Economic Impact *of* Public Transportation Investment

2020 Update

AMERICAN PUBLIC TRANSPORTATION ASSOCIATION

Economic Impact of Public Transportation Investment

2020 Update

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Report Prepared for:

American Public Transportation Association (APTA)

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APTA leads public transportation in a new mobility era, advocating to connect and build thriving communities.

Executive Summary

Objective

Public transportation is critical to the Americans who use it and even those who do not. It is a lifeline for many as it provides mobility options, generates jobs, spurs economic growth and supports public policies regarding energy use, air quality and carbon emissions. All of these are important elements when it comes to considering the benefits, costs and optimal investment levels of public transportation. This report focuses solely on one aspect—how investment in public transportation affects the economy in terms of employment, wages and business income. It specifically addresses how various aspects of the economy are affected by decisions made regarding investment in public transportation.

This report updates an earlier report, *Economic Impact of Public Transportation Investment*, prepared by Economic Development Research Group for the American Public Transportation Association in 2014.

Key findings are organized in terms of four categories: (1) **overall findings**, including the major changes from the previous report; (2) **longer-term effects of investment in public transportation**, which enables a variety of economic efficiency and productivity impacts to unfold as a consequence of changes in travel times, costs and access; (3) **the effects of spending money on public transportation**, which creates immediate jobs and income by supporting manufacturing, construction and public transportation operation activities; and (4) **conclusions** regarding the interpretation and policy consideration of economic impacts associated with public transportation investment.

Overall Findings

Increased investment in public transportation can lead to significant economic growth as a result of both the short-term stimulus impact of public transportation outlays and a longer-term, cumulative impact on economic productivity. The latter is enabled by increasing investment to improve our nation's urban transportation systems and sustaining the investment over time. While the total impact will depend on the level and distribution of investment, the magnitude of potential impact can be illustrated by considering a scenario of enhanced investment sustained over 20 years.

Under such a scenario of sustained higher investment (which would lead to improved quality and availability of public transportation), there would be a significant increase in ridership[1], supporting additional growth of the national economy. The impact by the end of the 20-year period would represent a ratio of approximately $5 billion of additional GDP per $1 billion invested annually. This includes $3 billion due to the productivity effect of cost savings in the economy and $1.8 billion supported by the pattern of public transportation investment spending. At current wage rates, this is equivalent to a ratio of approximately 49,700 jobs per $1 billion invested in public transportation.

[1] U.S. DOT FHWA. 2015 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance. Report to Congress (2016).

This report presents a methodology for calculating these impacts by examining the effects of three scenarios for long-term public transportation investment in the United States:

1. **a "No Growth Funding Scenario"** that maintains current spending levels and flat ridership;

2. **an "Increased Funding Scenario"** that represents a modest increase in funding ($2.9 billion per year) and corresponding increase in ridership; and

3. **a "Higher Increased Funding Scenario"** with more investment (an additional $7 billion per year) and higher ridership, which corresponds to levels of investment that APTA has recommended to Congress. Impacts of this scenario are summarized below. ***(See Table 1)***

*Difference in impact between the "Base Case" scenario and "Higher Increased Funding" scenario, expressed as a ratio of $1 billion of added annual investment in public transportation.

In the five years since the previous 2014 report, evolving mobility trends are magnifying the long-term cost savings effect of public transportation. In that report, the ratio for the long-term cost savings effect was $2 billion for every $1 billion invested, compared to $3.2 billion estimated in this report. This change is a result both of changing mobility options and new data that enabled the research team to accurately estimate new sources of economic impact. There are two important differences from previous reports.

First, this analysis estimates the significant travel cost savings for public transportation passengers who are able to use public transportation instead of Transportation Network Companies (TNCs) or taxis. Based on recent on-board surveys that ask public transportation passengers about their alternatives, this research indicates that 15 percent of additional transit trips in a scenario of increased public transportation investment and ridership would shift from TNCs and 4 percent would shift from taxis. This reflects the mode alternatives available to public transportation passengers, who often come from car-poor households, with fewer cars than drivers.

Table 1: Potential Long-term Economic Impact per Billion Dollars of Enhanced National Investment in Public Transportation (Annual Effect in the 2040)*

Category of Economic Impact	Value of Economic Impact (GDP Equivalent)	Wage Equivalent	Job Equivalent
Long-Term Cost Savings Effect	$3.2 billion	$1.4 billion	31,800
Investment Spending Effect	$1.8 billion	$1.2 billion	17,900
Total Economic Impact	$5.0 billion	$2.6 billion	49,700

**Difference in impact between the "Base Case" scenario and "Higher Increased Funding" scenario, expressed as a ratio of $1 billion of added annual investment in public transportation. See full text for interpretation of wage and job equivalents.*

[2] APTA. "Who Rides Public Transit?" (2017)

[3] TransitCenter. Who's On Board 2019: How to Win Back America's Transit Riders (2019).

[4] Uber's Economic Impact in the United States, 2018 (https://www.uber.com/newsroom/uber-in-the-economy/); Lyft Economic Impact Report, 2019 (https://www.lyftimpact.com/stats/national)

$11.7 Billion

will be saved annually in car operating costs by America's drivers as a result of APTA's recommendations

(In the year 2040, after sustained investment following APTA's recommendations.)

According to recent on-board surveys, 68 percent of bus riders and 50 percent of rail riders reported that they did not have a car available for their transit trip.[2] Given the cost differences between taking a TNC or taxi trips and taking public transit, enabling households to choose good quality public transit over a taxi or TNC can provide significant household cost savings.

Second, this analysis develops a new model to understand potential trends in reduced car ownership. According to the model, which was estimated based on census mode share and car ownership data, a 1 percent increase in public transit mode share corresponds to 0.02 fewer cars per household at the metropolitan area level (the equivalent of two out of every hundred households giving up a car). In the future, the ability of households to rely primarily on public transit and give up a car is expected to increase, as modes such as TNCs, carsharing, and micro-mobility become increasingly available. These modes can act as complements to transit. For example, individuals may use a TNC or a scooter to reach a train station. Or transit commuters may occasionally rely on TNCs on nights when they return home after transit service has ended.

A recent TransitCenter study found that for each additional transit trip taken, transit users made an additional 0.24 taxi or TNC trips, supporting the hypothesis that taxis and TNCs complement transit.[3] Surveys by Uber and Lyft provide further evidence of an evolution towards use of those modes as a feeder for high volume transit services as well as a factor reducing car ownership.[4]

Productivity Impacts

Investment in public transportation expands service and improves mobility, and if sustained over time at APTA's recommended level, can potentially affect the economy by providing:

- **travel and vehicle ownership cost savings** for public transportation passengers who are able to use public transit instead of other modes, including driving, taxis and TNCs of $11.7 billion annually;
- **reduced traffic congestion** for those traveling by automobile and truck, leading to direct travel cost savings for businesses and households, and business operating cost savings associated with worker wage and reliability effects of reduced congestion of $800 million annually;
- **business productivity** gained from access to broader labor markets with more diverse skills, enabled by expanded public transit service areas and reduced traffic congestion of $1.2 billion annually.

Spending Impacts

In addition to increasing workforce access and economic productivity, public transportation spending has additional impacts on the economy. Public transportation operations (i.e., management, operations and maintenance of vehicles and facilities) are a significant source of jobs in the United States. The analysis indicates that approximately 20,000 jobs are supported for a year per $1 billion dollars of annual spending on public transportation operations.

Capital investment in public transportation (including purchases of vehicles and equipment and the development of infrastructure and supporting facilities) are also a significant source of jobs. The analysis indicates that nearly 13,000 jobs are supported for a year per $1 billion of spending on public transportation capital.

Combining investment in public transportation capital and operations within the United States, the analysis indicates that an average of 17,900 jobs are supported for one year, per $1 billion dollars of annual spending on public transportation, given the existing mix of operations (72 percent) and capital (28 percent) expenditures.

All of the above job numbers include "direct" jobs associated with manufacturing, construction and operation of public transportation equipment and facilities, plus additional "supplier purchase effect" jobs at parts, materials and service providers, and "employee spending effect" jobs supported by consumer spending of workers' wages. These overall impacts can represent new jobs as long as there is an increase in public transportation spending and a sufficient number of unemployed persons to fill these jobs (so that other pre-existing jobs are not displaced).

The economic impacts of public transportation spending can be measured in other ways besides jobs. Corresponding to the 17,900 jobs is approximately $2.9 billion of added business output (sales volume), which provides $1.8 billion of GDP (gross domestic product or "value added")—including $1.2 billion of worker income. This additional economic activity generates approximately $382 million in federal, state and local tax revenues, that is $16.2 billion in annual federal, state and local tax revenue at APTA's recommended funding level.

Care should be taken in use of these impact measures. Specifically, they should not be added or otherwise combined, because a portion of the business output provides the worker income and other elements of GDP, which in turn are sources for tax revenues. It should also be noted that while all of these numbers are in real (constant) dollars, the ratio of jobs supported per $1 billion of spending will fall over time due to future changes in wages per worker.

2 Million Jobs

will be created or sustained
as a result of APTA's recommendations

$16.2 Billion

will be generated annually in federal, state and local tax revenue
as a result of APTA's recommendations

(In the year 2040, after sustained investment following APTA's recommendations.)

Conclusion

The analysis shows that public transportation investment can have significant impacts on the economy, and thus represent an important public policy consideration. These impacts include:

1. **supporting American jobs and industry** with spending on public transportation; and

2. **providing savings for households and businesses** due to improvement of transportation system performance.

In the long term, a program of enhanced investment sustained over 20 years can have a total effect on the economy in the range of 5 times the amount being spent annually. This is the equivalent of the value of 49,700 jobs per $1 billion spent (at current wage rates) or over 2 million jobs at APTA's recommended funding level. Actual national job growth impacts will depend on how national economic competitiveness, workforce availability and unemployment rates are affected.

Public transportation is a cost-efficient industry for several reasons:

- **Capital investments have a long lifetime.** As a result, capital costs per trip are low;

- **Transportation investments support cost savings** for both public transit users and non-users. With sufficient investment, improved public transportation may enable more households to reduce multiple car ownership. Relinquishing a car and transitioning to transit use can save approximately $9,797 per year[5], including $6,200 in the fixed costs of car ownership (insurance, license and registration, and depreciation).[6] The cost savings from replacing a TNC trip with public transit can average nearly $15 per trip.

It is important to stress that this analysis examines the scale of potential impacts on the economy and does not purport to show benefit-cost ratios. Specifically, economic impact studies do not account for some of the social and environmental impacts that are included in benefit-cost studies, although they do account for indirect and induced economic growth that is typically not included in benefit-cost studies.

The social and environmental impacts that are not counted in this economic impact study include, most notably, personal time savings, emissions impacts, and public transit's role in providing mobility for those without cars, along with backup mobility for those who do have personal vehicles. The inclusion of these additional benefits would generate a larger measure of total societal benefit per $1 billion dollars of public transportation investment. However, they were not analyzed because this report focuses specifically on how public transportation spending and investment affect the economy.

[5] APTA Transit Savings Report, June 2017.

[6] AAA Your Driving Costs 2018

1. Introduction

1.1 Context and Background

Context. There are many reasons to invest in public transportation. These include social, environmental, and economic considerations. For some riders, it provides a way to avoid parking and fuel costs, or traffic congestion delay and aggravation. Public transportation provides mobility for those who do not have access to a car. It also benefits those who do travel by car, as public transportation helps reduces traffic growth and congestion delays (compared to what might otherwise occur). There can be air quality and neighborhood development impacts that are considered beneficial for communities. These factors may be relevant as agencies prioritize transportation investments. Investment in public transportation affects the flow of money and generation of jobs in the economy.

Given the above context, the economic impact should be just one aspect of a broader story of impacts on society (social, environmental, equality). Yet there can be a particularly compelling interest, for both public discussion and agency decision-making, in better understanding how investment in public transportation does lead to wider effects on the economy. That is the purpose of this report.

Background. In 1984, the American Public Transportation Association (APTA) conducted a landmark study of the employment and business revenue impacts of investment in public transportation. That study was updated and expanded in 1999. A 2009 study of the same issue utilized new research, which was also leveraged in 2014 to update the study. Each subsequent study has revised the numbers from the prior study, expanded the range of types of impacts covered, and further refined measurement and computational methods. The 2019 study continues this progression, as it builds on recent data and research and addresses emerging issues.

The analysis methods that are laid out in these reports focus on national-level impacts, but also provide guidance for local and regional studies. It is important to note that the nature of public transportation investment has continually changed over time, the structure of the national economy has continued to evolve, and our analysis methods have continued to improve. Consequently, the findings of this study differ from those of earlier works, both in perspective and results.

1.2 Why Measure Economic Impacts

Transportation investment affects the economy through two fundamental mechanisms:

(1) *impacts of spending* — the act of investing money in public transportation facilities and operations supports jobs and income for that industry, as well as jobs and income in supplier industries and other affected elements of the economy; and (2) *costs and productivity impacts* — the public transportation services that are enabled by that investment provide enhanced mobility, time and cost savings; leading to broader economic growth that occurs as a result of changes in disposable household income, business productivity and market access.

There are public policy interests in both elements of economic impact, as they can help address a variety of issues, including:

- **Flow of Impacts.** Where does the money go? Who ultimately receives the added income, the reduced costs or the other benefits from capital investments and operations?

- **Breadth of Impacts.** Do the money benefits (in the form of added income or reduced cost) end up going to a narrow set or to a broad set of businesses and households?

- **Economic Stimulus and Competitiveness.** Do the capital investments and operations expenditures stimulate job and income growth where needed most (for either short-term economic stimulus or longer-term economic competitiveness)?

- **Consistency with Broad Public Policy.** Do the capital investments and operations activity complement or undermine other public investments? (in terms of efforts to add higher-paying jobs, support economic diversification, attract target industries and invest in target areas).

- **Complementing Benefit-Cost Analysis.** To what extent are there economic impacts related to mobility, access, and job preservation that are not otherwise recognized in benefit/cost analysis?

It is important to note that economic impact analysis is not the same as benefit-cost analysis. Economic impact analysis focuses specifically on measurable changes in the flow of money (income) going to households and businesses, including both spending and productivity effects. That is different from benefit-cost analysis, which considers the valuation of both money and non-money benefits including social, environmental and quality of life impacts. So, the effect on the economy, which is the primary subject of this report, should be seen as just one aspect of broader public policy considerations.

1.3 Report Organization

This report is organized into four Chapters.

1. **Introduction** – discusses the objectives of economic impact analysis and describes the facets of economic impact that are relevant to public transportation investment.

2. **How Public Transportation Affects the Economy** – presents a framework for classifying and viewing the different processes by which public transportation investment can lead to broader economic consequences.

3. **Transportation Performance Impacts on the Economy** – presents the results and methodology of an analysis of the economic growth that result from an increase in the availability and use of public transportation services.

4. **Spending Impacts** – presents the results and methodology of an analysis of the economic growth impacts that occur as a result of money flowing through the economy, which is triggered by public transportation capital and operations spending.

2. How Public Transportation Affects the Economy

2.1 Transportation Performance Impacts on the Economy

While the effects of public transportation investment spending can be of significant interest, longer-term travel benefits are a fundamental justification for public transportation investment that can ultimately lead to greater and more lasting impacts on an area's economy. Direct benefits for travelers fall into three core categories: (1) travel time savings, (2) travel cost savings, (3) reliability improvements. All three types of benefits can provide monetary savings for both public transportation passengers and for travelers who continue to use other transportation modes.

User benefits are derived from valuing traveler impact measurements such as changes in person hours traveled, vehicle miles traveled (VMT), and reliability improvements. Unit costs are then applied to these metrics to derive the direct user benefits. (Examples of unit costs are the vehicle operation expenditures per mile or hour, the value of time per hour, and the costs of accidents per incident, by type.)

Traditionally, public transportation passenger cost savings have been the primary factors considered as the benefits of public transportation projects. This mindset has changed significantly in recent years, and now it is widely accepted that public transportation investment can also help reduce roadway traffic congestion, with broader benefits for commercial truck deliveries, employer labor market access and other aspects of business productivity.

The *direct economic impact for travelers* can include vehicle operating cost savings (including fuel use savings) and parking cost savings for those switching from automobile to public transportation. In addition, a reduction in automobile traffic congestion due to greater public transportation use can also produce travel time savings as well as vehicle operating cost savings for highway users.

Transportation Benefits for Public Transportation Users

This section discusses the most obvious benefits from investing in public transportation — those for the users of public transportation services. Users include both those that would be using public transportation in both the lower and higher investment alternatives, and those that only use public transportation following the improvements possible at the higher investment level. These two groups of users sometimes experience different types of benefits.

Travel Time Savings. Improvements in public transportation services may lead to two types of travel time savings:

- Travel time savings for existing public transportation passengers from reduced access and egress time, waiting time, and in-vehicle travel time due to service improvements;

- Travel time savings for new public transportation passengers from reduced time driving and finding parking. Users that switch to public transportation often had unattractive, long

and congested driving commutes. Others switch simply because they find the in-vehicle experience of public transit more pleasant or convenient than having to drive and pay attention to the road.

Travelers can perceive travel via public transportation to be qualitatively different from automobile travel and thus valued differently. Public transportation can provide a higher value trip to the extent that passengers can use their travel time for business or other productive activities. However, public transportation can also provide a lower value trip if passengers wait exposed to the elements and then stand in crowded vehicles. While additional public transportation investment may provide more protected shelter for waiting and more comfortable and less crowded seating, this would not affect direct wages for business workers, nor would the benefits to personal travels have a direct economic effect.

Travel Cost Savings. Improvements in public transportation services may lead to cost savings for new public transportation users:

- For users decreasing personal car use — due to reductions in vehicle operating costs including fuel, parking, toll, maintenance, and wear-and-tear expenses;

- For users eliminating personal car use — due to eliminating vehicle purchase and ownership costs (including insurance and time-based depreciation.) In recent years, the proliferation of a suite of new mobility options, including transportation network companies (TNCs) and micromobility (such as bikeshare and scootershare) that can act as complements to public transit may support the reduction of personal car ownership.

- For users decreasing for-hire (taxi, TNC, carshare) vehicle use — due to the different between public transportation fares and for-hire vehicle fares.

Reliability Benefits. Improvements in public transportation services can enhance reliability for public transportation passengers by providing better information about vehicle arrivals, improving dispatching and scheduling, and investing in infrastructure like dedicated lanes to improve service quality.

Transportation Benefits for Non-Users

Public transportation investments can also have significant impacts on travelers who are not themselves using these services. These impacts are not often considered but can represent a significant portion of the beneficial outcomes from public transportation. These outcomes can be observed when taking a systems-level view

Travel Time Savings. Improvements in public transportation services primarily reduce delays for other road users by decreasing congestion-related delay. When road facilities are over capacity, average travel times increase, often in an exponential manner. Because most car drivers' choices do not include the congestion delay they impose on other users, reducing the number of cars on the road by shifting travelers to improved buses and trains can have widespread travel time savings effects.

Travel Cost Savings. Improvements in public transportation services may lead to cost savings for personal car users by reducing excess fuel use other incurred from driving in congested road conditions.

Reliability Benefits. Improvements in public transportation services can enhance reliability for cars and trucks as a consequence of less congestion-related traffic delay. These reliability benefits occur because rising traffic congestion can increase collision rates and lead to longer traffic backups when there is a disabled vehicle or collision. By taking some cars off the road, public transportation enhancements can reduce delay and increase reliability for all road users – including car, truck and public transportation drivers and passengers. NCHRP report 463

provides a detailed explanation of the definition of congestion, how it is measured, and how resulting traffic reliability issues affect passengers, businesses, and labor markets.[7]

The reason reliability is singled out in economic impact analysis is that, in addition to the direct effects on average travel time, it can also affect worker productivity, product and service delivery logistics, and market accessibility for both workers and customers. Unanticipated delays in worker arrival times or the arrival times of product inputs and services can hamper efforts to use just-in-time manufacturing and inventory systems, require more slack time in freight and warehouse scheduling processes, and can reduce productivity in service calls.

There are several ways to view and assess the economic value of time savings associated with reliability improvements. A commonly accepted approach is to recognize that many travelers (including car, truck, bus and train travelers) "pad" their personal schedules to allow for the possibility of greater congestion delay. This added "buffer time" (also known as "planning time") represents the necessity to leave early all the time to avoiding arriving late some of the time. By reducing the travel time uncertainty caused by traffic congestion, public transportation can reduce or eliminate the need for schedule buffering.

Economic Impacts of Travel Time Savings

In economic impact analysis, the treatment of travel time savings differs depending on trip purpose.

- Business trips (sometimes referred to as "on-the-clock" trips) include those conducted as part of a job. It is assumed that "time is money"—i.e., employers either pay directly for traffic delays by paying for the additional worker time, or indirectly through reduced employee productivity. Because of the latter effect, the USDOT recognizes the value of business travel time as the hourly cost of average labor — including wages, taxes and fringe benefits. From the viewpoint of economic impact analysis, that is a direct productivity cost to business.[8]

- "Commute trips" include those traveling between home and work. Generally, the direct value of time for commuters is recognized to be half of the wage rate. There is a further line of research showing that businesses ultimately end up also paying a wage premium to attract and maintain workers in congested areas where travel times and expenses are higher. The wage premium can represent the cost of an additional half-hour of labor and can be treated as an additional business productivity cost.[9]

- "Personal trips" are those done for any other purpose. Saving time on personal trips also have a clear value to travelers, which has been established by various "willingness to pay" studies. However, savings in personal travel time generally does not directly affect the flow of income generated in the economy and is thus not included in the economic impact analysis of this report.[10]

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[7] *Economic Productivity and Transportation Investment Priorities*: Literature Review, NCHRP Project 02-24, 2013. http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP02-24_Task1LitReview.pdf

[8] Revised Departmental Guidance on Valuation of Travel Time in Economic Analysis, US DOT, 2011. http://www.dot.gov/sites/dot.dev/files/docs/vot_guidance_092811c.pdf

[9] Timothy and Wheaton, Intra-Urban Wage Variation, Employment Location, and Commuting Times, J. Urban Economics, N.50, 2001; Ommeren and Rietveld, Compensation for commuting in imperfect Urban markets, Papers in Regional Science, V.86, N.2, June 2007, Brinkman, Congestion, Agglomeration and the Structure of Cities, Federal Reserve Bank of Philadelphia, Working Paper 13-25, 2013.

[10] While personal trips may involve some spending (on meals, recreation, etc.), and travel speeds may affect the timing and location of that spending, it is assumed that availability of faster public transportation options for personal trips will not increase total household spending in the U.S.

Accessibility Impacts

Improvements in public transportation services can also lead to economic productivity changes as a consequence of both expanded public transportation service and reduced traffic congestion. This can specifically include: *(a) mobility and market access* — business productivity benefits from access to a broader and more diverse labor market, and access to a wider customer market; and *(b) spatial agglomeration economies* — business productivity benefits from clustering of similar and complementary activities, enabled by public transportation services and terminal facilities.

Market Access and Agglomeration Economies. In addition to time and vehicle costs savings, public transportation provides household mobility benefits in terms of access to work, school, health care and/or shopping destinations. In the context of economic impact modeling, the work and shopping access benefits translate into increased productivity for business. This takes two forms:

(1) worker productivity enabled by access to a broader and more diverse labor market, offering better fit between desired and available workers skills, and

(2) economies of scale enabled by access to a wider customer market.

The labor market impact can be particularly notable, and is backed by public transportation passenger surveys, which measure the number of people using public transportation to travel to workplaces that they would otherwise not be able to access. These effects of larger market scale are sometimes referred to as agglomeration economies.

Public transportation supports economic growth through the concentration of economic activity and the clustering of offices, shops, entertainment centers, and other land uses around public transportation stops. Such clustering activity may provide increased efficiency through reduced labor cost, improved communication, lower infrastructure costs, and increased interaction with similar businesses. Clustering provides an opportunity for more face-to-face contact and for access to specialized labor, which result in higher productivity and more economic growth.

It is possible to estimate the labor market access effects of public transportation by observing the extent to which certain industries tend to cluster or agglomerate at locations where they can obtain a higher level of labor market or customer market access. Then one can measure the extent to which employment grows and creates income faster at those cluster locations.

In fact, many large cities could not possibly provide either the road capacity or the parking spaces needed to accommodate their downtown workforces without public transportation. In the same way, the clustering enabled by public transportation investment can facilitate economic linkages between organizations, government agencies, and workforce training institutions by providing access to labor, business networking opportunities, and suppliers.

Total Economic Development Impacts of Public Transportation Service. A wide range of local economic impact studies have estimated the regional economic impact of various alternative public transportation investment scenarios. These studies have done so by relying on regional economic models to estimate the impacts of public transportation enhancements on travel times and costs, workforce access and/or business market agglomeration. In doing so, they can demonstrate the substantial magnitude of impact that public transportation investment can potentially have on regional economies.

Benefits of Public Transportation without Direct Economic Effects

There are some benefits that do not directly translate into corresponding impacts on the flow of dollars in the economy.

Environmental Impacts. Reducing vehicle miles traveled has environmental implications. These benefits can be monetized. However, unless prices are applied (such as through emissions fees) there is no direct economic impact.

Safety Improvement Costs. Improvements in public transportation services may enhance safety by reducing collisions and associated insurance costs, personal losses and emergency response costs. The cost savings fall into four classes:

- Injury reduction for those shifting from automobiles to public transportation — due to the significantly lower incident rates for public transportation;
- Injury reductions for those still traveling by automobile — due to reductions in congestion and hence congestion-related collisions.
- Injury reductions for residents — to the extent that there are fewer cars on the road in the long-term, pedestrian and bicycle accidents and fatalities involving vehicles will be reduced.
- Reduced costs of traffic enforcement and emergency services.

The safety cost savings associated with increased public transportation investment is calculated as the sum of two elements: (1) the difference in average occupancy and accident rates for public transportation vehicles, cars and trucks, and (2) the difference in accident rates for roadway vehicles under alternative congestion levels.

Consideration of Property Value Impacts

From a macroeconomic perspective, the increase in property values near a public transportation station essentially represents a capitalization of the access and travel time benefits associated with those locations. Including this value in a regional or national economic impact study would be considered "doubling counting" since the value of time savings is already included in those other types of study. However, this form of analysis is useful both because it demonstrates the localized nature of some public transportation impacts, and because it also serves to confirm the value public transportation provides in the market. It also helps us understand how public transportation can shape development and land use changes.

2.2 Spending Impacts

Direct Spending Effects. *Capital investment* in public transportation supports purchases of equipment and facilities (including rolling stock, tracks, other guideways, rights-of-way, control equipment, and construction of terminals, stations, parking lots, maintenance facilities and power generating facilities). *Operations* of public transportation services supports associated jobs (drivers, maintenance workers, administrative and other transportation agency workers) as well as purchases of supplies needed for continuing operations (including motor fuel, electric power, maintenance parts and materials, etc.) Thus, investment in public transportation projects and services can directly support short-term construction jobs and longer-term operations jobs, as well as purchases of products that lead to further indirect impacts on industry activity and jobs.

The source of funding (fares, government support, etc.) that pays for these investments is not relevant to how the money flows through the economy, though it certainly affects benefit/cost ratios (regardless of source). From the

viewpoint of economic impact analysis (EIA), the investment can still lead to very real changes in the economy of some industries and areas, and that too is important to understand.

Indirect and Induced Effects. Direct investment in capital investment and operations of public transportation services lead to broader effects on the economy. They fall into two classes:

(a) *"Supplier Purchase" effects* on supporting industries, i.e., those that supply goods and services to enable the vehicle manufacturing and construction activities by providing engines, equipment parts, and the steel, concrete, wood and plastic materials needed for building vehicles, guideways and station facilities; and

(b) *"Employee Spending" effects* as employees spend their income on consumer goods and services — including healthcare, food, clothing, shelter, recreation and personal services.

The calculation of supplier purchase and induced employee spending effects is made on the basis of input-output (I-O) accounting tables. These matrices show the pattern of purchases and sales between industries in the economy. Base tables are constructed at a national level by the U.S. Bureau of Economic Analysis (BEA), and tables for smaller regions are derived by "regionalizing" the BEA tables to reflect inter-regional purchasing patterns. These regionalized tables thus utilize information on both the inputs used to produce a dollar of product for each specific industry and the extent that each industry's purchases are supplied by other firms located within or outside the study area. The multipliers are used to calculate the total direct, indirect and induced effect on jobs, income and output generated per dollar of spending on various types of goods and services in the study area.

3. Transportation Performance Impacts on the Economy

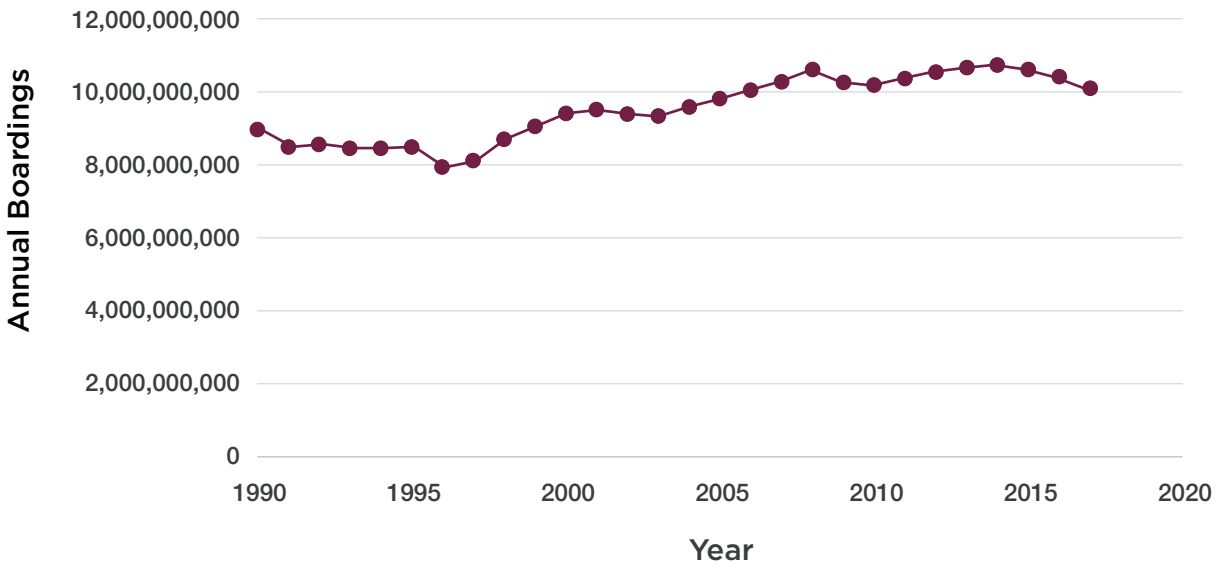
This chapter contains estimates of performance impacts of public transit in terms of monetized benefits and economic impacts. It describes the methodology and assumptions applied to estimate these benefits and impacts, and also acknowledges other benefits and impacts that were not quantified in this analysis.

3.1 Scenarios for Transportation Investment and Ridership

The analysis considers two public transit investment and ridership scenarios. The scenarios are founded in analysis presented in the most recent Conditions and Performance Report.[11] The report analyzes two types of public transit spending: expansion and preservation. It provides estimates of expected ridership growth under different levels of expansion spending, which are used to derive the two scenarios analyzed in this report. In order to account for the long-term impacts of sustained growth, this report presents a snapshot of benefits and impacts in the year 2040.

Context. Total ridership in the United States has been largely flat since approximately 2008 ***(See Exhibit 3-1)***. During this period, there has been limited investment in maintaining the state of good repair of public transit infrastructure in the United States, with the total state of good repair backlog estimated to be $89.9 billion in 2015, the most recent year for which data was analyzed, and was reported to be growing.[12] Local studies across the U.S. have tied ridership loss to declines in transit speed and reliability attributed to the declined state of good repair.[13] On the other hand, regions that have invested in expanding public transit have seen ridership gains.[14,15] Given this reality, the performance impact analysis considers one scenario in which expansion funding and ridership are both held constant. The second and third scenarios assumes a higher level of expansion investment, which spurs ridership growth, with estimates consistent with the Conditions and Performance Report.

Exhibit 3-1: Total Transit Ridership in the United States, 1990 to 2017



No Growth Funding Scenario: This scenario assumes sustained expansion funding at 2012 funding levels (as reported in the 2015 Conditions and Performance Report), which is approximately $7.4 billion in 2017 dollars. This funding level is expected to maintain ridership, which was approximately 10.2 billion unlinked trips[16] (about 6.8 linked trips).[17]

Increased Funding Scenario: This scenario assumes a modest increase in expansion funding to $10.8 billion (in 2018 dollars) annually. This is consistent with the "high growth" scenario in the Conditions and Performance Report. That report predicts that the difference in compound annual growth rates under the "high growth" scenario and the growth rate under 2012 expansion investment levels is approximately 0.7 percent. Given the assumption of a zero percent growth rate under sustained funding, the increased funding scenario assumes a 0.7 percent compound annual growth rate, which results in approximately 11.9 billion unlinked trips (7.9 billion linked trips) in the year 2040.

Higher Increased Funding Scenario: This scenario reflects a level of funding increase that was that APTA recommended to Congress in 2019. It increases total public transit funding (including both preservation and expansion) to $33.7 billion by 2026 (about $25.6 billion in 2018 dollars). This is consistent with expansion funding levels between the "higher growth" and the "highest growth" scenarios in the Conditions and Performance Report.[18] Extrapolating from the corresponding ridership growth projections, the increased funding scenario has a compound annual ridership growth of 2.7 percent, resulting in 14.5 billion unlinked trips (9.6 billion linked trips) in the year 2040.

Impacts of Preservation Spending. The Conditions and Performance Report also highlights the considerable preservation needs of the public transit system in the U.S. If preservation spending levels are not augmented, the average condition rating of public transit infrastructure is predicted to decline, according to the report. The most 2019 Conditions and Performance Report estimated the State of Good Repair backlog as $98.8 billion, which requires approximately $18.4 billion in annual reinvestment to fully eliminate by 2034.[19] The State of Good Repair backlog hampers the productivity of the U.S. economy. Over a six-year period, the backlog was estimated to result in a loss of $340 billion in cumulative business sales.[20] Because the impacts of preservation spending on ridership have not been estimated at a national level, this report does not attempt to estimate these impacts (both scenarios assume that preservation spending is held constant). However, the importance of preservation spending and the potential long-term impacts of underspending on preservation on ridership should not be overlooked.

[11] U.S. DOT FHWA. 2015 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance. Report to Congress (2016).

[12] APTA. The Economic Cost of Failing to Modernize Public Transportation (2018).

[13] APTA. The Economic Cost of Failing to Modernize Public Transportation (2018).

[14] APTA. Understanding Recent Ridership Changes: Trends and Adaptations (2018).

[15] Schmitt, Angie. "Only a Few American Cities Are Growing Transit Ridership – Here's What They're Doing Right." Streetsblog USA (March 2018).

[16] Unlinked trips consist of each stage of a journey, for example, each time an individual boards a bus or a train. Linked trips refer to the full journey from origin to destination.

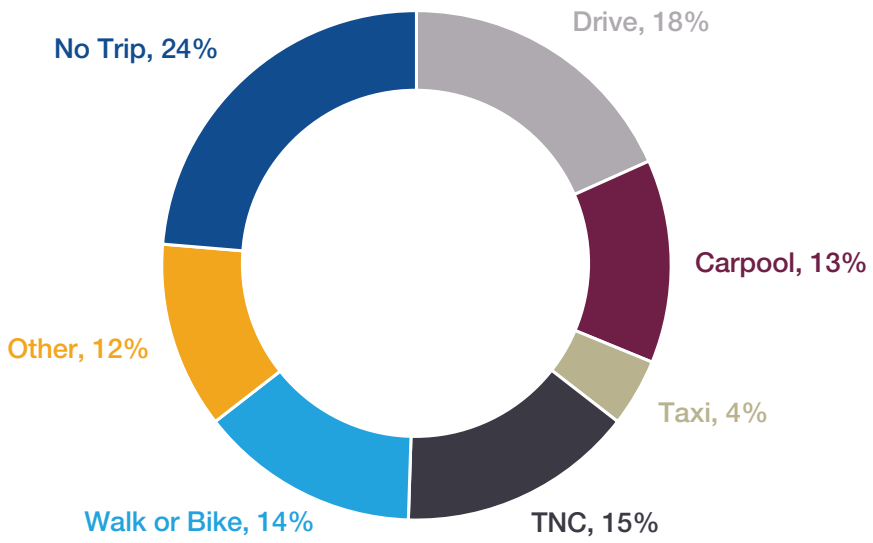
[17] APTA Fact Book (2019).

[18] The scenario assumes that the suggested annual increase in funding over the 2021 to 2026 continues through 2032, the year for which spending levels and expected ridership projections are reported in the Conditions and Performance Report.

[19] Status of the Nation's Highways, Bridges, and Transit. Conditions and Performance. 23rd Edition.

[20] APTA. The Economic Cost of Failing to Modernize Public Transportation (2018).

Exhibit 3-2: Mode Shift Profile



Source: APTA Who Rides Public Transit 2017, and research team analysis of recent on-board surveys.

3.2 Public Transportation Use and Mode Choice

Estimating the impacts of increased public transit ridership on the economy requires understanding of mode switching behavior associated with the ridership gain. That is, in the increased funding scenarios, public transit is more available and more convenient, resulting in higher transit ridership estimates. In the no growth funding scenario, where these transit improvements are not present, these additional transit trips would have to be made using other modes or may not be made at all. To calculate the benefits and potential cost savings of the additional transit trips in the increased funding scenarios, a mode shift profile is developed which answers the question: which modes would public transit users have used, if public transit were not available?

Mode switching profiles are generally compiled from survey research data. The survey research reported here asks current public transportation passengers what they would do if public transportation were not available. This is not quite the same question as who would come to public transportation services if they were to be expanded. However, it is reasonable to assume that the switching decisions would be fairly similar in both directions.

A compilation of responses to this survey question based on 69 reports from public transit agencies across the United States was included in the 2017 *Who Rides Public Transportation* APTA report. That report, which covers surveys that were conducted in the 2008 to 2015, does not include TNCs such as Uber and Lyft as an alternative, because these services were widely available only at the end of that survey period. The analysis presented here modifies the mode shift profile to include a 15 percent TNC share, which was estimated based on transit agency on-board surveys conducted in four cities during the 2014 to 2019 period. In addition, it excludes the “other transit” alternative, as the mode shift profile will be applied to understand how net new trips in the increased funding scenarios would be made in the no growth funding scenario.

The mode shift profile applied is shown in ***Exhibit 3-2***. Compared to the mode shift profile applied in the 2014 economic impact analysis, which used compiled survey data from 2007, a smaller share comes from driving and carpooling (31 percent compared to 46 percent) and the taxi share has declined from 10 percent to 4 percent. The declines are largely made up for with the introduction of TNCs. The walk, bike, and "no trip" shares have remained fairly constant.

The anticipated alternative choices of mode of service for bus passengers and for rail passengers could be very different, reflecting both shorter trip lengths for bus trips and income differences between bus and rail passengers. The percentages in ***Exhibit 3-2*** reflect the overall composition of existing transit trips.

3.3 Time, Cost and Reliability for Transit Users

Travel Time Savings. Investment in public transit expansion may produce time savings for existing public transit users. For example, new services closer to peoples' homes can reduce access and egress time. Increased service frequency reduces waiting time. In addition, investment in public transit expansion can produce time savings for users making new transit trips, shifting from other modes. New transit users may shift from highly congested driving trips and from slow walking trips.

Travel time savings for existing and new users generate societal benefits regardless of trip purpose. For business and commute trips, there travel time savings also have impacts on the economy, as explained in Chapter 2.

The extent of travel time savings depends on how public transit service is expanded. Due to the high variability in potential travel time savings, these benefits and impacts are not estimated here.

Exhibit 3-3: Assumed Per Trip Costs by Mode

Assumed Cost per Trip 2040 (in 2017 dollars)	
Transit	$1.56
TNC/Taxi	$16.29
Drive	$2.26

Sources: Costs are consistent with the APTA 2019 Fact Book (transit), https://www.taxifarefinder.com/rates.php (taxi and TNC), AAA Your Driving Costs 2018 report and Inrix Cost of Driving Index (drive)

Reliability Savings. As described in Chapter 2, investment in public transit can also generate reliability improvements for both existing and new transit users. The increased funding scenarios are expected to produce reliability improvements, which may reduce the amount of planned buffer time. This analysis does not estimate reliability benefits, which may also impact the economy through improved reliability for business and commute trips.

Travel Cost Savings. For new transit trips that shift from driving, taxi, and TNC modes, these new transit users experience travel cost savings. This analysis assumes the costs by mode on a per trip basis that are shown in ***Exhibit 3-3***.

Section 3.2 explained that the additional transit trips in the increased funding scenarios are made by individuals who take advantage of increased availability and convenience of transit in this scenario. These include individuals who, in the no growth funding scenario, elect to use more expensive options because of lack of transit availability or convenience. By applying the mode shift profile shown in ***Exhibit 3-2***, cost savings for users who use transit in the increased funding scenario but would drive in the no growth funding scenario are estimated to total **$200 million** in 2040. In the higher increased funding scenario, these savings total **$400 million**.

Cost savings for users who take transit in the increased funding scenarios but take a TNC or taxi in the no growth funding scenario are estimated to range from **$3.3 billion** (in the increased funding scenario) to **$8.2 billion** (in the higher increased funding scenario. These cost savings are significant, and they underlie the fact that for many transit riders, driving is not a potential alternative. According to recent on-board surveys, 68 percent of bus riders and 50 percent of rail riders reported that they did not have a car available for their transit trip.[21] In the absence of transit, many car-poor households are expected to rely on TNCs and taxis.

Cost Savings from Reduction in Automobile Ownership. With significant transit system improvements, some drivers would choose to eliminate a household vehicle. Research team analysis of 2017 U.S. Census data found that metro level transit mode share was a strong predictor of metro level car ownership (defined as cars per household). The analysis found that a 1 percent increase in transit mode share correlated with approximately 0.02 fewer cars per household, or the equivalent of two of every hundred households giving up a car.

In the future, the ability of households to rely primarily on public transit and give up a car may increase, as modes such as TNCs, carsharing, and micromobility, which can act as complements to transit become increasingly available. A recent TransitCenter study found that for each additional transit trip taken, transit users made an additional 0.24 taxi or TNC trips, supporting the hypothesis that taxis and TNCs complement transit.[22] Surveys by Uber and Lyft provide further evidence of an evolution towards use of those modes as a feeder for high volume transit services as well as a factor reducing car ownership.[23] A such, the relationship between transit mode share and car ownership from the 2017 metro analysis is likely a conservative estimate of the extent to which public transit investment can reduce car ownership in the future.

Individuals who shift from driving to transit save an estimated $9,797 per year.[24] The cost of owning and using a car includes fixed costs, such as license and registration, and variable costs, such as fuel and maintenance. Variable costs were considered in the cost per trip of driving, described under the "Travel Cost Savings" header above. The analysis of car ownership costs considers only the fixed costs, to avoid double counting. The fixed costs of car ownership are estimated as $6,202 per year.

Exhibit 3-4: Car Ownership Fixed Costs

Annual Cost Per Car	
Insurance	$1,232.00
License and Registration	$690.00
Depreciation	$3,580.00
Finance Charge	$700.00
Total Annual Fixed Cost	**$6,202.00**

Source: AAA Your Driving Costs 2018

Transit mode share in 2040 is projected to increase by 0.4 percent in the increased funding scenario and by 1.3 percent in the higher increased funding scenario, compared to the no growth scenario. Based on the relationship estimated by the research team, this is expected to correlate, conservatively, with a decrease in car ownership from 1.88 cars per household to 1.872 in the increased funding scenario and from 1.88 to 1.860 in the higher increased

[21] APTA. "Who Rides Public Transit?" (2017)

[22] TransitCenter. Who's On Board 2019: How to Win Back America's Transit Riders (2019).

[23] Uber's Economic Impact in the United States, 2018 (https://www.uber.com/newsroom/uber-in-the-economy/); Lyft Economic Impact Report, 2019 (https://www.lyftimpact.com/stats/national)

[24] APTA Transit Savings Report, June 2017.

[25] Wallace et al., Cost-Effectiveness of Access to Nonemergency Medical Transport

funding scenario. This modest reduction results in cost savings of approximately **$4.8 billion** in 2040 in the increased funding scenario and **$11.7 billion** in the higher increased funding scenario.

Value of Trips Not Made. As shown in Section 3.2, the increased transit funding scenarios are expected to induce transit trips. That is, with expanded transit, individuals will make trips that they otherwise would not have made. The mode shift profile in Section 3.2 estimates that approximately 24 percent of the new transit trips under the increased funding scenarios are induced.

Section 3.2 also shows that 14 percent of new trips switch from walk and bike. This mode shift reflects individuals who prefer to use transit to make a trip, potentially because of safety and weather protections or because of increased speed. In the increased funding scenarios, the increased availability and convenience of public transit makes it possible for these individuals to use transit for these trips. In the no growth funding scenario, individuals walk or bike because transit is either unavailable or inconvenient.

In both cases, individuals are willing to pay for a transit trip in the increased funding scenarios that they were not willing to pay for in the no growth funding scenario. Economist commonly use the "willingness to pay" concept to estimate the value of these induced trips. Individuals are willing to pay to make trips an amount that is commensurate with how much they value making that trip (or paying to use transit for that trip). Induced transit users may give up making these trips at any cost level between the cost in the increased funding scenario ($1.56) and the cost of not making the trip ($0).

These trips may include many trips that are often considered "optional", for example, recreation trips, or more frequent shopping trips, which are generally not expected to have a significant impact on the economy. However, there is evidence that induced public transit trips can also include medical and commute trips, which do have impacts on the economy. Research shows that ensuring access to preventative care such as vaccinations and cancer screenings as well as treatment for chronic conditions such as asthma, diabetes, and heart disease carries both health benefits for individuals, but also broader economic benefits to taxpayers. The aggregate cost of providing non-emergency medical transportation is smaller than that of treating patients with poorly managed diseases in the emergency room further down the road. As an example, the cost of missing appointments to manage asthma was estimated as $1,431.65 per capita.[25]

Many people in the United States also depend on public transit to get to work. Analysis of on-board surveys around the nation show that 50 percent or more of transit users commuting to work did not have a car available for that trip. This implies that public transit provides a critical role in job access and likely supports employment in the United States.

Given uncertainty about the exact "willingness to pay" for induced trips and the lack of data about the purpose of these trips, the analysis in this report does not include estimates of the value of inducted trips.

3.4 Time, Cost and Reliability for Other Road Users

Time, cost, and reliability savings also to automobile and truck travelers who benefit when public transportation leads to reduced traffic congestion growth. These benefits occur in urban areas where (current or projected future) traffic congestion during peak hours causes additional delay costs that can be reduced by diverting more commuting trips to public transportation.

The Value of Congestion Reduction. Congestion increases operating costs for car and truck drivers, adds to travel time, and can

have broader impacts on the economy. For example, congestion can reduce business productivity by increasing the time and reducing the reliability with which goods can be transported and reducing access to labor. The difference in vehicle operating costs under congested and free flow conditions are reported in ***Exhibit 3-5***.

Exhibit 3-5: Vehicle Operating Costs Under Congested vs. Uncongested Conditions

Vehicle Operating Cost ($/mile)		
	Free flow	Congested
Car	0.58	0.64
Truck	1.18	1.46

Source: ASCE Failure to Act: The Economic Impact of Current Investment Trends in Surface Transportation Technical Appendix

To estimate the impacts of investment in transit on were estimated based on four metropolitan area plans, which project congestion reduction resulting from public transit investment. The value of benefits per dollar invested in transit expansion is shown in ***Exhibit 3-6***. Values for Chicago and Washington, D.C. were estimated by the research team based on congestion projections in the plan and the values in ***Exhibit 3-5***. The values for Atlanta and Portland are based on user and wider benefits estimated as part of the long-range plan analysis.

Conservatively, this analysis focuses on the vehicle operating costs savings, which are estimated to be approximately $0.13 per dollar invested in public transit. Additional, congestion benefits are only applied to expansion spending in the thirty largest metro areas (approximately 84 percent of all public transit capital spending), where congestion impacts are expected to be significant. Based on this ratio, the congestion reduction benefits resulting from the increased funding scenario are approximately **$300 million** in 2040 and in the higher increased funding scenario are about **$800 million**.

3.5 Accessibility Impacts

The effect of *agglomeration economies* comes from the fact that widely available public transportation service can facilitate higher levels of metropolitan population and employment density, which, in turn can allow a metropolitan area's economy to become more productive. The reasons for this productivity gain are that:

- some businesses will have access to a larger and more diverse labor market, providing them with a better capacity to find workers with the desired skills, thereby enhancing labor productivity;
- some trade and service sector establishments will be able to access broader customer bases, allowing them to more efficiently arrange locations and resources to serve customers;

Exhibit 3-6: Benefits of Congestion Reduction

Benefits Per $ Invested		Benefits Included
Chicago	$0.06	Vehicle Operating Costs Savings Only
Washington, D.C.	$0.20	Vehicle Operating Costs Savings Only
Portland	$2.40	Includes travel time and productivity
Atlanta	$3.64	Includes travel time

– specialized knowledge spreads more quickly through social networks, enhancing human capital and labor productivity in technology and skill industries that benefit from such interaction; and

– greater diversity in economic activity and labor force skills breeds creativity and innovation.

These benefits, while occurring at a metropolitan level, can also translate into greater national level productivity if they take place across a broad spectrum of metropolitan areas. In the context of the present study, the magnitude of this effect is estimated first by considering the extent to which higher public transportation usage stimulates higher metropolitan density, and then by assessing the extent to which higher effective density translates into economic productivity.

Many studies have shown that adding public transportation capacity facilitates higher density development — particularly near public transportation stations, but also in downtown centers (through reduced need for parking). At the metropolitan level, public transportation ridership (as percent mode share) correlates with total metropolitan density such that a 1 percent change in public transportation's mode share relates to a change of roughly 650 people per square mile over the entire city. To be conservative, this section uses the much lower assumption that a 1 percent change in public transportation mode capture increases metropolitan density by 100 people per square mile. This lower assumption allows for the fact that correlation runs both ways — i.e., although public transportation facilitates higher density, higher density *requires* more public transportation.

Adopting the scenarios defined in Section 3.1, the scenario for increased public transportation investment would translate to an additional 1.2 billion public transportation trips per year in 2040 and boost the effective density of cities by approximately 0.8 percent. While the latter sounds small, extrapolating it to the 50 largest U.S. cities yields additional U.S. productivity (GDP) of about **$500 million** from the increased public transit investment.[26] Following the same logic, the higher increased funding scenario would generate **$1.2 billion** in additional productivity.

3.6 Overall Economic Impact of Cost and Productivity Changes

Direct Economic Impact. The impact of public transportation investment on both new public transportation passengers and continuing automobile travelers was shown to be substantial. For those households able to give up a car because of better public transit options, this would save them approximately $6,202 annually. This represents money returned to them for use on other household expenditures. The lowest quintile of households by income (one-fifth of all U.S. households) had household incomes of less than $24,638 in 2017.[27] For those at the lower range of incomes, this is a very substantial income benefit, providing an enormous gain in their desperately needed purchasing power.

In addition to the economic gains to public transportation passengers, the analysis in section 3.5 indicated that a further net gain to remaining automobile and truck drivers through congestion reduction.

Total Effects on the Economy. The long-term access and cost savings for travelers, which are addressed in this chapter, lead to further impacts on the economy through six mechanisms:

– New public transportation travelers who switch from automobile, taxi, and TNC travel receive savings in travel expenses and potentially in car ownership costs as well, which they can use to purchase other consumer products and services as they desire.

[26] Graham and Melo, 2018, based 0.047% change in GDP per 1% change in effective density; aggregate GDP in top 50 US cities is $12.7 trillion.

[27] U.S. Census Historical Income Tables

– Travelers who continue to commute to and from work by automobile can also benefit from reduced peak period traffic congestion, which leads to direct savings in automobile operating costs. Households can use the savings to purchase other consumer products and services as desired (and have more leisure time).

– Businesses that pay higher wages to attract workers in congested areas can potentially save on that labor cost premium as traffic congestion (or at least the growth of that congestion) is reduced. The net effect is a reduction in the cost of doing business. This represents an improvement in business productivity (i.e., the output/cost ratio), which can make affected businesses more cost competitive in global markets. The reduction in wage premium also offsets part of the household savings in commuting cost.

– Businesses in urban areas benefiting from faster and less congested commuting periods can also gain productivity as a result of gaining access to larger labor markets with more diverse and specialized skills. (See the "agglomeration economics" literature.) This can make affected businesses more cost competitive in global markets (without any necessary change in wage rates).

– At a regional level, business growth may occur insofar as the greater productivity and changes in consumer spending lead to more business sales and attraction of new business activity that sells products to elsewhere within the U.S. and abroad. However, at a national level, business growth can only occur insofar as businesses with enhanced productivity are able to serve a larger export market (due to enhanced cost competitiveness) or a larger domestic market (resulting from higher disposable income levels, as a consequence of productivity increases).

– At a regional level, business growth due to cost savings may lead to further economic impacts through indirect (supplier) an induced (worker re-spending) effects. However, at a national level, business growth can only occur insofar as businesses are able to increase productivity or sell to international markets.

The estimated economic impacts are shown in ***Exhibit 3-7*** on the next page. They reflect changes in household disposable income and business income, which are a direct consequence of greater public transportation availability. Those changes can lead to even broader impacts on the economy insofar as they spur shifts in business investment and location decisions, affecting labor markets and resource use. However, the broader consequences are more speculative and are not estimated here.

Due to the large number of assumptions that were necessary, these results should be interpreted as a reasonable estimate given the limitations of currently available data. However, they are illustrative of a broader methodology that can be applied in the future as improved data sources and improved scenario forecasts becomes available.

Altogether, the economic impact estimates indicate a potential increase in GDP of around **$9.1 billion/year** by the year 2040 in the increased funding scenario and **$22.2 billion/year** in the higher increased funding scenario, compared to the no growth scenario. In both scenarios, these impacts are approximately 3 times the assumed increment in annual investment. This ratio is greater than the ratio reported in the 2015 version of this report for two reasons:

1. This report considers different scenarios. The scenarios in this report are supported by funding requirements for different levels of ridership growth reported in the most recent Conditions and Performance Report[28] while the previous report considered different funding and growth scenarios supported by an older TCRP report.

Exhibit 3-7: Estimate of Scenario Impacts on the Economy, 2040

Form of Impact	Increased Funding Scenario	Higher Increased Funding Scenario
Cost Savings for Individuals who Shift from Drive to Transit	$200 million/yr.	$400 million/yr.
Cost Savings for Individuals who Shift from TNC/Taxi to Transit	$3.3 billion/yr.	$8.1 billion/yr.
Cost Savings from Congestion Reduction	$300 million/yr.	$800 million/yr.
Cost Savings from Auto Ownership Reduction	$4.8 billion/yr.	$11.7 billion/yr.
Business Productivity Gain from Enhanced Workforce Access	$500 million/yr.	$1.2 billion/yr.
Total Value Added (GDP equivalent)	**$9.1 billion/yr.**	**$22.2 billion/yr.**
Equivalent Wage Income Benefit	**$3.9 billion/yr.**	**$9.5 billion/yr.**
Equivalent Job Benefit	**90,000**	**219,000**

Reports the difference between "No Growth Funding" Scenario and "Increased Funding" Scenario

(effect of investing an additional $3.1 billion/year in expansion funding), and the difference between the "No Growth Funding Scenario and the "Higher Increased Funding Scenario" (effect of investing an additional $6.9 billion/year in expansion funding)

** All future-year dollar amounts are expressed in constant 2018 dollars*

2. This report utilizes new data from recent on-board surveys that asked transit riders about TNC use in the absence of public transit options and it also develops a new model of car ownership as it relates to public transit mode share.

Impacts may be greater insofar as higher business productivity (and as lower businesses costs) can make some American products more cost-competitive in global markets, generating even more income from further growth of exports.

Future GDP increases can mean more income for workers and more jobs created. The GDP increase by the year 2040 is equivalent to approximately 90,000 jobs in the increased funding scenario and 219,000 jobs in the higher increased funding scenario. Job creation will depend greatly on future rates of unemployment, labor force growth, changes in real (inflation-adjusted) wage rates, and business competitiveness in global markets.

Interpretation. The preceding analysis shows the nature of economic growth impacts that can be realized over a long period of time as a result of increased public transportation ridership growth. In interpreting those findings, it is important to note four issues:

1. These term impact estimates include only the effect of long-term transportation changes, which are in addition to the effect of ongoing transportation capital investment and operations spending discussed in Chapter 3.

[28] U.S. DOT FHWA. 2015 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance. Report to Congress (2016).

2. The benefits of increased public transportation use and reduced automobile traffic congestion grow over time, so that longer-term impacts will be even greater than those shown here for the year 2040.

3. This analysis counts only impacts on the flow of money in the economy. It does not include environmental benefits, social benefits for carless households, or any other class of benefit that do not directly affect the flow of money in the economy. A full benefit analysis would be needed to also assess those additional impacts.

It is also important to note that the economic impacts shown here apply to a set of illustrative scenarios, which are useful to demonstrate the substantial economic stakes associated with future investment in public transportation. Looking to the future, there is a clear need to consider additional scenarios for public transportation investment, and to also examine the economic impacts of alternative funding options.

Other Classes of Benefit and Cost. It is important to recognize that public transportation has a wide range of other costs and benefits that are not addressed in the analysis of economic impacts. They include the following:

– **Finance: Public Transportation Fares and Operating Subsidies.** Public transportation capital investments and operating costs are paid for through a series of mechanisms that vary from city to city. They include passenger fares, use of gas tax funds, and various other local and state tax mechanisms, including income and sales taxes. These costs must be considered in benefit-cost studies. The different options for raising funds also have widely divergent impacts on various economic sectors and population groups, which can also be studied. However, those issues are not addressed in this study, because it is important to isolate how public transportation investment and spending affect the economy separately from the issue of how the funding is raised.

– **Full Societal Benefits.** Public transportation capital investments and operations can also lead to a wide range of social benefits that are also valued by residents of affected areas. These may include impacts on energy use, air quality, carbon emissions, health, equity, and public costs associated with land use and development patterns. All of these various types of impact, often referred to as external impacts, can be assigned values and then considered in benefit-cost studies. However, it is important to note that many or most of these external impacts are valued by "willingness to pay" because they do not directly affect the flow of income in the economy. Accordingly, these broader impacts are not addressed in this study, as this study seeks to focus on a separate issue of how public transportation investment and spending affects the generation of jobs and flow of income in the economy.

– **Land Use Impacts.** In addition, the provision of public transportation services on a widespread scale can in the long run lead to greater reductions in automobile vehicle-miles due to broader changes in urban density and driving reliance. This is indicated by studies comparing urban areas with differing levels of public transportation service, which suggest that increased investment in public transportation could bring a reduction in automobile vehicle-miles that is substantially larger than the increase in public transportation passenger-miles.[29] However, those effects depend on the growth and density of the specific city, so the current analysis does not incorporate any such impacts.

[29] For instance, see *The Broader Connection between Public Transportation, Energy Conservation and Greenhouse Gas Reduction*, TCRP Study J-11(3), ICF for the American Public Transportation Association, 2008. www.apta.com/research/info/online/documents/land_use.pdf .

4. Spending Impact

Investment in public transportation facilities and systems affects the economy in two ways: (1) through the injection of spending on worker wages and purchases of materials and services, and (2) through cost savings and business productivity benefits that accrue as a result of public transportation services. This chapter focuses on the first category of impact, transit spending.

It is organized into five parts:

- *4.1 Definitions: Direct, Indirect and Induced Effects*
- *4.2 Mix of Capital and Operations Investment*
- *4.3 Economic Impact Modeling*
- *4.4 Overall Economic Impact of Money Flows*
- *4.5 Impact by Industry and Occupation*

4.1 Definitions: Direct, Supplier Purchases, Employee Spending

Capital investments in public transportation are made to accomplish one of three objectives:

- New system investments, with expenditures for land acquisition, engineering and all necessary system components;
- Modernization, with expenditures for replacement or rehabilitation of system components at the end of their useful lives; and
- Expansion, with expenditures for additions to existing services. The scope and range of expenditures for expansion projects vary greatly.

For all three classes of objective, *capital investment* is defined to include:

(1) *development of facilities* — including project design and construction of stations, maintenance buildings, right-of-way routes, power generation plants, etc. and (2) *purchases of equipment* — passenger vehicles (e.g., buses, trains) and supporting control and operations equipment. In addition, there is *ongoing spending* on operations and maintenance of public transportation systems, including bus and train services, maintenance activities and administration.

Labeling Economic Impacts. Both capital and operations spending on public transportation lead to impacts on the economy through three categories of economic impact. They are:

(c) *"Direct" effects* on workers and businesses engaged in the manufacturing of vehicles and control equipment, construction of guideways (tracks and special lanes) and station facilities, and operation of public transportation services;

(d) *"Supplier Purchase"* effects on supporting industries, i.e., those that supply goods and services to enable the vehicle manufacturing and construction activities by providing engines, equipment parts, and the steel, concrete, wood and plastic materials needed for building vehicles, guideways and station facilities; and

(e) *"Employee Spending"* effects as employees spend their income on consumer goods and services — including healthcare, food, clothing, shelter, recreation and personal services.

These economic "effects" can be viewed as indicators of the broader role of public transportation in a regional or national economy because they show how investment in public transportation supports jobs and income in other industries. They also illustrate how increases in public transportation spending generate additional jobs in the economy, if there are sufficient workers to fill these public transportation-generated jobs without displacing other existing jobs. If there are workers available for these new jobs, then an increase in public transportation spending can have very real "multiplier" effects by leading to more jobs not only in the construction and transportation industries, but also in other industries associated with supplier purchases and employee spending.

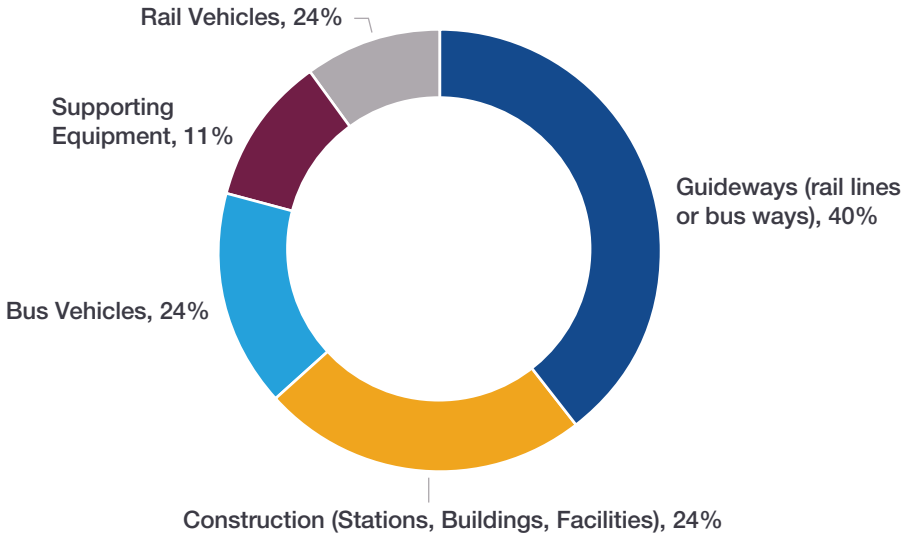
4.2 Mix of Capital and Operations Investment

Investment in public transportation capital and operations lead to different forms of job and income generation and affect different industries in the economy. For that reason, it is important to consider the public transit capital and operations funding mix.

Total U.S. Spending Mix. ***Exhibit 4-1*** shows the mix of products and services now being purchased as capital investment in public transportation within the U.S. ***Exhibit 4-2*** shows the mix between capital and operations, also at the national level. The most recent data from APTA (as of 2017) indicates that 72% of all public transportation investment is for operations and maintenance of existing systems, while 28% is for capital investment in construction and for vehicles and equipment needed to operate existing and expanded systems.

Federal Government Spending Mix. In accordance with U.S. authorization law, federal government funding for public transportation can be used for capital expenditures and preventive maintenance. However, according to the federally required standard accounting system, preventative maintenance includes components that are categorized as maintenance as well as components that are categorized as operations. Based on these categorizations, in the 2017 federal fiscal year, 37% of federal assistance for public transportation was designated for operating expenses and 63% was designated for capital expenses.

Exhibit 4-1: Capital Spending – Components of Capital Investment in Public Transportation in the U.S., 2017



Source: 2019 APTA Fact Book, Appendix A. www.apta.com/wp-content/uploads/2019-APTA-Fact-Book-Appendix-A.xlsx

Exhibit 4-2: Mix of Public Transportation Capital and Operations Spending 2017

	% of Capital Spending	% of Total Spending
Purchase of Buses	16%	5%
Purchase of Rail Vehicles	10%	3%
Purchase of Supporting Equipment	11%	3%
Construction of Guideways (rail lines or busways)	40%	11%
Construction of Buildings and Related Facilities	24%	7%
Subtotal: Capital Spending	100%	28%
Operations & Maintenance Spending		72%
Total Public Transportation Spending		100%

Source: 2019 APTA Fact Book, Appendix A.
www.apta.com/wp-content/uploads/2019-APTA-Fact-Book-Appendix-A.xlsx

Compared to the spending data summarized in the 2014 APTA Economic Impact Update, this newer data shows spending increases for guideways (+8%) and purchases of rail vehicles (+1%) and declines in spending on bus vehicles (-4%), construction of buildings and related facilities (-3%), and supporting equipment (-2%).

4.3 Economic Impact Modeling

The economic impact estimates in this study are based on a methodology commonly used to calculate impacts from transportation spending.

Calculation of Overall Impact on Jobs. The methodology uses a national economic model to: (1) track the pattern and mix of direct expenditures, (2) assess the portion of goods and services purchased within the U.S., and (3) trace the impacts generated from supplier purchases and employee spending. The current analysis is based on estimates that 80% of buses, 91% of rail vehicles, and 65 percent of supporting equipment purchases are made in America[30].

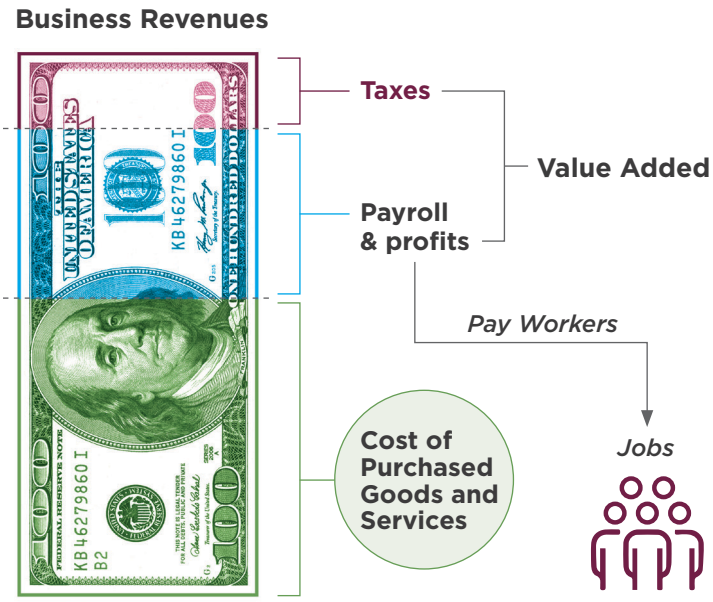
Other Metrics of Economic Impact. The economic impact of investment in public transportation occurs in the form of an increase in economic "activity" which can be measured in several different ways. They are:

- Total business output (volume of business revenues or sales)
- Total GDP (gross domestic product; also referred to as "value added", it reflects business profit, personal income, and taxes)
- Total labor income (i.e., wages/payroll and benefits, which is a subset of GDP)
- Total jobs associated with that labor income.

Job impacts are usually of most interest to the general public, partly because they are a unit of

[30] These estimates reflect the percentage of manufacturing occurring within the U.S. defined as the Local Purchase Percentage (LPP) within the IMPLAN economic model.

Exhibit 4-3:



Source: EDR Group.

measurement most easily understood and most often the most direct objective. It is important to note that these are alternative units of measurement of the same fundamental economic impacts, so they can *never* be added together. ***Figure 4-3*** presents the interactive relationships between the different economic impact measures.

4.4 Overall Economic Impact of Spending

Exhibit 4-4 shows the estimated breakdown of jobs generated in terms of direct spending, supplier purchases, and employee spending effects for both transit capital and operations spending. These estimates come from the national accounts of the IMPLAN input-output model.

Exhibit 4-4: Jobs Generated in the U.S. per Billion Dollars of Spending on Public Transportation

Jobs Generation per $ Billion of Spending	Capital Spending	Operations Spending	National Average
Direct Effect	4,410	8,702	7,500
Supplier Purchases (Indirect)	3,313	3,204	3,235
Employee Spending (Induced)	4,870	8,052	7,161
Total Jobs	12,593	19,958	17,896
Recommended Value for Use	**12,600**	**20,000**	**17,900**

Source: Calculations by EDR Group based on APTA Fact Book (2018 data) and IMPLAN Model (2018 prices). Note: Direct effect of capital spending includes vehicles, right-of-way, etc. Direct effect of operations spending includes jobs in transit agencies and contracted operations and are consistent with the job estimates in the 2019 APTA Fact Book.

Exhibit 4-5: Comparative Job Creation of Different Types of Public Outlays

Expenditure Type	Jobs per $Billion Outlays	Source	Year	Notes
Highway and transit	13,000	Council of Economic Advisers	2011	(A)
American Recovery & Reinvestment Act of 2009	10,870	Council of Economic Advisers	2009	(B)
Federal Defense	6,900	Watson Institute	2017	(C)
Clean Energy	9,800	Watson Institute	2017	(C)
Education	15,200	Watson Institute	2017	(C)
Infrastructure	9,800	Watson Institute	2017	(C)
Healthcare	14,300	Watson Institute	2017	(C)
Manufacturing	13,800	ACEEE*	2011	(D)
Construction	20,300	ACEEE*	2011	(D)
Trade-Services	18,800	ACEEE*	2011	(D)
Government	21,000	ACEEE*	2011	(D)
Outdoor Recreation	8,533	Outdoor Industry Association	2017	(E)
Energy Efficiency	9,300	U.S. Dept. of Energy	2014	(F)

**ACEEE: American Council for an Energy-Efficient Economy*

(A) Employment Impacts of Highway Infrastructure Investment, https://www.fhwa.dot.gov/policy/otps/pubs/impacts/

(B) Estimates of Job Creation from the American Recovery and Reinvestment Act of 2009, https://obamawhitehouse.archives.gov/administration/eop/cea/Estimate-of-Job-Creation/

(C) Job Opportunity Cost of War. Watson Institute - International & Public Affairs. Brown University (2017). https://watson.brown.edu/costsofwar/files/cow/imce/papers/2017/Job%20Opportunity%20Cost%20of%20War%20-%20HGP%20-%20FINAL.pdf

(D) "How Does Energy Efficiency Create Jobs?" - Fact Sheet. American Council for an Energy-Efficient Economy (2011). https://aceee.org/fact-sheet/ee-job-creation

(E) "The Outdoor Recreation Economy". Outdoor Industry Association (2017). https://outdoorindustry.org/wp-content/uploads/2017/04/OIA_RecEconomy_FINAL_Single.pdf

(F) "Assessing National Employment Impacts of Investment in Residential and Commercial Sector Energy Efficiency". Pacific Northwest National Laboratory (2014). https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-23402.pdf

The comparative analysis shown in ***Exhibit 4-5*** show that transit investment is competitive with other types of policy areas, including not only highway operations, but also defense, energy, education, healthcare, manufacturing, and other industries, in terms of stimulus for the overall economy.

Variation in Economic Impacts Over Time. The estimated ratios of jobs generated per billion dollars of spending that are shown here differ from prior studies. In general, these ratios tend to decrease over time for two reasons:

– The cost of paying workers tends to rise as worker productivity increases and as the buying power of the dollar is eroded by inflation over time. Increased productivity also means that fewer workers will be needed to provide the same services.

– The use of advanced equipment and material technologies — which affect the non-labor share of total costs — continues to rise over time. As spending on automated fare collection and control systems increase, the need for workers to manually provide these services is reduced.

There are several additional factors that also cause these job generation ratios to vary over time:

– Increasing globalization of trade tends to introduce more options for foreign-source parts and materials (which do not generate jobs in the U.S. economy). However, that trend can be mitigated through policies encouraging "made in America" purchasing.

– The job generation ratio for operations spending goes down as fuel cost takes a greater share of the money spent, particularly when the fuels are foreign-sourced petroleum products. However, job impacts can be increased if there is further switching to biodiesel and natural gas fuels (which are primarily made in the US).

– Economic impact models are gaining precision and detail about parts and material purchasing over time, which have tended to reduce job impact estimates as the models incorporate greater recognition of needs for highly specialized parts that may not be manufactured locally.

Variation in Economic Impacts by Region/ Area. The job generation ratios shown in ***Exhibit 4-4*** represent national impacts of public transportation spending. The corresponding impacts for any given state, region, metro area or city will be lower than the national figures because smaller shares of purchased equipment, parts and materials are typically produced within the geographically smaller area of study.[31]

Job Impacts of Alternative Investment Mixes. ***Exhibit 4-6*** shows how the job generation ratios vary depending on spending mix. A given level of operations spending generates more jobs

Exhibit 4-6: Jobs Generated in the U.S. per Billion Dollars of Investment in Public Transportation, for Alternative Capital/Operating Mixes (2018 Prices)

Category	Spending Mix (Capital / Operations)	Job Impact per Billion Dollars of Spending
Capital Investment Only	(100% / 0%)	12,600
Operations Investment Only	(0% / 100%)	20,000
National Total Investment	(28% / 72%)	17,900
Federal-Aid Investment Mix	(63% / 37%)	15,300

** National total includes spending by all federal, state, & local public transportation agencies, & companies within the US.*
Source: Calculations by EDR Group based on IMPLAN model, 2018 prices

[31] Regional economic models such as IMPLAN and RIMS-II, or broader economic analysis systems such as REMI and TREDIS, may be used to calculate impacts for smaller, sub-national regions.

Exhibit 4-7: Economic Impact of Spending $1 Billion on Public Transportation
(includes direct, supplier purchases, and employee spending) (2018$'s)

Economic Impact	Per $Billion of Capital Investment	Per $Billion of Operations Investment	Per $Billion of Average Investment
Output (Business Sales)	$2.6 billion	$3.0 billion	$2.9 billion
GDP (Value Added)	$1.2 billion	$1.9 billion	$1.8 billion
Labor Income	$0.8 billion	$1.3 billion	$1.2 billion
Tax Revenue (fed, state, local)	$264 million	$428 million	$382 million
Jobs (Employment)	12,600	20,000	17,900

Source: Calculations by EDR Group based on IMPLAN model, 2018 prices

than equivalent spending on capital investment because operations are more labor intensive, while capital investment requires more purchases of manufactured equipment. However, the two go together; it makes no sense to buy equipment without operating it, and it is not possible to continue operations in the long-term without upgrading or replacing some equipment and facilities. Combined, public transportation spending in the U.S. is estimated to generate around 17,900 jobs per billion dollars of spending (or 17.9 jobs per million dollars of spending).

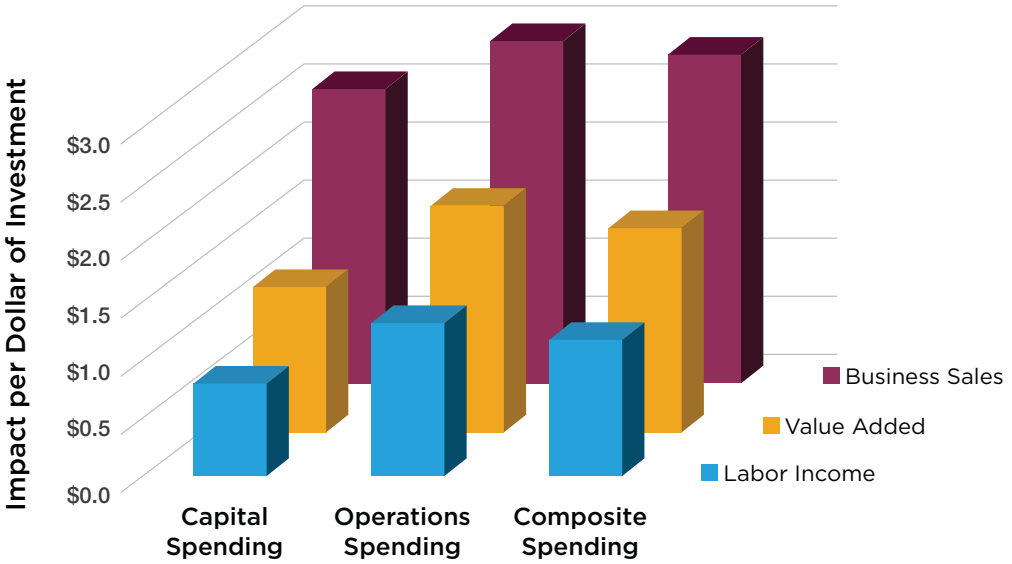
Federal Investment Impact on Jobs. Public transportation in the U.S. is funded by a combination of rider-paid fares, local/state revenue sources, federal funding, and other sources. To estimate the number of jobs supported just by federal investment in public transportation, it is necessary to recalculate the job figures using the specific spending mix that is applicable for federal funding. As previously noted, federal funding is focused on capital investment and preventative maintenance and by using the federal standard accounting system definition, this translates to 63% for capital expenses and 37% for operating expenses. That mix supports an estimated 15,300 jobs per billion dollars of federal spending on public transportation.

Other Impacts on Wages, Value-Added, and Output. *Exhibit 4-7* and *Exhibit 4-8* present additional metrics of economic impact per billion dollars of investment for capital, operations, and average investment. The broadest impact measure is output (e.g. business sales, which shows an average of $2.90 impact per dollar of public transportation spending. The impact measure preferred by most economists is GDP (Gross Domestic Product, also referred to as "value added"), which shows an average of $1.80 of change per dollar of investment. GDP consists of labor income, net corporate profits, and taxes. In addition, an average of 17,900 jobs are generated in the U.S. per billion dollars of investment. It is important to note that these numbers indicate the scale of investment impacts on the economy and are not benefit/cost ratios (which focus on long-term project benefits).

Tax Revenue Impacts. A breakdown of the corresponding tax revenue impacts of $1 billion of public transportation investment is shown in ***Exhibit 4-9***. Almost three-quarters of these tax revenues are generated because of additional labor income; the rest is generated as a consequence of additional business activity.

Exhibit 4-8: Ratios of Output, Value Added (GDP) and Income Impacts per Dollar of Public Transportation Investment

Source: Exhibit 4-7



4.5 Impacts by Industry

The job impacts shown earlier in ***Exhibit 4-7*** and ***Exhibit 4-8*** can be further disaggregated in terms of industries and occupations. A breakdown of national job impacts by major industry group is shown in ***Exhibit 4-10***. The mix of affected industry groups shown in those charts and tables reflects the combined outcome of four key factors:

– *The direct investment mix* for capital and operations – which in this case is primarily construction services; manufacturing of buses, trains, tracks and equipment; and government-owned public transportation services ***(as shown in Exhibit 4-2)***. This has changed since the last APTA impact update study.

– The locally-made portion of those manufactured products and services — which in this case means the U.S.-supplied portion: 100% for ongoing public transportation operations plus 80% for buses, 91% for train rolling stock, and 65% for control equipment.

Exhibit 4-9: Tax Revenues Generated per $Billion Dollars of Public Transportation Investment (in millions of 2018 dollars)

Tax Revenue Type	Federal Tax ($M's)	State & Local Tax ($M's)	Total ($M's)
Corporate Profits & Dividend Taxes	$21	$4	$26
Personal Income Tax	$96	$23	$119
Sales & Property Tax	$0	$82	$82
Social Security Contributions	$129	$2	$131
Other Taxes & Fees	$10	$14	$24
Total	**$256**	**$126**	**$382**

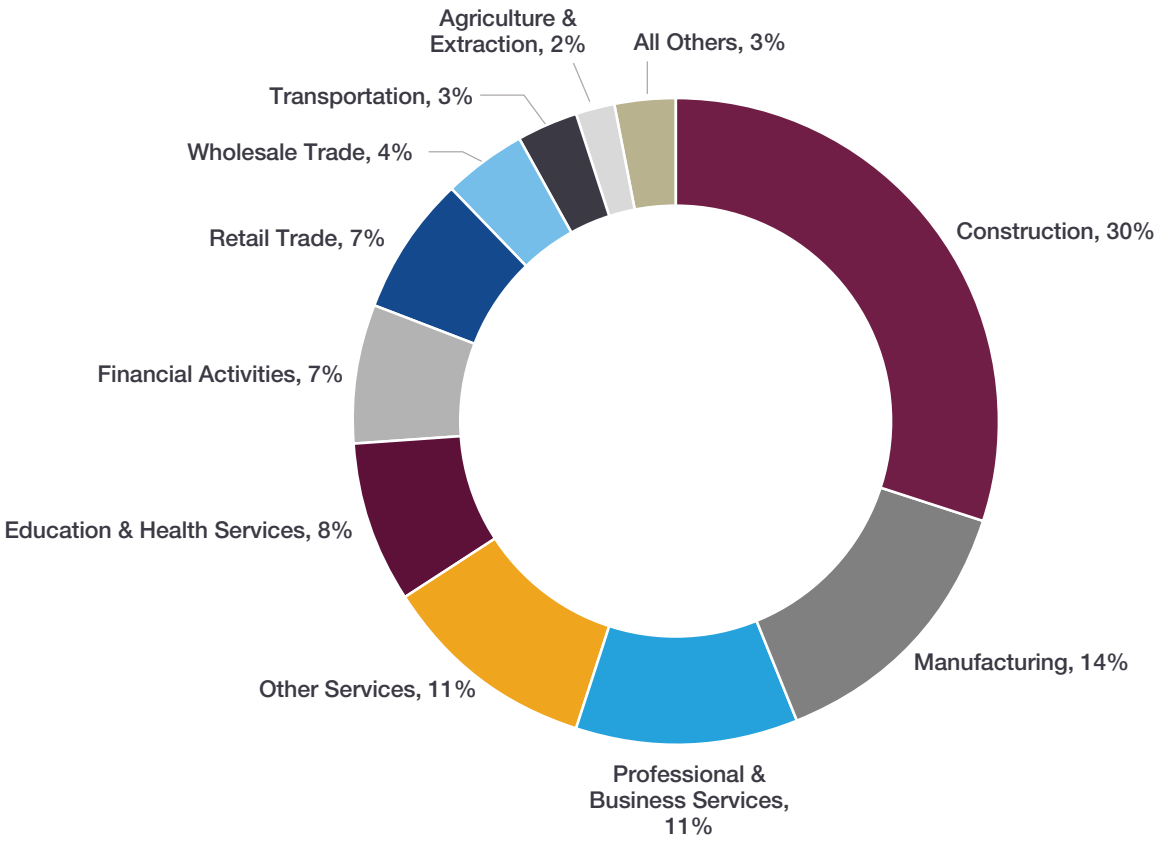
Source: Calculations by EDR Group based on IMPLAN model, 2018 prices.

– *The supplier purchases effect* on orders to their suppliers, which the national input-output table shows are distributed across a broad range of industries. For capital investment, these effects are concentrated in manufacturing of building materials and equipment, associated transportation and wholesale purchases, plus administrative, professional and financial services. For operations spending, these effects are concentrated in professional and administrative services, vehicle replacement parts manufacturing, wholesale trade, and petroleum products.

– *The employee spending effect* on worker spending of the additional wages, which the national input-output table shows are distributed across a very different range of industries — primarily health services, retail trade, restaurants and lodging, personal services, and financial services. This effect changes from year-to-year as the average labor compensation per worker in each U.S. industry changes, and the input-output models reflect such changes.

This chapter quantifies the economic effect of spending money on public transportation capital needs and operating expenses. To offer a more complete picture of total impacts on the economy, the final chapter of this report presents these stimulus effects along with the cost savings and productivity impacts summarized in Chapter 3.

Exhibit 4-10: Jobs per $ Billion of Public Transportation Capital Investment by Industry



Source: Calculations by EDR Group based on IMPLAN model

5. Summary of Findings

Together, the results presented in Chapters 3 and 4 of this report show that there is significant economic gain available from increased transit investment, both from stimulus effects and from long-term effects on national productivity. ***Exhibit 5-1*** presents the total impact of a scenario of enhanced public transportation ridership. These impacts are derived from two processes: (1) the effect of enhancing transportation system performance, which affects household and business operation costs (portrayed in Exhibit 3-7), and (2) the effect of spending on purchase of vehicles, materials, and construction activities ***(see Exhibit 4-7)***.

The combined effect indicates that the impact of an increase in public transit funding on U.S. annual GDP can exceed **$14 billion** by the year 2040 in the increased funding scenario and is nearly **$35 billion** in the higher increased funding scenario. In both cases, that is approximately **five times** the increment in annual investment in that year. The impact will be smaller in earlier years and potentially greater in later years.

Differences from the previous version of this report reflect the different scenarios analyzed here as well as newly available data sources that enabled the estimation of values such as cost savings from using transit as an alternative to TNC.

It is important to note that the analysis in this report shows the potential effect of additional investment in public transportation compared to not making any additional investment. These numbers do not incorporate any assumptions regarding how the money could otherwise be spent.

The findings show that the national economy needs dependable, efficient mobility options to continue a growth trajectory. They also show that there is significant economic gain available from a scenario of increased transit investment. In the long term, a program of enhanced investment over 20 years will lead to an accumulation of significant benefits.

Exhibit 5-1: Estimate of Increased Funding Scenario Impacts on the Economy, 2040

Scenario	Form of Impact	Impact of Transportation Performance Change (A)	Impact of Spending (B)	Total
Increased Funding	Value of Economic Impact	$9.1 billion/yr.	$5.5 billion/yr.	$14.6 billion/yr.
	Wage	$3.9 billion/yr.	$3.7 billion/yr.	$7.6 billion/yr.
	Job Equivalent	90,000	55,000	145,000
Higher Increased Funding	Value of Economic Impact	$22.2 billion/yr.	$12.4 billion/yr.	$34.6 billion/yr.
	Wage	$9.5 billion/yr.	$8.2 billion/yr.	$17.8 billion/yr.
	Job Equivalent	219,000	123,000	342,000

**All future year dollar amounts are expressed in constant 2018 dollars*

(A) From Exhibit 3-7

(B) Calculated from Exhibit 4-7 effect per $1 billion of additional spending, factored up to reflect $3.1 billion in the increased funding scenario and $6.9 billion in the higher increased funding scenario.

Note: Value of economic impact and wages cannot be added, as wages are a component of economic impact.

Economic Impact of Public Transportation Investment

2020 Update

APRIL 2020

Report Prepared for:

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Report Prepared by:

Economic Development Research Group, an EBP Company

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