.64	777.29	805.74	835.25
TRAFFIC ENG. & OPERATIONS	88.87	114.46	131.09	206.26	186.96	181.14	189.34	211.73
TOLL OPERATIONS	192.58	257.44	269.16	313.19	302.85	340.71	306.38	309.64
ROADS & HIGHWAYS TOTAL	3928.61	4603.89	4567.74	6343.89	4698.94	4814.27	4261.12	4495.45

This analysis does not address product categories related to program areas not specified in the legislation, nor does it address those categories that map to multiple program areas where attribution is an issue. The largest product category not covered because of overlap was Intermodal Access. The Intermodal Access product category funds projects used to improve surface transportation access (whether road or rail) to intermodal facilities (seaports and airports).

METHODOLOGY

Broad Approach...

EDR uses the Statewide Model to estimate the ROI for the programs under review. The Statewide Model is a dynamic computable general equilibrium (CGE) model that simulates Florida's economy and government finances.[7] Among other things, it captures the indirect and induced economic activity resulting from the direct program effects. This is accomplished by using large amounts of data specific to the Florida economy and fiscal structure. Mathematical equations[8] are used to account for the relationships (linkages and interactions) between the various economic agents, as well as likely responses by businesses and households to changes in the economy.[9] The model also has the ability to estimate the impact of economic changes on state revenue collections and state expenditures in order to maintain a balanced budget by fiscal year.

When using the Statewide Model to evaluate appropriation-based programs, the model is "shocked"[10] using static analysis to develop the initial or direct effects attributable to the projects funded by the state. In this analysis, the direct effects are unique to each transportation program area and described in their separate sections.

After the direct effects are developed and estimated, the model is then used to estimate the additional—indirect and induced—economic effects generated by the programs, as well as the supply-side responses to the new activity, where the supply-side responses are changes in investment and labor supply arising from the new activity. Indirect effects are the changes in employment, income, and output by local supplier industries that provide goods and services to support the direct economic activity. Induced effects are the changes in spending by households whose income is affected by the direct and indirect activity.

All of these effects can be measured by changes (relative to the baseline) in the following outcomes:

- State government revenues and expenditures
- Jobs
- Personal income
- Florida Gross Domestic Product
- Gross output
- Household consumption
- Investment
- Population

[7] The statewide economic model was developed using GEMPACK software with the assistance of the Centre of Policy Studies (CoPS) at Victoria University (Melbourne, Australia).

[8] These equations represent the behavioral responses to economic stimuli – to changes in economic variables.

[9] The business reactions simulate the supply-side responses to the new activity (e.g., changes in investment and labor supply).

[10] In economics, a shock typically refers to an unexpected or unpredictable event that affects the economy, either positive or negative. However, as used above, a shock refers to some action that affects the current equilibrium or baseline path of the economy. It can be something that affects demand, such as a shift in the export demand equation; or, it could be something that affects the price of a commodity or factor of production, such as a change in tax rates. In the current analyses, a shock is imposed to simulate the introduction of transportation expenditures into the economy.

EDR's calculation of the return on investment uses the model's estimate of net state revenues and expenditures. Other required measures for this report include the number of jobs created, the increase or decrease in personal income, and the impact on gross domestic product, all of which are included in the model results.

PROGRAM FINDINGS

In the pages that follow, the analysis for each transportation program area includes diagnostic tables describing the composition and statistics of the projects under review. Key terms used in the tables are described below:

State Payments in the Window $(M) – Represents the amount of state payments made to the program in each fiscal year.

Total Net State Revenues $(M) – Represents the amount of new state revenue generated by the program in each fiscal year.

Personal Income (Nominal $(M)) – Reflects income received by persons from all sources. It includes income received from participation in production as well as from government and business transfer payments. It is the sum of compensation of employees (received), supplements to wages and salaries, proprietors' income with inventory valuation adjustment (IVA) and capital consumption adjustment (CCAdj), rental income of persons with CCAdj, personal income receipts on assets, and personal current transfer receipts, less contributions for government social insurance.

Real Disposable Personal Income (Fixed 2010-11 $(M)) – Reflects total after-tax income received by persons; it is the income available to persons for spending or saving.

Real Gross Domestic Product (Fixed 2010-11 $(M)) – Measures the state's output; it is the sum of value added from all industries in the state. GDP by state is the state counterpart to the Nation's gross domestic product.

Consumption by Households and Government (Fixed 2010-11 $(M)) –Reflects the goods and services purchased by persons plus expenditures by governments consisting of compensation of general government employees, consumption of fixed capital (CFC), and intermediate purchases of goods and services less sales to other sectors and own-account production of structures and software. It excludes current transactions of government enterprises, interest paid or received by government, and subsidies.

Real Output (Fixed 2010-11 $(M)) – Consists of sales, or receipts, and other operating income, plus commodity taxes and changes in inventories.

Total Employment (Jobs) – Provides estimates of the number of jobs, full time plus part time, by place of work. Full time and part time jobs are counted at equal weight. Employees, sole proprietors, and active partners are included, but unpaid family workers and volunteers are not included.

Population (Persons) – Reflects first of year estimates of people, includes survivors from the previous year, births, special populations, and three types of migrants (economic, international, and retired).

THE ROADS AND HIGHWAYS PROGRAM AREA

Overview of the Roads and Highways Program Area…

The Roads and Highways program area represents the largest portion of the Department of Transportation's work program budget. The table below lists the relevant part of the work program funding for this area, starting in FY 2013-14 and projected out to FY 2020-21.

Work Program Budget- Roads & Highways (Millions of $)							
Historical			Work Program July 1, 2016				
13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
$3,928.6	$4,603.9	$4,567.7	$6,343.9	$4,698.9	$4,814.3	$4,261.1	$4,495.4

Both the Federal and state governments consider highway infrastructure to be an important factor in economic growth. The highway system contributes to economic growth through multiple paths. Perhaps most importantly, it enables producers to reach new markets or to reach existing markets at a cheaper price.[11] One study estimated that an overwhelming majority of industries (32 out of the 35 industries studied) experienced a reduction in costs due to the establishment of the Interstate Highway System in the 1950s.[12]

Highway infrastructure reduces business costs in in several ways:

1.) Reduction in Travel Time: Congestion is a significant problem in the United States. The improvement or expansion of roads can reduce congestion which, in turn, reduces the travel time for moving goods. Every additional hour on the road costs the trucking industry approximately $67.[13] The 2015 Urban Mobility Report estimated that congestion costs commercial trucks $28 billion in expenses and fuel.[14]

2.) Safety: Improved highway infrastructure can lead to a reduction in vehicular accidents. One study of the total economic costs of vehicular accidents in United States indicated the annual cost was $242 billion.[15] The cost components include productivity losses from persons being unable to work, medical expenses, property and vehicular damages and the lifetime economic costs of a fatality or serious injury to society.

3.) Reduction in Operating Costs: The majority of goods produced and consumed in the United States will, at one point, be moved through the National Highway System. The transportation of these goods amount to an additional cost that will be passed on to the final consumer of the good or services. By adding new roads, improving old roads and eliminating substandard roads, operating costs can be reduced as the product travels quicker and cheaper.

[11] Shatz, H., Kitchens K., Rosenbloom, S., & Wach, M.,"Highway Infrastructure and the Economy: Implications for Federal Policy", *The Rand Institute*. 2011: xiv.

[12] Nadiri, Ishaq., Mamuneas, Theofanis, "Contributions of Highway Capital to Industry and National Productivity Growth", *Federal Highway Office of Policy Development*, September 1996.

[13] Ellis, David, "Technical Memorandum: Cost Per Hour and Value of Time Calculations for Passenger Vehicles and Commercial Truck For Use in the Urban Mobility Study", *Texas Transportation Institute*. May 2008: 5.

[14] Texas A&M Transportation Institute, "2015 Urban Mobility Scorecard", August 2015:17.

[15] Blincoe, L. J., Miller, T. R., Zaloshnja, E., & Lawrence, B. A. "The economic and societal impact of motor vehicle crashes, 2010. (Revised)", *National Highway Traffic Safety Administration*. May 2015:1.

Better highway infrastructure benefits consumers, too. In June 2016, the Florida Department of Transportation (DOT) estimated that over 307 million miles are driven daily on the State Highway System.[16] Annually, the average American drives approximately 13,476 miles a year.[17] They rely on the roadway system to get to work, buy goods and services, and to participate in leisure activities. One study even found a positive link between public infrastructure spending and personal income growth.[18]

Improved highway infrastructure benefits individuals by reducing travel costs and increasing labor productivity. Further, the average U.S. household spends approximately $8,000 on auto-related goods and services each year, with a large portion of that budget dedicated to operating and maintaining personal vehicles.[19] This indicates that any improvement in the road infrastructure can lead to a reduction in personal auto-related costs.

Highway infrastructure also increases productivity by allowing workers to access better—or at least a greater array of—employment opportunities. This benefits the employers as well as employees, since it provides access to a larger pool of qualified labor. Ultimately, the economy benefits as better employment matching leads to higher levels of productivity growth.

The immediate (or short-term) benefit of highway infrastructure on the economy is the creation of jobs and income. Every highway infrastructure project entails contracting the work to private construction companies that hire workers, purchase construction supplies and equipment, and reinvest or distribute any remaining profit. All of these activities benefit the broader economy. Due to its immediate benefit, infrastructure spending is a favorite choice by governments to stimulate the economy.

While business site selection surveys have consistently found highway accessibility ranks first or second in importance for the selection of new locations, economists have spent decades measuring the exact relationship between infrastructure spending and economic output.[20] The relationship is difficult to measure for several reasons. First, most studies are limited by data availability. Most reliable data on public and private capital investments start after 1945. Second, the question of causation exists. Does public capital increase private investment, or does an increase in private investment lead governments to invest in more public infrastructure? Third, other variables (such as technological factors, population, and education) may not be accurately accounted for in the analysis, leading to biased and unreliable estimates.

However, the general consensus in the academic research suggests a significant, positive relationship between public infrastructure and economic output. Economic output increases due to the infrastructure's impact on the productivity of private capital and labor. Productivity measures the amount of output per unit of production input (whether labor and private capital). Greater productivity means more output given the same level of labor and private capital inputs. For example, a newly resurfaced highway lowers the trucking industry's overall operating costs and delivery times. This

[16] Florida Department of Transportation, "State Highway System Report 1: All Roads", June 3, 2016:1.
[17] Federal Highway Administration Office of Highway Policy Information, "Average Annual Miles per Driver by Age Group", July 13, 2016.
[18] Kevin Duffy-Deno and Randall W. Eberts, "Public Infrastructure and Regional Economic Development: A Simultaneous Equations Approach", *Federal Reserve Bank of Cleveland*, (August 1989).
[19] U.S. Bureau of Labor Statistics, "Table 8. Region of Residence: Average Annual Expenditures and Characteristics", (September 2012).
[20] *Area Development Annual Surveys* regarding site selection and relocation. For 2015 data, and an analysis of respondents by industry and position within the organization, see: http://www.areadevelopment.com/Corporate-Consultants-Survey-Results/Q1-2016/corporate-executive-site-selection-facility-plans-441729.shtml. Accessed December, 2016.

benefits the productivity of private capital because the asset (the truck) depreciates at a much lower rate and lasts longer. The productivity of labor increases because it now takes the driver less time to complete the trip, thereby enabling more trips.

The relationship between public capital and economic output was clear in the 1950s and the 1960s. Many academic researchers have linked the rapid U.S. economic expansion of the 50s and 60s to the development of the U.S. Interstate Highway System.[21] During that period, the Interstate Highway System established connections to and between cities and towns that were previously inefficient. One analysis attributed about 1.4% per year of U.S. growth before 1973 to the establishment of the Interstate Highway System.[22] Another study estimated that trucking costs would be 19% higher without the Interstate Highway System.[23] A 1989 paper linked the decline in public capital spending that started in the late 1960s to the U.S. productivity slowdown witnessed in the 1970s and 1980s.[24]

More recent estimates suggest that the positive relationship still exists, but at a much lower level. Some researchers have suggested that the gains in highway expansion do not offer the same benefits as the initial construction of the interstate.[25] For example, the addition of a new lane on I-10 may lower travel costs, but this value is lower than the value of the interstate's original construction. Its original completion linked new markets and dramatically reduced travel costs. To this point, a 2006 analysis estimated a strong decline in the rate of return for highway infrastructure.[26] The study estimated the return dropped from 54% in the years 1949 to 1959 to 13.6% in the years of 1990 to 2000.[27] Also, a 2011 literature review found a consensus among published studies that the rate of return for highway infrastructure has fallen.[28]

Other issues cast doubt on the effectiveness of highway expansion and improvement. One body of literature suggests that new highway lanes do not ease congestion issues and lower time travel costs. This research has found that highway expansion instead leads to additional vehicle usage on the highway. This concept is referred to as "induced demand".[29] A 1996 study estimated that congestion savings were matched on a 1:1 basis with a proportional increase in traffic.[30] A 1997 study of California highway construction found that every 10% increase in lanes added led to a 9% increase in vehicle miles

[21] Ishaq Nadiri and Theofanis Mamuneas, "Contributions of Highway Capital to Industry and National Productivity Growth", *Federal Highway Office of Policy Development*, (September 1996).
[22] John Fernald, "Roads to Prosperity? Assessing the Link between Public Capital and Productivity", *The American Economic Review,* Vol 89, No.3:619-638.
[23] Theodore Keeler and John Ying, "Measuring the Benefits of Large Public Investment", *Journal of Public Economics*, Vol 36, (1998): 69-85.
[24] David Aschauer, "Is Public Expenditure Productive?", *Journal of Monetary Economics*, Vol 23, (1989): 177-200.
[25] Theofanis Mamuneas and Ishaq Nadiri., "Production, Consumption and the Rates of Return to Highway Infrastructure Capital," *National Bureau of Economic Research*, (August 2006).
[26] Theofanis Mamuneas and Nadiri Ishaq, "Production, Consumption and the Rates of Return to Highway Infrastructure Capital", *National Bureau of Economic Research,* August 2006.
[27] Ibid.
[28] Shatz, H., Kitchens K., Rosenbloom, S., & Wach, M.," Highway Infrastructure and the Economy: Implications for Federal Policy",*The Rand Institute*. 2011: xiv.
[29] Douglas Lee, "Induced Traffic and Induced Demand", *Concepts of Induced Demand,* Appendix B: 1:16.
[30] P. Goodwin, "Empirical Evidence on Induced Traffic: A Review and Synthesis", *Transportation,* Vol 23: 35-54

traveled (VMT).[31] Another California study found the "induced demand" effect, but at a slightly lower rate: a 10% increase in lane miles added led to a 6.4% increase in traffic.[32]

A widely accepted way of measuring the impact of public infrastructure is through output elasticities. Elasticity is defined as the change in output for a given percentage change in an input. For example, an output elasticity of .20 implies that for every 1% change in total infrastructure, private output goes up by 0.20%. Aschauer (1989) estimated that the output elasticity of public capital ranges from .39 to .56.[33] Munnel (1990b) found the elasticity between public capital and output to be 0.15.[34] A more in-depth look at county-specific data and the provision of highway infrastructure found that a 10% percent increase in highway capital lead to a 0.14% increase in economic output.[35] Tatom (1991) found a similar relationship and estimated an elasticity of output of .146.[36]

Description of the Data and Methodology…

The DOT work program funds the expansion, improvement and maintenance of the state-operated highway system. The State Highway System is a network of 12,105 centerline miles of highways owned and maintained by the state or state-created authorities. Major elements include the Interstate System, Florida's Turnpike and other toll facilities.[37] The budget funds the addition of new lanes; the repaving of existing lanes; and the repair and maintenance of the highway system and state-controlled road system. The budget also funds the necessary ancillary supports including engineering, land purchases and environmental mitigation.

This analysis groups 14 product categories into the Roads and Highways program area. The included product categories and a description of each can be found below[38]:

- **State Highway System (SHS)**: The scope of work in this program includes the construction, addition or improvement of lands, interchanges, ramps, feeder roads, toll collection facilities and motorist service facilities which are on the State Highway System.
- **Other Roads**: The Other Roads Program involves the construction and improvement of roads which are not on the State Highway System (SHS).
- **Right of Way Land**: The Right of Way Land Program provides for the acquisition of property necessary to support the highway and bridge construction programs.
- **Safety**: This product category addresses SHS safety hazards that are not included in projects funded by other product categories.
- **Bridges**: The Bridge Program funds the repair and replacement of bridges in Florida.

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[31] M. Hansen and Y. Huang, "Road Supply and Traffic in Urban Areas: A Panel Study", *Transportation Research,* Vol.31A: 205-218.

[32] Robert Cervero, "Road Expansion, Urban Growth, and Induced Travel: A Path Analysis", Journal of the American Planning Association, Vol 69, Issue 2: 145-163.

[33] David Aschauer, "Is Public Expenditure Productive?", *Journal of Monetary Economics*, Vol 23, (1989): 177-200.

[34] Alicia Munnel, "How Does Public Infrastructure Affect Regional Economic Performance?", *New England Economic Review,* Sept./Oct. (1990b).

[35] Alicia Munnel, "Comments on 'Is There Too Little Capital? Infrastructure and Economic Growth,' by Charles Hulten and Robert M. Schwab," *American Enterprise Institute Conference on Infrastructure Needs and Policy Options for the 1990s, (*February 1991).

[36] John Tatom, "Public Capital and Private Sector Performance", *Federal Reserve Bank of St. Louis* Review, *(*May/June 1991): 3-15.

[37] The Florida Department of Transportation, "Program and Resource Plan", (April 2015): 1-2.

[38] Description of each product category came from: The Florida Department of Transportation, "Program and Resource Plan", (April 2015).

- **Resurfacing**: This program accomplishes the resurfacing of pavements on the State Highway System.
- **Preliminary Engineering**: This program funds the activities and resources of engineering services required for the development, improvement, and maintenance of the State Highway System.
- **Construction & Engineering Inspection**: This program includes the activities and resources required to monitor, review, inspect, and administer highway and bridge construction projects.
- **Right of Way Support**: This program funds the activities and resources necessary to acquire and manage right of way property for the construction of transportation projects.
- **Environmental Mitigation**: This program consists of the offsetting of impacts from highway improvements on wetlands and surface waters.
- **Materials and Research**: This program funds the investigation, design, and analysis of materials used in the State Highway System
- **Operations and Maintenance**: This program is comprised of activities that support and maintain the transportation infrastructure once it is constructed and operational.
- **Traffic Engineering and Operations**: This program develops and applies solutions to traffic engineering problems that do not require significant structural alterations of existing and planned roadways.
- **Toll Operations**: This program funds the administration of revenue collection activities on toll roads and bridges throughout the state.

The analysis relied on historical fiscal year funding data beginning in FY 2013-14 and ending in FY 2015-16. The latest adopted DOT work program budget was used to forecast funding levels over the next five fiscal years, starting in FY 2016-17 and ending in FY 2020-21. DOT also provided information on historical and projected new lane miles added to the highway system; the number of lanes improved or resurfaced each fiscal year; DOT infrastructure asset data; and local road capital outlay data.

EDR used the Statewide Model to develop an ROI for the Roads and Highways program area. As discussed in the Methodology section, the Statewide Model is a dynamic computable general equilibrium (CGE) model that simulates Florida's economy and government finances. The inputs into the model were:

- An increase in expenditures on investments in government-owned assets.
- A redirection of the state budget away from the general market basket of goods and services provided by government to fund the increase in expenditures on investments in government-owned assets.
- An increase in total output due to highway funding.

The investment increase simulates the direct effect of spending on road infrastructure. The analysis also assumes that the spending on the transportation investment is a redirection away from other goods and services provided by the state government. Therefore, an amount equal to the increased funding for transportation was removed from state expenditures on a market basket of goods. This treatment is consistent with prior EDR return on investment reports.

The increase in total output is an estimate of the relationship between economic output and highway infrastructure. As discussed previously, the literature suggests a positive elasticity of output. Based-on the academic literature, the ROI evaluation used an output elasticity of .15. This can be defined as

follows: for every 1% of new highway infrastructure, total Florida output increases by 0.15%. The chosen elasticity recognizes the lower output elasticities found in more recent analyses.

The elasticity of output is measured in multiple ways, and those results are then aggregated. New highway infrastructure is estimated as lane miles added every year or resurfaced every year. These estimates are compared to the total number of lane miles in the State Highway System to develop an output elasticity. The analysis relied on DOT's infrastructure asset data to determine the output elasticities for the Operations and Maintenance and Bridges portions of the program area. Finally, the Other Roads contribution to output was based-on in-house estimates of local capital data and historical Local Highway Finance Reports that report capital outlay expenditures.

Highway infrastructure can take years to complete, with the benefits to output not materializing until final completion. In this analysis, the output benefits of key product categories (State Highway System, Other Roads, Bridges) were delayed by a couple of years to represent the lag between the program costs and the program benefits. Due to the lag, the benefits of infrastructure spending in the years prior to the analysis (FY 2011-12, FY 2012-13) were included in the analysis.

Analysis and Findings…

Statewide Economic Model Impact of the ROADS & HIGHWAYS PROGRAM (FY2013-FY2015)

	2012-2013	2013-2014	2014-2015	Total
State Payments in the Window $ (M)	3928.6	4603.9	4567.7	**13,100.2**
Total Net State Revenues $ (M)	797.2	810.0	867.2	**2,474.4**
Return-on-Investment by Year	0.20	0.18	0.19	
Return-on-Investment for the 3 year period				**0.19**

		2012-2013	2013-2014	2014-2015	Total		Average per Year
Personal Income	Nominal $ (M)	21,973.0	24,070.0	26,668.0	**72,711.0**		**24,237.0**
Real Disposable Personal Income	Fixed 2010-11 $ (M)	18,565.0	20,431.0	22,644.0	**61,640.0**		**20,546.7**
Real Gross Domestic Product	Fixed 2010-11 $ (M)	17,316.3	18,769.5	20,802.6	**56,888.4**		**18,962.8**
Consumption by Households and Government	Fixed 2010-11 $ (M)	18,037.1	17,926.0	19,425.7	**55,388.8**		**18,462.9**
Real Output	Fixed 2010-11 $ (M)	36,300.1	35,567.1	37,497.8	**109,365.0**		**36,455.0**
		2010 - 11	**2011 - 12**	**2012 - 13**	**Minimum**	**Maximum**	**Average per Year**
Total Employment	Jobs	140,141	101,984	92,523	**92,523**	**140,141**	**111,549**
Population	Persons	0	63,648	120,160	**0**	**120,160**	**61,269**

The ROI for the Roads & Highways program area is projected at 0.19 for the historical analysis covering FY 2013-14 through FY 2015-16. For every dollar spent on the program, the state of Florida received 19 cents back in tax revenue. The Roads & Highways program greatest contribution is to real Disposable Personal Income, and secondarily to real Gross Domestic Product (GDP). The analysis estimated that the Roads & Highways program area increased real Disposable Personal Income by about $20.5 billion every year and increased Florida's real GDP by about $19.0 billion every year. On average, there were over 100,000 additional jobs in the state economy attributable to the spending on the Roads & Highways program area.

Statewide Economic Model Impact of the ROADS & HIGHWAYS PROGRAM (FY2016-FY2020)

	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	Total
State Payments in the Window $ (M)	6343.9	4698.9	4814.3	4261.1	4495.4	**24,613.6**
Total Net State Revenues $ (M)	938.1	1,015.4	1,023.4	892.1	903.6	**4,772.7**
Return-on-Investment by Year	0.1	0.2	0.2	0.2	0.2	
Return-on-Investment for the 5 year period						**0.19**

		2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	Total		Average per Year
Personal Income	Nominal $ (M)	25,770.0	30,276.0	31,160.0	26,326.0	24,648.0	**138,180.0**		**27,636.0**
Real Disposable Personal Income	Fixed 2010-11 $ (M)	21,908.0	25,730.0	26,502.0	22,342.0	20,823.0	**117,305.0**		**23,461.0**
Real Gross Domestic Product	Fixed 2010-11 $ (M)	20,126.4	23,637.6	24,346.8	20,525.1	19,129.7	**107,765.7**		**21,553.1**
Consumption by Households and Government	Fixed 2010-11 $ (M)	17,683.3	20,861.6	21,548.2	18,245.3	17,071.5	**95,409.9**		**19,082.0**
Real Output	Fixed 2010-11 $ (M)	42,065.2	44,774.5	43,419.2	34,396.2	32,335.5	**196,990.6**		**39,398.1**
		2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	Minimum	Maximum	Average per Year
Total Employment	Jobs	147,462	124,738	99,755	64,221	68,605	**64,221**	**147,462**	**100,956**
Population	Persons	0	63,968	129,728	189,568	233,248	**0**	**233,248**	**123,302**

The analysis of the forecasted work program (FY 2016-17 through FY 2020-21) also led to a ROI of 0.19. For every dollar spent on the program, the state of Florida will receive 19 cents back in tax revenue. The Roads & Highways program area contributes $23.5 billion to real disposable income and contributes $21.6 billion to Florida's real GDP in an average year. The Roads & Highways program, on average, will add over 100,000 jobs to the state economy.

A critical assumption buttressing the EDR results relates to the Roads & Highways program area's contribution to Florida's output. As discussed in the Data & Methodology section, the analysis estimated an output elasticity based on academic research and DOT's mileage and capital asset data. For both ROIs, the analysis estimated that, on average, a little less than 1% of all of Florida's output can be attributed to the Roads & Highways program area. This estimate was then spread evenly across all industries in the Statewide Model. To restate the earlier discussion, this output effect is not a direct result of road spending on the economy. Rather, it is a secondary impact that the road and highway system has on the broader economy. The bottom line is that Florida's total output increases due to the positive productivity shock on private capital and labor inputs.

DOT's spending on roads and highways clearly boosts the state's GDP, disposable personal income and employment. Every highway infrastructure project entails contracting the work to private construction companies that hire workers, purchase construction supplies and equipment, and reinvest or distribute any remaining profit. This direct spending then filters across the broader economy through induced and indirect effects. The indirect impact is the spending by the firms that provide supplies to the infrastructure projects. The induced impact is the resulting purchases of goods and services from workers employed at the projects. The secondary impact to total output described above is then overlaid on these results.

The state revenue impact is positive, but muted. The state's largest source of revenue is the state sales tax. Construction materials for public infrastructure projects are exempted from the state sales tax. This means that the revenue benefit primarily occurs through the indirect and induced effects which are not as large as the direct effect.

The ROI is below 1.0 for several reasons. First, the output elasticity benefits all industries in Florida. Some of these industries produce a sizable amount of taxable output; other industries generate a sizeable amount of non-taxable activity. For example, an increase in the output of a manufacturer that produces intermediate goods[39] will not necessarily lead to a large increase in state revenue, since most of the manufacturer's intermediate goods are exempted from the state sales tax. It also true that, in reality, all industries (tax-generating or not) will not equally benefit.

Second, one of the largest reported benefits of highway spending is travel time savings. Travel time savings is the value consumers place on the reduction of travel time between two distinct points. While DOT lists this as a critical factor in evaluating the overall benefits of transportation infrastructure, travel time savings cannot be meaningfully quantified within the parameters of the statutory definition for economic benefit. Various estimates have been developed that attempt to monetize the savings value, but they have so far failed to produce a linkage to real dollars that can be spent in the economy.[40] In a cost-benefit analysis, personal time travel savings would be measured and captured, but since this evaluation is limited to the tangible economic impact of the Roads and Highways program area, it is not included.

Third, there are substantial state costs associated with the construction and operation of the highway system. In total, the 14 budgetary categories cost the state, on average, about $4.3 billion per year in the historical analysis and about $4.9 billion per year in the forecasted analysis. The program returned approximately $1 billion in tax revenue every year to the state. While this is a sizeable contribution to the state's revenues, it is not enough to offset the state's expense.

[39] Intermediate Good are goods used as inputs in the production of final goods. For example, the circuit board on a smartphone is an intermediate good.

[40] In this regard, DOT's 2014 Value of Time Travel of Money report estimates personal travel time value (at the local level) at 50% of the hourly median household income. In 2014, personal time travel savings was estimated at $12.25 per hour.

THE RAILS PROGRAM AREA

Overview of the Rails Program…

The rail industry has contributed to the U.S. economy for over 150 years. As the very first, cheap and efficient land-based transportation model, the introduction and widespread deployment of rail services advanced the U.S economy to another level. Even today, rail is the most efficient land-based commodity transportation tool. The work program funds rail safety inspections, rail corridor acquisition, the development of commuter rail services, maintenance and rehabilitation of rail facilities, and rail-highway grade crossing safety improvements.[41] The table below identifies the relevant funding in the work program beginning in FY 2013-14 and projected out to FY 2020-21.

Work Program Budget- Rails (Millions of $)							
Historical			Work Program July 1, 2016				
13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
$89.66	$109.97	$76.64	$379.14	$192.40	$154.15	$171.86	$116.27

The majority of the work program funding goes toward passenger rail systems in Florida. The SunRail and Tri-Rail commuter rail systems are both included in the work program. SunRail is commuter rail system that serves the greater Orlando area. The Tri-Rail System provides passenger rail service between Palm Beach, Broward, and Miami-Dade counties. The Tri-Rail System recorded approximately 4.4 million passenger trips in 2014 and approximately 4.3 million passenger trips in 2015.[42] Commuter rail primarily serves as an alternative option to auto commuting. Typically, consumers save money by switching from personal auto use to commuter rail. In this regard, a 2014 America Public Transportation Association report estimated that consumers save $845 dollars a year by switching from car to public transportation.[43]

In 2013, freight railroad in Florida moved nearly 88.7 million tons of freight.[44] That is equivalent to around 5.3 million heavy truck loads. As of 2013, Florida had over 3,842 miles of rail lines.[45] About 2,743 of these miles are mainline track which is the principal artery through which trains moved.[46] About 95% of the rail in Florida is privately-owned. [47]Bulk commodity industries in Florida like fertilizer, timber, and agricultural products rely on freight rail to transport the goods out of Florida. Florida also relies on freight rail to import commodities like cars, coal and machinery. Nationally, rail transported 2.1 trillion tons of commodities in 2012.[48] In that same year, the trucking industry transported over 13.2 trillion tons of commodities.[49]

[41] The Florida Department of Transportation, "Program and Resource Plan", (April 2015): 1-29.
[42] South Florida Regional Transportation Authority, "South Florida Regional Transportation Authority Comprehensive Annual Financial Report", 2015:67.
[43] American Public Transportation Association, "Economic Impact of Public Transportation Investment" (2014): 20.
[44] Florida Department of Transportation, "Florida Transportation Trends & Conditions", (2015): 21.
[45] Ibid.
[46] Ibid.
[47] Florida Department of Transportation,"2010 Florida Rail System Plan—Investment Element" (December 2010): 2-4.
[48] Federal Highway Administration, "Freight Facts and Figures 2013" (2013): 3.
[49] Ibid.

Freight rail transportation is a cheaper, more efficient method of transportation than trucking.[50] On average, rail is four times more efficient.[51] A 2014 Congressional Budget Office study estimated that general freight trucking costs 14.85 cents per ton mile compared to an average cost of 5.85 cents per ton mile on freight rail.[52] Any significant redirection of the transportation of goods towards rail would be beneficial to producers, consumers and the overall general economy.

Freight rail has benefits beyond lower transportation costs. Accidents occur both in rail and truck transportation. Rail accidents include collisions at rail crossings, train derailments and fatalities involving people struck by trains. Trucking accidents include multiple-vehicle collisions or the truck overturning. While both rail and truck accidents are costly, trucking accidents occur more frequently.[53] In 2012, the trucking industry was involved in over 317,000 accidents, incidents and crashes. In the same year, the rail industry reported less than 5,000 accidents, incidents, and crashes.[54] A 2014 Congressional Budget Office study estimated that the accident cost per-ton mile was 1.55 cents for trucks and 0.17 cents per-ton mile for rail.[55]

Another benefit to rail is the reduction in road maintenance costs. The trucking industry is responsible for the majority of the damage done to the highway system. A U.S Government Accountability Report estimates that every semi-truck does as much road damage as 9,600 cars.[56] In contrast, rail does very little damage to the public road system as it only interacts with the road system at rail crossings. Further, since over 95% of the rail lines are private in Florida[57], most rail line maintenance is performed by private companies. The 2014 Congressional Budget Office study estimated that the cost per-ton mile on the roadway system was 0.85 cents for trucking and only 0.055 cents for the rail industry.[58]

A switch to rail also reduces total congestion costs. The latest Urban Mobility Scorecard estimated that congestion caused Americans to spend an extra 6.9 billion hours in traffic and to purchase an extra 3.1 billion gallons of fuel.[59] The report also projects congestion to get worse. Miami, Orlando and Tampa are in the top 50 "worst congestion" cities in America.[60] Both passenger rail and freight rail lowers congestion on Florida roads. One of the recommendations by the Urban Mobility Report is to expand rail capacity. A 2014 Congressional Budget Office study estimated that the congestion cost per-ton mile was 0.65 cents for trucks and 0.01 cents for the rail industry.[61]

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[50] David Forkenbrock, "Comparison of External Costs of Rail and Truck Freight Transportation", *Transportation Research*. Part A: Vol 35 (2001): 321-337.
[51] Association of American Railroads, "The Economic Impact of America's Freight Railroads", (June 2016).
[52] Congressional Budget Office, "Social-Cost Pricing in Freight Transportation" *Conference on the Role of Freight Transportation in Economic Competiveness.* (December 11, 2014).
[53] Federal Highway Administration, "Freight Facts and Figures 2013" (2013): 65.
[54] Ibid.
[55] Congressional Budget Office, "Social-Cost Pricing in Freight Transportation" *Conference on the Role of Freight Transportation in Economic Competiveness. (*December 11, 2014): 2.
[56] U.S. Government Accountibility Office, "Excessive Truck Weight: An Expensive Burden We Can No Longer Support", (July 16, 1979): 23.
[57] Florida Department of Transportation,"2010 Florida Rail System Plan—Investment Element" (December 2010): 2-4.
[58] Congressional Budget Office, "Social-Cost Pricing in Freight Transportation" *Conference on the Role of Freight Transportation in Economic Competiveness.* (December 11, 2014): 2
[59] Texas A&M Transportation Institute, "2015 Urban Mobility Scorecard", (August 2015):1.
[60] Ibid.
[61] Congressional Budget Office, "Social-Cost Pricing in Freight Transportation" *Conference on the Role of Freight Transportation in Economic Competiveness. (*December 11, 2014): 2.

Description of the Data and Methodology…

The DOT work program funds the expansion, improvement and maintenance of the rail system. Rail funding can include rail safety inspections, rail corridor acquisition, the development of commuter rail services, maintenance and rehabilitation of rail facilities, and rail-highway grade crossing safety improvements.[62] The majority of the work program funding goes toward passenger rail.

The analysis relied on historical fiscal year funding data beginning in FY 2013-14 and ending in FY 2015-16. The latest work program budget was used to forecast funding levels over the next five fiscal years, starting in FY 2016-17 and ending in FY 2020-21.

EDR used the Statewide Model to develop the ROI for the Rails portion of the work program. As discussed in the Methodology section, the Statewide Model is a dynamic computable general equilibrium (CGE) model that simulates Florida's economy and government finances. The inputs into the model were:

- An increase in investment in local rail agencies.
- A redirection of the state budget away from the general market basket of goods and services provided by government to fund the increase in expenditures on investments in local rail agencies.
- A reduction of consumer purchases in auto-related goods and services and an increase in income.
- A reduction in the production costs of goods through lower transportation costs.
- A reduction in public expenditures on road transportation.
- An increase in overall productivity.

The work program's budget was inputted directly as local expenditures in rail. The analysis assumes that this spending is a redirection away from other goods and services provided by the state government. Therefore, an amount equal to the increased funding was removed from state expenditures on a market basket of goods. This policy is consistent with prior EDR return on investment reports.

The analysis relied on data from the Federal Highway Administration and DOT's Macroeconomic Analysis of Florida Transportation Investments to estimate the amount of tonnage redirected from trucks to rail. The private and public savings that resulted from this redirection came from the 2014 Congressional Budget Office Study.

The consumer input was estimated by EDR based on DOT's work program share of Florida's total passenger rail ridership; the result was used to generate the savings from using passenger rail. Commuter rail data was obtained through DOT's 2014 and 2015 Florida Transit Handbooks and public documents from the regional transit authority agencies. These documents provided commuter rail systems' ridership levels, trip duration and costs. Auto-related data came from the Automobile Association of America and the U.S Bureau of Labor Statistics Consumer Expenditure Survey.

Congestion savings were based on historical Urban Mobility Reports. The Urban Mobility Reports estimated how much public transportation saved urban districts in both auto and truck-related congestion costs. Rail was attributed a share of the congestion savings based-on ridership-levels.

[62] The Florida Department of Transportation, "Program and Resource Plan", (April 2015): 1-29.

Analysis and Findings…

Statewide Economic Model Impact of the RAILS PROGRAM (FY2013-2015)

	2012-2013	2013-2014	2014-2015	Total
State Payments in the Window $ (M)	89.7	110.0	76.6	**276.3**
Total Net State Revenues $ (M)	2.0	3.0	0.0	**5.0**
Return-on-Investment by Year	0.02	0.03	0.00	
Return-on-Investment for the 3 year period				**0.02**

		2012-2013	2013-2014	2014-2015	Total		Average per Year
Personal Income	Nominal $ (M)	92.0	112.0	119.0	**323.0**		**107.7**
Real Disposable Personal Income	Fixed 2010-11 $ (M)	83.0	99.0	106.0	**288.0**		**96.0**
Real Gross Domestic Product	Fixed 2010-11 $ (M)	77.4	90.9	97.4	**265.7**		**88.6**
Consumption by Households and Government	Fixed 2010-11 $ (M)	83.6	97.8	103.4	**284.8**		**94.9**
Real Output	Fixed 2010-11 $ (M)	71.5	85.5	82.7	**239.7**		**79.9**
		2010 - 11	2011 - 12	2012 - 13	Minimum	Maximum	Average per Year
Total Employment	Jobs	357	325	202	**202**	**357**	**295**
Population	Persons	0	96	256	**0**	**256**	**117**

The ROI for the Rails program area is projected at 0.02 for the historical analysis covering FY 2013-14 through FY 2015-16. For every dollar spent on the program, the state of Florida received 2 cents back in tax revenue. The Rails program area increased real Disposable Personal Income by about $96 million every year and increased Florida's real Gross Domestic Product by about $88.6 million every year. On average, there were over 295 additional jobs in the state economy attributable to spending on the Rails program area.

Statewide Economic Model Impact of the RAILS PROGRAM (FY2016-2020)

	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	Total
State Payments in the Window $ (M)	379.1	192.4	154.2	171.9	116.3	**1,013.9**
Total Net State Revenues $ (M)	6.0	6.0	4.0	4.1	5.0	**25.1**
Return-on-Investment by Year	0.02	0.03	0.03	0.02	0.04	
Return-on-Investment for the 5 year period						**0.02**

		2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	Total		Average per Year
Personal Income	Nominal $ (M)	173.0	161.0	166.0	182.0	182.0	**864.0**		**172.8**
Real Disposable Personal Income	Fixed 2010-11 $ (M)	150.0	144.0	149.0	162.0	163.0	**768.0**		**153.6**
Real Gross Domestic Product	Fixed 2010-11 $ (M)	137.8	132.3	136.9	148.8	149.7	**705.5**		**141.1**
Consumption by Households and Government	Fixed 2010-11 $ (M)	120.9	115.4	120.9	132.0	133.8	**622.9**		**124.6**
Real Output	Fixed 2010-11 $ (M)	155.3	117.6	120.4	133.2	131.4	**657.9**		**131.6**
		2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	Minimum	Maximum	Average per Year
Total Employment	Jobs	1,007	413	312	371	302	**302**	**1,007**	**481**
Population	Persons	0	352	512	640	768	**0**	**768**	**454**

The analysis of the forecasted work program (FY 2016-17 through FY 2020-21) also led to a ROI of 0.02 for the Rails program area. For every dollar spent on the program, the state of Florida will receive 2 cents back in tax revenue. The Rails program area contributes $153.6 million to real Disposable Personal Income and $141.1 million to real GDP in an average year. The Rails program area will, on average, add over 480 jobs to the state economy every year.

The majority of the Rails program area funding goes toward passenger rail systems in Florida. Only two passenger projects are funded by FDOT and currently operating (SunRail and Tri-Rail). Together, the two passenger rail systems record less than 5 million passenger trips annually.[63,64] In contrast, the State Highway System recorded over 306 million daily vehicle miles in 2015[65], and Florida's fixed-route bus system recorded over 270 million passenger trips in 2014. The comparatively small amount of trips on passenger rail limited its impact on the state's economy.

Another factor is the nature of the FDOT spending. A lot of the costs are front-loaded in periods before the benefits are realized. One such example is SunRail. SunRail began operations in late 2014, but work program expenditures on the rail system started much earlier. Another example comes from the latest work program's inclusion of expenditures for the development of an 85-mile stretch of commuter rail from Jupiter to Downtown Miami.[66] The date that this passenger rail system will actually begin operations is uncertain. While the expansion of SunRail is expected to be completed by 2018, the expansion's impact on total SunRail passenger ridership is uncertain.

EDR's analysis assumed that a portion of the passenger trips on the rail system resulted from redirected automobile trips. As mentioned previously, there is a cost savings when individuals switch from cars to passenger rail. This savings was inputted into the model as additional income for Florida residents. Along with the additional income, a reduction in automobile-related consumption purchases was included. Together, these inputs benefit Florida's GDP and Personal Income measures. However, the impact is less clear for state revenue collections, because the state collects a significant amount of revenue from automobile-related purchases. In FY 2014-15, Florida collected $3.9 billion in state sales tax from automobile-related purchases.[67] In FY 2015-16, Florida collected $1.3 billion in Highway Fuel Sales Tax and over $1.1 billion in Motor Vehicle Licenses.[68] The positive income change offsets the impact on lower automobile-related purchases, but not completely.

EDR's analysis also measured the impact that the Rails program area has on rail improvement and rehabilitation. The analysis assumed that the expenditures on rail improvement led to an increase in freight rail in Florida, with a corresponding decrease in commercial trucking in Florida. As discussed in the previously, a switch to freight rail lowers business transportation costs, reduces congestion, lowers highway maintenance costs, and reduces accident costs.[69] All these savings were inputted into the

[63] South Florida Regional Transportation Authority, "South Florida Regional Transportation Authority Comprehensive Annual Financial Report", 2015:67

[64] Ruiter, Jason. (2016, April 29). SunRail Marks 2nd Anniversary with Plans for Growth. *Orlando Sentinel,* Retrieved from: http://www.orlandosentinel.com/news/sunrail/os-sunrail-2nd-anniversary-20160428-story.html.

[65] Florida Department of Transportation, "State Highway System Report 1: All Roads", June 3, 2016:1.

[66] See: *http://www.tri-railcoastallinkstudy.com/* for a more detailed description of the proposed passenger rail system.

[67] The Department of Revenue Office of Tax Research, "Validated Sales Tax Receipts Data", March 7, 2016. Retrieved: *http://floridarevenue.com/taxes/pages/colls_from_7_2003.aspx*

[68] Revenue Estimating Conference, "Revenues to State Transportation Trust Fund Revised Forecast", August 16, 2016. Retrieved: *http://edr.state.fl.us/Content/conferences/transportation/Transresults.pdf*

[69] Please see*:* Congressional Budget Office, "Social-Cost Pricing in Freight Transportation" *Conference on the Role of Freight Transportation in Economic Competiveness. (*December 11, 2014).

Statewide Model and led to positive increases in the reported economic measures. However, the economic impacts were minimal given the small amount of the Rails program area budget devoted to freight rail improvements. In the historical ROI run (FY 2013-14 through FY 2015-16), about 25% of the budget was spent on rail improvement and rehabilitation. In forecasted ROI run (FY 2016-17 through FY 2020-21), less than 4% of the budget will be spent on rail improvement and rehabilitation. Since the overwhelming majority of the rail system is privately-owned, how many public dollars will be spent on rail improvement that otherwise would not have occurred is unknown.[70] There is an economic benefit associated with rail improvement, but DOT spending may be simply subsidizing or displacing private capital spending that would have taken place in the absence of the public funding.

Both of the Rails program area's final ROIs were low. The income and economic benefits from passenger rail and rail improvement were not enough to offset the cost of the program. However, the ROIs were not negative, indicating that Florida does benefit due to its spending on the Rails program area. In this case, the economic measures for GDP and Personal Income might be better indicators of program value than the state's ROI.

[70] Florida Department of Transportation, "Florida Transportation Trends & Conditions", (2015): 21.

THE PUBLIC TRANSIT PROGRAM AREA

In this paper, Public Transit is defined as a fixed-route bus operating system. In Florida, 29 public transit systems operate in urban areas across the state.[71] One of these systems, the Tri-Rail, can be counted both as a passenger rail and a fixed-route bus operating system since it runs buses to and from the rail system. For the purpose of this section, it is excluded from the following discussion. Generally, the work program assists in the expansion, renovation and improvement of the transit systems in Florida. The table below identifies the relevant funding in the work program for this area, starting in FY 2013-14 and projected out to FY 2020-21.

Work Program Budget- Public Transit (Millions of $)							
Historical			Work Program July 1, 2016				
13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
$205.02	$214.44	$271.51	$407.96	$274.03	$253.22	$267.83	$262.25

The table below lists the top 8 transit agencies in Florida, and their total number of passenger trips in both 2013 and 2014. The largest is Miami-Dade County Transit Authority, which operates 1,032 vehicles. Smaller transit systems exist in less dense populations.[72] For example, the Hernando County Transit System runs only 4 routes with limited hours and no services available on the weekend.[73]

Total Passenger Trips, 2013 and 2014			
Transit Authority	Location	Total 2013 Passenger Trips	Total 2014 Passenger Trips
Miami-Dade Transit	Miami-Dade	110,289,327	109,674,441
Broward County Transit	Broward	40,850,926	40,825,445
LYNX	Orlando	29,082,988	29,367,232
Hillsborough Area Regional Transit	Hillsborough	15,028,441	15,334,839
Pinellas Suncoast Transit Authority	Pinellas	14,150,506	14,184,320
Jacksonville Transportation Authority	Duval	12,299,409	12,225,824
Palm Beach County Transportation Agency	Palm Beach	12,018,198	11,426,791
Gainesville Regional Transit System	Alachua	10,832,674	10,814,433

All of the major transit systems in Florida operate at a loss and are subsidized by county, state and federal agencies. An analysis of 28 Florida transit agencies revealed that operating revenue (passenger fares) covered only 28% of the total operating expense of the transit systems. This is not unique to Florida. The National Transit Summary & Trends produced by the U.S Office of Budget and Policy estimates that only 32% of transit operations are covered by fares.[74] In this analysis, local government covers about 30% of public transit operating expenses; state government about 26%; and, the Federal government about 8%.[75]

[71] This analysis only addresses 28 fixed-route bus routes. In other analyses, both the SunRail Passenger Rail System and the Tri-Rail System (which includes bus routes) are included in a total reported transit system count of 30. These passenger rail systems are analyzed in the Rails Program Area Section.
[72] Florida Department of Transportation, "2015 Florida Transit Handbook", (2015): 8.
[73] Ibid
[74] National Transit Database: Office of Budget and Policy, "National Transit Summary & Trends", (February 2015): 14.
[75] Ibid.

Public transit is heavily subsidized by government because it offers so many social and economic benefits. The first benefit is that it provides a transportation alternative to travel by automobile. Car ownership is expensive. The 2011 Consumer Expenditure Survey estimates that the average American household spends over $8,000 on automobile transportation every year.[76] Many low-income households are unable to afford reliable vehicular transportation. This impacts their ability to go to school, to work and to appointments.

Empirical evidence suggests that a relationship exists between public transit availability and worker productivity and employment. A 2014 study found a similar relationship between limited transit access and higher unemployment rates in New York City.[77] The study recommended the expansion of rapid bus transit in the city.[78] An earlier study found a relationship between transit accessibility and labor rate participation in two U.S. cities.[79] A 2015 study on intergenerational mobility found that areas with significantly lower commuting times to work (through better transit options) have higher levels of upward economic mobility.[80]

This problem has become especially acute over the past 40 years as job opportunities have shifted away from urban areas to the suburban ring surrounding the urban core. This problem is referred to as spatial mismatch, and it especially impacts low-income families who continue to live in urban core.[81] These households now experience much longer and expensive commutes and incur higher search costs to find jobs. Viable public transit is one way of lessening the impact of spatial mismatch.

Even if the employment impact of public transit is disregarded, consumers save money by switching from automobiles to public transit. The average automobile trip is around 5 miles.[82] Given the American Automobile Association average cost per mile of 59 cents in 2015, the average car ride costs the rider around $3.00. The average five-mile taxi cab fare in Florida is about $16.00.[83] The average fare paid in Florida for bus transit was about $1.00 in 2015.[84] Public transit is clearly the cheapest option, and what amounts to small differences per trip can cumulatively turn into substantial consumer savings given that over 270 million trips occur on public transit in Florida every year.[85]

The second benefit of public transit is the reduction of congestion in urban areas. This benefits everyone, including non-users of public transit such as automobile drivers and the trucking industry. The 2015 Urban Mobility Report estimated that drivers spend approximately 6.9 billion hours in traffic and wasted 3.1 billion gallons of fuel.[86] The cost is shared between personal automobile users (83%) and the

[76] U.S. Bureau of Labor Statistics, "Table 8. Region of Residence: Average Annual Expenditures and Characteristics", (September 2012).
[77] Kaufman, Moss, Hernandez and Tyndall, "Mobility, Economic Opportunity and New York City Neighborhoods", (November 2015).
[78] *Ibid.*
[79] Thomas Sanchez, "The Connection Between Public Transit and Employment", *Prepared for Presentation at the Association of Collegiate Schools of Planning Annual Conference*. (November 1998).
[80] Chetty, Hendren, Kline and Saez, "Where is the Land of Opportunity? The Geography of Intergenerational Mobility in the United States" (June 2014).
[81] John Kain. "The Spatial Mismatch Hypothesis: Three Decades Later", *Housing Policy Debate,* Vol 3, Issue 2. (1992): 371:392.
[82] American Public Transportation Association, "Economic Impact of Public Transportation Investment" (2014): 20.
[83] U.S.A Today, "Cities with the highest, lowest taxi cab fares" , Retrieved: http://www.usatoday.com/story/travel/2013/04/29/taxi-fares-us-cities/2121967/
[84] Florida Department of Transportation, "2015 Florida Transit Handbook", (2015): 8.
[85] Ibid.
[86] Texas A&M Transportation Institute, "2015 Urban Mobility Scorecard", (August 2015):1.

trucking industry (17%).[87] Public transit is one option for relieving congestion. An earlier Urban Mobility report estimated that public transit saved $331 million in congestion costs across 5 Florida metropolitan areas in 2012.[88]

Description of the Data and Methodology…

The DOT work program funds the expansion, improvement and operating costs of public transit in Florida. It does this through the provision of grants to local transit agencies to purchase equipment, subsidize passenger fares, and increase passenger capacity. The work program also funds the Florida Commission for the Transportation Disadvantaged. The Commission's mission is to ensure the availability of cost-efficient, cost-effective, and quality transportation services for the disadvantaged in Florida. Among other services, they provide transportation to the disadvantaged who need access to medical care, the grocery store or work.

EDR's analysis relied on historical fiscal year funding data beginning in FY 2013-14 and ending in FY 2015-16. The latest work program budget was used to forecast funding levels over the next five fiscal years, starting in FY 2016-17 and ending in FY 2020-21.

EDR used the Statewide Model to develop an ROI for the Public Transit program area. As discussed in the Methodology section, the Statewide Model is a dynamic computable general equilibrium (CGE) model that simulates Florida's economy and government finances. The inputs into the model were:

- An increase in local expenditures on public transportation.
- A redirection of the state budget away from the general market basket of goods and services provided by government to fund the increase in expenditures on public transportation.
- A reduction of consumer purchases in auto-related goods and services, with a commensurate increase in personal income.
- A reduction in the production costs of goods through lower transportation costs.
- An increase in overall productivity.

The work program's budget was inputted directly as local expenditures on public transit. The analysis assumes that the spending is a redirection away from other goods and services provided by the state government. Therefore, an amount equal to the funding was removed from state expenditures on a market basket of goods. This policy is consistent with prior EDR return on investment reports.

The consumer input was estimated by EDR based on DOT's work program share of Florida's total transit passengers. The analysis relied on DOT's 2014 and 2015 Public Transit Handbooks to generate the work program's share. The handbooks provided information by transit system for the total number of passengers, average fare per trip, and total operating expenses and revenues. Automobile costs came from both the Automobile Association of America and the American Public Transportation Association's 2014 Economic Impact of Public Transportation Investment Report.

Congestion savings were based on historical Urban Mobility Reports. These reports provide an estimate of the public transportation-related savings for Florida's metropolitan districts coming from congestion reductions for personal automobiles and trucks. Transit was attributed a share of the savings based-on ridership-levels.

[87] Ibid.
[88] Texas A&M Transportation Institute, "2012 Urban Mobility Scorecard", (December 2012): 50-54.

Analysis and Findings…

Statewide Economic Model Impact of the PUBLIC TRANSIT PROGRAM (FY2013-FY2015)

	2012-2013	2013-2014	2014-2015	Total
State Payments in the Window $ (M)	205.0	214.4	271.5	**690.9**
Total Net State Revenues $ (M)	8.9	8.0	11.9	**28.8**
Return-on-Investment by Year	0.04	0.04	0.04	
Return-on-Investment for the 3 year period				**0.04**

		2012-2013	2013-2014	2014-2015	Total		Average per Year
Personal Income	Nominal $ (M)	403.0	468.0	612.0	**1,483.0**		**494.3**
Real Disposable Personal Income	Fixed 2010-11 $ (M)	364.0	423.0	552.0	**1,339.0**		**446.3**
Real Gross Domestic Product	Fixed 2010-11 $ (M)	339.5	388.6	507.1	**1,235.2**		**411.7**
Consumption by Households and Government	Fixed 2010-11 $ (M)	368.1	410.7	537.1	**1,315.9**		**438.6**
Real Output	Fixed 2010-11 $ (M)	314.0	340.0	442.1	**1,096.0**		**365.3**
		2010 - 11	**2011 - 12**	**2012 - 13**	**Minimum**	**Maximum**	**Average per Year**
Total Employment	Jobs	1,441	1,145	1,335	**1,145**	**1,441**	**1,307**
Population	Persons	0	356	708	**0**	**708**	**355**

The ROI for the Public Transit program area is projected at 0.04 for the historical analysis covering FY 2013-14 through FY 2015-16. For every dollar spent on the program, the state of Florida received 4 cents back in tax revenue. The Public Transit program area increased real Disposable Personal Income by about $446.3 million every year and increased real Gross Domestic Product by about $411.7 million every year. On average, there were over 1,300 additional jobs in the state economy attributable to spending on the Public Transit program area.

Statewide Economic Model Impact of the PUBLIC TRANSIT PROGRAM (FY2016-FY2020)

	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	Total
State Payments in the Window $ (M)	408.0	274.0	253.2	267.8	262.3	**1,465.3**
Total Net State Revenues $ (M)	20.0	16.0	13.0	15.1	14.2	**78.3**
Return-on-Investment by Year	0.05	0.06	0.05	0.06	0.05	
Return-on-Investment for the 5 year period						**0.05**

		2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	Total		Average per Year
Personal Income	Nominal $ (M)	862.0	686.0	692.0	766.0	792.0	**3,798.0**		**759.6**
Real Disposable Personal Income	Fixed 2010-11 $ (M)	777.0	619.0	624.0	690.0	714.0	**3,424.0**		**684.8**
Real Gross Domestic Product	Fixed 2010-11 $ (M)	713.8	568.7	573.3	633.9	655.9	**3,145.6**		**629.1**
Consumption by Households and Government	Fixed 2010-11 $ (M)	625.7	500.2	507.6	562.0	584.2	**2,779.6**		**555.9**
Real Output	Fixed 2010-11 $ (M)	702.0	508.1	510.0	569.7	596.3	**2,886.1**		**577.2**
		2016-2017	**2017-2018**	**2018-2019**	**2019-2020**	**2020-2021**	**Minimum**	**Maximum**	**Average per Year**
Total Employment	Jobs	3,082	1,384	1,098	1,225	1,134	**1,098**	**3,082**	**1,585**
Population	Persons	0	800	1,216	1,536	1,888	**0**	**1,888**	**1,088**

The analysis of the forecasted work program (FY 2016-17 through FY 2020-21) led to an ROI of 0.05 for the Public Transit program area. For every dollar spent on the program, the state of Florida will receive 5 cents back in tax revenue. The Public Transit program area contributes $684.8 million to real Disposable Personal Income and $629.1 million to real Gross Domestic Product in an average year. The Public Transit program area will, on average, add nearly 1,600 jobs to the state economy every year.

The major benefit of the funding for the Public Transit program area is cost savings for consumers and businesses. The costs savings occur in multiple ways. The largest cost savings is to individuals who switch from the use of cars or taxis to public transit. A smaller benefit is related to the reduction in congestion costs. Lower congestion reduces personal automobile operating costs and lowers business transportation costs. These cost savings translate into gains in personal income and business profit. The large positive increments of real GDP and real Disposable Personal Income that are attributed to the Public Transit program area reflect these benefits.

However, the benefits of public transit do not translate into strong revenue gains for the state. The income gains are related to fewer purchases of automobile-related goods and services. Florida receives a considerable amount of revenue from the taxation of automobile-related goods and services. In FY 2014-15, Florida collected $3.9 billion in state sales tax from automobile-related purchases.[89] In FY 2015-16, Florida collected $1.3 billion in Highway Fuel Sales Tax and over $1.1 billion in Motor Vehicle Licenses.[90]

The reduction in automobile-related purchases decreases state revenue collection. The income gains increase state revenue collections through additional spending on goods and services. Since the spending related to income gains is spread across the range of all goods and services, it requires more overall spending to fully offset the revenue loss from automobile-related businesses. This situation occurs because some of the goods and services are non-taxable or taxed at different rates.[91] In EDR's analysis, the income benefits increased spending just high enough to make net revenue positive for the state.

Another leakage develops when some of the income gains are saved rather than redirected towards the consumption of other goods or services. Savings effectively defers consumption until a much later date. This means that some of the income gains might not be spent until the individual retires, perhaps 20 or 30 years later. This is still beneficial to Florida, but in the very long-run. EDR's analysis looks at a three-year historical period and a forecasted five-year period. Neither of these periods capture very long-run impacts.

The analysis also attempted to model the productivity benefits of public transit. As discussed in the introduction to this section, public transit benefits labor productivity by expanding an individual's access to a larger job market. This also benefits employers who now have access to a larger pool of qualified labor. The economy benefits as better employment matching leads to higher levels of productivity growth. The analysis assumed that in the absence of public transit, employers would have paid a "wage

[89] The Department of Revenue Office of Tax Research, "Validated Sales Tax Receipts Data", March 7, 2016. Retrieved: http://floridarevenue.com/taxes/pages/colls_from_7_2003.aspx

[90] Revenue Estimating Conference, "Revenues to State Transportation Trust Fund Revised Forecast", August 16, 2016. Retrieved: http://edr.state.fl.us/Content/conferences/transportation/Transresults.pdf

[91] For example, an individual redirects his spending away from gasoline to food items. The food items are exempt from state sales tax, and the state loses revenue because gasoline was taxable.

premium" to attract the same employees.[92] In this analysis, the "wage premium" is equal to the cost differential between using a car and public transit, for certain employment-specific uses. In the model, this cost was added to the total labor bill of Florida industries. The weight of the added cost lowered overall production and negatively impacted GDP and revenue collection.

Overall, the results were mixed. Both analyses estimated large returns to real GDP and real Personal Income. However, the ROIs were only 0.04 and 0.05. The low ROI was primarily attributable to transit's role in decreasing automobile use and the nature of Florida's tax system. The Florida tax system relies heavily on consumption-based taxes. Since, the primary impact of transit is a reduction away from automobile consumption, the revenue impact is muted.

[92] American Public Transportation Association, "Economic Impact of Public Transportation Investment" (2014): 20.

THE SEAPORTS PROGRAM AREA

The Seaports program area assists in the expansion, renovation and improvement of the seaport system in Florida. The table below identifies the relevant funding in the work program starting in FY 2013-14 and projected out to FY 2020-21.

Work Program Budget- Seaports (Millions of $)							
Historical			Work Program July 1, 2016				
13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
$259.90	$112.21	$94.18	$141.25	$111.19	$109.51	$131.75	$108.86

Seaports are a major component of Florida's transportation sector. As the most efficient and cheapest form of international transportation, businesses that import or export to global destinations depend heavily on their existence. As international trade has increased substantially over the past few decades, so have the need for seaports. About 90% of all international trade occurs through the world's seaports. Florida's geographic proximity to Latin America and its 1,350 miles of coastline has allowed it to take advantage of all forms of waterborne trade. Currently, Florida has 15 public seaports. In 2015, four of its seaports (Miami, Palm Beach, Everglades, and Jacksonville) experienced some of the fastest growth in the United States for cargo exports.[93]

In 2015, Florida seaports handled over 103 million tons of goods.[94] Ten of Florida's seaports can handle cargo ships. The largest port in terms of tonnage is the Tampa Bay Port. In 2015, the Tampa Port handled over 37 million tons of goods.[95] Nationally, the Tampa Bay Port is the 17th busiest port in the United States.[96] The table below summarizes total tonnage by Florida seaport.

Imports, Exports and Domestic Shipments of Waterborne Tonnage				
Port	Imports	Exports	Domestic	Total
Port of Tampa Bay	8,143,620	5,934,608	23,296,064	37,374,291
Port Everglades	9,417,910	3,563,468	11,020,285	24,001,663
JAXPORT	7,393,365	2,659,230	7,652,142	17,704,737
PortMiami	4,567,926	4,045,813	0	8,613,739
Port Manatee	6,358,960	158,772	0	6,517,732
Port Canaveral	3,128,965	83,830	938,931	4,151,726
Port of Palm Beach	380,739	1,168,550	544,780	2,094,069
Port Panama City	975,532	1,036,552	20,342	2,032,426
Port of Fernandina	22,348	281,633	0	303,981
Port of Pensacola	68,923	56,622	92,150	217,695

[93] The Florida Department of Transportation, "The 2015 Florida Seaport System Plan", (July 2016): 1-5.
[94] The Florida Department of Transportation, "The 2015 Florida Seaport System Plan", (July 2016): 3-2.
[95] Ibid.
[96] United States Department of Transportation, "Table 1-57: Tonnage of Top 50 Water Ports, Ranked by Total Tons (a)", (July 2016).

Besides handling cargo, seven Florida seaports support the cruise industry. In 2015, 22 cruise lines docked 74 ships at one of the seven ports.[97] The cruise industry operate both one-day and multi-day trips out of Florida. The primary market for multi-day trips was the Caribbean. In 2015, the Florida cruise industry recorded over 15 million cruise passengers.[98] This number is up by over 17% since 2010. The majority of Florida cruise passengers were out-of-state visitors. The table below summarizes total passengers by Florida seaport.

Total Cruise Passengers at Florida Seaports						
Port	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
PortMiami	4,145,043	4,018,161	3,774,452	4,078,529	4,939,062	4,915,576
Port Canaveral	2,802,951	3,144,668	4,004,283	3,986,994	4,193,005	4,168,666
Port Everglades	3,674,226	3,932,843	3,757,320	3,600,636	4,001,354	3,773,386
Port Tampa Bay	802,775	875,611	974259	854,260	888,343	867,114
Port of Key West	953,462	1,007,494	906068	832,887	800,752	804,624
JAXPORT	347,136	377,452	390,852	371,263	363,994	366,021
Port of Key West	284,884	303,000	341,004	345,827	364,829	350,932
Total	13,010,477	13,659,229	14,148,238	14,070,396	15,551,339	15,246,319

Many jobs in Florida are tied to Florida seaports. Direct seaport employment includes pilots, customhouse brokers, vessel agents, stevedores and terminal operators. However, the seaports also benefit related industries. For example, the rail and trucking industries share in seaport-induced business as they are called on to pick up or off-load cargo from the seaports. In addition, tourist-related industries benefit from the cruise ship traffic, since the cruise ships attract additional visitors to the state. Most out-of-state visitors spend a few additional days in Florida, visiting other attractions before or after the multi-day cruise. This visitor spending benefits local hotels, restaurants, shopping malls and attractions.

Description of the Data and Methodology…

The DOT work program funds the expansion and improvement of seaports in Florida. The Seaports program area funds projects such as security infrastructure, land acquisition, dredging, construction of storage facilities and terminals, and acquisition of equipment to move cargo and passengers.[99]

EDR's analysis relied on historical fiscal year funding data beginning in FY 2013-14 and ending in FY 2015-16. The latest work program budget was used to forecast funding levels over the next five fiscal years, starting in FY 2016-17 and ending in FY 2020-21.

EDR used the Statewide Model to develop an ROI for the Aviation portion of the work program. As discussed in the Methodology section, the Statewide Model is a dynamic computable general equilibrium (CGE) model that simulates Florida's economy and government finances. The inputs into the model were:

[97] The Florida Department of Transportation, "The 2015 Florida Seaport System Plan", (July 2016): 3-12.
[98] The Florida Department of Transportation, "The 2015 Florida Seaport System Plan", (July 2016): 3-11.
[99] The Florida Department of Transportation, "Program and Resource Plan", (April 2015): 1-38.

- An increase in local agency expenditures on the seaports.
- A redirection of the state budget away from the general market basket of goods and services provided by government to fund the increase in expenditures on seaports.
- New spending attributable to visitors tied to the cruise industry.
- An increase in output based on job and payroll estimates at the seaports.

The work program's budget was inputted directly as local expenditures at the seaports. The analysis assumes that the spending is a redirection away from other goods and services provided by the state government. Therefore, an amount equal to the increased funding was removed from state expenditures on a market basket of goods. This policy is consistent with prior EDR return on investment reports.

Visitor expenditure data was estimated based on the Seaports program share of total visitors in Florida. Seaports' visitor share was based on passenger cruise ship embarkment data. The analysis assumes that the cruise was the primary reason for the tourists' visit to Florida; therefore, the analysis attributed all of the in-state spending by these visitors to the seaports.

Total seaport output was estimated by EDR based on employment and wage data obtained through the Florida Seaport Transportation and Economic Development Council's "2012 Statewide Economic Impact of Florida Seaports" and the Council's 2016 report: "The Statewide Economic Impacts of Florida Seaports". RIMS II multiplier data was used to estimate output. The analysis included output associated with maritime services at the seaports. This includes cargo terminal operations, piloting and towing, freight forwarders and warehousing at the ports, and barge operations. Rail and trucking output dependent on the transport of goods to and from the ports was also included.

Analysis and Findings…

Statewide Economic Model Impact of the SEAPORTS PROGRAM (FY2013-2015)

	2012-2013	2013-2014	2014-2015	Total
State Payments in the Window $ (M)	259.9	112.2	94.2	**466.3**
Total Net State Revenues $ (M)	367.2	264.7	188.2	**820.1**
Return-on-Investment by Year	1.4	2.4	2.0	
Return-on-Investment for the 3 year period				**1.76**

		2012-2013	2013-2014	2014-2015	Total		Average per Year
Personal Income	Nominal $ (M)	9,827.0	8,190.0	6,387.0	**24,404.0**		**8,134.7**
Real Disposable Personal Income	Fixed 2010-11 $ (M)	8,283.0	6,983.0	5,495.0	**20,761.0**		**6,920.3**
Real Gross Domestic Product	Fixed 2010-11 $ (M)	7,725.9	6,415.1	5,048.1	**19,189.2**		**6,396.4**
Consumption by Households and Government	Fixed 2010-11 $ (M)	9,374.9	7,153.8	5,280.5	**21,809.2**		**7,269.7**
Real Output	Fixed 2010-11 $ (M)	15,127.6	10,627.9	7,262.1	**33,017.6**		**11,005.9**
		2010 - 11	**2011 - 12**	**2012 - 13**	**Minimum**	**Maximum**	**Average per Year**
Total Employment	Jobs	94,184	47,664	22,331	**22,331**	**94,184**	**54,726**
Population	Persons	0	26,592	41,792	**0**	**41,792**	**22,795**

The ROI for the Seaports program area was 1.76 for the historical analysis covering FY 2013-14 through FY 2015-2016. For every dollar spent on the program, the state of Florida received 1 dollar and 76 cents back in tax revenue. The Seaport program area increased real Disposable Personal Income by about $6.92 billion every year and increased real Gross Domestic Product by about $6.4 billion every year. On average, there were nearly 55,000 additional jobs in the state economy attributable to spending on the Seaports program area.

Statewide Economic Model Impact of the SEAPORTS PROGRAM (FY2016-2020)

	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	Total
State Payments in the Window $ (M)	141.3	111.2	109.5	131.8	108.9	**602.7**
Total Net State Revenues $ (M)	318.5	297.6	286.8	378.3	349.4	**1,630.6**
Return-on-Investment by Year	2.3	2.7	2.6	2.9	3.2	
Return-on-Investment for the 5 year period						**2.71**

		2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	Total		Average per Year
Personal Income	Nominal $ (M)	8,687.0	8,958.0	8,903.0	11,314.0	10,531.0	**48,393.0**		**9,678.6**
Real Disposable Personal Income	Fixed 2010-11 $ (M)	7,339.0	7,632.0	7,629.0	9,681.0	9,044.0	**41,325.0**		**8,265.0**
Real Gross Domestic Product	Fixed 2010-11 $ (M)	6,742.2	7,011.4	7,008.6	8,893.7	8,308.5	**37,964.4**		**7,592.9**
Consumption by Households and Government	Fixed 2010-11 $ (M)	5,920.0	6,183.9	6,197.8	7,899.5	7,406.7	**33,607.8**		**6,721.6**
Real Output	Fixed 2010-11 $ (M)	13,195.3	12,028.4	11,119.6	14,408.6	12,649.9	**63,401.8**		**12,680.4**
		2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	Minimum	Maximum	Average per Year
Total Employment	Jobs	73,198	51,842	39,998	54,585	41,996	**39,998**	**73,198**	**52,324**
Population	Persons	0	20,512	36,704	49,696	65,952	**0**	**65,952**	**34,573**

The analysis of the forecasted work program (FY 2016-17 through FY 2020-21) led to a ROI of 2.71 for the Seaports program area. For every dollar spent on the program, the state of Florida received 2 dollars and 71 cents back in tax revenue. The Seaport program area contributes $8.27 billion to real Disposable Personal Income and $7.59 billion to real Gross Domestic Product in an average year. The Seaport program area will, on average, add over 52,000 jobs to the state economy every year.

The Seaport program area's ROI was driven, in large measure, by tourist spending. Passenger cruise ships operate out of seven Florida seaports. In 2015, the cruise line industry recorded over 15 million passengers.[100] EDR's analysis attributed a share of these passengers to the historical ROI analysis and attributed an estimate of future cruise passengers to the forecasted ROI analysis. A large percentage of these passengers are out-of-state visitors who will spend a few additional days in Florida visiting attractions, staying at lodging, eating meals and purchasing goods and services at retail stores. A large majority of these purchases are taxable, and the fact that both ROIs are above 1.0 reflects the taxable spending impact.

Florida seaports' handled over 103 million tons of goods last year.[101] A significant amount of economic activity is generated to handle the freight. This activity includes navigation of the cargo ships, handling and storing the freight, and transportation of the goods to and from the seaport. This analysis attributed a share of this output to the Seaport program area. This treatment also contributed to ROIs above 1.0.

[100] The Florida Department of Transportation, "The 2015 Florida Seaport System Plan", (July 2016): 3-11.
[101] The Florida Department of Transportation, "The 2015 Florida Seaport System Plan", (July 2016): 3-2.

Overall, the ROI for the Seaport program area was very strong. Both the historical and forecasted ROIs were above 1.0, indicating that the state more than recouped its investment in Florida seaports. Also, the sizable amount of associated economic activity benefitted Florida through higher employment, higher Gross Domestic Product, and higher Personal Income.

THE AVIATION PROGRAM AREA

Aviation provides a necessary and very important contribution to Florida's economy. Aviation facilitates the travel of goods and people to and from Florida. It allows Floridians to travel across the globe for both personal and professional reasons. Funds provided to the Aviation program area assist in the expansion, renovation and improvement of Florida's public airports. The table below lists the relevant part of the work program funding for this area, starting in FY 2013-14 and projected out to FY 2020-21.

Work Program Budget- Aviation (Millions of $)							
Historical			Work Program July 1, 2016				
13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21
$178.28	$320.94	$347.41	$262.23	$225.33	$213.61	$210.27	$256.15

Florida has over 129 public-use airports. Of this number, 19 are commercial service airports. Commercial service airports are publicly-owned airports that have at least 2,500 passenger boardings each calendar year and provide scheduled passenger service.[102] The remaining airports are classified as general aviation airports. The table below provides information on the top 8 busiest commercial airports in Florida. Collectively, Florida's commercial airports serviced over 71 million passengers in 2013.[103]

2013 Aviation Total Enplanements, Domestic and International			
Airport Name	Domestic Enplanements	International Enplanements	Total Enplanements
Miami International	10,029,011	9,596,802	19,625,813
Orlando International	15,404,416	1,950,588	17,355,004
Ft. Lauderdale International	9,949,181	1,805,599	11,754,780
Tampa International	8,214,410	263,556	8,477,966
Palm Beach International	2,797,236	51,196	2,848,432
Southwest Florida	3,754,984	116,134	3,871,118
Palm Beach International	2,797,236	51,196	2,848,432
Jacksonville International	2,399,206	165,375	2,564,581

The remaining 110 airports are classified as general aviation airports. General aviation airports are defined as public-use airports that do not have scheduled service or have less than 2,500 annual passenger boardings.[104] General aviation airports benefit the local area by providing aeronautical functions that are either not economically viable at the nearest commercial service airport or distance-prohibitive. This can include aeromedical flights, aerial firefighting, law enforcement helicopters, agricultural functions (like aerial application of fertilizers and pesticides) and corporate flights or self-

[102] U.S. Department of Transportation: Federal Aviation Administration, "Report to Congress: National Plan of Integrated Airport Systems 2017-2021", (2016): 3.
[103] The Florida Department of Transportation, "FDOT Aviation Economic Impact Study Update", (August 2014): 5-4.
[104] U.S. Department of Transportation: Federal Aviation Administration, "Report to Congress: National Plan of Integrated Airport Systems 2017-2021", (2016): 3.

piloted business flights.[105] The Federal Aviation Administration estimated that over $12 billion is spent regularly at general aviation airports in the United States.[106]

In 2015, Florida hosted 106.6 million visitors, and approximately 50% of them arrived through one of Florida' commercial service airports.[107] Florida airports are especially crucial to attracting international visitors as air travel may be the only viable transportation mode for these leisure and business travelers. The FDOT Aviation Economic Study estimated that the commercial-use airports brought in over 7.26 million international visitors in 2013, with the majority arriving at either Miami International Airport or Orlando International Airport.[108]

The public-use airport system generates a significant amount of output and employs a large amount of people on airport grounds. The 2014 DOT economic impact study estimated that 170,000 jobs occur on-airport grounds in Florida. Additionally, some Florida industries are dependent on the Florida aviation system. These include air cargo operators that transport large amount of goods to and from Florida on a daily basis. The 2014 study estimated that over 52,000 jobs are linked to the air cargo industry in Florida.

A closely linked economic impact involves aviation-related businesses in Florida. This can include aircraft maintenance, aircraft repair and aircraft production. The civilian aircrafts and parts industry was one of Florida's largest export business sectors in 2014 and 2015. The aircrafts and parts industry exported $4.8 billion in 2014 and $4.7 billion in 2015.[109] This represents about 8% of all commodities exported from Florida.[110] The 2014 economic impact study estimated aviation-related employment at over 76,000 in Florida.

Description of the Data and Methodology…

The DOT work program funds the expansion and improvement of aviation in Florida. Funding for the Aviation program area assists affected local governments in planning, designing, constructing, and maintaining airport facilities. Qualified projects include safety, security, planning, capacity enhancement, land acquisition, facility preservation, and economic development projects.[111]

EDR's analysis relied on historical fiscal year funding data beginning in FY 2013-14 and ending in FY 2015-16. The latest work program budget was used to forecast funding levels over the next five fiscal years, starting in FY 2016-17 and ending in FY 2020-21.

EDR used the Statewide Model to develop an ROI for the Aviation program area. As discussed in the Methodology section, the Statewide Model is a dynamic computable general equilibrium (CGE) model that simulates Florida's economy and government finances. The inputs into the model were:

- An increase in local agency expenditures on the airports.
- A redirection of the state budget away from the general market basket of goods and services provided by government to fund the increase in expenditures on airports.
- The addition of expenditures attributable to visitors.

[105] U.S. Department of Transportation Federal Aviation Administration, "General Aviation Airports: A National Asset", (May 2012): 2.
[106] Ibid.
[107] For a brief overview of Florida visitors see: http://www.visitflorida.org/resources/research/research-faq/
[108] The Florida Department of Transportation, "FDOT Aviation Economic Impact Study Update", (August 2014): 5-4.
[109] United States Census Bureau, "Total U.S. Exports (Origin of Movement) from Florida."
[110] Ibid.
[111] The Florida Department of Transportation, "Program and Resource Plan", (April 2015): 1-16.

- An increase in output based on job and payroll estimates.

The work program's budget was inputted directly as local expenditures at the airports. The analysis assumes that the spending is a redirection away from other goods and services provided by the state government. Therefore, an amount equal to the funding was removed from state expenditures on a market basket of goods. This policy is consistent with prior EDR return on investment reports.

Visitor expenditure data was estimated based on aviation's share of Florida tourism activity. Prior return on investment reports have assigned tourism activity to Visit Florida, the private market, and beach renourishment. In this report, an additional share of tourism activity was assigned to the Seaports program area. A portion of the remaining tourism activity was assigned to the Aviation program area. Visitor counts and spending were obtained through Visit Florida reports.

Total aviation output was estimated by using employment and wage data obtained through DOT's 2014 Florida Aviation Economic Impact Study Update and RIMS II Multiplier data. The analysis included output associated with on-airport activities, air cargo activity, and aviation-related businesses. On-airport activities include airport management, airlines and fixed-based operators (fueling services and aircraft maintenance). Air Cargo businesses engage in providing air transportation of cargo without transporting passengers. This component also includes business activity related to sorting, storing and transporting the air cargo. Aviation-related business is defined as any business engaged in aircraft maintenance, aircraft manufacturing or sales by the manufacturer, and service of aircraft parts and components.

Analysis and Findings…

Statewide Economic Model Impact of the AVIATION PROGRAM (FY2013-2015)

	2012-2013	2013-2014	2014-2015	Total
State Payments in the Window $ (M)	178.3	320.9	347.4	**846.6**
Total Net State Revenues $ (M)	260.3	486.4	410.2	**1,156.9**
Return-on-Investment by Year	1.5	1.5	1.2	
Return-on-Investment for the 3 year period				**1.37**

		2012-2013	2013-2014	2014-2015	Total		Average per Year
Personal Income	Nominal $ (M)	7,200.0	14,080.0	13,705.0	**34,985.0**		**11,661.7**
Real Disposable Personal Income	Fixed 2010-11 $ (M)	6,043.0	11,895.0	11,665.0	**29,603.0**		**9,867.7**
Real Gross Domestic Product	Fixed 2010-11 $ (M)	5,636.5	10,927.7	10,716.4	**27,280.6**		**9,093.5**
Consumption by Households and Government	Fixed 2010-11 $ (M)	6,852.5	12,817.2	11,877.8	**31,547.6**		**10,515.9**
Real Output	Fixed 2010-11 $ (M)	11,943.2	21,503.1	18,943.1	**52,389.4**		**17,463.1**
		2010 - 11	**2011 - 12**	**2012 - 13**	**Minimum**	**Maximum**	**Average per Year**
Total Employment	Jobs	60,667	95,772	59,232	**59,232**	**95,772**	**71,890**
Population	Persons	0	20,416	54,272	**0**	**54,272**	**24,896**

The ROI for the Aviation program area is projected at 1.37 for the historical analysis covering FY 2013-14 through FY 2015-16. For every dollar spent on the program, the state of Florida received 1 dollar and 37 cents back in tax revenue. The Aviation program area increased real Disposable Personal Income by about $9.9 billion every year and increased Florida's real Gross Domestic Product by about $9.1 billion

every year. On average, there were nearly 72,000 jobs in the state economy attributable to spending on the Aviation program area.

Statewide Economic Model Impact of the AVIATION PROGRAM (FY2016-2020)

	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	Total
State Payments in the Window $ (M)	262.2	225.3	213.6	210.3	256.1	**1,167.5**
Total Net State Revenues $ (M)	328.5	333.9	367.5	421.8	554.3	**2,006.0**
Return-on-Investment by Year	1.3	1.5	1.7	2.0	2.2	
Return-on-Investment for the 5 year period						**1.72**

		2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	Total		Average per Year
Personal Income	Nominal $ (M)	9,496.0	10,376.0	11,652.0	13,129.0	16,759.0	**61,412.0**		**12,282.4**
Real Disposable Personal Income	Fixed 2010-11 $ (M)	7,994.0	8,802.0	9,926.0	11,198.0	14,276.0	**52,196.0**		**10,439.2**
Real Gross Domestic Product	Fixed 2010-11 $ (M)	7,343.9	8,086.2	9,118.8	10,287.4	13,115.1	**47,951.4**		**9,590.3**
Consumption by Households and Government	Fixed 2010-11 $ (M)	6,447.8	7,130.7	8,065.6	9,138.8	11,696.0	**42,479.0**		**8,495.8**
Real Output	Fixed 2010-11 $ (M)	15,612.9	14,990.9	15,821.7	17,311.2	22,420.1	**86,156.9**		**17,231.4**
		2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	Minimum	Maximum	Average per Year
Total Employment	Jobs	69,306	52,226	48,870	51,746	71,900	**48,870**	**71,900**	**58,810**
Population	Persons	0	23,840	44,320	63,904	83,616	**0**	**83,616**	**43,136**

The analysis of the forecasted work program (FY 2016-17 through FY 2020-21) led to an ROI of 1.72 for the Aviation program area. For every dollar spent on the program, the state of Florida received 1 dollar and 72 cents back in tax revenue. The Aviation program area contributes $10.4 billion to real Disposable Personal Income and $9.6 billion to Florida's real GDP in an average year. The Aviation program area will, on average, add nearly 59,000 jobs to the state economy every year.

Two factors contributed to the strong ROI. The first factor was the allocation of tourists to the Aviation program area. The analysis attributed, on average, about 2.31 million tourists to the Aviation program area. According to Visit Florida, the average tourist spends about $145 a day and stays 4.5 nights in Florida. The majority of this spending is taxable at the state level. These taxable purchases include hotel lodgings, meals at restaurants, car rentals, gasoline purchases, souvenir and gift purchases at retail outlets and tickets to sporting events and theme parks. Some of these purchases are subject to the state sales and use tax. Car rentals and gasoline purchases are subject to a rental car surcharge and fuel tax. This spending induces large increases in the sales and use tax of $762 million during the historical period and $1.3 billion during the forecasted period.

The second major factor involves the allocation of output to the Aviation program area. For this purpose, total output is defined as the ongoing activity of businesses that either occurs within Florida's public aviation system or is dependent upon that system. The assignment of output affects the model directly and includes expenditures on supplies and the salaries of employees. The indirect effects are the changes in employment, income and output by the local suppliers that provide goods and services to the aviation industry in Florida. The induced effects are the changes in household spending whose income is affected by the direct and indirect activity. The large direct, indirect and induced impacts from aviation-related output was a significant factor in the high ROI, the large increase in GDP and Personal Income, and the impact on employment.

Some of the industries included in the analysis had higher-than-average economic multipliers. Aviation manufacturing and air cargo delivery have greater impacts on Florida's economy than more traditional Florida industries, like hospitality and food service. Both industries have average wages that are higher than the state average, and this leads to a greater economic impact. In addition, manufacturing has large input purchases and stronger backward linkages to local suppliers. Both of these factors led to greater economic impacts.

Overall, the ROI is strong. Florida's airports are a substantial and necessary component of Florida's economy. They facilitate visits by tourists and attract aviation-related industries. The industry, itself, is directly responsible for a significant amount of economic output. The ROIs of 1.37 and 1.72 reflects these factors.