SEPTA DRIVES THE ECONOMY OF PENNSYLVANIA

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1.0 SEPTA DRIVES THE ECONOMY OF PENNSYLVANIA

Transportation services have both direct and catalytic effects on economic activity. As Pennsylvania's largest transit service provider, SEPTA is a major employer and a significant purchaser of goods and service in the Commonwealth. SEPTA's expenditures on wages, goods and services stimulate a large magnitude of economic activity across the Commonwealth.

The broader economic benefits of SEPTA far exceed those reflected only in activity associated with its employment and purchases of goods and services. SEPTA's services enhance the region and Commonwealth's productivity and competitiveness by enabling compact development patterns, dense clusters of economic activity, and access to employment. Although these economic benefits impacts may seem abstract, the can be quantified through analyses of relative property values, patterns of development and population, and regional productivity and growth. As demonstrated in this report SEPTA's direct and catalytic effects on the region and Commonwealth are very large. These positive impacts can be expanded through continued investment in SEPTA, or on the other hand, diminished thorough disinvestment.

Collectively, these analyses demonstrate the vital role of the southeast region to the economy and tax base of Pennsylvania, the importance of SEPTA to the economy of this region, and the centrality of transit service to continuation of the productive development patterns that are crucial for the competitiveness of the region and the Commonwealth.

1.1 REPORT METHODOLOGY AND ORGANIZATION

The report is organized as follows:

- *Section 1: SEPTA Drives the Economy of Pennsylvania* gives an overview of the agency, its importance to the southeastern Pennsylvania region, and of the importance of that region to the Commonwealth's economy, tax base and growth patterns.

- *Section 2: SEPTA's Economic Footprint* reviews how the authority is an economic generator through its operating and capital activity, supporting a large volume of employment and economic activity in the region and Commonwealth through its expenditures.

- *Section 3: SEPTA's Property Value and Development Impacts* describes how transit service catalyzes private economic activity, increasing the value of residential properties and spurring patterns of residential and commercial development by enabling dense activity and serving as a desirable amenity for commuters.

The Appendices to this report describe in detail the approach and methodology utilized to quantify the impacts described throughout the report. Econsult Solutions, Inc. (ESI) employs industry-standard economic modeling techniques to estimate direct economic activity generated by SEPTA and to translate that activity into total economic output, employment and associated earnings, as well as tax

revenue impact. In addition, we employ commonly used hedonic regression modeling techniques to isolate the impact of proximity to transit on suburban housing values. Regional economic activity and economic impacts are calculated for the five-county region served by SEPTA (Bucks, Chester, Delaware, Montgomery and Philadelphia counties) and for the Commonwealth of Pennsylvania. Residential property values are calculated for the suburban counties only, because the ubiquity of transit service within the City of Philadelphia makes it far more difficult to measure the differential between houses that are and are not proximate to transit service. Other development impacts are described at more localized levels that are heavily served by transit.

The analysis seeks to quantify the current annual level of economic activity associated with SEPTA by using the most appropriate and recent data available for each component of the analysis. In some cases, these data represent the most recent available year, while in other cases, an average of multiple years is used to provide for greater data reliability. Comparisons to prior activity and impact levels and included in some instances in order to illustrate changes over time using a comparable analytical approach.[1] Where relevant, comparisons are made in activity levels or economic effects before and after the passage of Act 89 transportation funding legislation by the Commonwealth of Pennsylvania (which was signed into law in November 2013).

Data utilized throughout this report include data SEPTA, reported budgetary figures, data derived from public sources, such as property data provided by county governments, and other government data on demographics and employment.

1.2 ABOUT THE SOUTHEASTERN PENNSYLVANIA TRANSPORTATION AUTHORITY (SEPTA)

The Southeastern Pennsylvania Transportation Authority (SEPTA) is the nation's sixth largest transit system, providing a vast network of fixed route services, ADA paratransit, and shared ride services for Bucks, Chester, Delaware and Montgomery counties. This coverage area spans 2,200 square miles and has a population of more than four million residents.

SEPTA operates 145 fixed routes through more than 2,700 vehicles across a variety of modes, including bus, subway, rail and trolley service (see Figure 1.1). SEPTA is also among the region's largest employers, with a workforce of around 9,400. Its services carry more than 300 million passengers a year, and more than 1 million passengers each weekday. SEPTA's transportation infrastructure and services are funded by a combination of passenger fares, and federal, Commonwealth and local funds.

The Commonwealth of Pennsylvania is a crucial investor in SEPTA's infrastructure and services. Pennsylvania's Act 44 of 2007 provides operating funding for SEPTA's ongoing services. This funding was amended and expanded through Pennsylvania's Act 89 in November 2013. This comprehensive transportation funding package set aside various funding streams for operating and capital funding for

[1] As explained in Appendix D, comparisons to prior analyses of SEPTA's economic impact conducted by Econsult should not be understood to represent the change in activity over the intervening years due to methodological differences between the calculations.

public transit on an ongoing basis, enabling SEPTA to significantly increase its capital activities to address a backlog of state of good repair projects and avert planned service reductions.[2]

FIGURE 1.1: SEPTA SERVICE MAP

Source: SEPTA (2018)

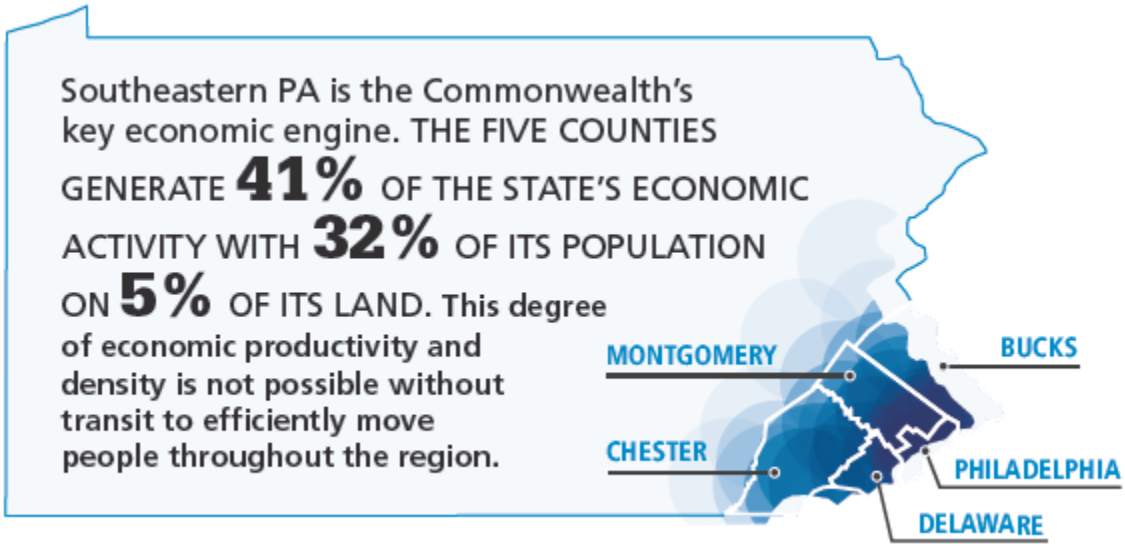
[2] See Section 2.1 for further discussion of Act 89 and the importance of the capital activity that it has enabled.

1.3 SOUTHEASTERN PENNSYLVANIA: THE ECONOMIC ENGINE OF THE COMMONWEALTH

Southeastern Pennsylvania is a key engine for Commonwealth's economy. Despite occupying just 5 percent of Pennsylvania's land area, the five-county region (Bucks, Chester, Delaware, Montgomery and Philadelphia counties) represent 32 percent of Pennsylvania's population, and represent 41 percent of Pennsylvania's gross economic product (see Table 1.1).

TABLE 1.1: SOUTHEASTERN PENNSYLVANIA SHARE OF THE COMMONWEALTH

Category	Five-County Region	Commonwealth of Pennsylvania	Five-County Share	Data Source
Land Area	2,156 sq miles	44,743 sq miles	4.8%	U.S Census Bureau (Census 2010)
Population	4.096 million	12.784 million	32.0%	U.S Census Bureau (2016)
Private Sector Employment	1.670 million	5.062 million	33.0%	BLS QCEW (2016)
Gross Product	$285.7 billion	$702.1 billion	40.7%	IMPLAN (2015)

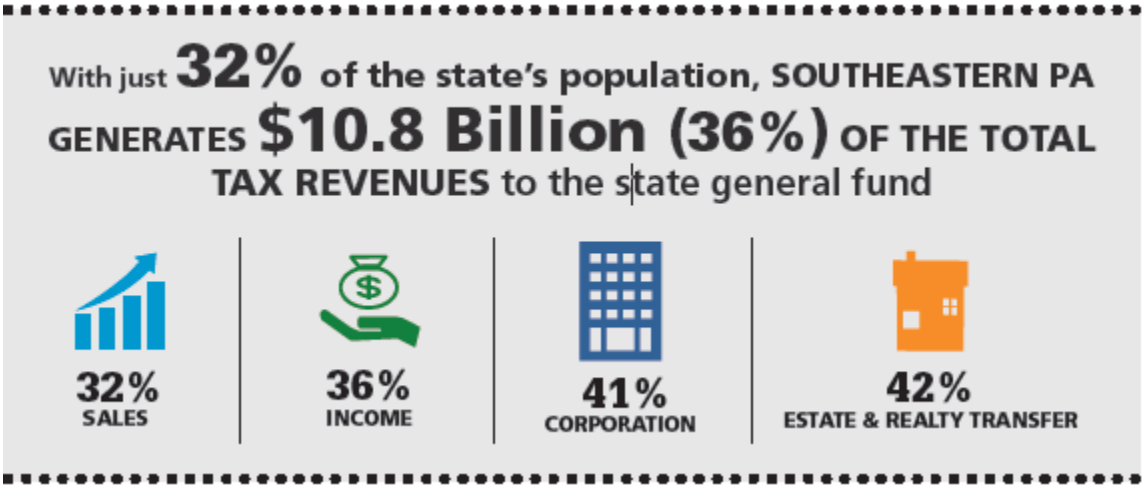


Due to this economic productivity, the southeast region is an outsized contributor to the Commonwealth's general fund. Approximately 36 percent of the general fund revenues are estimated to originate in the five-county region (see Table 1.2).[3] This contribute totals an estimated $10.8 billion of the Commonwealth's $30 billion general fund.

TABLE 1.2: SOUTHEASTERN PA ESTIMATED CONTRIBUTION TO PENNSYLVANIA GENERAL FUND

Tax Type	Five-County	Bucks	Chester	Delaware	Montgomery	Philadelphia
Sales	32%	6%	6%	5%	8%	7%
Income	36%	7%	7%	5%	10%	7%
Corporation	41%	5%	6%	4%	11%	14%
Estate & Realty Transfer	42%	8%	7%	6%	11%	10%
Total	**36%**	**6%**	**6%**	**5%**	**10%**	**9%**

Sources: See Appendix A



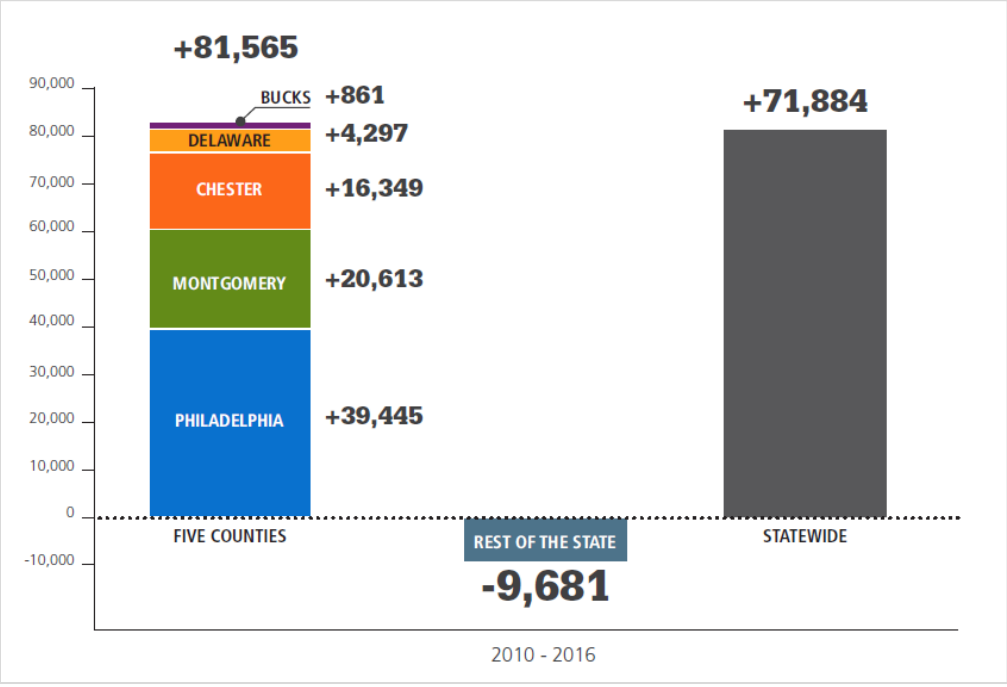
[3] Note that the southeast region's percentage contribution to the Pennsylvania tax base (36 percent of the general fund) is somewhat lower than its contribution to the Commonwealth's gross economic product due to its proximity to neighboring states like New Jersey and Delaware, which leads to some leakage in taxable activity. For example, commuters who work in region but live in another state do not pay Pennsylvania income tax, and do not pay Pennsylvania sales tax on purchases made in their home state.

This productivity has also made the southeast region an engine of growth for the Commonwealth. Census Bureau data on population growth by county from 2010-2016 shows that the southeast region has grown by more than 80,000 people from July 1, 2010 to July 1, 2016, while Pennsylvania's population growth over that time period is roughly 72,000. That means that the southeast region has represented more than the total population growth of the Commonwealth during that six-year period (see Table 1.3).[4]

TABLE 1.3: SOUTHEASTERN PENNSYLVANIA SHARE OF POPULATION GROWTH

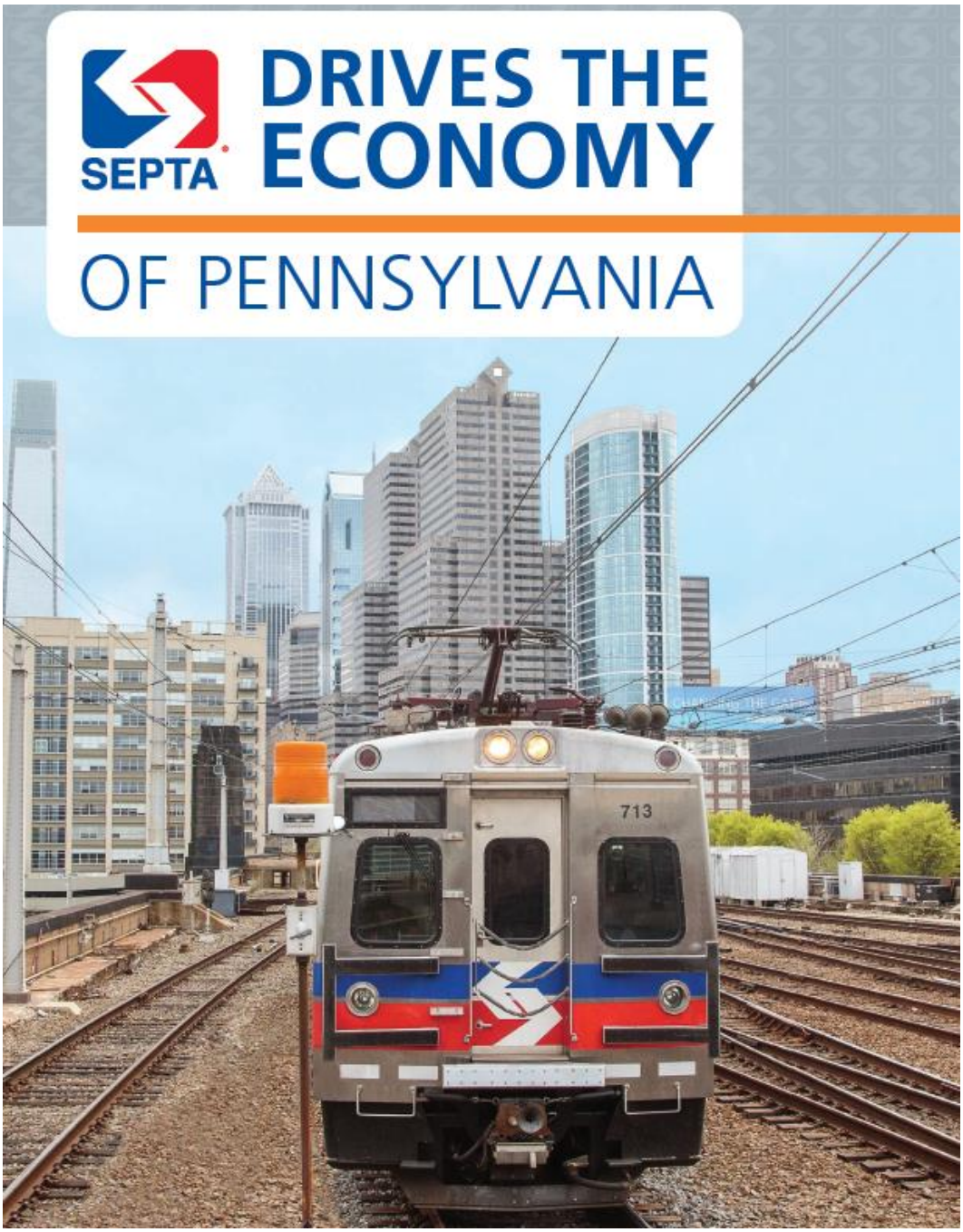
Geography	2010	2016	Growth 2010-2016
Bucks	625,538	626,399	861
Chester	499,963	516,312	16,349
Delaware	559,105	563,402	4,297
Montgomery	801,112	821,725	20,613
Philadelphia	1,528,427	1,567,872	39,445
Pennsylvania	12,712,343	12,784,227	71,884
Southeastern PA	**4,014,145**	**4,095,710**	**81,565**
Remainder of PA	**8,698,198**	**8,688,517**	**(9,681)**

Source: US Census Bureau July 1 Population Estimates (Vintage 2016)



[4] Note that population growth estimates by county for 2017 as not yet available from the Census Bureau. Initial estimates show an increase of around 18,400 for Pennsylvania as a whole for 2017.

This population growth is indicative of the impact of transit service on enabling density, growth and development. Southeastern Pennsylvania's businesses count on a network of reliable and frequent transit services to directly transport employees as well as to reduce traffic congestion on the region's highway and road network. All residents of the region benefit from SEPTA, including those who are not direct users of the service, because it is critical to the economic vibrancy of the region. In turn, the economic productivity of the southeastern region is key to the tax base of the Commonwealth, benefiting residents across Pennsylvania.



2.0 SEPTA'S ECONOMIC FOOTPRINT

In addition to the impact of SEPTA's service on regional productivity (as discussed in Section 1) and development patterns (as discussed in Section 3), SEPTA is itself an economic generator through its capital and operating expenditures each year.

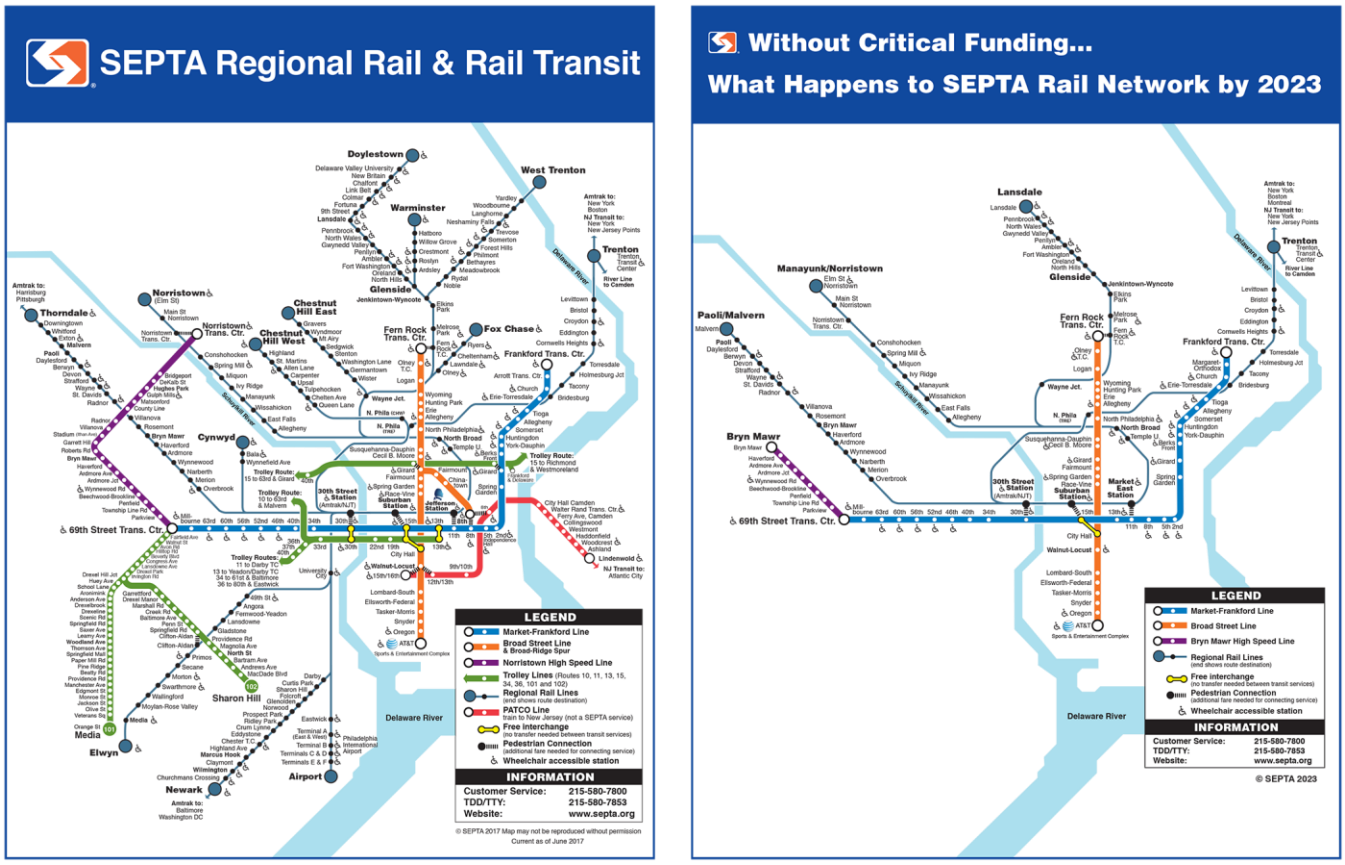
SEPTA is a major initiator of capital projects for the maintenance and expansion of its network. Since the passage of Act 89, SEPTA's annual capital investments have increased significantly, growing the economic impact of this activity. SEPTA is also a major hub of employment throughout the region and procurement activity throughout the region and Commonwealth through its day to day mission as a transportation operator. These direct expenditures on capital and operating activity in turn generate significant "spillover impacts," supporting employment in a range of sectors across the economy.

2.1 CAPITAL INVESTMENTS SINCE ACT 89

As of 2013, SEPTA faced a backlog of more than $5 billion in capital replacement needs including critical infrastructure and aging vehicles. The lack of a reliable funding stream limited the amount of activity that SEPTA could undertake on an annual basis reduced its borrowing capabilities.

This critical shortage forced SEPTA to develop a "Realignment Plan" which called for a significant downsizing of its network through 2023 to match ensure safety and reliability under available funding conditions. This included the suspension and truncation of several Regional Rail lines, forced conversion of trolley service to bus service, and reductions of service frequency throughout the network (see Figure 2.1).

FIGURE 2.1: SEPTA SEPTEMBER 2013 REALIGNMENT PLAN

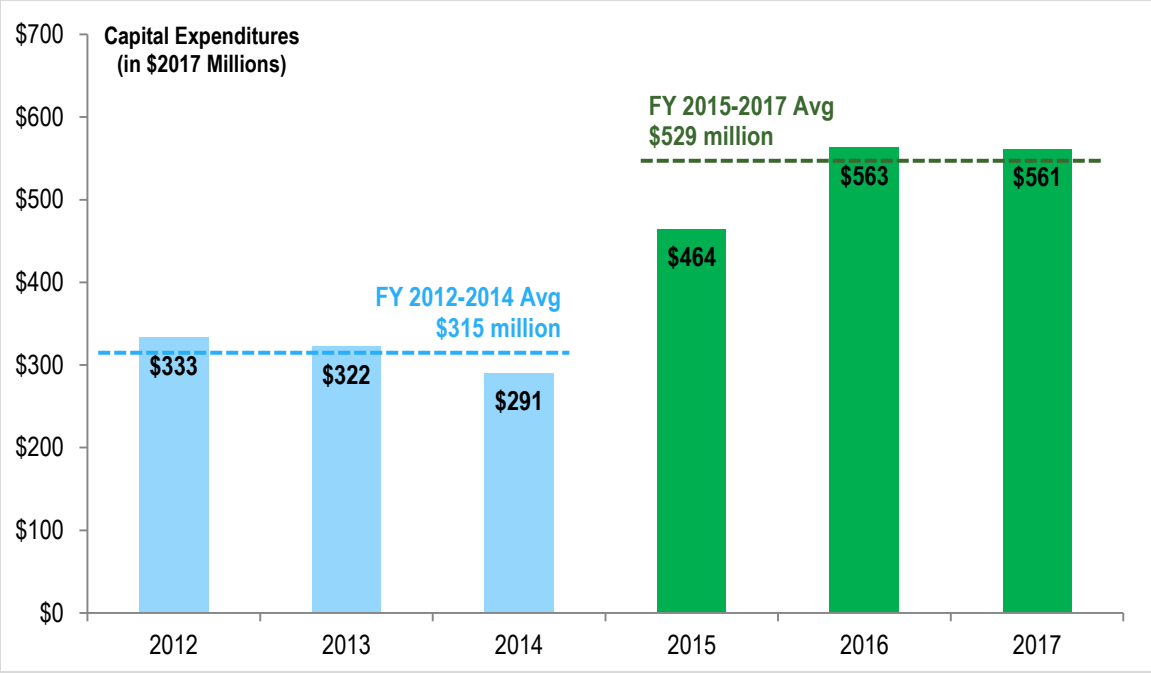


Source: SEPTA (published September 2013)

In November 2013, the Pennsylvania Legislature passed Act 89, which provided dedicated long-term funding source for capital projects and a near doubling of SEPTA's annual capital budget. As this legislation took effect in 2014, SEPTA was ready to efficiently invest the new capital dollars for long needed maintenance, state of good repair capital refurbishments, and replacement of vehicles. SEPTA is now four years into a 20-year capital program that addresses its long-standing backlog and creates the opportunity to consider much needed expansion to meet the needs of private sector and population growth across the region.

Figure 2.2 below shows SEPTA's annual capital expenditures over the FY 2012-2017 period. In the three years prior to Act 89 (FY 2012-2014), SEPTA's capital expenditures averaged $315 million per year (in current dollars). With the passage of Act 89, the annualized level increased to $529 million from FY 2015-2017 (see Figure 2.2).

FIGURE 2.2: ANNUAL SEPTA CAPITAL INVESTMENTS, FY 2012-2017 (IN $2017 MILLIONS)

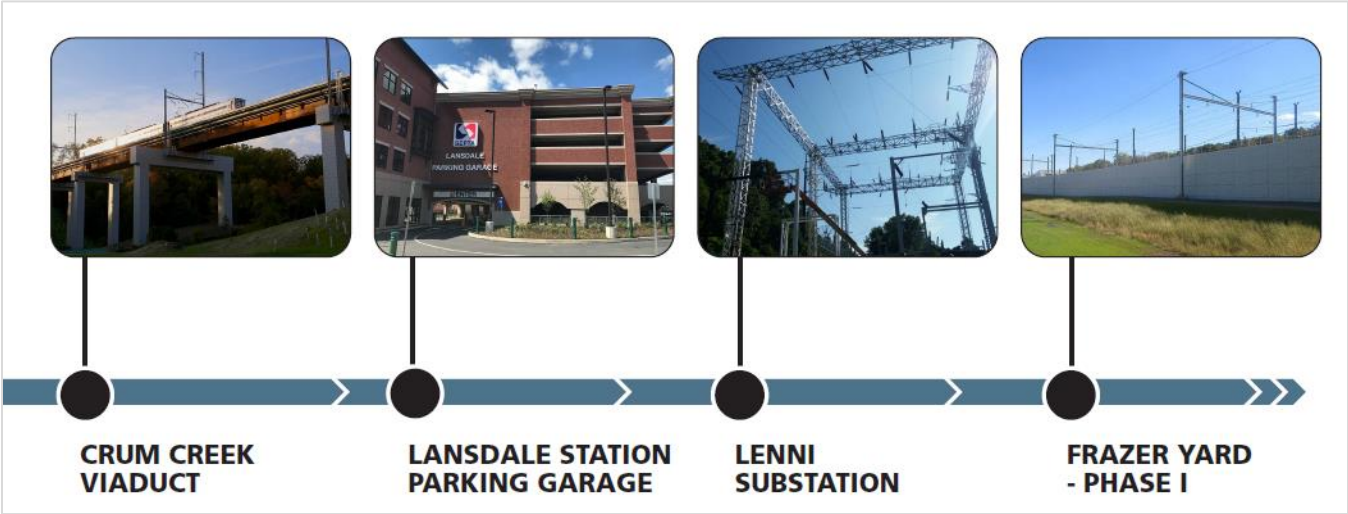


Sources: SEPTA (expenditure data), Consumer Price Index (inflation adjustment)

Completed Capital Projects

These additional funds through Act 89 have allowed SEPTA to pursue critical infrastructure projects across the network. Large scale capital projects have been completed across suburban and city locations over the past three years (see Figure 2.3 and Figure 2.4).[5]

FIGURE 2.3: RECENTLY COMPLETED LARGE SCALE CAPITAL ACTIVITY (SUBURBS)



- **Crum Creek Viaduct:** The 915-foot Crum Creek Viaduct on the Media/Elwyn Regional Rail Line was originally constructed in 1895, and had reached the end of its useful life. In 2017, SEPTA completed the replacement of the Viaduct for nearly $90 million.

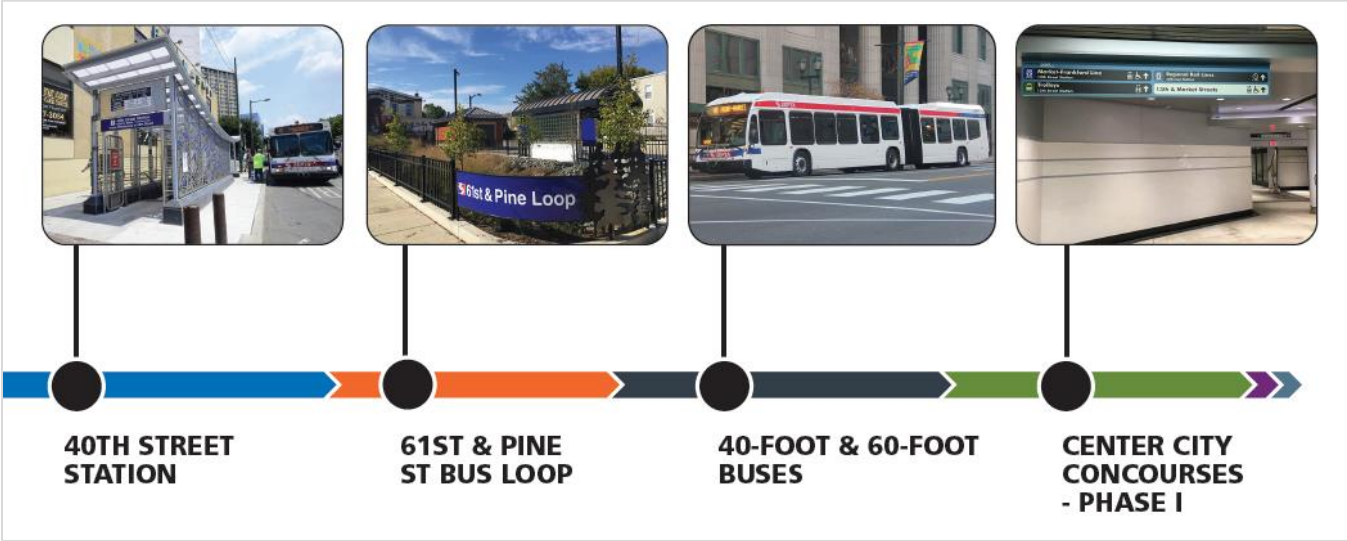
- **Lansdale Station Parking Garage:** At one of its busiest Regional Rail stations, SEPTA undertook the construction of a fully accessible parking garage, a new bus laydown area, and a new neighborhood station. The $43 million project was completed in 2017.

- **Lenni Substation:** The Lenni Substation on the Media/Elwyn Regional Rail Line in Delaware County was overhauled in 2016. This $10.5 million project replaced the major power components that were originally installed in the 1920s.

- **Frazer Yard – Phase 1**: To accommodate the forthcoming expansion of railcar and locomotive fleets, SEPTA is upgrading the Frazer Maintenance Facility in Chester County by adding storage tracks and making major upgrades to existing structures. This $139 million project will be implemented in phases, the first of which was completed in 2017.

[5] SEPTA. "Rebuilding the System: Fiscal Year 2017 Capital Budget, FY 2017 – 2028 Capital Program", May 2016.

FIGURE 2.4: RECENTLY COMPLETED LARGE SCALE CAPITAL ACTIVITY (CITY)



- **40th Street Station**: The 40th Street Station on the Market-Frankford Line has been made fully ADA accessible by improving the platforms and stairways, installing elevators, and upgrading the safety features and lights. This $11 million project was completed in 2017.

- **61st & Pine Street Bus Loop**: From FY 2016 – 2020, SEPTA has worked to improve multiple bus and trolley loops by adding accessibility features and improving operator bathroom facilities, platforms, lighting, and landscaping. SEPTA invested $1.8 million in improvements and additions at the 61st & Pine Street Bus Loop construction which was completed in the Fall of 2017.

- **40-foot & 60-foot Buses**: SEPTA's Bus Purchase Program turns over approximately 100 buses per year on average. Over the next five years, SEPTA will be adding 550 new 40-foot hybrid and electric buses to their fleet.

- **Center City Concourses – Phase 1:** The first phase of the multiphase renovations to the Center City Concourses will be completed by the summer of 2018 and will focus on the South Broad concourse. In early stages of the project, escalators and elevators have been replaced and structural enhancements and repairs have been made to improve the safety and accessibility of the concourses. The eight phase project is expected to cost approximately $60 million.

Another critical infrastructure upgrade to enhance SEPTA's safety program was the successful implementation of **Positive Train Control** (PTC) across SEPTA rail network. In spring 2017, SEPTA became one of the first agencies to fully install and begin operation of this federally mandated technology. The PTC system enhances rider and worker safety by regulating train speed and separations, preventing potential collisions or errors.

Ongoing Capital Projects

Capital activity continues through large scale ongoing projects across all five counties:

- **Bucks County – Levittown Station Reconstruction:** The second phase of the Station and Loop Improvements at Levittown Station is currently in progress. When complete in 2018, the station on the Trenton Regional Rail Line will be fully ADA accessible and include canopied platforms, new signage, expanded parking capacity, and other passenger amenities.

- **Chester County – Paoli Intermodal Transportation Center**: A brand new transportation center is being constructed in Paoli along the Paoli/Thorndale Regional Rail Line to replace the previous station. The transportation center will be fully ADA accessible and include pedestrian overpasses, new crosswalks, three elevators, high-level platforms, enhanced bus facilities, and a 600 space commuter parking garage. The two-phased project will cost a total of nearly $90 million.

- **Delaware County – Elwyn to Wawa Rail Service:** SEPTA is extending service on the Media/Elwyn Regional Rail Line from its current terminus at Elwyn Station to Wawa, PA. In order to do so, SEPTA will spend approximately $150 million to renew infrastructure, rehabilitate old track and structures, and ultimately build a new station with a 600-space commuter parking deck.

- **Montgomery County – Ardmore Transportation Center**: SEPTA has plans for multiple improvements to the Ardmore Transportation Center that will be carried out in two phases over the next ten years. The first phase includes ADA accessibility improvements, a brand new station building, and additions such as canopies, platforms, pathways, lighting, signage, and elevators. The second phase includes the construction of a 500 space parking garage and additional site improvements.

- **Philadelphia – City Hall & 15th Street Stations:** SEPTA is in the midst of renovating the 15th Street and City Hall Stations to improve customer use, safety, and security. New elevators, ramps, and corridors will make both stations fully ADA accessible while the reconfigured fair lines will improve passenger flow with the new SEPTA Key Program. In total, SEPTA has budgeted nearly $150 million for the project.

2.2 ANNUAL ECONOMIC IMPACT FROM CAPITAL INVESTMENTS

In an interconnected economy, direct expenditures give rise to "spillover" impacts when the initial dollars are recirculated by suppliers ("indirect effects") and employees ("induced effects"). The total economic impact of SEPTA's capital investments within the regional and Commonwealth economy are the sum of these direct, indirect and induced effects.[6]

SEPTA's capital investments generate $775 million in economic impact within Pennsylvania each year, supporting more than 5,400 jobs and more than $300 million in earnings (see Table 2.1)

TABLE 2.1: ANNUAL ECONOMIC IMPACT FROM SEPTA'S CAPITAL INVESTMENTS, FY 2015 - FY 2017 (IN $2017)

Impact Type	Pennsylvania	Five-County	Bucks	Chester	Delaware	Montgomery	Philadelphia
Direct Output ($M)	$401	$391	$30	$31	$110	$63	$156
Indirect & Induced Output ($M)	$374	$334	$52	$47	$44	$82	$109
Total Impact ($M)	**$775**	**$725**	**$82**	**$78**	**$154**	**$145**	**$265**
Employment Supported	5,420	5,130	560	530	1,140	1,000	1,900
Earnings ($M)	$302	$287	$31	$30	$64	$56	$107

Sources: See Appendix B

The annual economic impact from SEPTA's capital investment within the Commonwealth has increased by 70 percent in inflation adjusted terms since the passage of Act 89. From FY 2012 - FY 2014, the average annual economic impact of these investments within the Pennsylvania economy was $456 million (see Table 2.2).

TABLE 2.2: ANNUAL ECONOMIC IMPACT FROM SEPTA'S CAPITAL INVESTMENTS, FY 2012 - FY 2014 (IN $2017)

Impact Type	Pennsylvania	Five-County	Bucks	Chester	Delaware	Montgomery	Philadelphia
Direct Output ($M)	$235	$228	$18	$18	$64	$37	$91
Indirect & Induced Output ($M)	$221	$196	$31	$28	$26	$48	$64
Total Impact ($M)	**$456**	**$424**	**$48**	**$46**	**$90**	**$85**	**$155**
Employment Supported	3,250	3,070	340	320	690	590	1,140
Earnings ($M)	$181	$171	$18	$18	$39	$33	$64

Sources: See Appendix B

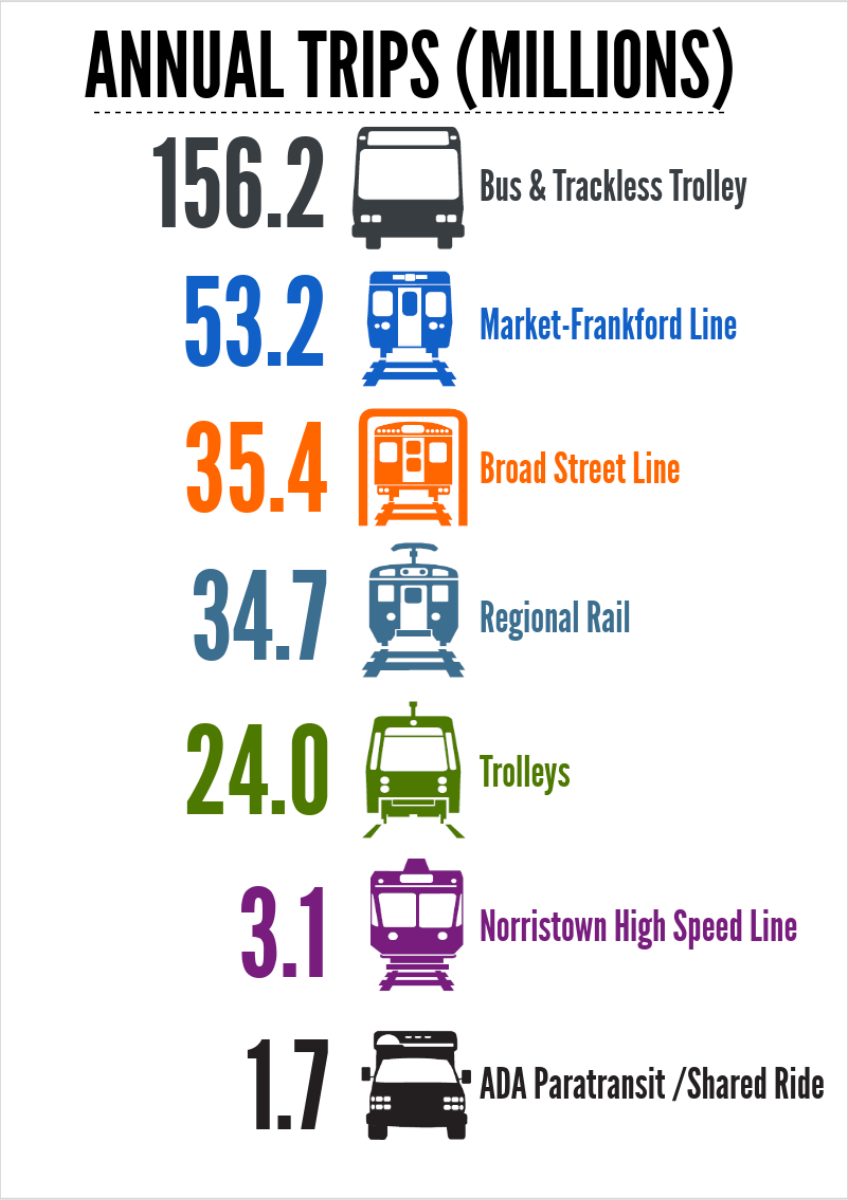
[6] See Appendix B for further information on ESI's approach to modeling the economic and fiscal impacts from direct expenditures.

2.3 ONGOING OPERATIONS

Every day, SEPTA trains, buses, trolleys and paratransit vehicles provide more than 1 million trips across the region to work, school, doctor's appointments and entertainment activities. This transit service is the lifeblood of the regional economy. As one of the area's larger employers, SEPTA also supports the local economy as an employment provider and purchaser of goods and services.

In FY 2017, total SEPTA ridership across all modes was 308 million. Around half of these trips (156 million) were by bus and trolley bus. The Market-Frankford and Broad Street subway lines combined for 89 million trips, followed by Regional Rail service, which carried 35 million trips (see Figure 2.5).

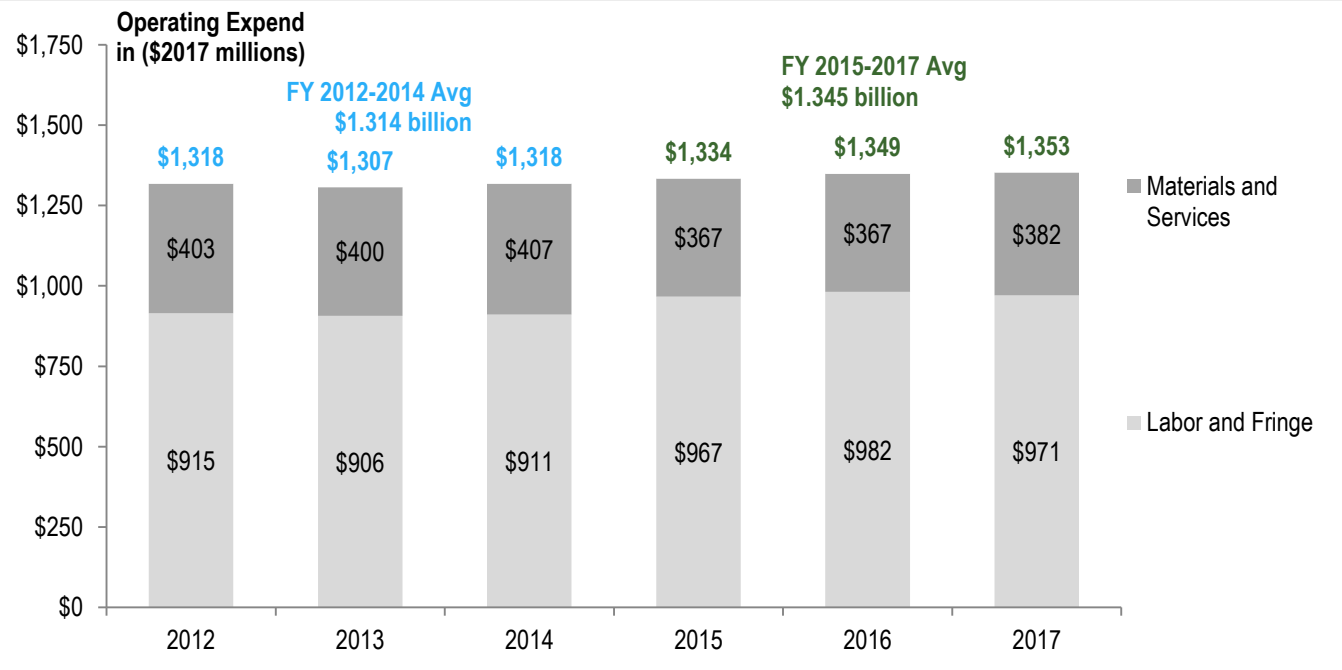
FIGURE 2.5: SEPTA RIDERSHIP BY MODE, FY 2017



Source: SEPTA

SEPTA's annual operating budget for FY 2017 was $1.35 billion. When accounting for inflation, this budget level has remained relatively stable in recent years. Total operating expenditures averaged $1.31 billion (in $2017) from FY 2012-2014, and $1.35 billion (in $2017) from FY 2015-2017 (see Figure 2.6). SEPTA has balanced its budget in each of the past 17 fiscal years.

FIGURE 2.6: ANNUAL SEPTA OPERATING EXPENDITURES, FY 2012-2017 (IN $2017)

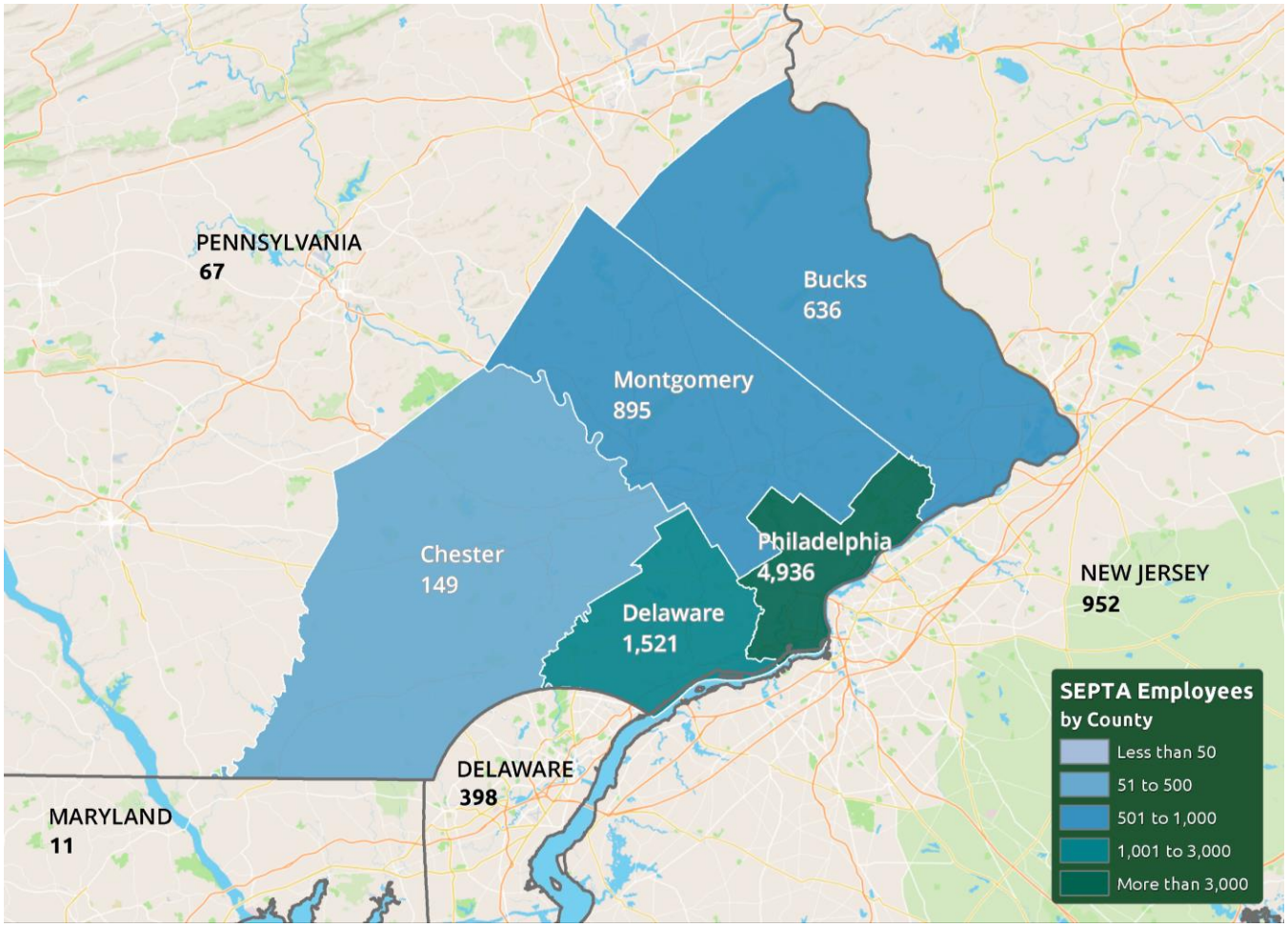


Sources: SEPTA (expenditure data), Consumer Price Index (inflation adjustment)

SEPTA has a staff of more than 9,400 employees, the vast majority of whom are dedicated to supporting these operating activities. Labor and fringe costs accounted for 72 percent of total operating costs in FY 2017, with the remainder spent on various materials and services.

SEPTA's employees reside throughout the Philadelphia region, with 85 percent living in the five-county region and slightly more than half (nearly 5,000) living in the city of Philadelphia (see Figure 2.7). This means that the wages that SEPTA employees receive are typically re-spent and recirculated within communities across the region, supporting businesses across a range of sectors.

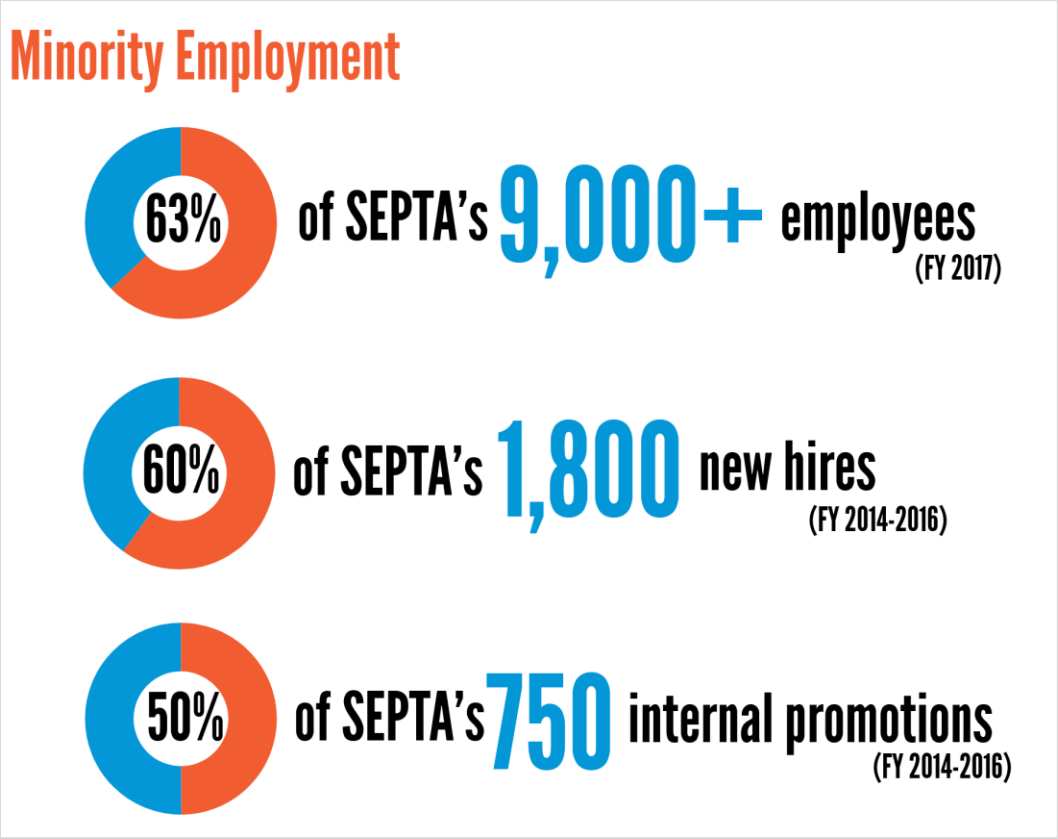
FIGURE 2.7: SEPTA EMPLOYEES BY COUNTY OF RESIDENCE



Source: SEPTA (anonymized employee data)

SEPTA is also committed (as reflected in its Strategic Business Plan), to attracting, developing and maintaining a diverse workforce. As of FY 2017, 63 percent of SEPTA's workforce was a member of a minority group. Recent and hiring and promotion data indicate that this commitment continues, with 60 percent of new hires from FY 2014-2016 and 50 percent of internal promotions from FY 2014-2016 representing members of minority groups (see Figure 2.8).

FIGURE 2.8: SEPTA MINORITY EMPLOYMENT AND HIRING



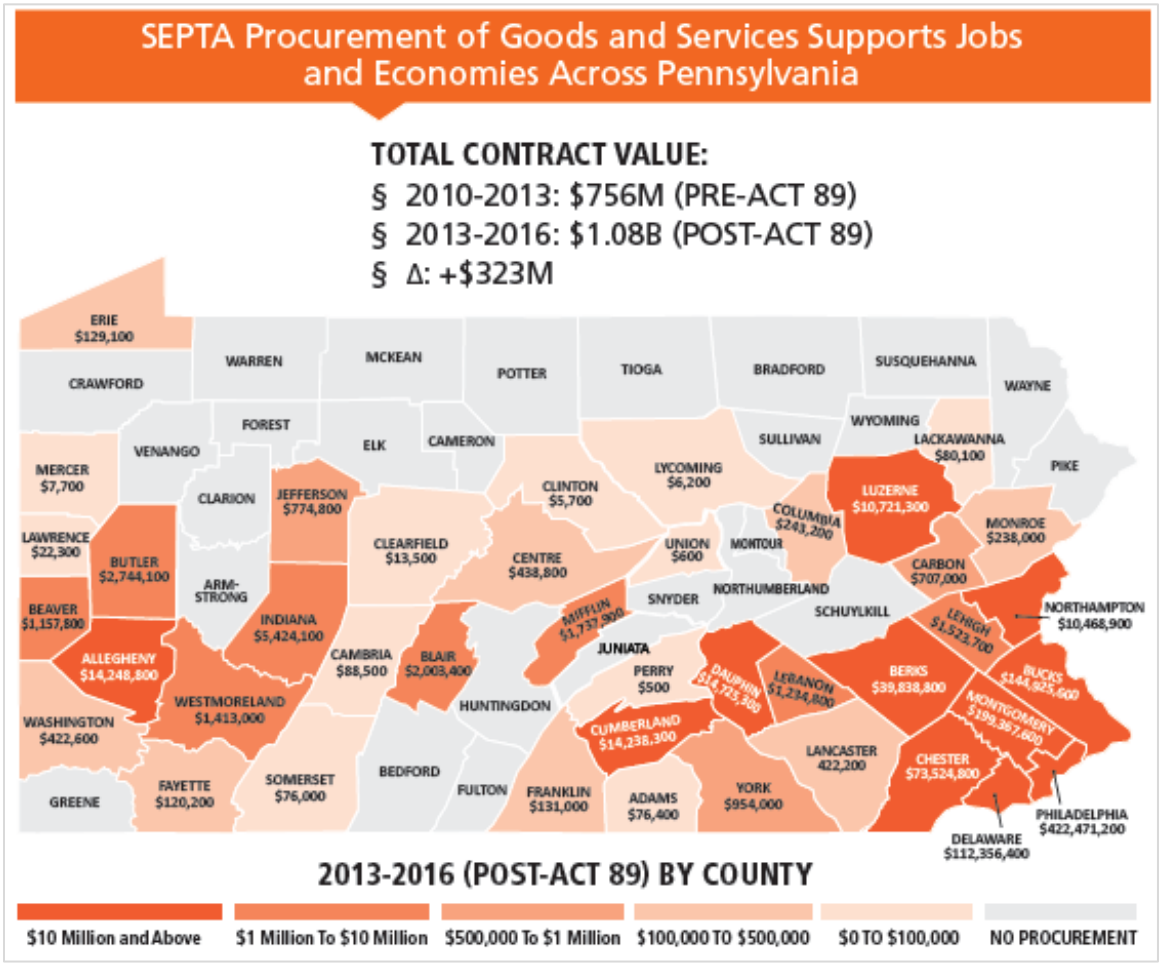
Source: SEPTA (anonymized employee data)

SEPTA's purchasing activity is also a significant source of economic stimulus for businesses in the region and across the Commonwealth. In calendar years 2013-2016, the total contract value of SEPTA purchasing within Pennsylvania (including both operating and capital expenditures) was nearly $1.1 billion, up from around $750 million in calendar years 2010-2013 (prior to the passage of Act 89).

While business in the southeast region received the largest portion of that spending, significant purchasing took place in counties across Pennsylvania, including more than $1 million in contract value each in 14 counties outside of the southeast region: Allegheny, Beaver, Berks, Blair, Butler, Cumberland, Dauphin, Indiana, Lebanon, Lehigh, Luzerne, Mifflin, Northampton, and Westmoreland (see Figure 2.9)

Significant contracts include a $26 million contract for electrical construction services with a construction company headquartered in Berks County, a $13 million contract for the design and installation of positive train control infrastructure with a company in Cumberland County, and $5 million contract for replacement parts from a company in Indiana County.

FIGURE 2.9: SEPTA PENNSYLVANIA CONTRACT VALUE BY COUNTY, CY 2013-2016



Source: SEPTA Purchasing Data

2.4 ANNUAL ECONOMIC IMPACT FROM ONGOING OPERATIONS

SEPTA's operating expenditures are a significant driver of economic activity in the region and Commonwealth through their direct, indirect and induced effects.[7] SEPTA operations generate $2.3 billion in economic impact in Pennsylvania each year, supporting nearly 18,000 jobs and more than $1.4 billion in earnings (see Table 2.3).

TABLE 2.3: ANNUAL ECONOMIC IMPACT FROM SEPTA'S OPERATIONS, FY 2015 - FY 2017 (IN $2017)

Impact Type	Pennsylvania	Five-County	Bucks	Chester	Delaware	Montgomery	Philadelphia
Direct Output ($M)	$1,247	$1,221	$53	$52	$110	$118	$889
Indirect & Induced Output ($M)	$1,028	$982	$93	$44	$171	$139	$535
Total Impact ($M)	**$2,275**	**$2,203**	**$146**	**$95**	**$281**	**$258**	**$1,424**
Employment Supported	17,950	17,460	1,090	770	2,100	2,010	11,490
Earnings ($M)	$1,413	$1,377	$64	$42	$148	$119	$1,004

Sources: See Appendix B

In inflation adjusted-terms, annual operating impacts from FY 2015-2017 are effectively unchanged from the annualized level from FY 2012-2014. This means that SEPTA has increased its capital activity without material additions to its operational staffing and expenditure levels. The average annual economic impact of SEPTA operations from FY 2012-2014 was $2.2 billion (see Table 2.4)

TABLE 2.4: ANNUAL ECONOMIC IMPACT FROM SEPTA'S OPERATIONS, FY 2012 - FY 2014 (IN $2017)

Impact Type	Pennsylvania	Five-County	Bucks	Chester	Delaware	Montgomery	Philadelphia
Direct Output ($M)	$1,209	$1,174	$53	$53	$106	$119	$842
Indirect & Induced Output ($M)	$1,004	$950	$91	$45	$164	$139	$511
Total Impact ($M)	**$2,213**	**$2,124**	**$144**	**$98**	**$269**	**$258**	**$1,354**
Employment Supported	17,520	16,890	1,050	740	2,020	1,920	11,160
Earnings ($M)	$1,351	$1,305	$62	$42	$140	$116	$945

Sources: See Appendix B

[7] See Appendix B for further information on ESI's approach to modeling the economic and fiscal impacts from direct expenditures.

2.5 COMBINED ANNUAL IMPACT FROM CAPITAL AND OPERATIONS

Combined, the annual economic impacts from SEPTA's capital investments and ongoing operations generate more than $3 billion dollars of impact within the Pennsylvania economy each year, supporting more than 23,000 jobs and more than $1.7 billion in earnings (see Table 2.5). This impact has increased by 14 percent from $2.7 billion a year from FY 2012-2014 (see Table 2.6).

TABLE 2.5: COMBINED ANNUAL ECONOMIC IMPACT FROM SEPTA'S CAPITAL AND OPERATIONS, FY 2015 - FY 2017 (IN $2017)

Impact Type	Pennsylvania	Five-County	Bucks	Chester	Delaware	Montgomery	Philadelphia
Direct Output ($M)	$1,648	$1,612	$83	$83	$219	$182	$1,045
Indirect & Induced Output ($M)	$1,403	$1,316	$145	$91	$215	$221	$644
Total Impact ($M)	**$3,051**	**$2,928**	**$228**	**$174**	**$434**	**$403**	**$1,689**
Employment Supported	23,370	22,590	1,650	1,300	3,240	3,010	13,390
Earnings ($M)	$1,715	$1,665	$95	$72	$212	$175	$1,111

Sources: See Appendix B

TABLE 2.6: COMBINED ANNUAL ECONOMIC IMPACT FROM SEPTA'S CAPITAL AND OPERATIONS, FY 2012 - FY 2014 (IN $2017)

Impact Type	Pennsylvania	Five-County	Bucks	Chester	Delaware	Montgomery	Philadelphia
Direct Output ($M)	$1,444	$1,401	$71	$71	$170	$156	$933
Indirect & Induced Output ($M)	$1,225	$1,147	$122	$73	$190	$187	$576
Total Impact ($M)	**$2,669**	**$2,548**	**$192**	**$144**	**$359**	**$343**	**$1,509**
Employment Supported	20,770	19,960	1,390	1,060	2,710	2,510	12,300
Earnings ($M)	$1,531	$1,477	$81	$60	$179	$149	$1,009

Sources: See Appendix B

2.6 ANNUAL TAX REVENUE IMPACT FROM CAPITAL AND OPERATIONS

This volume of annual activity yields a significant return to local governments and to the Commonwealth of Pennsylvania in the form of tax revenues. While SEPTA is not directly subject to any sales, income or property tax, the wages that it pays its employees and the income indirectly generated by its activity contribute to the income tax base for local governments and for the Commonwealth. In addition, the indirect and induced impact of SEPTA's activity as it ripples throughout the economy occurs broadly within the private sector of the economy, and is therefore tax generating.

On an annual basis, the total economic activity (including direct, indirect and induced impacts) from SEPTA's capital investments and ongoing operations generates $68 million in tax revenue for the Commonwealth of Pennsylvania and well $37 million in revenue for the City of Philadelphia (see Table 2.7).

TABLE 2.7: COMBINED ANNUAL TAX REVENUE FROM SEPTA'S CAPITAL AND OPERATIONS, FY 2015 - FY 2017 (IN $2017)

	City of Philadelphia			Commonwealth of Pennsylvania		
Tax Type	**Operations**	**Capital**	**Total**	**Operations**	**Capital**	**Total**
Income ($M)	$26	$3	$29	$30	$9	$39
Sales ($M)	$2	$1	$3	$16	$6	$22
Business ($M)	$4	$1	$5	$5	$2	$7
Total ($M)	**$32**	**$4**	**$37**	**$51**	**$17**	**$68**

Sources: See Appendix B

Importantly, these tax revenue impacts are reflective only of the activity related to SEPTA's economic footprint (as reviewed throughout this section), and do not include the significant fiscal implications for local government and for the Commonwealth of the catalytic impacts on property value and development discussed in Section 3 below.

3.0 SEPTA'S PROPERTY VALUE AND DEVELOPMENT IMPACTS

The broadest economic benefits from transit service are derived not from the expenditure and employment footprint of the agency itself, but from the economic activity and investment that transit service itself enables and attracts. Transit service is a valued amenity to many commuters, reducing their transportation costs in both dollars and time. Accordingly, its effects can be seen on residential property values and on clusters of population growth. In addition, transit service enables the movement of people at scale needed to support dense clusters of commercial activity in the metropolitan core and along commercial corridors throughout the city and region. These dense and productive nodes are the locus of investment and development that ultimately drive the growth potential of the regional economy and its tax base.

Robust transit service is thus a crucial component of the region's ability to attract these significant investments in a competitive environment. Importantly, it means that regional residents and businesses derive significant economic value from SEPTA service, even if they themselves are not transit riders.

3.1 SUBURBAN RESIDENTIAL PROPERTY VALUES

While public transit service confers benefits for a region and its economy writ large, some of those benefits are also captured by households through property values reflected within the housing market. Residential property transactions provide direct observations of property value as agreed to by a willing buyer and seller at a given point in time and location. A statistical technique call hedonic regression analysis can parse from these transactions the additional value conferred by a specific amenity, such as proximity to transit service, holding constant the other characteristics of the property.

For owners of these houses, the amenity value conferred by proximity to transit represents a significant (and growing) portion of the value of their home, which represents the most important financial asset for many households. Further, housing values are a central component of local and county tax bases, both through the property tax and through the real estate transfer tax.

Analytical Approach

A regression model was estimated using data from over 315,115 transactions of single-family homes in Bucks, Chester, Delaware, and Montgomery counties. The transactions cover the 2005 to 2016 period which covers the period before and the period after the housing crash in 2007. We accounted for the impact of the housing crash on house prices by including a series of variables that allowed us to control for the year that each property was sold. The data includes the sale price and date, the attributes of the individual house and the address of each property.[8]

[8] See Appendix C for a detailed description of the modeling methodology and results

Importantly, SEPTA's Regional Rail system (as well as its fixed transit modes like subways and trolleys, and its bus network) also serves residential neighborhoods within the City of Philadelphia. This analysis does not focus on the value conferred to these properties because of measurement difficulties in isolating the impact of Regional Rail service within an area where there is ubiquitous transit service from other modes as well. It should also be recognized that the service likely contributes value to rental occupied properties, and to other commercial properties (as discussed in Section 3.3 below). Accordingly, the estimates presented in this analysis should be understood as conservative.

The distance of each transaction to nearby Regional Rail and Norristown High Speed Line (NHSL) stations was calculated using Geographic Information System (GIS) tools, and distances were categorized into distance bands (0-½ mile, ½-1 mile, 1-2 miles and 2-3 miles) for the purpose of analysis.[9] In addition, a composite metric was developed to account for the relative service level of each station as a function of the number of AM peak trains, the number of AM express trains, and the number of parking spaces at the station.[10] After initial estimates were developed as a function of station quality and distance bands, a statistical process was applied to "smooth" results at the individual property level to remove significant breaks in value for nearby houses on opposite sides of a distance threshold.[11]

SEPTA Regional Rail service positively affects the value of suburban homes within convenient distances to stations.[12] Positive property value impacts are observed for all distance bands and service level qualities. Impacts increase slightly from the innermost ring (within a half mile) to the band between a half and one mile, then decline as distance increases. Impacts also increase in a relatively linear pattern as service level rating increases.

Figure 3.1 below displays the property value impacts of SEPTA's Regional Rail and NHSL network across the region.[13] Property value impacts are shown on a percentage basis, with higher values shown in darker colors. Impacts are largest in the immediate vicinity of stations, and then dissipate out

[9] This analysis also accounted for whether properties were proximate to multiple stations, and whether they were located within a half-mile of a Norristown High Speed Line (NHSL) station. About 461,000 single-family houses, or 62 percent of all single-family houses in the four-county region, fall within the catchment of a Regional Rail station.

[10] Each component of this composite rating was normalized on a scale from 0 to 1, and weighted based on the statistical relationship between the component and station level ridership. Service level ratings for each station are calculated entirely in reference to other stations within the SEPTA network, and therefore do not imply a normative judgement of the adequacy of service at any station, but simply the relative service level compared to other SEPTA stations.

[11] For example, a house that is 1.99 miles from a station and is assigned to the 1-2 mile band may receive a materially different estimate from a house located 2.01 miles from a station assigned to the 2-3 mile band, though in practice the difference in transit proximity between the two properties may be minimal. The smoothing technique assigns a continuous set of incremental values to each house within a defined spatial grid based on the average value within each grid and those adjacent to it. When applied, those houses within a band that are adjacent to higher value bands will be assigned a higher value (for example, a house at 1.01 miles from a station will likely be assigned a higher value than a house at 1.99 miles) and values for nearby houses will likely vary incrementally from each other, rather than being uniform within a distance band..

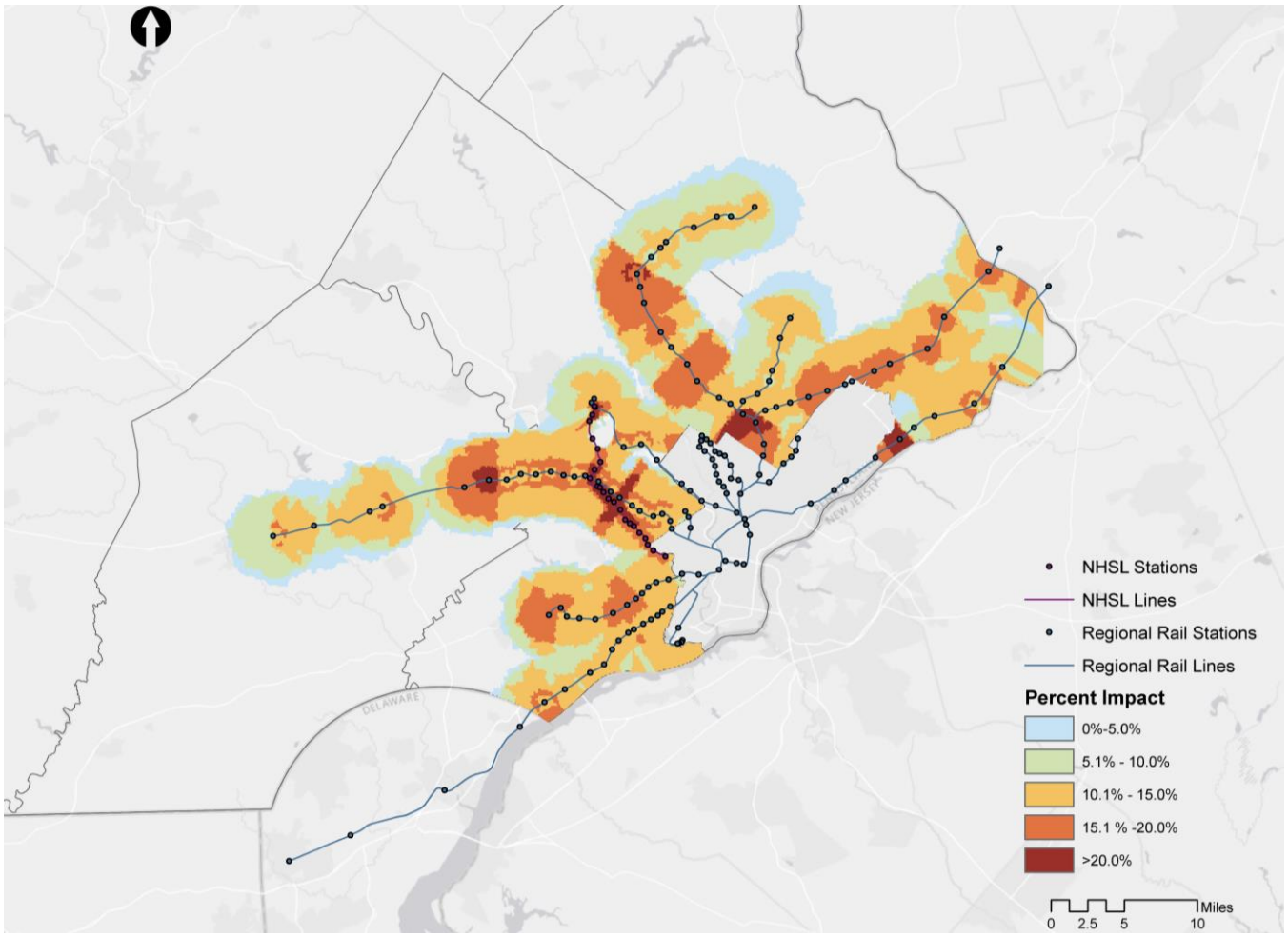
[12]Note that NHSL stations were not differentiated by service level in the manner described above, and that the catchment area for these stations was calculated out to a one-half mile rather than the three miles for Regional Rail stations. Within this analysis, NHSL service should be viewed as an additive contributor to the overall value attributed to Regional Rail stations, rather than a unique subject of the analysis in and of itself.

[13] All transactions within the City of Philadelphia or outside of the Commonwealth of Pennsylvania are excluded. Note that those lines such as the Chestnut Hill East and West that are located entirely within the City of Philadelphia are still included in the analyses, because the three miles buffer around stations within these lines reaches portions of the suburban counties.

An interactive version of this map, which includes values for each individual property, can be accessed online at < www.septa.org/economic-impact>

to a three mile buffer. The interaction between stations and lines yields additional value (for example, where the NHSL and Thorndale Regional Rail lines run in close proximity near the border between Delaware County and Montgomery County). Finally, stations with higher service levels can yield higher impacts than neighboring stations along the same lines

FIGURE 3.1: HOUSING VALUE IMPACTS



Source: ESI Calculations

Aggregate Results

In aggregate, SEPTA's rail service adds $14.5 billion in residential property value across Bucks, Chester, Delaware and Montgomery counties (see Figure 3.2):

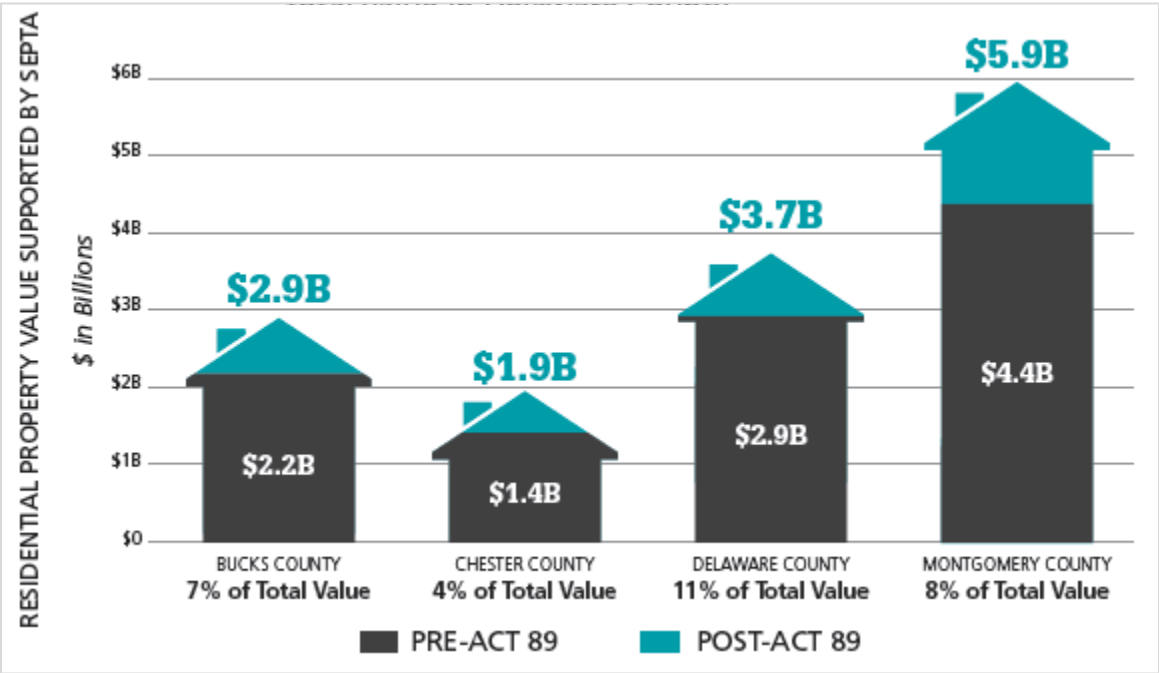
- Impacts range from $1.9 billion (representing 4 percent of total value) in Chester County to $5.9 billion (representing 8 percent of total value) in Montgomery County.[14]

- This $14.5 billion increment represents 7.4 percent of the aggregate single family residential property value across the suburban counties.

- The average value increment per house across the four counties is $19,400.[15]

- Impact levels are about one-third higher than those observed before Act 89 (using transactions from 2005-2013), which total $10.9 billion, or 5.7 percent of total value.[16]

FIGURE 3.2: INCREMENTAL SUBURBAN RESIDENTIAL PROPERTY VALUE



Source: ESI Calculations

[14] This increment implies that existing property values would be estimated to fall by this amount if service were discontinued. Note that the hedonic model estimates the value of accessibility generated by SEPTA in the suburban counties and does not value the loss associated with a diminished economy or increased congestion that would result from the elimination or reduction of Regional Rail service, both of which would have an additional impact on property values over time by reducing demand. As such, these impacts should be thought of as capturing the amenity value for proximity to transit only, and represent a lower bound estimate of the property value impacts that would result in the long run from a suspension of SEPTA's Regional Rail service.

[15] Note that both the percentage of total value and the average increment are calculated among all households, including those that are not proximate to transit (and therefore have an incremental proximity value of $0). Among only those households that are proximate to transit, the average incremental value from transit is around $31,000, representing around 12 percent of current housing value.

[16] Note that the statistically significant differences between the two periods of time do not establish Act 89 as the causal mechanism for the relative importance of transit in suburban housing values, but does demonstrate the increasing relative importance of transit proximity in the housing market. From an economic standpoint, the increased reliability of future service enabled by Act 89 should impact the economic decisions of both residents and businesses that consider transit a valued amenity. See Appendix C for further discussion.

Incremental values can also be calculated for housing that is proximate to a given rail line or station. Table 3.1 below shows the incremental home value attributable to transit near each of the thirteen SEPTA Regional Rail lines.

- In percentage terms, average impacts per house fall into a relatively narrow band ranging from 11 percent to 15 percent.

- Incremental value varies significantly in dollar terms by line based on the average house price against which the transit increment is applied, and the volume of single family housing within the buffer area of each line.[17]

TABLE 3.1: SUBURBAN RESIDENTIAL PROPERTY VALUE IMPACTS BY REGIONAL RAIL LINE

Line	Transit Attributable Home Value ($M)	Transit Proximate Houses	Average Impact per House (%)	Average Impact per House ($)
Airport	$354	30,300	12.1%	$11,700
Chestnut Hill East	$412	11,500	14.7%	$35,800
Chestnut Hill West	$331	9,400	12.7%	$35,300
Cynwyd	$777	18,200	13.6%	$42,800
Doylestown	$3,590	101,700	12.3%	$35,300
Elwyn	$2,319	103,700	12.7%	$22,400
Fox Chase	$489	12,600	14.4%	$38,800
Newark	$1,578	91,400	12.3%	$17,300
Norristown	$1,776	45,200	11.8%	$39,300
Thorndale	$4,610	98,900	12.5%	$46,600
Trenton	$990	49,000	11.2%	$20,200
Warminster	$1,763	66,300	11.1%	$26,600
West Trenton	$3,083	99,700	12.9%	$30,900

Source: ESI Calculations

[17] Importantly, the three miles buffers between rail lines overlap to a significant degree (as seen in Figure 3.1). All properties within the three mile buffer of a line are included in the calculation of incremental value by line, even when those properties also fall within the buffer of a different rail line, or also derive value from proximity to a NHSL station. Accordingly, the nearby value increment for all lines sums to a greater number than the total value by county. Values are best understood as the incremental value conferred by transit within a three mile buffer of each line, rather than value that is specifically attributable to that line. No double counting of houses occurs within any single three mile buffer.

Tax Revenue Implications

This incremental value is also crucial to supporting the tax base of local governments and school districts, which typically rely on real estate-related taxes as their primary source of revenue. Incremental increases in property values due to the amenity value of transit lead to additional government revenue (or alternatively lower tax rates for all residents) through local property taxes on the assessed value of residential houses. Higher sales prices also lead to increases in local and Pennsylvania collections of the real estate transfer tax when a property is sold. Incremental real estate transfer tax revenue can estimated in a straightforward manner from observed sales, and is estimated below. The magnitude of revenue impact from higher property tax collections is much higher, but due to variable assessment practices and tax rates across suburban communities it is not quantified as part of this report.[18]

The observed sales price for all single family housing sales in the suburban counties from 2014-2016 can be combined with the estimated property impacts from transit to yield an incremental sales value attributable to transit. This reflects, for all single family houses sold over this period, the additional price of those sales due to transit proximity, which totaled about $700 million per year (or 7.5 percent of total sales value). The real estate transfer tax rate at the county and Commonwealth level are then applied to this increment in order to estimate the additional revenue generated on an annual basis by the positive effect of transit proximity on housing values. It is estimated that the incremental value attributable to transit in the four-county regions generates around $7 million in additional Commonwealth revenues each year, and around $3.5 million each in additional revenues for county governments and schools (see Table 3.2).

TABLE 3.2: AVERAGE ANNUAL REAL ESTATE TRANSFER TAX IMPACTS FROM SEPTA SERVICE (2014-2016)

Impact Type	Suburban Total	Bucks	Chester	Delaware	Montgomery
Number of Sales	29,589	7,346	6,083	6,360	9,801
Aggregate Sale Price	$9.31 billion	$2.39 billion	$2.21 billion	$1.64 billion	$3.07 billion
Sales Increment from Transit	$699 million	$157 million	$98 million	$162 million	$281 million
Incremental Real Estate Transfer Tax	$13.97 million	$3.14 million	$1.97 million	$3.24 million	$5.63 million
Pennsylvania (1%)	$6.99 million	$1.57 million	$0.98 million	$1.62 million	$2.81 million
County (0.5%)	$3.49 million	$785,000	$492,000	$809,000	$1.41 million
School (0.5%)	$3.49 million	$785,000	$492,000	$809,000	$1.41 million

Source: ESI Calculations

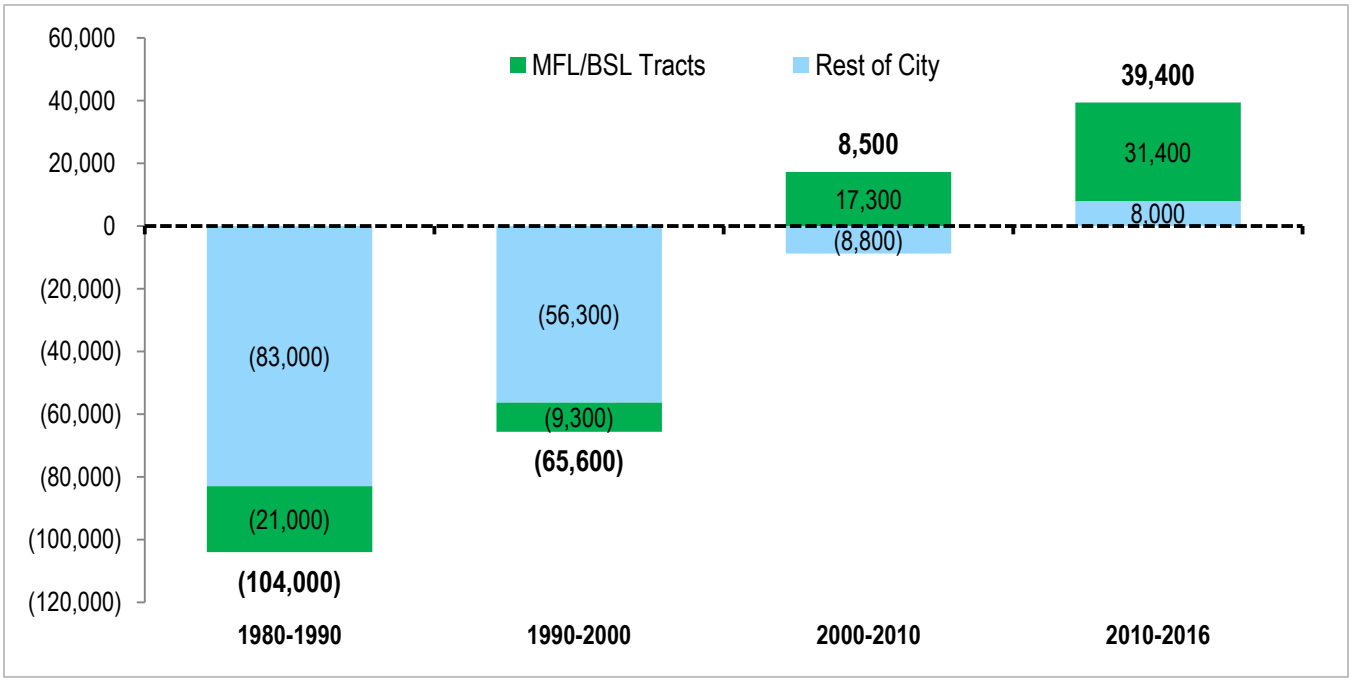
[18] In addition to variation by county, municipality and school district in property tax rates, property tax assessments are not conducted on a regular basis, meaning that assessed values against which property taxes are applied do not always align with market values, frustrating a direct translation of property value impacts into tax revenue impacts. See Appendix C for further discussion.

3.2 PHILADELPHIA NEIGHBORHOOD GROWTH

As noted in Section 1.3, the five counties of southeastern Pennsylvania accounted for more than 100 percent of Pennsylvania's population growth from 2010-2016. Of that growth, the majority took place within Philadelphia, which added nearly 40,000 residents over this six-year period. This population growth in Philadelphia represents the reversal of long-range trends, which saw the city's population drop from a peak of more than 2 million in 1950 to a low point of less than 1.5 million in 2006 before beginning to grow again.

Census tract level data shows that Philadelphia's population recovery and recent growth has been largely driven by tracts bordering the city's two high frequency, metro-style routes, the Market Frankford Line (MFL) and the Broad Street Line (BSL). In the 1980s and 1990s, population declines in these tracts were moderate, while the city as a whole suffered significant losses. Between 2000 and 2010, the population in these tracts grew enough to offset losses elsewhere in the city, leading to a slight increase in citywide population. From 2010 to 2016, population in these tracts has grown by 31,400, representing more than three-quarters of the citywide growth over this period (see Figure 3.3). As of 2016, the total population in these MFL/BSL tracts is around 364,000, nearly one-quarter of the citywide population of 1.57 million.

FIGURE 3.3: HISTORIC POPULATION GROWTH ADJACENT TO MFL AND BSL SUBWAY LINES



Source: U.S. Census Bureau

A citywide spatial analysis shows a clear relationship between patterns of population growth, housing values, and development activity over the 2010-2016 and the routes that provide frequent service:

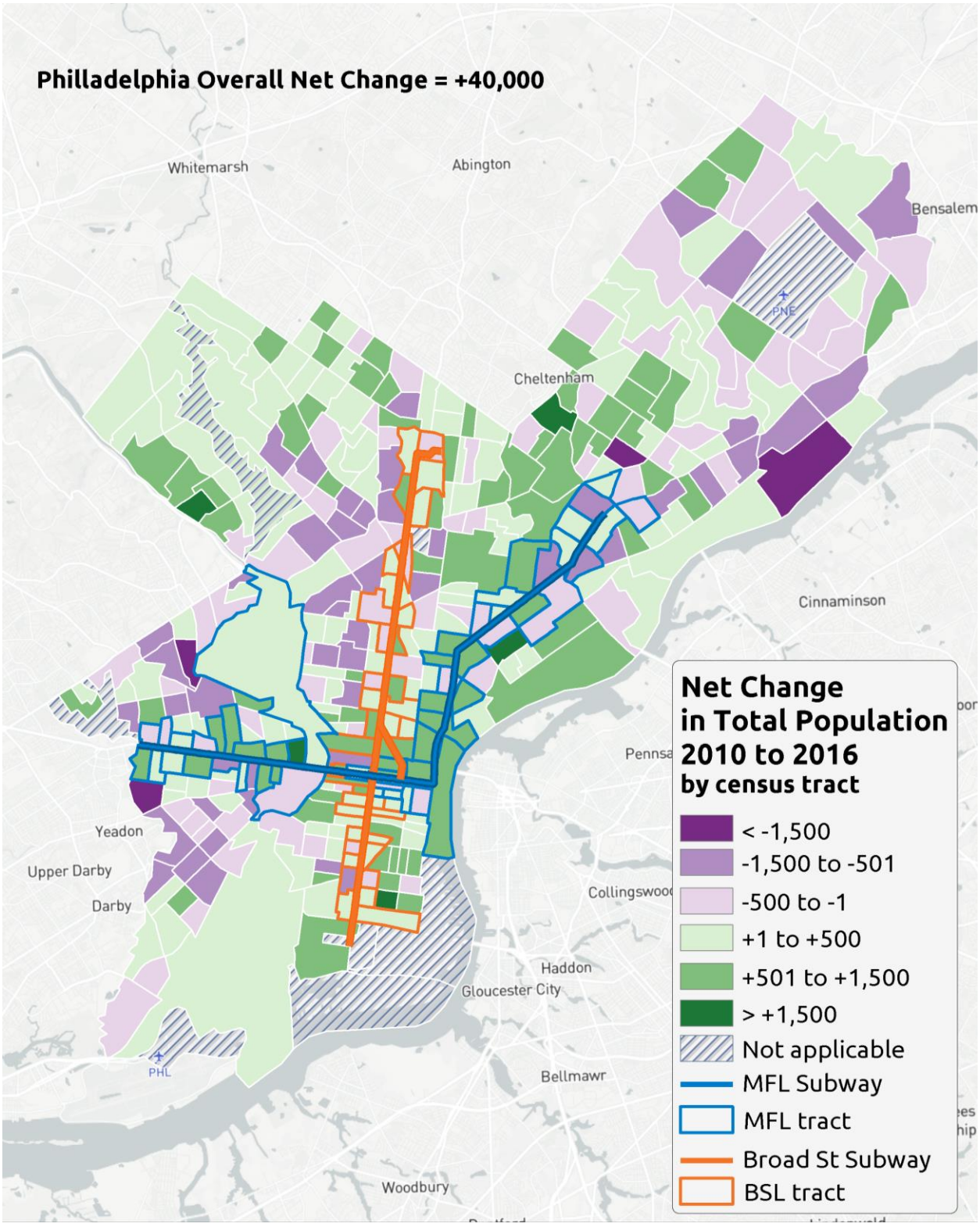
- Figure 3.4 maps the net change in population from 2010 to 2016 in each Census tract in Philadelphia. Clear population growth patterns are visible (in green) along the eastern branch of the MFL (in the neighborhoods of Fishtown and Kensington), west of Center City along the MFL and in lower North Philadelphia along the BSL).

- Figure 3.5 maps the change in residential property values from Q1 2010 to Q4 2016 by neighborhood, as measured by ESI's Philadelphia Housing Index.[19] Neighborhoods served by the MFL that are centers of population growth (like Fishtown and Kensington) have also seen a significant appreciation of housing values. Value increases are also seen in neighborhoods at the periphery of Center City (like Point Breeze to the south and Brewerytown and Poplar to the north) that benefit from access to downtown through a combination of transit options (including the BSL and frequent bus service).

- Figure 3.6 maps total residential and commercial building permits over the 2010-2016 period. In addition to the nodes of population and housing growth described above, clusters of development activity are visible along the trolley routes serving west and southwest Philadelphia, and around the northern termini of the BSL and MFL.

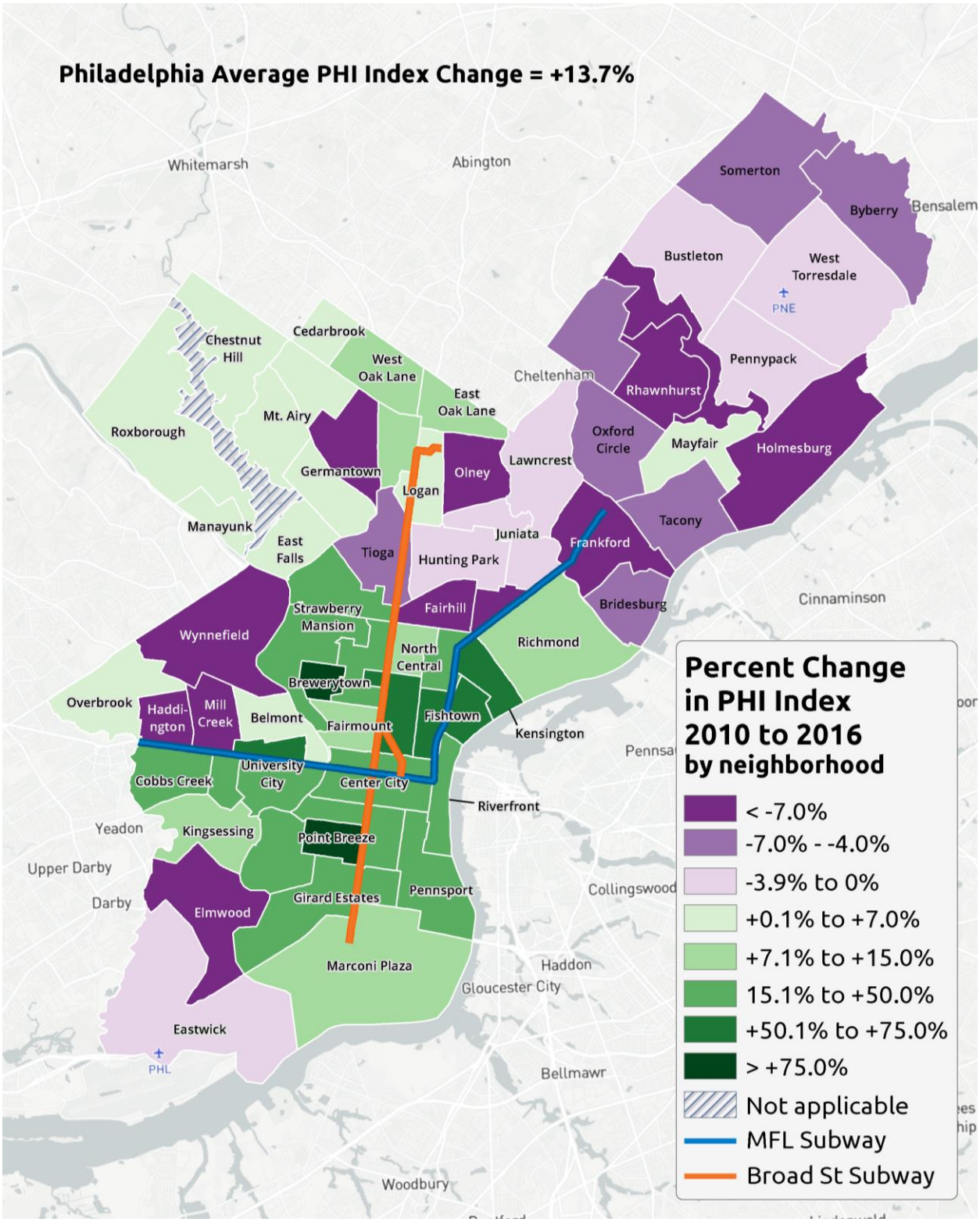
[19] For more information on the methodology utilized and updated results from this data source, see: <http://www.econsultsolutions.com/philadelphia-housing-index/>

FIGURE 3.4: CHANGE IN PHILADELPHIA POPULATION BY CENSUS TRACT, 2010-2016



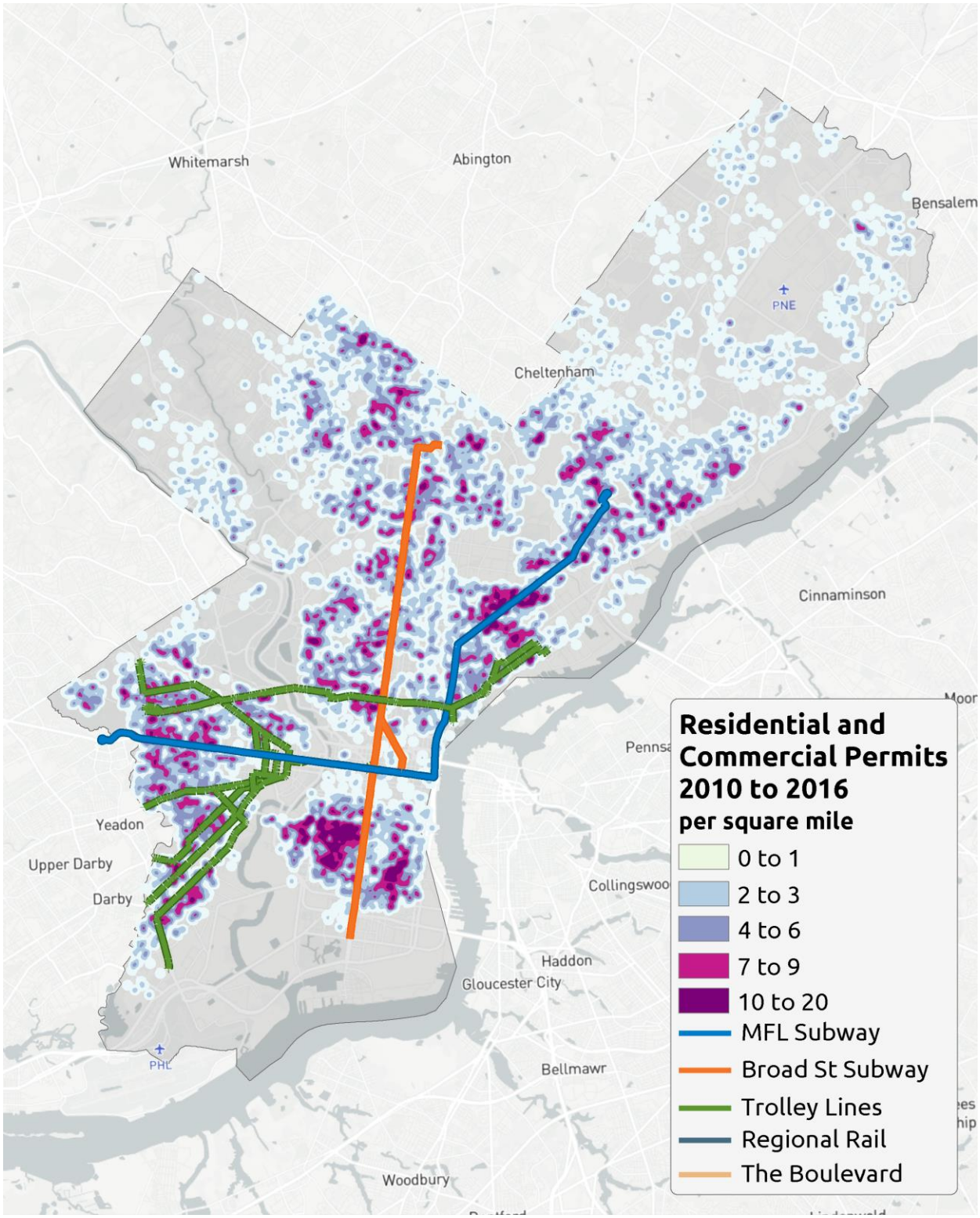
Source: American Community Survey (July 1 Population Estimates)

FIGURE 3.5: CHANGE IN PHILADELPHIA RESIDENTIAL HOUSING VALUES BY NEIGHBORHOOD, 2010-2016



Source: ESI Philadelphia Housing Index (PHI)

FIGURE 3.6: PHILADELPHIA RESIDENTIAL AND COMMERCIAL BUILDING PERMIT DENSITY, 2010-2016



Source: ESI Analysis of City of Philadelphia data

3.3 COMMERCIAL DEVELOPMENT

The Greater Philadelphia region has well over 80 million square feet of commercial office space as well as vast amounts of retail space. Not only does SEPTA connect the city's workers and residents to these properties but it also encourages additional investments along its Regional Rail, subway, bus, and trolley lines. Both residents and businesses value proximity to public transportation which encourages both commercial development and employment growth in transit-served areas.

The regional transportation network is also a crucial differentiator in the competitiveness of a region, and accordingly a major facilitator of regional productivity and economic growth. Congestion and extended commute times have an economic and quality of life cost for regional residents and businesses. More narrowly, increased density within a metropolitan core has a demonstrated relationship with increased productivity and knowledge spillover (often described as "agglomeration effects") that enhance a region's competitiveness and yield further growth in a reinforcing cycle. Robust transit service is crucial to a balanced transportation network that can overcome the spatial geometry challenge of delivering a significant volume of daily commuters into an area with a limited footprint without enduring costly congestion delays.

This section discusses patterns of commercial development supported by SEPTA's regional transit network. It covers in turn the concentration of employment in Philadelphia's downtown core, the redevelopment of parking lots within this downtown area, transit oriented development along key nodes and stations, and the role of transit in the revitalization of suburban commercial centers.

Downtown Employment Density

Employment density in a downtown core is a key determinant of regional productivity and growth. Regions are effectively competitors with one another to attract businesses, investment, and ultimately people. In this environment, the ability of a transportation network to efficiently connect workers with businesses is one of the determinants of attractiveness.[20] Concentrations of employment in an urban core capitalize on infrastructure that can bring commuters to a central area at scale, increasing the efficiency of the overall network. Public transit is central to enabling such a network to function.

Employment density is also associated with higher levels of productivity and economic growth. Volumes of economic research have identified the benefits from agglomeration, which boost productivity by enabling the rapid exchange of knowledge and ideas, spurring innovation.[21] These gains are often self-reinforcing, as nodes of specialized knowledge attract further investment, yielding still greater density and growth. Importantly, agglomeration effects apply to consumption as well, with concentrations of amenities (such as food and beverage, retail or arts and culture) in a particular area attract a disproportionate share of consumer spending.

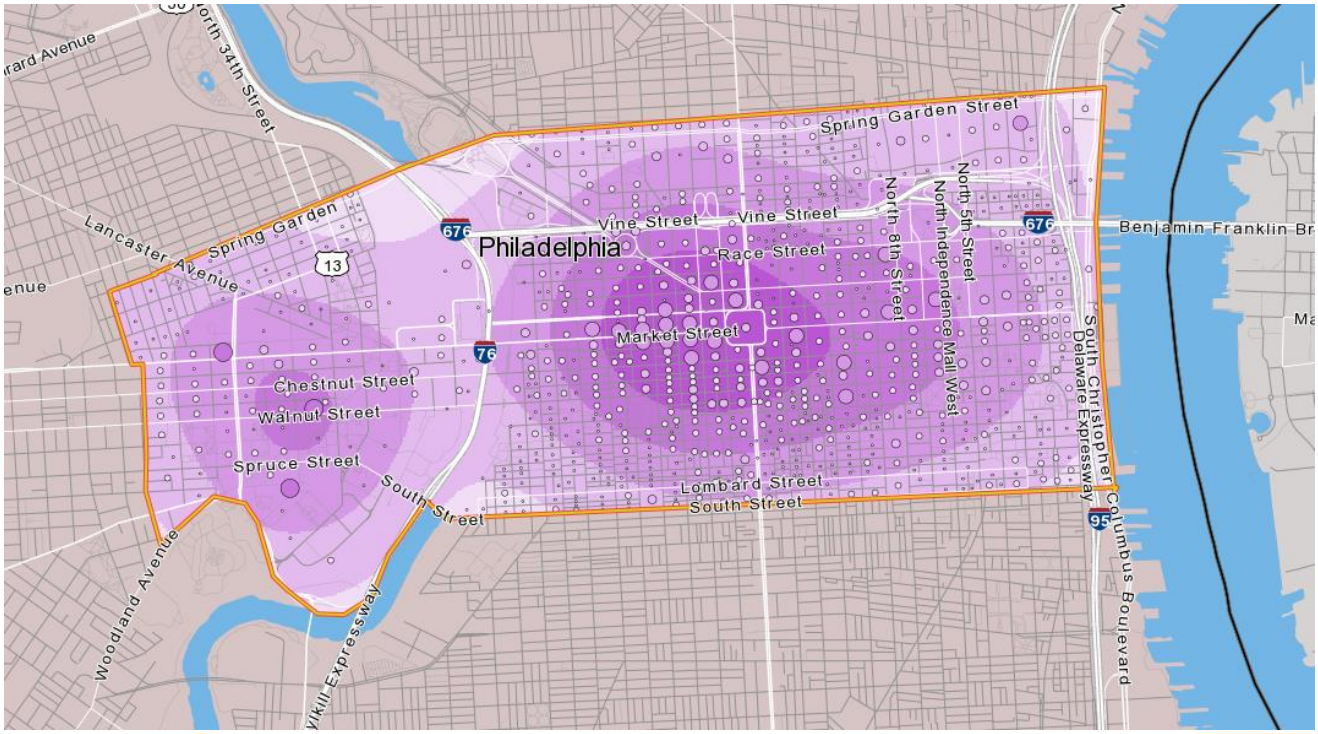
Philadelphia's urban core increasingly represents such a center of employment density and productivity. The downtown area defined in Figure 3.7 stretches from Spring Garden to South Street and from the Delaware River to 42nd Street in order to include the primary employment hubs of Center City and University City. More than 300,000 primary jobs are located within this boundary, accounting for effectively half (49 percent) of all primary employment in the city of Philadelphia. Density is highest at the core of Center City (as denoted by the darker shading) around key transit access points at City Hall and Suburban Station.

[20] For example, when Jefferson Health recently evaluated locations for consolidating its corporate headquarters, it narrowed its focus by considering "the commute length to different location options, as well as their access to public transportation and nearby amenities." In December 2017, Jefferson announced it had signed a 16 year lease at 1101 Market Street, directly above SEPTA's Jefferson Station. Senior Vice President of Facilities and Real Estate Ronald Bowlan credited this decision to the site's access and amenities, stating that "corporate functions can work in any location, but the analysis with employees, public transportation and amenities that will be there when East Market and the Gallery is completed, it worked for us."

See: Natalie Kostelni, "How Jefferson went from 30 possible sites to 1101 Market for new HQ." *Philadelphia Business Journal,* December 26, 2017. <https://www.bizjournals.com/philadelphia/news/2017/12/26/jefferson-health-new-hq-1101-market-street-search.html>

[21] See for example: National Bureau of Economic Research. "Agglomeration Economics." Edward Glaeser, Editor. 2010. <http://papers.nber.org/books/glae08-1>

FIGURE 3.7: PHILADELPHIA DOWNTOWN EMPLOYMENT DENSITY, 2015



Source: Census Bureau LEHD (2015)

This area covers 4.5 square miles of land, yielding a concentration of about 70,000 jobs per square mile. By contrast the region as a whole has 1.8 million jobs in 2,200 square miles – a density of roughly 900 jobs per square mile.

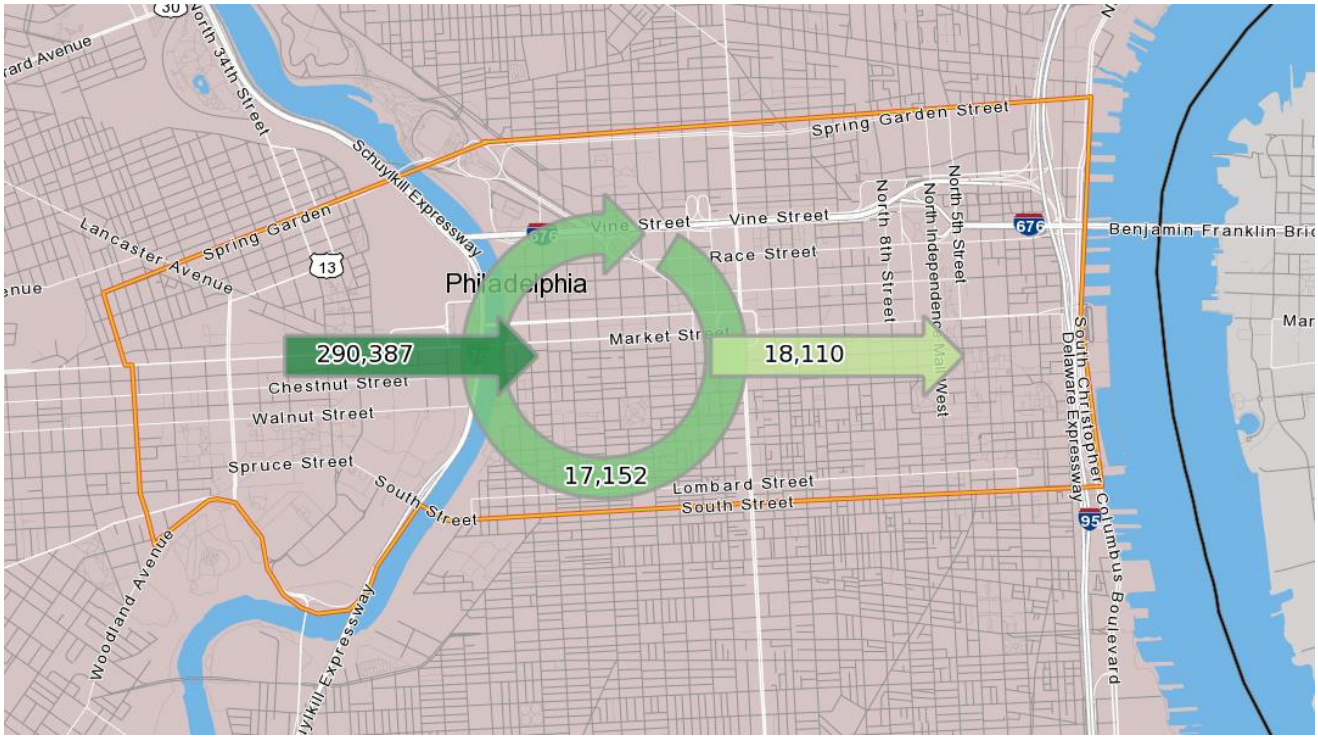
The vast majority of these workers do not reside in this downtown core, but instead commute into it on a daily basis:

- More than 290,000 workers (94 percent of downtown employees) live outside of the urban core, while just 17,000 live and work within the area (see Figure 3.8).

- The majority of these workers (51 percent) live in Philadelphia and approximately 79 percent live in the five-county region. The remaining 65,000 (21 percent) workers commute into Center City from New Jersey, other counties in Pennsylvania, Delaware, and New York (see Table 3.3).

- In addition, around 18,000 residents in the downtown core commute outside of the core on a daily basis. SEPTA's Regional Rail service sees around 9,000 AM boardings from its downtown stations each weekday, indicating that these out commuters from downtown are also strongly reliant on transit service.

FIGURE 3.8: COMMUTING PATTERNS INTO AND OUT OF DOWNTOWN PHILADELPHIA, 2015



Source: Census Bureau LEHD (2015)

TABLE 3.3: HOME LOCATION OF DOWNTOWN WORKERS, 2015

Home Location	Workers	% of Workers
Five-County Region	*243,000*	*79%*
Philadelphia County, PA	155,500	51%
Montgomery County, PA	32,600	11%
Delaware County, PA	31,900	10%
Bucks County, PA	12,500	4%
Chester County, PA	10,500	3%
Outside Region	*64,600*	*21%*
New Jersey	38,500	13%
Rest of PA[22]	17,800	6%
Delaware	3,800	1%
New York	1,600	1%
Other	2,800	1%
Total	**308,000**	**100%**

Source: Census Bureau LEHD (2015)

[22] The top Pennsylvania counties of origin outside of the southeast region include the counties immediately proximate to the region (Lancaster, Berks, Lehigh and Northampton) which combine for around 6,000 daily commuters. The remaining commuters are dispersed across the Commonwealth

Downtown Parking Lot Development

Surface parking lots represent a low intensity use for land within a central business district like downtown Philadelphia, limiting the density and in turn the productivity of the city and region. The land use decisions of property owners are a product of a set of incentives that are impacted in multiple respects by transportation service. First, robust transit service reduces the volume of commuters choosing to drive into the business district on a daily basis, which in turn reduces the pricing power and therefore profitability of operating a parking lot. Second, robust transit service increases the viability of high intensity uses like high-rise office buildings and multifamily housing by enabling large number of commuters to access a site. Therefore, transit service is a crucial variable in evaluating the relative attractiveness of parking and development uses in a central business district.

According to the Philadelphia City Planning Commission, Center City Philadelphia saw its parking inventory decline by 7.2 percent from 2010 to 2015, falling from just over 50,000 parking spaces in 2010 to 46,400 in 2015.[23] Meanwhile, between 2010 and 2015, developments on previous parking facilities eliminated 2,426 parking spaces in 16 lots and garages in Center City. The decrease in parking inventory was paired with a decrease in the occupancy rate from 77.7 percent in 2010 to 73.9 percent in 2015, indicating that parking demand fell even further than supply, suggestion the potential for continued development. Prominent examples of large scale developments of former parking lots currently underway include:

- **Comcast Technology Center:** At 1800 Arch Street, a 360-space public parking lot has been replaced by the Comcast Technology Center. The 60-story skyscraper (the tallest in the country outside of New York and Chicago) will provide Philadelphia's downtown with over 1.5 million square feet of office, hotel, and retail space when the project is complete in spring of 2018. The tower will host 3,000-4,000 employees on a daily basis (the ninth largest without any dedicated parking for this workforce, which is made possible by its proximity to SEPTA's Suburban Station.

- **Lincoln Square:** On the corner of Broad and Washington, construction has begun on Lincoln Square, a mixed-use development which will include over 300 apartments, over 400 parking spots, and approximately 100,000 square feet of retail space easily accessible via SEPTA's Broad Street Line. The project, scheduled to be completed by the end of 2018, will replace the previously empty parking lot and create a southern anchor for the Avenue of the Arts.

- **1301 Market:** Across the street from City Hall, the 110 spot parking lot at 13th and Market will be replaced by a 38-story office tower. The planned 840,000 square foot building will be completed in 2020 and will include two roof top terraces, a fitness area, and a conference center along with retail and restaurant space on the ground floor.

[23] See: Philadelphia City Planning Commission. "Center City Philadelphia Parking Inventory", 2015 <www.phila.gov/CityPlanning/aboutus/planningservices/Documents/2015_Parking_Study.pdf>

COMCAST TECHNOLOGY CENTER

Source: Comcast

LINCOLN SQUARE RENDERING

Source: Alterra Property Group

Transit-Oriented Development (TOD)

The amenity value provided by transit service is increasingly recognized as an opportunity for compact, mixed use development in both urban and suburban locations. TOD projects follow sound land use strategies by aligning commercial activity, neighborhood amenities and transportation access, enabling larger concentrations of residents and commuters. The Delaware Valley Regional Planning Commission (DVPRC) has developed an extensive database of TOD projects completed or planned throughout the Philadelphia region, as well as resources on opportunities for TOD development.[24]

Within Philadelphia, completed and planned TOD projects represent some of the largest scale investments in the region. Most prominently, the area around 30th Street Station is increasingly viewed as a potential hub of employment rivaling Center City. In addition, TOD projects represent building blocks in underinvested communities like North Philadelphia and West Philadelphia.

Large-scale completed and planned projects within Philadelphia include:

- **FMC Tower:** Known as the city's first "vertical neighborhood", FMC Tower stands at 730-feet tall and includes both office space and residential space in addition to ground floor retail and restaurant space. Its location across from 30th Street Station provides easy access for its residents and workers alike. Notably, the Cira South parking garage, which connects to FMC Tower with the 33 story Evo Cira Centre South, has significant underused capacity, and plans are underway to convert the ground floor from parking to a food hall.[25]

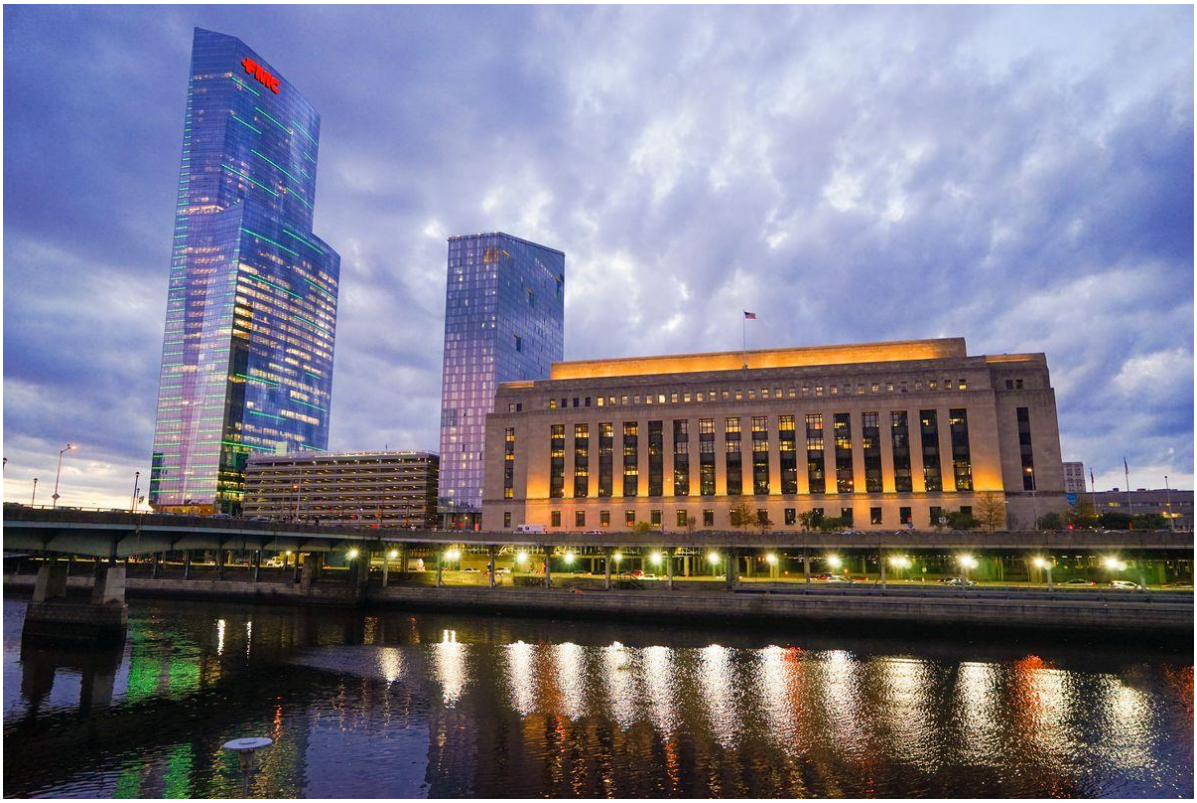
- **Schuylkill Yards:** At 30th and Market Streets, the construction of the $3.5 billion Schuylkill Yards project began in late 2017. Drexel University and Brandywine Realty Trust have partnered to transform 14 acres in University City into an innovation hub over the next 15 to 20 years, with a master plan calling for 6.9 million square feet of new construction. The first phase of the project will include Drexel Park, a 12,000 square foot green lawn across from 30th Street Station, in addition to 4.6 acres of residential, office, research, and retail development.

- **North Station District:** The first phase of this transformative transit-oriented development was announced in early 2017. The currently vacant four-acre site across from the North Philadelphia Station will include two residential buildings with over 200 apartment units and 215,000 square feet of office space. The project will revitalize this blighted area in North Philadelphia and its strategic location alongside the North Philadelphia Regional Rail Station and along the Broad Street Line will connect it to Center City.

[24] See: Delaware Valley Regional Planning Commission. "Transit-Oriented Development." <https://www.dvrpc.org/TOD/>

[25] See: Inga Saffron. "Philadelphia has a new skyline, and it's not in Center City." *Philadelphia Inquirer.* June 4, 2017. < http://www.philly.com/philly/columnists/inga_saffron/philadelphia-has-a-new-skyline-and-its-not-in-center-city-20170601.html>

FMC TOWER AT CIRA CENTRE SOUTH



Source: Curbed Philadelphia

SCHUYLKILL YARDS RENDERING

Source: Brandywine Realty Trust

Suburban Commercial Centers

TOD projects are also a crucial component of changing development patterns in suburban communities across the region. Consumer preferences are increasingly shifting away from the traditional car-oriented shopping centers, and towards suburban communities that are creating pedestrian-friendly downtowns that connect businesses and amenities to residents. Transit stations are crucial to enabling the density needed for these communities, supporting local retail and office uses and allowing residents easy access to employment opportunities.

Large-scale completed and planned projects across the region include:

- **King of Prussia:** SEPTA's planned King of Prussia Rail Project will connect downtown Philadelphia and the suburban towns along the Norristown High Speed Line to King of Prussia. In doing so, the areas surrounding the station stops will benefit from new development and redevelopment around the proposed stations. ESI's previous analysis on this new service estimates that the project will stimulate approximately 310,000 square feet of new real estate development in King of Prussia each year. In turn, this new commercial, office, and residential space will bring an additional 1,200 employees and 400 new residents to the area each year.[26]

- **Ambler:** Multiple residential and commercial projects near Ambler Station have helped to revitalize the borough's commercial core within a Redevelopment Overlay District. Station Square at Ambler is a townhome development roughly one-third of a mile from the station that features 58 three-story townhomes. Immediately adjacent to the station, a long-abandoned industrial building has been adapted into a LEED-certified class-A office building called Ambler Boiler House.

- **Ardmore:** Dranoff Properties began construction on One Ardmore Place during the spring of 2017. The $58 million 110-unit luxury apartment complex is designed to minimize the environmental footprint of its residents. In addition to residential space, the development will include ground floor restaurants and shops, a landscaped terrace, and recreation area. The development itself will transform the neighborhood into a walkable suburban community with mass-transit options to connect its residents with the region's largest employment centers.

- **Malvern:** Just one-quarter mile from the Malvern Station, the Eastside Flats were built to bring the pedestrian friendly restaurants and retail to downtown Malvern. The complex includes 190 rental apartments, 25,000 square feet of retail space, and 5,000 square feet of office space all located in walking distance of the Paoli/Thorndale Line.

[26] See: The Economy League of Greater Philadelphia. "Connecting KOP: The Benefits of SEPTA's King of Prussia Rail Project", December 2015. <http://economyleague.org/providing-insight/regional-direction/2015/12/15/new-study-the-benefits-of-septa-king-of-prussia-rail>

KING OF PRUSSIA RENDERING

Source: SEPTA

EASTSIDE FLATS IN MALVERN

Source: Lincoln BP Management Inc.

APPENDIX A – METHODOLOGY: SOUTHEASTERN PENNSLYVANIA SHARE OF COMMONWEALTH

The share of Pennsylvania's general fund attributable to the five-county southeastern region (Bucks, Chester, Delaware, Montgomery and Philadelphia counties) is estimated by utilizing government and private data sources to allocate the geographic source of revenues for each of the major general fund revenue sources. Collectively, sales tax, income tax, corporation tax and estate and realty transfer tax revenue comprised 90 percent of Pennsylvania's general fund revenues in FY 2015-2016.

The tables below detail the data sources utilized to estimate the county by county contribution to each revenue source, and the proportion of Commonwealth revenues estimated to originate in southeastern Pennsylvania. The weighted average of the southeastern Pennsylvania contribution to each of these funds represents the region's overall contribution to the Commonwealth's general fund.

Income tax revenue is the largest single revenue source for the Pennsylvania general fund, accounting for 36 percent of general fund revenue (or $11.0 billion). Data from the Pennsylvania Treasury available in the statistical supplement to the Pennsylvania FY 2015-2016 Tax Compendium tracks the remittance of personal income tax by county.[27] Data from calendar year 2014 indicates that the southeast region accounts for 36.1 percent of Pennsylvania income tax collections (see Table A.1).[28]

TABLE A.1: DISTRIBUTION OF PENNSYLVANIA INCOME TAX REVENUE (FY 2015-2016)

	Pennsyl-vania	Five-County	Five-County Share of PA	Bucks	Chester	Dela-ware	Mont-gomery	Phila-delphia
Income Tax ($M)	**$10,963**	**$3,962**	**36.1%**	**$756**	**$720**	**$590**	**$1,127**	**$768**
Data Sources / Method								
Income Tax Paid	Income Tax Paid by County – Pennsylvania Treasury (2014)							

[27] For the full report, see: <http://www.revenue.pa.gov/GeneralTaxInformation/News%20and%20Statistics/Pages/Reports%20and%20Statistics/Tax-Compendium.aspx>

[28] This figure is likely somewhat smaller than the southeastern region's contribution to the overall Pennsylvania economy (41 percent of gross economic product, as detailed in Section 1.3) due to commute patterns across state borders. Residents of the southeastern region who live in nearby states (like New Jersey and Delaware) do not pay the Pennsylvania income tax.

Sales tax revenue represents about one-third of Pennsylvania's general fund (or $9.7 billion). Based on data from the Pennsylvania Treasury, it is estimated that the southeastern Pennsylvania region accounts for 31.6 percent of all sales tax revenues to the Commonwealth.[29]

TABLE A.2: ESTIMATED DISTRIBUTION OF PENNSYLVANIA SALES TAX REVENUE (FY 2015-2016)

	Pennsyl-vania	Five-County	Five-County Share of PA	Bucks	Chester	Dela-ware	Mont-gomery	Phila-delphia
Sales Tax Remittance ($M)	$4,414	$1,250	28.3%	$221	$218	$188	$302	$322
Motor Vehicle Sales Tax Remittance ($M)	$1,348	$395	29.3%	$74	$63	$53	$90	$114
Miscellaneous/LCB Sales Tax ($M)	$3,898	$1,408	36.1%	$269	$256	$210	$401	$273
Total ($M)	**$9,659**	**$3,054**	**31.6%**	**$564**	**$537**	**$451**	**$793**	**$709**
Data Sources / Method	*Note: Columns may not sum due to rounding*							
Sales Tax Remittance	Direct Remittance by County – Pennsylvania Treasury (FY 2016)							
Motor Vehicle Remittance	Direct Remittance by County – Pennsylvania Treasury (FY 2016)							
Miscellaneous/LCB	Geographic Shares based on Taxable Income by County – Pennsylvania Treasury (2014)							

Corporation tax revenues account for about 17 percent of Pennsylvania's general fund (or $5.1 billion). Pennsylvania Treasury data does not directly collect corporation tax revenues by originating location, and such an analysis would run into challenges due to the inconsistent relationship between the location of business activity and the physical address where corporations are headquartered (which itself may be chosen for advantageous tax purposes). Accordingly, the southeastern Pennsylvania share of the gross regional product (GRP) as reported by the IMPLAN economic software modeling package is utilized to allocate corporation tax revenues by geographic location. It is estimated that 40.7 percent of Pennsylvania corporation tax revenue originates from business activity in the southeast region (see Table A.3).

TABLE A.3: ESTIMATED DISTRIBUTION OF PENNSYLVANIA CORPORATION TAX (FY 2015-2016)

	Pennsyl-vania	Five-County	Five-County Share of PA	Bucks	Chester	Dela-ware	Mont-gomery	Phila-delphia
Corporation Tax ($M)	**$5,138**	**$731**	**40.7%**	**$241**	**$312**	**$219**	**$588**	**$731**
Data Sources / Method								
Income Tax Paid	Geographic Shares based on Gross Regional Product (IMPLAN 2015)							

[29] This figure is likely somewhat smaller than the southeastern region's contribution to the overall Pennsylvania economy due to the degree of leakage of sales across state lines enabled by the location of the five-county region near the New Jersey and Delaware borders.

Finally, inheritance/estate tax and realty transfer tax revenues account for about 5 percent of Pennsylvania's general fund (or $1.5 billion). The Pennsylvania Treasury reported collections of each of these taxes by county for FY 2015-2016. Combined, the southeast region represents 41.7 percent of all general fund revenues from these two sources (see Table A.4).

TABLE A.4: DISTRIBUTION OF PENNSYLVANIA ESTATE AND REALTY TRANSFER TAX (FY 2015-2016)

	Pennsyl-vania	Five-County	Five-County Share of PA	Bucks	Chester	Dela-ware	Mont-gomery	Phila-delphia
Estate Tax Remittance ($M)	$959	$380	39.6%	$80	$66	$57	$107	$70
Realty Transfer Tax Remittance ($M)	$561	$253	45.1%	$43	$43	$29	$62	$76
Total ($M)	**$1,519**	**$634**	**41.7%**	**$122**	**$109**	**$87**	**$170**	**$146**
Data Sources / Method	*Note: Columns may not sum due to rounding*							
Estate Tax Remittance	Direct Remittance by County – Pennsylvania Treasury (FY 2016)							
Realty Transfer Tax Remittance	Direct Remittance by County – Pennsylvania Treasury (FY 2016)							

Together, these four sources represented more than 90 percent of Pennsylvania's general fund revenues ($27.3 billion out of $30.3 billion) in FY 2015-2016. Therefore, when aggregated they serve as a reliable indicator of the southeast region's proportional contribution to the general fund. In total, southeastern Pennsylvania is estimated to generate 36 percent of the Commonwealth's general fund (see Table A.5).

TABLE A.5: DISTRIBUTION OF MAJOR PENNSYLVANIA GENERAL FUND REVENUES (FY 2015-2016)

	Pennsyl-vania	Five-County	Five-County Share of PA	Bucks	Chester	Dela-ware	Mont-gomery	Phila-delphia
Income Tax ($M)	$10,963	$3,962	36.1%	$756	$720	$590	$1,127	$768
Sales Tax ($M)	$9,659	$3,054	31.6%	$564	$537	$451	$793	$709
Corporation Tax ($M)	$5,138	$731	40.7%	$241	$312	$219	$588	$731
Estate and Realty Transfer Tax ($M)	$1,519	$634	41.7%	$122	$109	$87	$170	$146
Sum ($M)	**$27,279**	**$9,739**	**35.7%**	**$1,683**	**$1,680**	**$1,346**	**$2,677**	**$2,354**

Note: Columns may not sum due to rounding

Taxes represented account for 90 percent of Pennsylvania General Fund Revenue (FY 2016)

The proportion of Commonwealth revenues generated by the southeast region from the four major general fund revenue sources is then applied to the remaining revenue sources (for which direct geographic information is not available) to extrapolate the region's contribution to the full general fund. The region's 36% share of the $30.3 billion in total revenue implies a contribution of $10.8 billion to the general fund (see Table A.6).

TABLE A.6: CONTRIBUTION OF SOUTHEASTERN REGION TO PENNSYLVANIA GENERAL FUND REVENUES (FY 2015-2016)

	FY 2015-2016
Pennsylvania General Fund Revenue from Major Sources ($M)	$27,279
Southeastern Contribution from Major Sources ($M)	$9,739
Southeastern Contribution (%)	35.7%
Pennsylvania Total General Fund Revenue ($M)	$30,258
Estimated Southeastern Contribution (%)	35.7%
Southeastern Contribution to Total General Fund I Revenue ($M)	**$10,803**

APPENDIX B – METHODOLOGY: ECONOMIC OUTPUT

Economic impact calculations are generated by estimating the initial amount of direct activity occurring within the five-county region and Commonwealth of Pennsylvania in each category, and then using input-output models to translate this direct economic activity into the total amount of economic activity that it supports within those geographies. The total activity includes "spillover" impacts generated by spending on goods and services and by spending of labor income by employees. This section summarizes the methodologies and tools used to construct, use, and interpret the input-output models needed to estimate total economic impact of SEPTA's capital investments and ongoing operations.

SCOPE OF ANALYSIS

The analysis seeks to quantify the current annual level of economic activity associated with SEPTA. To do so, it seeks to use the most appropriate and recent data available for each component of the analysis. In some cases, these data represent the most recent available year (often 2016), while in other cases, an average of multiple years is used to provide for greater data reliability. For example, current capital investment impacts are modeled based on an average of three years of activity (FY 2015-2017) to avoid allowing any large scale project taking place in a given year to distort the calculation. To provide for a parallel methodology, operating impacts are calculated in the same manner. Throughout the analysis, the approach seeks to quantify the most representative available inputs for SEPTA's *current* impact level, rather than aligning precisely to a specific twelve-month period. Annualized capital investments and operating impacts are also calculated for the FY 2012-2014 period. Impacts for both the FY 2012-2014 period and FY 2015-2017 period are expressed in inflation-adjusted dollars ($2017) to allow for appropriate comparison of impacts.

Economic impacts are calculated for the five-county region served by SEPTA (Bucks, Chester, Delaware, Montgomery and Philadelphia counties) and for the Commonwealth of Pennsylvania. This includes direct impacts, which are modeled within the geography in which they occur, as well as indirect and induced impacts, which capture spillover effects within the relevant geographies. Tax revenue impacts are calculated for the City of Philadelphia and Commonwealth of Pennsylvania. Impacts occurring outside of these geographies are excluded, as are additional local property tax revenue effects within suburban jurisdictions.

Data utilized throughout this report are largely provided by SEPTA, and match publicly reported budgetary figures. Other data has been derived from public sources, such as property data provided by county governments, and government data on demographics and employment.

B.1 DIRECT ACTIVITY FROM CAPITAL INVESTMENTS

SEPTA provided information on annual capital expenditures by contract type for Fiscal Years 2012-2017. Expenditures were converted to current dollars using the Consumer Price Index from the Bureau of Labor Statistics.[30] Annualized expenditure amounts in $2017 were then averaged for the FY 2012-2014 period (yielding an annual average of $299 million in nominal terms and $315 million in $2017) and FY 2015-2017 period (yielding an annual average of $520 million in nominal terms and $529 million in $2017) (see Table B.1).

TABLE B.1: ANNUAL SEPTA CAPITAL INVESTMENTS (NOMINAL AND $2017)

Fiscal Year	Nominal Spend ($M)	Inflation-Adjusted Spend ($2017 M)
2012	$311.5	$331.1
2013	$305.6	$322.1
2014	$280.2	$290.6
2012-2014 Avg	**$299.1**	**$315.2**
2015	$447.9	$464.0
2016	$550.3	$563.0
2017	$561.1	$561.1
2015-2017 Avg	**$519.8**	**$529.4**

Budget detail provided by SEPTA was utilized to categorize the expenditures by type. Soft constructions costs (for services like architecture and engineering) and hard construction costs represented contracted dollars to external vendors (which in turn is spent on a mix of labor, goods and services). Additionally, SEPTA pays internal employees for capital activity. Finally, SEPTA directly purchases a range of materials and supplies.

The direct construction activity modeled within the analysis takes place within the five-county region and is therefore considered local, regardless of where contractors or employees may be headquartered or reside.[31] However, some large scale capital purchases may be sourced from outside of the region (most notably vehicle purchases, which are largely sourced externally with the exception of Silverliner V train cars manufactured in the region). These non-local materials are excluded from the regional economic impact.

In addition, some portion of purchasing takes place in the remainder of the Commonwealth outside of the five-county region. The proportion of these purchases is estimated from geographic analysis of

[30] This calculation is done by applying the ratio between the CPI-U index in 2017 and the activity year to the nominal values, which expresses the purchasing power in $2017 terms.

[31] These leakages are accounted for in the modeling of indirect and induced spending, as described in Section A.3 below.

SEPTA purchasing data. Due to this adjustment, the volume of local materials for the Pennsylvania analysis exceeds the volume of local materials included in the regional analysis.

The sum of activity from soft and hard construction costs, labor, and local materials represents the total volume of direct activity that is modeled within the local economy. Modeled expenditures represent 72 to 76 percent of total expenditures (varying by geography and time period) (see Table B.2).

TABLE B.2: MODELED CAPITAL INVESTMENTS ($2017)

	2012-2014		2015-2017	
Category	**Five-County Region**	**Commonwealth of Pennsylvania**	**Five-County Region**	**Commonwealth of Pennsylvania**
Soft Costs ($M)	$30.3	$30.3	$58.2	$58.2
Hard Construction Costs ($M)	$57.7	$57.7	$171.5	$171.5
Labor (in-house) ($M)	$73.1	$73.1	$93.9	$93.9
Materials / Supplies ($M)	$154.2	$154.2	$205.8	$205.8
Local Materials (%)	43%	48%	33%	38%
Non-Local (excluded) (%)	*(57%)*	*(52%)*	*(67%)*	*(62%)*
Modeled Materials/Supplies ($M)	$66.7	$73.6	$67.2	$77.4
Total Modeled ($2017M)	**$227.8**	**$234.7**	**$390.8**	**$400.9**
Total Modeled (%)	**72%**	**74%**	**74%**	**76%**

B.2 DIRECT ACTIVITY FROM ONGOING OPERATIONS

Operating activity for the same FY 2012-2017 time period is modeled based on budget detail provided by SEPTA.[32] All expenditures are converted to current dollars based on Consumer Price Index from the Bureau of Labor Statistics. Annualized expenditure amounts in $2017 were then averaged for the FY 2012-2014 period (yielding an annual average of $1.248 billion in nominal terms and $1.314 billion in $2017) and FY 2015-2017 period (yielding an annual average of $1.320 billion in nominal terms and $1.345 billion in $2017) (see Table B.3).

[32] Activity is segmented by fiscal year on a cash basis.

TABLE B.3: ANNUAL SEPTA OPERATING EXPENDITURES (NOMINAL AND $2017)

Fiscal Year	Nominal Spend ($M)	Inflation-Adjusted Spend ($2017 M)
2012	$1,232	$1,318
2013	$1,240	$1,306
2014	$1,270	$1,318
2012-2014 Avg	**$1,248**	**$1,314**
2015	$1,288	$1,334
2016	$1,319	$1,349
2017	$1,353	$1,353
2015-2017 Avg	**$1,320**	**$1,345**

Expenditures are sorted by category based on SEPTA's budget information. Deductions from these annual expenditures by category are taken to remove spending that does not take place within the modeled geography (region and Commonwealth).

All employee compensation paid by SEPTA is considered local, since work activity takes place within the five-county region.[33] The remaining purchases of materials and services were reviewed to determine the extent to which they were sourced within the region and Commonwealth. For some large scale goods, direct purchasing data was available to determine the proportion taking place within the geography. For other goods, the local purchase percentage estimated by IMPLAN modeling software for the relevant categories was used to estimate the proportion of expenditures taking place within the region (see Table B.4).

[33] Leakage of induced spending due to employees that live outside of the region or Commonwealth is accounted for the impact modeling described below.

TABLE B.4: LOCAL PURCHASE PROPORTIONS WITHIN GREATER PHILADELPHIA BY SECTOR

Category	Local Purchase %	2012-2014 Expenditures ($2017M)	2012-2014 Modeled Expenditures ($2017M)	2015-2017 Expenditures ($2017M)	2015-2017 Modeled Expenditures ($2017M)
Purchased Transportation	94.2%	$81.9	$77.2	$92.8	$87.4
Services	87.4%	$58.9	$51.5	$66.3	$58.0
Insurance	84.8%	$57.6	$48.8	$13.6	$11.6
Materials and Supplies	69.9%	$55.9	$39.1	$65.8	$46.0
Fuel Transportation	2.4%	$46.8	$1.1	$34.8	$0.8
Financing / Depreciation / Taxes	*(excluded)*	$43.3	$0.0	$40.2	$0.0
Propulsion Power	91.2%	$37.6	$34.3	$32.8	$29.9
Water & Sewer	71.2%	$9.5	$6.7	$10.0	$7.1
Natural Gas	11.5%	$6.1	$0.7	$6.5	$0.7
Vehicle and Facility Rental	99.5%	$3.0	$2.9	$6.1	$6.0
Tires & Tubes	17.4%	$2.6	$0.5	$3.3	$0.6
Total		**$403.2**	**$262.8**	**$372.2**	**$248.2**

The volume of purchasing taking place outside of the region but within the Commonwealth of Pennsylvania was determined through a geographic analysis of SEPTA purchasing data. Through this approach, it is estimated that 67 percent of materials and services in the FY 2015-2017 period were purchased within the region, and 74 percent within the Commonwealth. These local expenditures are summed with labor and fringe benefits to yield total modeled expenditures. Modeled expenditures represent 89 to 93 percent of total operating expenditures (varying by geography and time period) (see Table B.5).

TABLE B.5: MODELED OPERATING EXPENDITURES

Category	2012-2014 Five-County Region	2012-2014 Commonwealth of Pennsylvania	2015-217 Five-County Region	2015-217 Commonwealth of Pennsylvania
Labor and Fringe ($M)	$910.8	$910.8	$973.1	$973.1
Materials and Services	$403.2	$403.2	$372.2	$372.2
Local	65%	74%	67%	74%
Non-Local (excluded)	*(35%)*	*(26%)*	*(33%)*	*(26%)*
Modeled Activity ($M)	$262.8	$298.2	$248.2	$274.2
Total Modeled ($2017M)	**$1,174.7**	**$1,209.1**	**$1,221.2**	**$1,247.3**
Total Modeled (%)	**89%**	**92%**	**91%**	**93%**

B.3 ECONOMIC AND FISCAL MODELING

Expenditures within a given geography give rise to "spillover" impacts when those dollars are recirculated to suppliers and to employees within the Pennsylvania economy. In so doing, they also support additional employment and earnings, and generate tax revenue for local governments and for the Commonwealth.

ESI has constructed an input-output model of the Pennsylvania economy using IMPLAN software to estimate the total impact of these net expenditures on the Commonwealth's economy. The detail that follows explains briefly the theory behind input-output modeling, the mechanics of utilizing it to estimate economic and employment impacts, and then fiscal model utilized to estimate tax revenue impacts to the Commonwealth government from SEPTA economic activity.

INPUT-OUTPUT MODELING: OVERVIEW

Economic impact estimates for annualized capital and operating activity are generated by utilizing input-output models to translate an initial amount of direct economic activity into the total amount of economic activity that it supports, which includes multiple waves of spillover impacts generated by spending on goods and services and by spending of labor income by employees. In an inter-connected economy, every dollar spent generates two spillover impacts:

- First, some amount of the proportion of that expenditure that goes to the purchase of goods and services gets circulated back into an economy when those goods and services are purchased from local vendors. This represents what is called the "indirect effect," and reflects the fact that local purchases of goods and services support local vendors, who in turn require additional purchasing with their own set of vendors.

- Second, some amount of the proportion of that expenditure that goes to labor income gets circulated back into an economy when those employees spend some of their earnings on various goods and services. This represents what is called the "induced effect," and reflects the fact that some of those goods and services will be purchased from local vendors, further stimulating a local economy.

The role of input-output models is to determine the linkages across industries in order to model out the magnitude and composition of the spillover impacts to all industries of a dollar spent in any one industry. Thus, SEPTA's total economic impact is the sum of its own direct economic footprint, plus the indirect and induced effects generated by that direct footprint (see Table B.6).

TABLE B.6: ECONOMIC IMPACT MODELED BY GEOGRAPHY

Geography	Direct Activity	Indirect / Induced Activity
Five-County	Five-County Region	Direct: Five-County → Spillover: Five-County + Direct: Rest of PA → Spillover: Five-County
Rest of Pennsylvania	PA (net of Five-County)	Direct: Rest of PA → Spillover: Rest of PA + Direct: Five-County → Spillover: Rest of PA
Pennsylvania (total)	Five-County + Rest of PA	Five-County + Rest of PA

INPUT-OUTPUT MODEL MECHANICS

To model the impacts resulting from the direct expenditures ESI developed a customized economic impact model using the IMPLAN input/output modeling system. IMPLAN represents an industry standard approach to assess the economic and job creation impacts of economic development projects, the creation of new businesses, and public policy changes within a county its surrounding area

IMPLAN has developed a social accounting matrix (SAM) that accounts for the flow of commodities through economics. From this matrix, IMPLAN also determines the regional purchase coefficient (RPC), the proportion of local supply that satisfies local demand. These values not only establish the types of goods and services supported by an industry or institution, but also the level in which they are acquired locally. This assessment determines the multiplier basis for the local and regional models created in the IMPLAN modeling system. IMPLAN takes the multipliers and divides them into 536 industry categories in accordance to the North American Industrial Classification System (NAICS) codes.

The IMPLAN modeling system also allows for customization of its inputs which alters multiplier outputs. Where necessary, certain institutions may have different levels of demand for commodities. When this occurs, an “analysis-by-parts” (ABP) approach is taken. This allows the user to model the impacts of direct economic activity related to and institution or industry with greater accuracy. Where inputs are unknown, IMPLAN is able to estimate other inputs based on the level of employment, earnings, or output by an industry or institution.

TAX REVENUE IMPACTS

The direct, indirect and induced economic output from SEPTA’s capital investments and annual operations produce increases in various tax bases, which in turn lead to increased tax revenue collections for local governments and for the Commonwealth. While IMPLAN produces estimates of these tax revenue amounts, ESI’s does not utilize these results directly. Instead, we utilize a custom fiscal model that relies on the known relationships between various types of economic activity and tax collections (i.e. effective tax rates) to translate the increases in activity estimates by IMPLAN into attendant tax revenue results. These calculations are performed independently for the City of Philadelphia and Commonwealth of Pennsylvania.

For a non-profit entity such as SEPTA, care must also be given to ensure that taxable and non-taxable activity types are properly distinguished. Most notably, SEPTA's direct activity is not subject to any sales, income or property tax. However, income generated by SEPTA's employment footprint is subject to local wage tax and Pennsylvania income tax. In addition, the indirect and induced impact of SEPTA's activity as it ripples throughout the economy occurs broadly within the private sector of the economy, and is therefore understood to be tax generating.

It is important to note that while the Philadelphia economy is wholly contained within the Pennsylvania economy, the City and Commonwealth governments are separate and distinct entities with distinct tax bases and revenues. Therefore, fiscal impacts do not overlap – each represents distinct tax revenues generated to the respective governments.

In addition, it is acknowledged that SEPTA's operations and capital investments also generate taxable activity within and therefore tax revenues to additional jurisdictions besides the City of Philadelphia and Commonwealth of Pennsylvania, including within suburban jurisdictions throughout Pennsylvania and at the state and local level in New Jersey and Delaware. These amounts are much smaller than the ones calculated here, and are excluded for this analysis to be conservative. Finally, no estimate of the catalytic impacts of SEPTA's presence in the city and region (such as investment by private sector entities) are included in these tax revenue calculations.

B.4 IMPACTS BY COUNTY

As described above, direct, indirect and induced impacts are modeled for the five-county region and the Commonwealth as a whole, and results are expressed at the aggregate level. Next, five-county results are allocated to the individual counties using a "share down" approach. This framework utilizes known direct activity levels by county as well as proxy measures of relative economic activity within those counties to allocate the proportion of impact by category to each county. Each proportion is expressed as each county's share of the five-county region such that the sum of the individual county totals is equivalent to the modeled five-county total.

Separate proxies are developed for direct, indirect (supply chain) and induced (labor income) impacts for capital investments, employee costs within the operating budget, and expenses within the operating budget. These proportions are applied to employment and earnings in addition to output. Table B.7 below shows the proportions utilized to allocate this activity by county, and the data sources utilized to estimate this distribution.

TABLE B.7: GEOGRAPHIC DISTRIBUTION OF ECONOMIC IMPACT

Category	Bucks	Chester	Dela-ware	Mont-gomery	Phila-delphia	Distributional Basis
Capital Investment						
Direct	7.8%	7.9%	28.0%	16.2%	40.0%	Location of major projects FY 2015-2017
Indirect	11.5%	14.9%	10.5%	28.1%	34.9%	Gross Regional Product (IMPLAN 2015)
Induced	17.7%	13.7%	14.6%	22.5%	31.4%	Workers Residing in County (LEHD 2014)
Operations – Employee Costs						
Direct	2.5%	1.5%	8.6%	5.0%	82.4%	Operating Subsidies Formula (FY 2017)
Indirect	N/A	N/A	N/A	N/A	N/A	N/A[34]
Induced	7.8%	1.7%	18.7%	11.2%	60.6%	SEPTA Employee Zip Codes
Operations – Expenses						
Direct	11.5%	14.9%	10.5%	28.1%	34.9%	Gross Regional Product (IMPLAN 2015)
Indirect	11.5%	14.9%	10.5%	28.1%	34.9%	Gross Regional Product (IMPLAN 2015)
Induced	17.7%	13.7%	14.6%	22.5%	31.4%	Workers Residing in County (LEHD 2014)

The shares of activity by category and county are then applied to the five-county impacts (including output, employment and earnings) in each category. Share based on the most recent available data are applied to both the FY 2015-2017 and FY 2012-2014 periods.

This step generates impact results by category for each county. These results can then be aggregated into total countywide activities for both the FY 2015-2017 and FY 2012-2014 periods (see Table B.8 and Table B.9).

[34] Impacts from SEPTA's employee costs are by definition either direct (the initial wages and benefits paid to employees) or induced (the recirculation of these initial wages within the local economy by SEPTA's employees). Indirect impacts represent spending captured by SEPTA's suppliers, which are included in the Operations – Expenses category.

TABLE B.8: ANNUALIZED ECONOMIC IMPACT BY COUNTY, FY 2015-2017 ($2017M)

Category	5 -County Total	Bucks	Chester	Dela-ware	Mont-gomery	Phila-delphia
Capital Investment ($2017M)	**$725**	**$82**	**$78**	**$154**	**$145**	**$265**
Direct	$391	$30	$31	$110	$63	$156
Indirect	$116	$13	$17	$12	$33	$41
Induced	$218	$39	$30	$32	$49	$68
Operations – Employee Costs ($2017M)	**$1,738**	**$84**	**$27**	**$227**	**$134**	**$1,266**
Direct	$973	$24	$15	$84	$49	$802
Indirect	N/A	N/A	N/A	N/A	N/A	N/A
Induced	$765	$60	$13	$143	$86	$464
Operations – Expenses ($2017M)	**$465**	**$61**	**$68**	**$54**	**$124**	**$158**
Direct	$248	$29	$37	$26	$70	$87
Indirect	$90	$10	$13	$9	$25	$31
Induced	$127	$22	$17	$19	$29	$40
Total ($2017M)	**$2,928**	**$228**	**$174**	**$434**	**$403**	**$1,689**

Note: Rows and Columns may not sum due to rounding

TABLE B.9: ANNUALIZED ECONOMIC IMPACT BY COUNTY, FY 2012-2014 ($2017M)

Category	5 -County Total	Bucks	Chester	Dela-ware	Mont-gomery	Phila-delphia
Capital Investment ($2017M)	**$424**	**$48**	**$46**	**$90**	**$85**	**$155**
Direct	$228	$18	$18	$64	$37	$91
Indirect	$67	$8	$10	$7	$19	$23
Induced	$129	$23	$18	$19	$29	$41
Operations – Employee Costs ($2017M)	**$1,627**	**$79**	**$26**	**$212**	**$126**	**$1,185**
Direct	$911	$23	$14	$78	$46	$751
Indirect	N/A	N/A	N/A	N/A	N/A	N/A
Induced	$716	$56	$12	$134	$80	$434
Operations – Expenses ($2017M)	**$497**	**$65**	**$73**	**$57**	**$133**	**$169**
Direct	$263	$30	$39	$28	$74	$92
Indirect	$106	$12	$16	$11	$30	$37
Induced	$128	$23	$18	$19	$29	$40
Total ($2017M)	**$2,548**	**$192**	**$144**	**$359**	**$343**	**$1,509**

Note: Rows and Columns may not sum due to rounding

APPENDIX C – METHODOLOGY: PROPERTY VALUE IMPACTS

Public transit service confers economic benefits for a region and its economy writ large. Some of the value of those benefits is captured by private households through transit's impacts on property value. The impacts of SEPTA Regional Rail and Norristown High Speed Line (NHSL) service on residential property be measured thought statistical analysis of the tens of thousands of residential sales transaction that have taken place in the in the region's suburban housing market over the last 12 years. Residential property transactions provide direct observations of property value as agreed to by a willing buyer and seller at a given point in time and location. A statistical technique call hedonic regression analysis can parse from these transactions the additional value conferred by a specific amenity, such as proximity to transit service, holding constant the other characteristics of the property.

The access to public transportation service afforded by the Regional Rail and NHSL stations across Bucks, Chester, Delaware and Montgomery counties, confers benefits to residents including improved accessibility and reduced travel costs and time. Given the finite supply of houses located near stations, economic theory holds that those individuals that value access to public transportation, and the benefits provided, will bid up the prices of homes located near stations.[35] The extent of value of these benefits is will be affected by proximity to the station and the quality of transportation service provided at the station. In addition, because housing is a long-term investment, the degree of certainty (or uncertainty) about the ongoing quality of the transit service available at the station will be reflected in transit service premiums.

Importantly, SEPTA's Regional Rail system (as well as its fixed transit modes like subways and trolleys, and its bus network) also serves residential neighborhoods within the City of Philadelphia. This analysis does not focus on the value conferred to these properties because of measurement difficulties in isolating the impact of Regional Rail service within an area where there is ubiquitous transit service from other modes as well. It should also be recognized that the service likely contributes value to rental occupied properties, and to other commercial properties (as discussed in Section 3). Accordingly, the estimates presented in this analysis should be understood as conservative.

ESI's 2013 study of residential property transactions from 2005-2012 across the four-county suburban region found that proximity to Regional Rail stations does indeed confer additional housing value out to a distance of three miles from the station.[36] Further, this analysis found that additional value (above and beyond the proximity) was conferred by the presence of frequent service and the availability of parking. These findings were broadly consistent with other literature showing the capitalization of transit service into property values

This evaluation builds on and extends that analysis, making updates to both the dataset and methodological approach. Updated transaction data is utilized, extending the analysis through 2016. Information is gathered in this analysis on all residential parcels across the four suburban counties

[35] Importantly, proximity to rail stations can also impose nuisance effects, such as noise and increased local congestion, on nearby neighbors. These potential dampening effects will be reflected in the analysis to the extent that they are reflected in pricing patterns.

[36] Econsult Solutions, Inc. "The Impact of SEPTA Regional Rail Service on Suburban House Prices." October 2013.

(including those that have not transacted), which allows for a more granular analysis and presentation of incremental impact results. This extended time period also allows for a differential analysis of impacts before and after the passage of Act 89 transportation funding near the end of calendar year 2013. This updated analysis shows larger overall property value effects across each of the counties, and shows a statistically significant difference in incremental property value effects in the calendar year 2014-2016 period relative to pre Act 89 transactions.[37]

C.1 ANALYTICAL APPROACH

Hedonic regression models are the most popular technique used to estimate the effects of rail transit on residential property values. Hedonic modeling can provide estimates of the relative average impact that any housing or neighborhood attribute contributes to property valuations while statistically holding all other variables constant. When executed correctly, hedonic modeling offers valuable information about the relative contribution of property characteristics, such as access to commuter rail service, to the value of real property.

This study utilizes a hedonic regression model to analyze the impact of the proximity to SEPTA's Regional Rail stations on the residential property values in the suburban Pennsylvania counties of Bucks, Chester, Delaware and Montgomery, hypothesizing a positive relationship between the proximity to the rail station and the value of single-family residential properties. The hypothesis is assessed using the following hedonic regression model:

$$House\ Value_i = f(S, L, N, Rail)$$

Where:

> ***S** is the vector of structural characteristics of the house, including total square feet of the house, lot size, the number of full bathrooms, the number of bedrooms, the age of the house and whether or not the house is new construction.*
>
> ***L** is a vector of the locational attributes of the house as measured by the distance to the closest secondary central business district.*[38]
>
> ***N** is a vector of neighborhood socioeconomic characteristics measured at the Census Tract level. These include average household size, average household income and other demographic variables.*

[37] Note that the statistically significant differences between the two periods of time do not establish Act 89 as the causal mechanism for the relative importance of transit in suburban housing values (see Section C.2 for further discussion). The statistically significant differences do indicate, however, that proximity to transit has become relatively more valuable over this time period. The observed incremental value from 2014-2016 (Post Act 89) is understood and the best representation of current incremental value, and is utilized to calculate aggregate results at various geographic levels.

[38] Secondary central business districts include Chester, Coatesville, Doylestown, Kennett Square, King of Prussia, Lansdale, Norristown, Pottstown, and West Chester in Pennsylvania and Newark and Wilmington in Delaware.

Rail *is vector of variables that measure that proximity of the house to the closest Regional Rail stations and the relative service level offered by each station*

The hedonic model estimates the value of accessibility generated by SEPTA in the suburban counties and does not value the loss associated with a diminished economy or increased congestion, both of which would have an additional impact on property values. For example, the elimination or reduction of Regional Rail service would likely reduce employment in Center City Philadelphia and throughout the region. This reduction would lower demand for residential properties region-wide, lowering property values further.[39] The impacts calculated within this analysis capture the current amenity premium between homes that are and are not transit proximate, but do not capture the broader-reaching property value implications of Regional Rail service for all regional households through its impact on region wide growth. As such, these impacts should be thought of as a lower bound estimate of the property value impacts that would result in the long run from a suspension of SEPTA's Regional Rail service.

C.2 DATA

The regression model was estimated using data from over 315,115 transactions of single-family homes in Bucks, Chester, Delaware, and Montgomery counties. The transactions cover the 2005 to 2016 period which covers the period before and the period after the housing crash in 2007. The impact of the housing crash on house prices was accounted for by including a series of variables that control for the year that each property was sold. The data includes the sale price and date, the attributes of the individual house and the address of each property.

The distance of each transaction to nearby Regional Rail and NHSL stations was calculated using Geographic Information System (GIS) tools. A common method to account for the distance to a transit station is to classify each property into various distance bands. As such, each transaction was classified into one of the following five groups measured by distance to the station: less than one-half mile; between one-half and one mile, between one and two miles, between two and three miles and greater than three miles.[40] Adjustments were made to account for physical barriers, such as areas where intermittent river crossings make straight line distance an inappropriate proxy for access to a station, and to account for the impact of being located within close proximity to multiple stations by counting the number of stations within three miles of each transaction. Each transaction was also classified each transaction as to whether or not it was located within one-half mile of a NHSL station.[41]

[39] See Voith, Richard "The Suburban Housing Market: the Effects of City and Suburban Employment Growth," Real Estate Economics, (1999) vol. 27, pp. 621-48 for an examination of the impacts of Philadelphia employment on suburban house value.

[40] The literature suggests that the typical "driveshed" catchment for commuter rail stations is between three and five miles. Our analysis also found that after three miles, the effect of proximity to the station becomes insignificant implying that beyond three miles, the presence of a Regional Rail station has little or no property value impacts

[41] Note that NHSL stations were not differentiated by service level in the manner described below, and that the catchment area for these stations was calculated out to a one-half mile rather than the three miles for Regional Rail stations. Within this analysis, NHSL service should be viewed as an additive contributor to the overall value attributed to Regional Rail stations, rather than a unique subject of the analysis in and of itself.

DEFINING SERVICE LEVEL

It is likely that the level of transit service offered at each station will have an impact on the level of the property value benefits generated by a station, with those having a high level of service generating larger impacts, all else equal, than stations with low levels of service. To estimate these differential impacts, a composite "service level" metric was created for each of SEPTA's more than 100 Regional Rail stations, and the incremental housing value for each distance was estimated as a function of the service level.[42]

This composite metric is a function of three components for each station: 1) Total AM peak trains serving the station; 2) AM peak express trains serving the station; 3) Parking spots at the stations. A normalized ranking was developed for each station within the SEPTA network for each of these components (with each station assigned a score ranging from 0, for the lowest level of service/parking, to 1, for the highest level). Next, a regression analysis was conducted to determine the relationship of each of these components to ridership levels by station, and these results were used to assign a weight to each of the three components. Using these weights, the three components were aggregated to yield a composite service level score for each station, expressed as a number between 0 (low service) and 1 (high service).

Importantly, these service level ratings for each station are calculated entirely in reference to other stations within SEPTA's Regional Rail network. Thus, for example, a service level score above or below the median does not imply that service quality is "good" or "bad" in a normative sense, or relative to available service in any other area of the country. Rather, it implies only that service levels are higher or lower than the median station across the SEPTA Regional Rail network.

ACT 89

Prior to the passage of Act in November 2013, SEPTA was unable to fund its capital needs. The resulting uncertainty about future service could have an impact on an individual's willingness to pay to be close to transit. The greater the uncertainty in the future of SEPTA, the less an individual might be willing to pay for a house that is located close to a train station (in effect compensating the buyer for the risk surrounding SEPTA's continued operations through a lower price). By providing a more secure funding stream for capital improvements, Act 89 helped to reduce the uncertainty surrounding SEPTA's continued operations, by providing funding to help reduce SEPTA's capital improvement backlog. This reduced uncertainty should be capitalized into house prices in the form of increased premiums for being located close to a train station.

The impact of Act 89 on the property value impact of SEPTA can be estimated by estimating the regression model twice, once for transactions from the pre-Act 89 period (2005-2013) and again for the post-Act 89 period. Incremental impacts derived from regression coefficients are then applied to the

[42] Note that this composite approach differs somewhat from Econsult's 2013 analysis, which grouped stations into "high service" and "low service" categories based on a threshold number of AM peak trains that served the station, and into "high parking" and "low parking" categories based on a threshold number of spaces available at the station. By avoiding a fixed cut off point separating high and low service, the composite approach described below is better able to capture gradations of service levels across SEPTA's rail network on a continuous scale.

same base of transit proximate houses to determine aggregate incremental value before Act 89, which can be compared to the Post-Act 89 results presented above.[43]

While this analysis can establishes statistical differences in incremental value for transit proximate housing before and after the passage of Act 89, it cannot directly establish the causal mechanism for these changes in relative value. Given the long-term nature of housing investments, the degree of certainty of the long-term availability of rail service enabled by the passage of Act 89, relative to planned service cutbacks absent the funding package, should enhance the value of transit proximity for those who consider it an amenity. In addition, the growth of the city of Philadelphia as an employment center in recent years should contribute to the relative attractiveness of housing proximate to rail stations which enable access to the central city. Notably, this employment growth itself is also inter-related with the passage of Act 89, since employment densities are far higher around key transit-served nodes (as discussed in Section 3).

C.3 INCREMENTAL EFFECTS OF RAIL SERVICE

The coefficients on the structure, location, and neighborhood characteristics have the expected signs and are all statistically significant. Of primary interest for this analysis is the relationship between the station distance bands, service levels and house prices.

Since service levels are defined uniquely by station, incremental impacts by distance vary for each station. To provide a sense of the magnitude of impacts at various service levels, Table C.1 presents percentage impacts on housing values by distance band for illustrative stations scoring below (0.2 and 0.3) around (0.4) and above (0.6 and 0.8) the median station service level.

Positive property value impacts are observed for all distance bands and service level qualities. Impacts increase slightly from the innermost ring (within a half mile) to the band between a half and one mile, then decline as distance increases. Impacts also increase in a relatively linear pattern as service level rating increases.

[43] Note that the service characteristics by station are held constant in the pre and post analyses, meaning that the current level of service is assumed across the full time period. In addition, the regression analysis includes a control for the year of sale, such that all sales are estimated in terms of their current value, accounting for overall market appreciation over this period.

TABLE C.1: STATION IMPACTS BY DISTANCE AND SERVICE LEVEL

	Service Level Composite Rating				
Distance (Nearest Station)	**0.2**	**0.3**	**0.4**	**0.6**	**0.8**
< Half Mile	4.6%	6.8%	9.0%	13.4%	17.9%
1/2 - 1 Mile	5.6%	7.8%	10.1%	14.5%	18.9%
1 - 2 Miles	2.0%	4.2%	6.4%	10.8%	15.3%
2 - 3 Miles	0.5%	2.7%	4.9%	9.4%	13.8%

Source: ESI Calculations

Next, a statistical process was applied to "smooth" estimated results for individual properties. While sorting houses into distance bands provides sufficient sample size to estimate incremental impacts (as shown above), the application of results within fixed bands implies significant "breaks" in incremental value for nearby houses on opposite sides of a distance threshold.[44] Accordingly, initial estimates for each house are adjusted by applying a smoothing technique assigns a continuous set of incremental values to each house within a defined spatial grid based on the average value within each grid and those adjacent to it.[45] This process is applied across all properties in the four counties to generate revised estimates of incremental value for each property, which are scaled to the initial aggregated estimates generated by the regression analysis (described in Section C.4 below).

Figure C.1 below visualizes these results across SEPTA's network.[46] Property value impacts are shown on a percentage basis, with higher values shown in darker colors. Impacts are largest in the immediate vicinity of stations, and then dissipate out to a three mile buffer. The interaction between stations and lines yields additional value (for example, where the Norristown High Speed Line and Thorndale Regional Rail lines run in close proximity near the border between Delaware County and Montgomery County). Finally, stations with higher service levels can yield higher impacts than neighboring stations along the same lines.

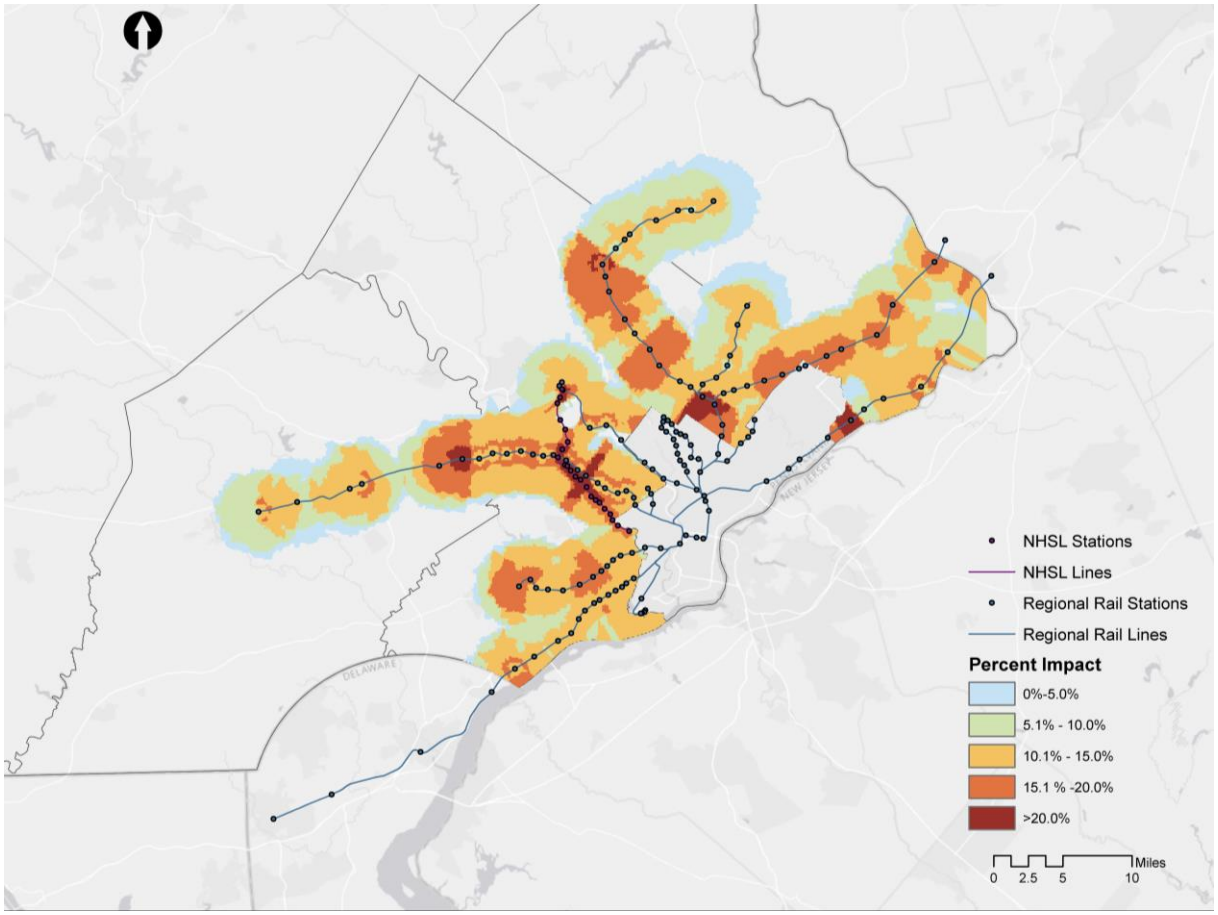
[44] For example, a house that is 1.99 miles from a station and is assigned to the 1-2 mile band may receive a materially different estimate from a house located 2.01 miles from a station assigned to the 2-3 mile band, though in practice the difference in transit proximity between the two properties may be minimal.

[45] In practice, this means that rather than all houses within a band being assigned the same incremental value, those houses that are adjacent to higher value bands will be assigned a higher value (for example, a house at 1.01 miles from a station will likely be assigned a higher value than a house at 1.99 miles) and values for nearby houses will likely vary incrementally from each other.

[46] An interactive version of this map, which includes values for each individual property, can be accessed online at <www.septa.org/economic-impact>

As noted earlier, transactions within the City of Philadelphia are excluded from the analysis.

FIGURE C.1: HOUSING VALUE IMPACTS



Source: ESI Calculations

C.4 AGGREGATE IMPACTS

These percentage impacts by station can also be expressed as aggregate property value impacts across a range of geographies. To do so, the relationships derived from the hedonic regression analysis are used to estimate housing values for all detached single family houses across the four counties. For all homes that are proximate to transit (within three miles of a station), the incremental value attributed to transit proximity is estimated (as described in Section C.3 above), and a revised housing value absent that increment is calculated.[47] The difference between aggregate housing values and "no transit" housing values in a given geography represent the incremental housing value attributable to proximity to transit service. Said another way, transit attributable value can be understood as the incremental loss of housing values that would occur if SEPTA's rail service was discontinued.

Table C.2 below shows aggregate value increments across the suburban counties:

- About 461,000 out of 748,000 single family homes across the suburban counties (or 62 percent) are located within the catchment of a station, and therefore have a portion of their total value attributable to transit.

- The aggregate incremental value conferred by transit access is estimated at $14.5 billion.[48] This represents 7.4 percent of the total single family housing value in the suburban counties. The average increment is $19,400.[49]

- The pre Act 89 housing value attributable to transit is estimated at $10.9 billion across the region, representing 5.7 percent of total single family housing value. Therefore, the impacts calculated post-Act 89 are about one-third higher than those pre-Act 89. These differences are statistically significant.

[47] Note that this approach is more granular that the approach used in Econsult's 2013 study to estimate aggregate values, which utilized the average housing value across the four county region as the baseline against which incremental changes from SEPTA service were applied. Within this revised approach, differences in price levels across the region contribute to differences in incremental value in dollar terms, since a unique baseline value is utilized for each property.

[48] This figure does not include any value from rail stations attributable to other uses, such as condominiums, apartments, hotels, office buildings and retail stores, nor does it include the value conferred to properties within the City of Philadelphia.

[49] Note that both the percentage of total value and the average increment are calculated among all households, including those that are not proximate to transit (and therefore have an incremental proximity value of $0). Among only those households that are proximate to transit, the average incremental value from transit is around $31,000, representing around 12 percent of current housing value.

TABLE C.2: HOUSING VALUE IMPACTS BY COUNTY – PRE AND POST ACT 89

Metric	Suburban Total	Bucks	Chester	Delaware	Montgomery
Total Single-Family Homes	747,500	217,100	142,900	159,300	228,200
Transit Proximate Homes	461,400	125,500	46,700	142,800	146,400
% Transit Proximate	61.7%	57.8%	32.7%	89.6%	64.2%
Post Act 89 (2014-2016)					
Transit Attributable Home Value	$14.5 billion	$2.9 billion	$1.9 billion	$3.7 billion	$5.9 billion
% of Total Home Value	7.4%	6.5%	3.7%	10.8%	8.3%
Average Increment per Home (All)	$19,400	$13,400	$13,500	$23,400	$26,000
Pre Act 89 (2005-2013)					
Transit Attributable Home Value	$10.9 billion	$2.2 billion	$1.4 billion	$2.9 billion	$4.4 billion
% of Total Home Value	5.7%	4.9%	2.8%	8.1%	6.3%

Source: ESI Calculations

Incremental values can also be calculated for housing that is proximate to a given Regional Rail line or station. This calculation is undertaken by comparing the current housing value to estimated value in a "no transit" scenario as described above within a given geographic buffer.

Importantly, the three miles buffers between Regional Rail lines and stations overlap to a significant degree. When calculating the incremental value near any given line or station, all properties within the buffer included, even when those properties are also within the buffer of a different line or station. Accordingly, the nearby value increment for all stations sums to a greater number than the proximate value for all lines, and the nearby value for increment for all lines sums to a greater number than the total value by county due to this double counting. Accordingly, values are best understood as the incremental value conferred by transit within a three mile buffer of each line or station, rather than value that is specifically attributable to that line or station (since some portion of the value within each buffer may be contributed to by other lines or stations, or by proximity to a NHSL station). No double counting of houses occurs within a given buffer.

Table C.3 below shows the incremental home value attributable to transit near each of the thirteen Regional Rail lines. Average percentage impacts per house fall into a relatively narrow band ranging from 11 percent to nearly 15 percent. However, aggregate value varies significantly based on both the volume of single family housing within the buffer area,[50] and the average housing price against which the transit increment is applied.

[50] Note that all transactions within the City of Philadelphia or outside of the state of Pennsylvania are excluded. This significantly reduces volume of transit proximate homes observed for those rail lines with significant portions in the City of Philadelphia or the states of New Jersey or Delaware. Note that those lines such as the Chestnut Hill East and West that are located entirely within the City of Philadelphia are still included in the analyses, because the three miles buffer around stations within these lines reaches portions of the suburban counties.

TABLE C.3: SUBURBAN RESIDENTIAL PROPERTY VALUE IMPACTS BY REGIONAL RAIL LINE

Line	Transit Attributable Home Value ($M)	Transit Proximate Houses	Average Impact per House (%)	Average Impact per House ($)
Airport	$354	30,300	12.1%	$11,700
Chestnut Hill East	$412	11,500	14.7%	$35,800
Chestnut Hill West	$331	9,400	12.7%	$35,300
Cynwyd	$777	18,200	13.6%	$42,800
Doylestown	$3,590	101,700	12.3%	$35,300
Elwyn	$2,319	103,700	12.7%	$22,400
Fox Chase	$489	12,600	14.4%	$38,800
Newark	$1,578	91,400	12.3%	$17,300
Norristown	$1,776	45,200	11.8%	$39,300
Thorndale	$4,610	98,900	12.5%	$46,600
Trenton	$990	49,000	11.2%	$20,200
Warminster	$1,763	66,300	11.1%	$26,600
West Trenton	$3,083	99,700	12.9%	$30,900

Source: ESI Calculations

Table C.4 below shows impacts for one sample station within each county. As with the rail lines discussed above, results for the three mile buffer around a given station can be expressed in terms of aggregate value, average percentage impact per house, and average dollar impact per house.[51] Impact levels considerably based on service levels, the density of housing, and baseline housing values.

TABLE C.4: HOUSING VALUE IMPACTS – SELECTED REGIONAL RAIL STATIONS

Station	County	Transit Attributable Home Value ($M)	Transit Proximate Houses	Average Impact per House (%)	Average Impact per House ($)
Doylestown	Bucks	$194	13,000	6.5%	$14,900
Paoli	Chester	$712	10,000	16.0%	$69,400
Media	Delaware	$733	19,000	13.3%	$39,500
Norristown	Montgomery	$367	20,000	12.5%	$18,100

Source: ESI Calculations

[51] As described above, these impacts should be understood as the incremental impact of rail service within the buffer around a given station, not necessarily the impacts attributable to that station alone.

C.5 REAL ESTATE TRANSFER TAX IMPACTS

This incremental value is crucial to supporting the tax base of local governments and school districts, which typically rely on real estate-related taxes as their primary source of revenue. Incremental increases in property values and sales prices due to the amenity value of transit can be thought of as leading to additional government revenue, or as alleviating the need for increases in property tax rate to generate the same level of government funding.

The level of local government revenue from increased property values assessments supported by this incremental value is difficult to quantify for a number of reasons. Most importantly, market values calculated in this study may not align with assessed values, in part because properties are not re-assessed on a regular basis.[52] In addition, property tax rates vary by county, municipality and school district, and a unique calculation of impacts for each entity is beyond the scope of this study. Nonetheless, the revenue impacts from additional property tax value are far greater in magnitude then then the real estate transfer tax revenue estimates described below.

In addition to ongoing real estate taxes, housing values also impact the level of real estate transfer tax collected by the Commonwealth and by counties when a property is sold. When a property is sold within the four county region, a transfer tax of 1 percent of the sale price goes to the Commonwealth, as well as a tax that is typically 1 percent to local government (divided evenly between the county government and schools).[53] Incrementally higher sale prices therefore translate into additional revenue when a sale takes place.

For all transactions taking place from 2014-2016 (post-Act 89), the observed sale price was matched with the incremental housing value attributable to SEPTA (as estimated by the regression analysis). These results are aggregated by county and the three years are averaged to reflect the incremental price increase on single family residential housing sales attributable to transit.[54] The real estate transfer tax rate at the Commonwealth and local level are then applied to this increment in order to estimate the additional revenue generated on an annual basis by the positive effect of transit proximity on housing values (see Table C.5).

[52] Pennsylvania requires uniformity in the assessment of real estate values, meaning that a county cannot conduct a "spot" reassessment of a single property. The reasons for reassessment of an individual property are limited to: (1) a property has been subdivided; (2) a physical change has been made to a property, such as new construction or removal or change of existing improvements; (3) a catastrophic loss has occurred to the property; or (4) a change in use of the property (e.g., tax-exempt status) has taken place. See: Pennsylvania Legislator's Municipal Deskbook, *Fourth Edition (2014).* Absent these conditions, reassessments can only occur as part of a countywide reassessment, which tends to occur infrequently.

[53] Certain townships in Chester and Delaware counties charge a slightly higher local rate. This additional revenue is conservatively excluded from this analysis.

[54] Note that this approach implicitly assumes that the same volume of transactions that were observed would have taken place absent the incremental value conferred by transit proximity, but that those transactions would have taken place at a lower price point absent the transit-attributable value. It is possible that transit proximity could also contribute (positively or negatively) to the rate of transactions, which would also impact the level of real estate transfer tax collections.

TABLE C.5: AVERAGE ANNUAL REAL ESTATE TRANSFER TAX IMPACTS FROM SEPTA SERVICE (2014-2016)

Impact Type	Suburban Total	Bucks	Chester	Delaware	Montgomery
Number of Sales	29,589	7,346	6,083	6,360	9,801
Aggregate Sale Price	$9.31 billion	$2.39 billion	$2.21 billion	$1.64 billion	$3.07 billion
Sales Increment from Transit	$699 million	$157 million	$98 million	$162 million	$281 million
Incremental Real Estate Transfer Tax	$13.97 million	$3.14 million	$1.97 million	$3.24 million	$5.63 million
Pennsylvania (1%)	$6.99 million	$1.57 million	$0.98 million	$1.62 million	$2.81 million
County (0.5%)	$3.49 million	$785,000	$492,000	$809,000	$1.41 million
School (0.5%)	$3.49 million	$785,000	$492,000	$809,000	$1.41 million

Source: ESI Calculations

APPENDIX D – COMPARABILITY WITH PREVIOUS ANALYSES

D.1 ECONOMIC IMPACT

Prior economic impact calculations for SEPTA were conducted by Econsult and released in April 2013. Methodologies and data inputs used to quantify these impacts have changed somewhat from the prior report to the current one. This analysis should be understood to represent the most accurate current quantification of SEPTA's impact given currently available data and methods, rather than a direct update of the prior analysis limited to the tools and methods available at that time. Accordingly, results from the current analysis cannot be compared to 2013 results to establish a "growth rate" for intervening time period, because these impacts were not computed in a parallel manner. By contrast, the comparison between FY 2015-2017 and FY 2012-2014 annualized operating and capital activities were conducted using a parallel methodology, and can be understood to represent a change in impact levels.

While a number of minor methodological approaches differ between the 2013 and 2017 analyses, based on available data and analytic techniques, one major difference is of particular note. Economic impacts in this analysis are modeled using IMPLAN software, while the 2013 analysis was conducted using RIMS models from the Bureau of Economic Analysis. One major difference between the IMPLAN and RIMS models are the differing definitions of "employment" embedded within each model. IMPLAN generates employment results in terms of "annual jobs", meaning that 12 months of employment equates to one job. Seasonal employees are counted fractionally, meaning that three months of employment would equate to one-quarter of a job. The BEA approach embedded in RIMS, by contrast, does not distinguish between full-time and part-time jobs in its employment count. Therefore, the total employment figure reported in the 2013 report includes a mix of full-time and part-time jobs without any adjustment, while the total employment reported in this analysis adjusts jobs to an annualized basis. Due to this differential, aggregate employment counts appear lower in the current study, despite higher earnings and earnings per job figures.

D.2 SUBURBAN PROPERTY VALUE

Similarly, Econsult produced an October 2013 analysis of the impacts of Regional Rail service on suburban house prices that follows a similar structure to the suburban property value analysis undertaken in this report. However, both the data and methodology has been updated to produce the most accurate analyses given current information and methods, and results should not be compared between this analyses and the 2013 report. The comparative results pre Act 89 (2005-2013) and post Act 89 (2014-2016) presented in this report are calculated using a consistent methodology, and are appropriate for longitudinal comparison.

Among several methodology and data updates between the 2013 analysis and the current analysis, two are worth describing in more detail. First, the updated analysis not only utilizes transaction from the interim (2013-2016) period, but also accesses information on all parcels within the suburban counties, rather than just those that transacted over the observation period. While regression results are still calculated based only on the subset of property transactions (since the transaction is the mechanism

through which the market value of a house is observed), the regression results are applied across all properties to generate estimated values for each property against which increments are applied for transit proximate housing. This approach produces a more granular estimate of aggregate value for a given geography (where a county, a rail line or a given station) than applying the increment to average property values.

In addition, the current analysis takes an updated approach to defining service levels at each of SEPTA's rail stations. The 2013 analysis used thresholds of train service and parking availability to separate stations into binary categories of "low" or "high" service and parking availability. By contrast, this analysis utilizes internal comparisons of train frequencies and parking availability to develop a composite service level measure relative for each station relative to other SEPTA stations on a continuous scale. This approach allows for finer gradations between service levels by station, and accordingly more granular estimates of nearby impacts.

APPENDIX E – ABOUT ECONSULT SOLUTIONS, INC. (ESI)

This report was produced by Econsult Solutions, Inc. ("ESI"). ESI is a Philadelphia-based economic consulting firm that provides businesses and public policy makers with economic consulting services in urban economics, real estate economics, transportation, public infrastructure, development, public policy and finance, community and neighborhood development, planning, as well as expert witness services for litigation support. Its principals are nationally recognized experts in urban development, real estate, government and public policy, planning, transportation, non-profit management, business strategy and administration, as well as litigation and commercial damages. Staff members have outstanding professional and academic credentials, including active positions at the university level, wide experience at the highest levels of the public policy process and extensive consulting experience.