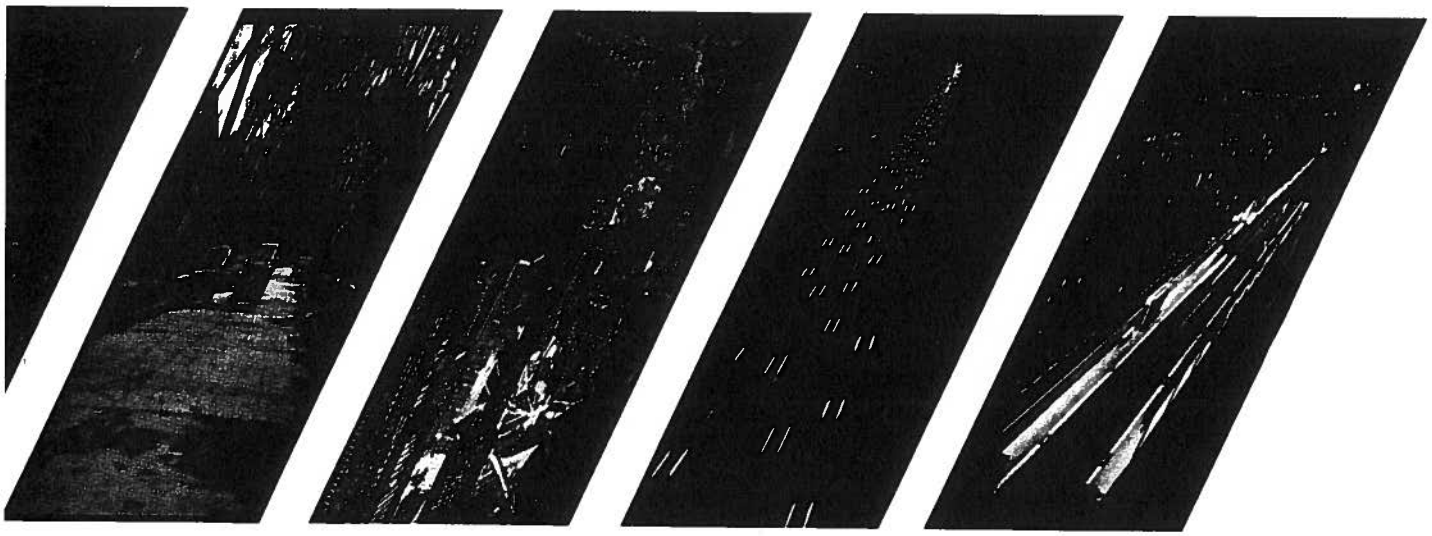
Commuter Rail

Serving America's Emerging Suburban/ Urban Economy



a report for

American Public Transit Association

APTA

prepared by

The Carmen Group, Inc.

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Executive Summary

Every day, commuter rail becomes more essential to American competitiveness, and more central to dominant American work and living patterns. Commuter rail is the link between our cities that are centers of commerce and industry and the suburbs where 48.1 percent of the American work force now lives. Commuter rail has become the lifeblood of the suburban/urban relationship, adding value to the taxpayer in both locations.

This report quantifies the economic benefits that commuter rail in the United States generates, not only in the regions they serve, but also for the nation. Benefits flow to a broad constituency of commuters, taxpayers, businesses, and metropolitan areas as a whole. Public funding of commuter rail makes these benefits possible, providing needed capital investment and drawing riders away from more costly forms of transportation. Commuter rail uses these public funds in a cost-effective manner; per-passenger-mile operating expenses have remained stable and farebox recovery rates are near 50 percent. To meet the nation's 21st century transportation needs, commuter rail will need to be an integral part of regional transportation systems which include highways, motor buses, and heavy and light rail.

Profile of the Commuter Rail Rider

Drivers: Most commuter rail riders own two or more automobiles. Although automobile transportation is available, these passengers appreciate the affordability, safety, and time savings associated with commuter rail service.

Taxpayers: On an annual basis, commuter rail riders pay an estimated $4.1 billion in federal income tax, $2.2 billion in state income tax, and an estimated $651 million in gas and fuel taxes.

Middle Class: The average commuter rail rider is likely to be married, a homeowner, and earning a household income greater than $50,000. People in this income group account for 88 percent of all federal income taxes received.

Reverse Commute: While most riders are suburbanites heading for jobs in the central city, a growing number are reverse commuters, leaving homes in the city to work in the suburbs.

Community Benefits

Economic benefits from commuter rail accrue not only to passengers but also to the general public. Rail commuters and the general public avoid economic costs estimated at $4.5 billion per year.

Congestion-Mitigation Benefits: By mitigating traffic congestion, commuter rail service saves the American public $1.9 billion per year.

Safety Benefits: Through the use of commuter rail instead of automobiles, the public avoids an estimated $1.7 billion in annual costs caused by traffic-related injuries and fatalities.

Environmental Benefits: Commuter rail is environmentally friendly. The nation benefits by mitigating environmental degradation costs by $263 million a year.

Job Creation

Capital Projects: Over the last 10 years, commuter rail capital investments totaling $24 billion have created 420,000 jobs. Commuter rail capital projects have produced 219,000 jobs in the construction industry, 109,000 jobs in the manufacturing industry, and close to 40,000 jobs each in the service sector and retail/wholesale trade sector.

Operating Jobs: Commuter rail systems currently employ over 23,000 people. As systems expand to meet increasing demand, commuter rail employment will grow.

Taxes Generated: From 1985-1996, commuter rail capital projects have generated an estimated $3.5 billion in federal, state, and local tax revenue.

Business Benefits

Freight Industry: Freight transportation, which comprises 6.2 percent of the U.S. gross domestic product, benefits from reduced road congestion in areas served by commuter rail systems. Commuter rail saves the truck and freight industry between $300 million and $450 million per year.

Expanded Labor Pool: Commuter rail service allows businesses to attract labor and customers from a wider geographical area, resulting in more sales opportunities and a higher-skilled work force.

Business Location Choice: Reverse commuting allows businesses to draw on urban labor.

Catalyst for Economic Development: Commuter rail investments spur regional business and real estate development.

Retail Sales Benefits: Merchants find that a location proximate to a commuter rail station adds value to their businesses.

Benefits to the Rider

Cost Savings: Rail commuters who own cars save between $2 and $6 per day compared to automobile commuting.

Convenience: Commuter rail riders avoid 23 to 81 hours of traffic congestion per year. Rail commuters who avoid this delay save between $247 and $865 in time and fuel costs annually.

Workday Commute: Every day 1.2 million people ride commuter rail (87 percent use commuter rail to travel to their jobs).

Return on Investment

Commuter rail annually yields $5.2 billion in economic and societal benefits. Federal funds to commuter rail systems in 1994 were $952 million. The benefits of commuter rail are four-times greater than the federal investment. These benefits include: cost savings from avoided congestion; cost savings from the mitigation of traffic accidents and environmental damage; and tax revenues generated. These benefits are above and beyond the personal value of commuter rail transportation to the rider such as the value of employment or travel.

Economic Rationale

Low-Cost Benefits: Commuter rail operating assistance is economically justified because it draws additional riders, in turn reducing congestion, in-

creasing economic development and lowering environmental costs. These benefits outweigh the cost of the assistance.

Commuter Rail Performance

Growing Ridership: Demand for commuter rail service is on the rise. Overall commuter rail ridership increased 8.8 percent between 1993 and 1996. Over the last four years, established systems have gained 26 million passenger trips and new starts have experienced a 27 percent growth in ridership.

Farebox Recovery: Commuter railroads have consistently paid a significant portion of their operating expenses through farebox recovery. In recent years commuter railroads have maintained farebox recovery near 50 percent.

Low Per-Mile Costs: Commuter rail systems operate efficiently, maintaining service at low per-passenger-mile costs. Commuter rail operating costs have remained almost unchanged from 1990-1994, at around 27 cents per-passenger-mile.

Use of Preexisting Infrastructure: Whether for expansion or new service, commuter rail has collaborated with freight railroads to utilize existing freight rail infrastructure and corridors rather than building new tracks.

State and Local Contribution: Federal funds are a small portion of commuter rail operating revenues. State and local sources supplied 90.5 percent of operating funding.

A Vital Component of Regional Transportation

Intermodal Connections: Commuter rail will continue to serve an important role in regional transportation systems that include highways, buses, heavy rail, and light-rail. These modes will continue to work in conjunction to serve U.S. transportation needs in the growing suburban/urban economy.

Economic Pathway Between City and Suburb: Recent studies have shown that cities and suburbs are becoming tightly integrated and more dependent upon the prosperity of one another. Commuter rail serves as the transportation lifeline between city and suburb.

A Cost-Effective Partner for Highways: The U.S. Department of Transportation has estimated costs to maintain highway and bridge conditions at current levels and annual costs to improve highway and bridge system performance at $54.8 billion and $74.0 billion, respectively. By contrast, the annual cost to maintain and improve all forms of transit amounted to $7.9 billion and $12.9 billion, respectively.

Increasing Highway Costs: Acquisition-of-right-of-way costs have increased four fold since 1987, and the cost to add one lane-mile of highway capacity has risen 13.7 percent in real terms since 1987.

Highway Limitations: Adding highway capacity is becoming more expensive. In addition, studies demonstrate that new capacity will not effectively meet the needs of America's commuters.

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Integral to the National Economy

introduction

Every day, commuter rail becomes more essential to American competitiveness, and more central to dominant American work and living patterns. Commuter rail is the link between our cities that are centers of commerce and industry and the suburbs where 48.1 percent of the American work force now lives. Commuter rail has become the lifeblood of the suburban/urban relationship, adding value to the taxpayer in both locations.

This report quantifies the economic benefits that commuter rail in the United States generates, not only in the regions they serve, but also for the nation. Benefits flow to a broad constituency of commuters, taxpayers, businesses, and metropolitan areas as a whole. Public funding of commuter rail makes these benefits possible, providing needed capital investment and drawing riders away from more costly forms of transportation. Commuter rail uses these public funds in a cost-effective manner; per-passenger-mile operating expenses have remained stable and farebox recovery rates are near 50 percent. To meet the nation's 21st century transportation needs, commuter rail will need to be an integral part of regional transportation systems which include highways, motor buses, and heavy and light rail.

U.S. Commuter Rail Systems

CalTrain (Peninsula Corridor Joint Powers Board, PCJPB)

Connecticut Department of Transportation (ConnDOT)

Maryland Mass Transit Administration (MARC)

Massachusetts Bay Transportation Authority (MBTA)

Metra

MTA-Long Island Rail Road (LIRR)

MTA-Metro-North Railroad

NJ Transit

North San Diego County Transit District (NSDCTD)

Northern Indiana Commuter Transportation District (NICTD)

Southeastern Pennsylvania Transit Authority (SEPTA)

Southern California Regional Rail Authority (SCRRA-Metrolink)

Tri-County Commuter Rail Authority (TCRA-Tri-Rail)

Trinity Railway Express (Dallas Area Rapid Transit & Fort Worth T)

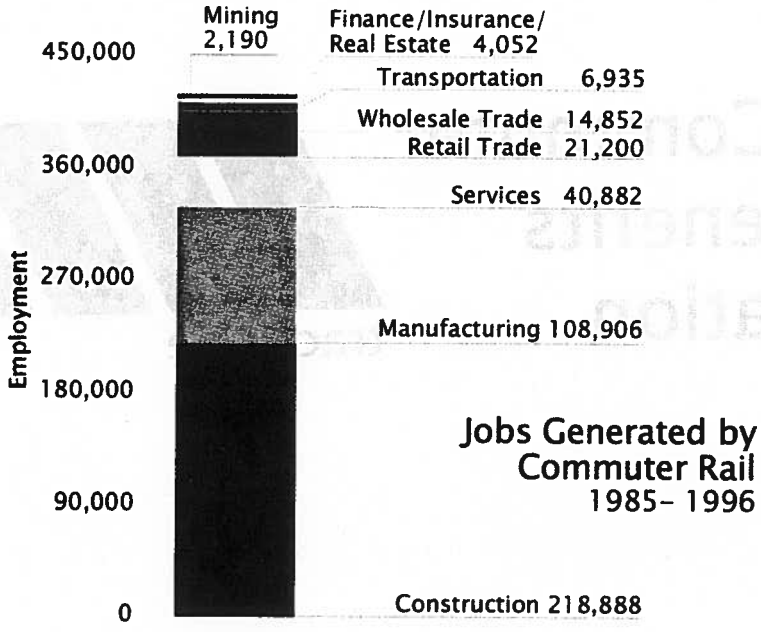
Virginia Railway Express (VRE-Northern Virginia Transportation Commission & the Potomac and Rappahannock Transportation Commission)

How Commuter Rail Benefits the Nation

Commuter railroads carry an estimated 1.2 million passengers every business day. Most passengers are traditional suburb-to-city riders, but as employment patterns within metropolitan areas and the relationship between cities and suburbs change, so does commuter rail travel. Many commuter rail systems now operate reverse commutes to transport central city workers to suburban jobs; operate weekend service for tourists and sporting events; and link together two or more suburban areas. Commuter rail is an economic lifeline between cities and suburbs, facilitating mutually beneficial economic relations that improve an entire metropolitan area.

Commuter rail generates benefits for the commuter and non-commuter alike.[1] In fact, it generates total benefits estimated over $5.2 billion annually. These result from nearly $1 billion in federal government assistance and $2.5 billion in state and local government assistance (1994 figures). Commuter rail capital projects and spending generate employment and tax benefits not only for their communities, but also for their regions and the nation as a whole. Non-commuters benefit from reduced congestion, fewer traffic fatalities and injuries, and lower environmental costs. Rail commuters save $2 to $6 a day compared with automobile commuting. With a more mobile labor force, businesses can draw on a larger geographical area for skilled labor. Through stronger suburban/urban linkages, the entire nation benefits.

commuter rail capital spending has generated more than 400,000 jobs since 1985



General Economic Benefits

Benefits from commuter rail accrue to the public in two ways:

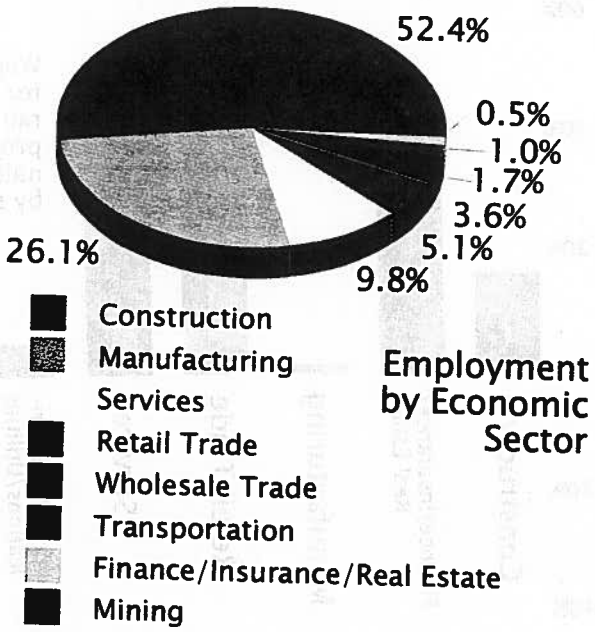
1) Capital investment spurs sales and employment. These benefits are detailed in this section and cover the period from 1985-1996.

2) Commuter rail operations generate benefits in the form of cost savings. These benefits arise from mitigating the costs of traffic congestion, traffic accidents and fatalities, and environmental degradation. The cost savings from commuter rail are detailed in the section "How All Commuters and Taxpayers Benefit from Commuter Rail." Those savings are estimated on an annual basis.

Job Creation

Commuter rail has experienced significant growth in recent years as new systems began service and existing systems expanded. In 1996, commuter rail systems employed more than 23,000 people in an industry with high union participation. The future promises more of the same: as commuter rail expands to meet increasing ridership and to mitigate increased traffic congestion and environmental degradation.

Commuter rail authorities have increased capital spending to meet increased ridership. This has generated employment and tax benefits for communities, regions, and the nation. From 1985 through 1996, commuter rail capital expenditures have resulted in the creation of an estimated 420,000 jobs[2] in a wide range of high-paying industries. This estimate applies only to



Employment by Economic Sector

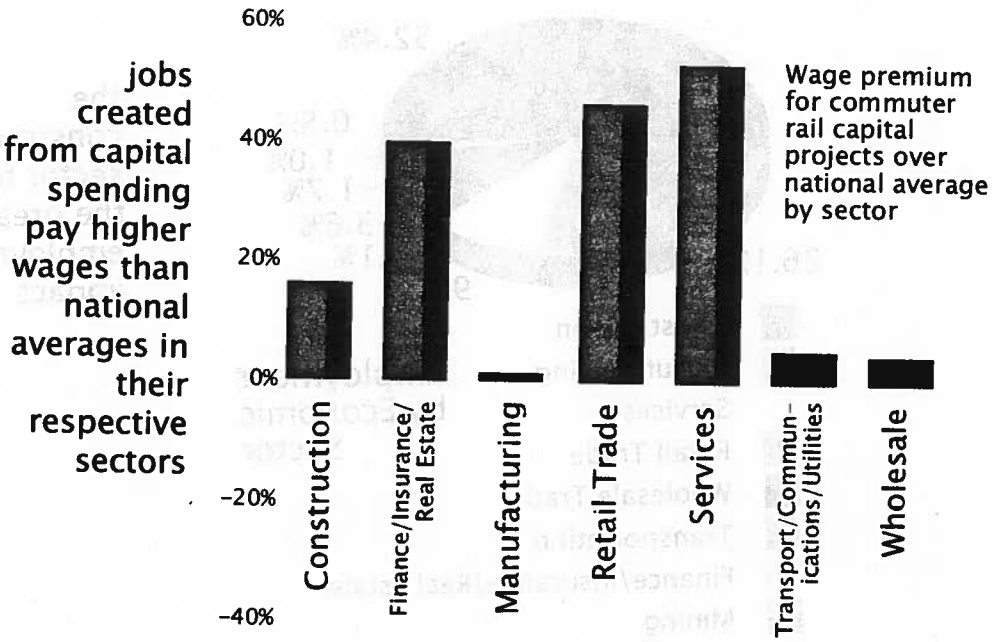
the construction sector had the greatest employment impact

the direct and first-level indirect effects of commuter rail systems' capital spending. Excluding labor compensation, taxes, and leakages outside the U.S. economy (e.g., imports), total spending from the $24 billion invested by commuter rail since 1985 reached an estimated $38.9 billion, or 1.61 times the initial investment.

Spending of commuter rail capital funds has spread from very specialized industries into almost every sector of the national economy. Therefore, the employment effects resulting from commuter rail's expansion are just a portion of the total number of jobs created. While these jobs penetrated into every industry of the nation's economy, they also encompassed all professions and positions within particular industries, from the secretary to the executive, the technician to the engineer, the production line worker to the researcher.

The most jobs generated from commuter rail capital expenditures were in the railroad construction industry which accounted for 44.8 percent of all jobs created. The retail and wholesale trade industries accounted for 8.7 percent of total employment generated, while engineering, architectural, and surveying jobs accounted for another 5.2 percent. Jobs in other industries such as building construction, communication equipment, motor freight transportation, local transit facilities, power distribution and specialty transformers, and personnel supply services round out the employment effects. Commuter rail's capital expenditures had a positive impact on more than 360 different industries measuring only first and second-level spending effects.

The construction sector accounts for over half the total employment generated, almost 219,000 jobs, and the greatest employment impact.



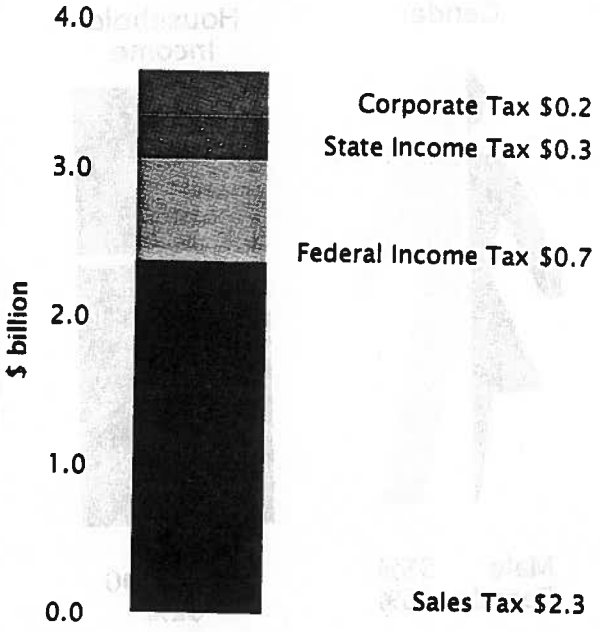
Commuter rail capital projects created another 109,000 jobs in manufacturing, representing 26.1 percent of total employment effect. The service sector and retail/wholesale trade sector also experienced job gains, amounting to approximately 41,000 and 36,000 jobs, respectively.

Commuter rail capital expenditures create jobs in industries that pay higher than average wages in their respective economic sectors. For instance, railroad construction compensation pays $3,768 annually over the average for all construction. The heavy emphasis on railroad construction raised overall average annual compensation in the construction sector to $25,475 (1987 dollars), 15.9 percent over the national average annual compensation.[3] Jobs created in the service sector, however, enjoy the greatest compensation premium over the national average at 52.9 percent or nearly $10,000. Employment in retail trade earns $4,600 over the national average. Employment compensation in wholesale trade and manufacturing also pays higher than the national average.

Tax Revenues

Besides employment, commuter rail authorities' capital spending also has an impact on tax revenues. Inputs and materials purchased are subject to state and local sales taxes, while the compensation paid to workers is taxed by state and federal authorities. In addition, profits generated from sales are subject to corporate income taxes. As noted above, these revenues are generated from first and second level spending and not from subsequent spending. Commuter rail capital expenditures generated an estimated $3.5 billion in state and federal tax revenue from 1985-1996. State sales taxes constitute the majority of total tax revenues generated at nearly 65.7 percent. Federal and state income taxes accounted for 20 percent and 8.6

Tax Revenues from Capital Expenditures 1985–1996	$billion
state & local sales taxes	2.3
state income tax	0.3
federal income tax	0.7
corporate income tax	0.2
total	3.5



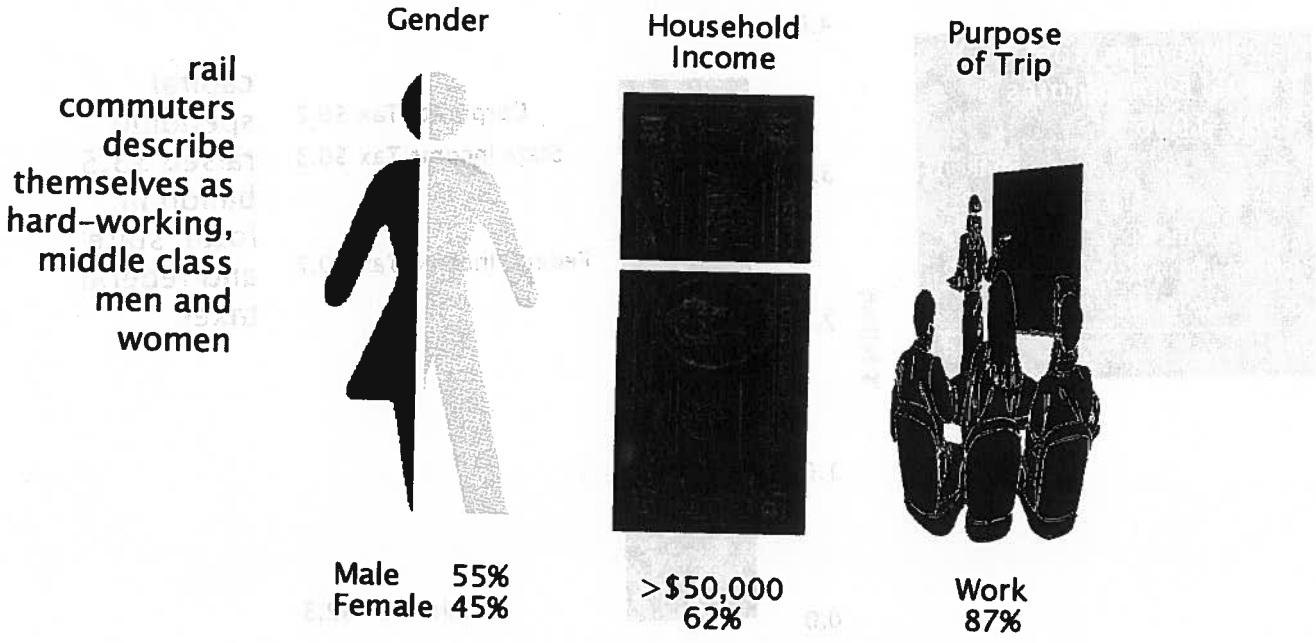
capital spending raised $3.5 billion in local, state and federal taxes

percent, respectively. Since this analysis covers only first and second level spending, actual tax revenues should be in excess of the estimated $3.5 billion.

As commuter rail ridership increases and systems expand, commuter railroads will continue to bring positive employment and tax revenue impacts well past the year 2000. A study of Metra's FAST Project estimated employment gains of nearly 90,000 jobs over the project's ten-year cycle.[4] Tri-County Commuter Rail Authority (Tri-Rail) of South Florida estimated that its five-year transit development plan that includes service expansions and improvements will generate estimated employment gains of 6,300 jobs over five years. The resulting federal and state tax revenues generated from these projects are estimated at $368 million from Metra's FAST Project and $21.6 million from Tri-Rail's transit development plan. Seven commuter rail systems have capital projects estimated at $3.8 billion planned through 2004. Other commuter rail systems have capital improvement and expansion plans in the works.[5]

Economic Multipliers

Funds used to pay for commuter rail projects are spent many times over in the U.S. economy. For example, the manufacturer producing the signal equipment (first-level producer) paid electronics and sheet metal suppliers (second level producer) for inputs, who spent the money paid to them on materials (third level producer). This progression continues until the monies from the original purchase are depleted through consumption or leakages such as imports or taxes. This analysis of commuter rail systems' capital expenditures focuses only on the first and second level spending effects.



Demographic Profile of the Commuter Rail Rider

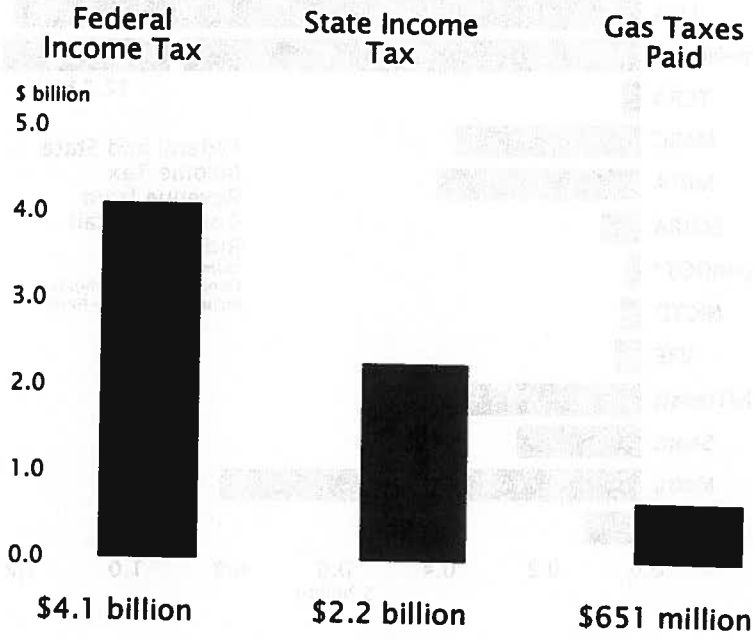
Who is the commuter rail rider? What is his/her role in the local, regional and national economy? The commuter rail rider is both consumer and producer, taxpayer and user of public goods.

The common characteristic of riders is the reason why they use commuter rail: to get to and from work (approximately 87.0 percent). Rail commuters usually have automobiles available for their daily commutes, but choose commuter rail because it is quick, safe, and inexpensive. Riders are mostly suburbanites, but a growing number are "reverse-commuters" who leave their homes in the city to work in the suburbs.

Other demographics of commuter rail riders:

- 62.5 percent have a household income greater than $50,000;
- 55 percent are male; 45 percent are female;
- nearly all pay significant amounts of local, state, and federal taxes;
- most have two or more cars available;
- they are likely to be married; and
- they are likely to be homeowners.

Most commuter rail riders describe themselves as middle-class, hard-working individuals. Metro-North, serving the New York and Connecticut suburbs north of New York City, reports that 67 percent of its riders are married. Three-fourths of Northern Indiana Commuter Transportation District's (NICTD) commuters are women. Of NJ Transit's



commuter rail riders annually pay an estimated $6.3 billion in state and federal income taxes, plus paying an additional $651 million in gasoline taxes a year

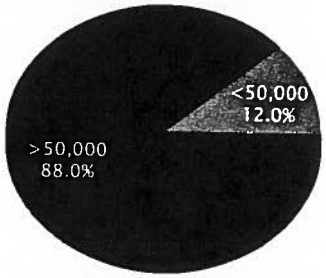
ridership, 73 percent are homeowners. Most rail commuters fall into the fifth (highest) quintile of household income. People in this income category not only spend the most money on public transportation by nearly 2.5 times over people in other categories, but also spend more on public transportation as a percentage of their total annual expenditures than do people in any other category.[6]

This profile of the commuter rail rider, however, does not depict the diversity of ridership. Many evening commuter rail trains are filled with night-shift workers heading for downtown office buildings. In South Florida, many commuter rail riders do not have a car and would otherwise be unable to travel if not for Tri-Rail. Senior citizens comprise as much as 14.5 percent of total ridership on some commuter rail systems. Half of Metra's riders are professionals who can catch up on work while they ride into the city. Commuter rail riders fill most every role in the U.S. economy: corporate executives, technicians, skilled workers, laborers, professionals, clerical staff, homemakers, and students.

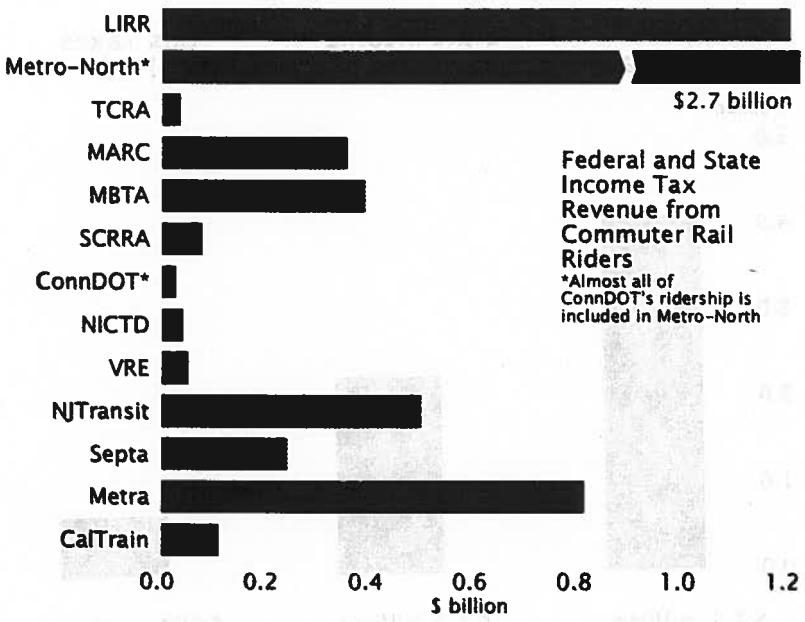
As taxpayers, rail commuters annually pay an estimated $2.2 billion in state income taxes and $4.1 billion in federal income taxes. According to the Internal Revenue Service, taxpayers with incomes greater than $50,000 a year account for 88 percent of all federal income taxes paid.[7] This group, according to the U.S. Consumer Expenditure Survey, also pays the greatest share of personal income in federal, state, and local income taxes compared to other income groups.

The tax burden is not limited to rail commuters' income. They are also automobile drivers, the majority having two or more cars. Spending $1.2 billion on gasoline annually, rail commuters pay an estimated $651 million in gasoline and fuel taxes per year.

Federal Income Taxes Received by Household Income: 1993



commuter rail riders generate significant state and federal income tax revenue every year



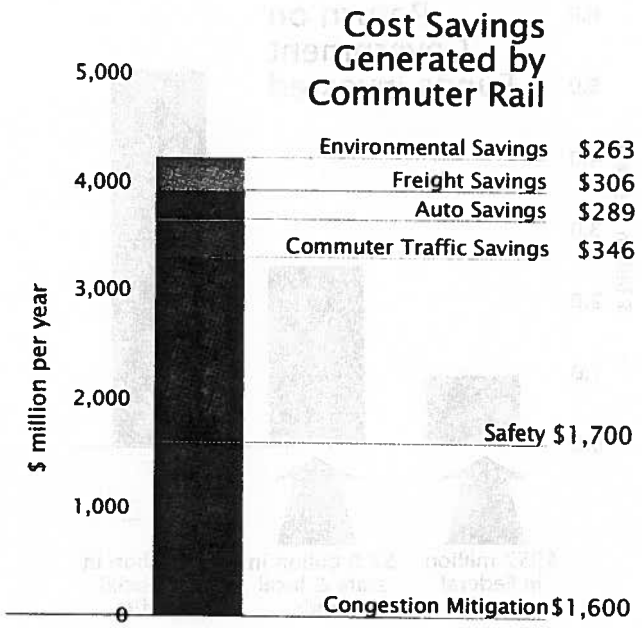
How All Commuters and Taxpayers Benefit from Commuter Rail

Thus far, the discussion has focused on the economic effect of improvements or additions to commuter rail systems rather than benefits resulting directly from rail operations. In addition to the 23,000 people the systems directly employ, commuter rail operations benefit both commuters and the public in a variety of ways.

Commuter rail reduces congestion and its related costs, thereby creating cost savings and benefits. Economic benefits from commuter rail accrue not only to passengers but to automobile commuters and the general public as well. Automobile commuters benefit from less traffic congestion, fewer traffic fatalities and injuries, reduced air and noise pollution, and a cleaner environment. As commuter rail ridership increases, these cost savings will increase as well. In contrast, the single-occupancy vehicle (SOV, an automobile with a single passenger) creates social costs for commuters and the general public.[8]

Cost savings resulting from commuter rail operations are estimated at $4.5 billion a year. These cost savings include:

- avoidance of costs related to traffic accidents and fatalities ($1.7 billion);
- mitigation of costs from traffic congestion for all commuters ($1.6 billion);
- savings to the rail commuter from avoiding traffic delays ($346 million);



rail commuters and the general public avoid costs estimated at $4.5 billion per year

- savings to the motor freight and transportation industry ($306 million);
- savings to the rail commuter compared to commuting via automobile ($289 million); and
- mitigation of environmental degradation ($263 million).

Where a range of savings were provided, these figures represent low-end estimates. The upper-end estimates are provided as each cost saving is examined in more detail.

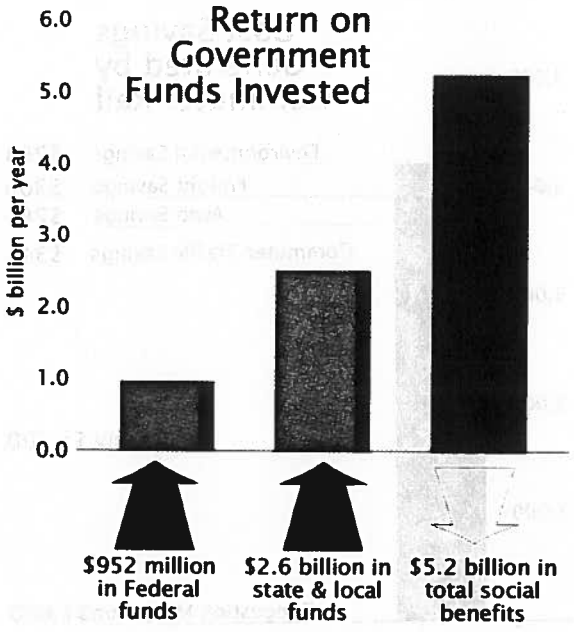
As noted earlier, commuter rail systems employ 23,000 people. A portion of the compensation to these employees may be viewed as an economic benefit. The economic benefit of commuter rail employment is valued at $423 million a year.[9]

In a previous section, federal, state and local tax gains from commuter rail investments over the past eleven years were estimated at $3.5 billion. On an annual basis, these benefits are $318 million.[10]

Including the value of system employment and tax revenue generated in a given year, the total "return" on public funds amounts to approximately $5.2 billion a year. This figure includes:

- annual cost savings from commuter rail operations ($4.5 billion);
- annual compensation of commuter rail employment above the value of government financial assistance ($423 million); and
- annual tax revenue generated from commuter rail capital investment ($318 million).

commuter rail generates significant economic returns on public funds invested



This estimate does not account for economic multiplier effects from capital improvements or wages.[11]

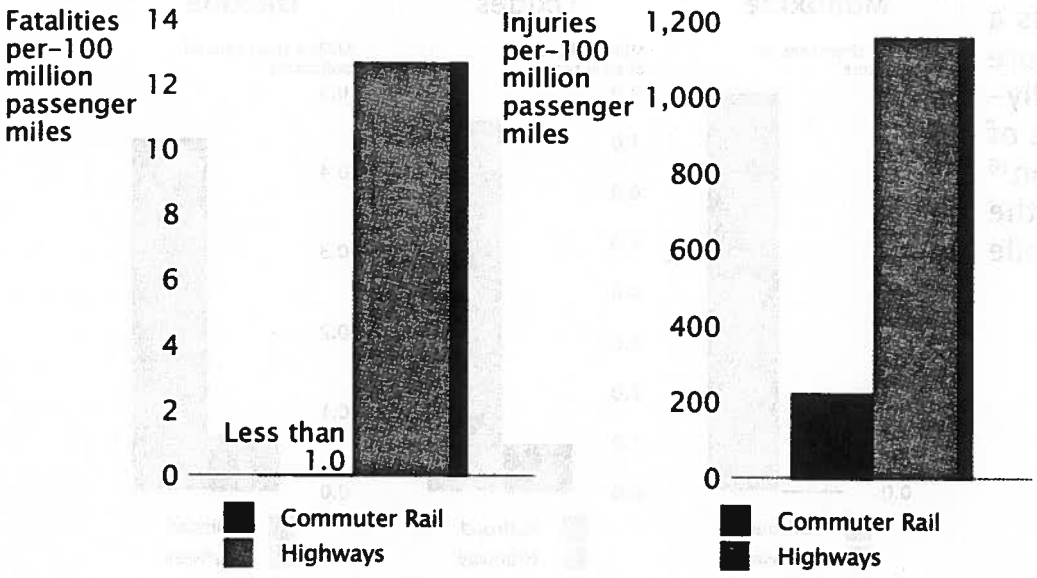
In 1994, federal funds to commuter rail equaled $952 million, while state and local funds amounted to $2.6 billion.[12] Federal funds and state and local funds are used for complementary purposes. Federal funds are almost exclusively used for capital expenditures while state and local funds significantly fund commuter rail operations. Economic benefits of $5.2 billion resulting from commuter rail are four-times the federal investment; almost double the state and local investment; and are a 46.4 percent return on all public funds.

The annual cost savings commuter rail service generates are detailed below.

Social Benefits Worksheet $Millions

Above and beyond the economic value of the transportation to the rider, like work or leisure.

Savings	Freight	306
	Congestion Mitigation	1,600
	Safety	1,700
	Environmental	263
	Compared to Automobile	289
	Traffic avoidance	346
	Total Cost Savings	$4,504
Gains	Employment	423
	Generated Tax Revenue	318
	Total Economic Gain	$741
Total	**Total Social Benefits**	$5,245



commuter rail is a very safe mode of transportation

Traffic congestion costs the U.S. economy approximately $51 billion annually.[13] Commuter rail reduces this cost because it is a "non-congestible" mode of transportation. This means that if demand increases for rail commuting, the commuter rail system will add more rail cars and/or more trains. Adding more trains reduces waiting and travel times for rail commuters. Commuter rail also removes automobiles from the highways, therefore reducing commuting times for drivers.

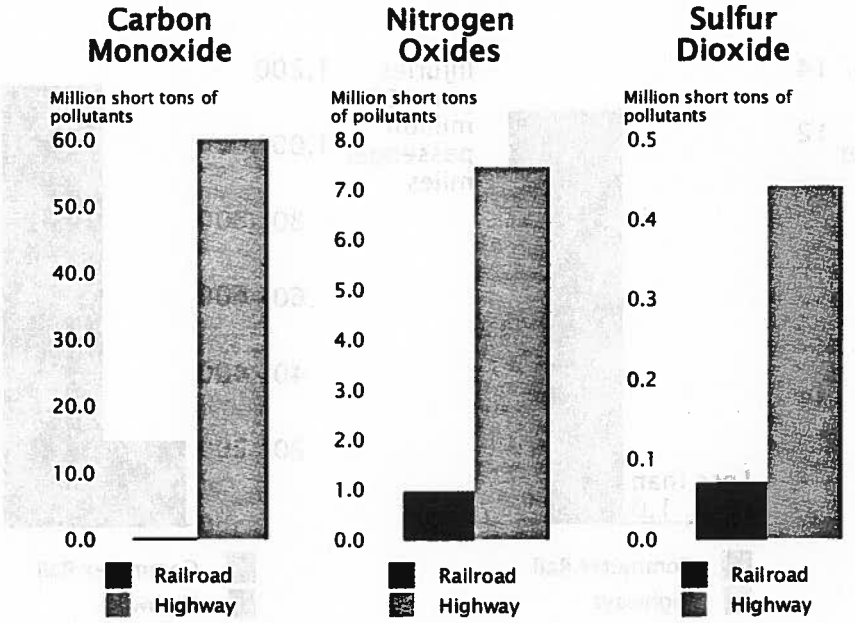
On the other hand, adding automobiles to a morning or afternoon commute increases the delay for all other drivers on the road. Regular drivers experience increased delays, but new drivers are unaware they have imposed these delays on other drivers. These costs imposed on others but not experienced personally are called "externalities." Automobile commuting creates externalities in the form of increased traffic congestion costs, whereas commuter rail mitigates these externalities. Therefore, if placing rail commuters back on the highways only increased traffic delays by five percent, the cost of traffic congestion in communities served by commuter rail would increase by an estimated **$1.6 billion** annually.

Externalities

Externalities are costs or benefits which are not included in the price of an item. Externalities may be positive or negative depending upon their effects.

Less traffic also means fewer traffic fatalities and injuries. Janet Rothenburg-Pack, in her study of the economic benefits of Philadelphia's commuter rail system, SEPTA, noted that traffic-related injuries and fatalities were estimated to cost the U.S. economy $334 billion in 1988. She suggested that if commuter rail helped avoid only *one-half of one percent* of those injuries and fatalities, the cost savings would total **$1.7 billion.**[14] Recent studies have found that the costs of automobile accidents are borne not only by those involved, but that society as a whole bears one-quarter to one-third of the cost of all motor vehicle accidents.[15]

commuter rail is a more environmentally-friendly mode of transportation[16] than the automobile



Commuter rail is a safe mode of transportation by any standard. From 1991-1995, there were only 19 passenger fatalities on commuter rail. In 1994, there were 1,560 commuter rail-related injuries, and only one commuter rail fatality. By comparison, automobile-related injuries in 1994 were 3.1 million, and highway passenger fatalities totaled 34,293. On a per-passenger-mile basis, the number of commuter rail passenger fatalities in 1994 was virtually zero per-100-million-passenger miles. In 1994, there were 12.7 highway passenger fatalities for every 100 million passenger miles. Commuter rail-related injuries are far below automobile-related injuries per-100-million-passenger miles, 224 to 1,160.[17]

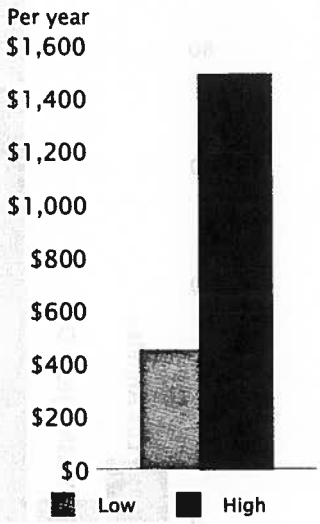
Finally, everyone benefits from a cleaner environment and reducing the costs associated with environmental degradation caused by automobile travel. Commuter rail releases far fewer pollutants into the atmosphere than do automobile emissions.[18] Noise pollution from commuter rail is also significantly less than that produced on highways. According to Ms. Rothenburg-Pack, the cost of air and noise pollution from an automobile is estimated to be between $1 and $2 per day per vehicle.[19] Assuming that every commuter rail rider is a potential single-occupancy vehicle driver, commuter rail saves an estimated **$160 million** to $232 million per year. Kenneth Small and Camilla Kazimi estimated the average pollution costs of the automobile in the Los Angeles area at 3¢ per mile, covering damage to the environment and subsequent adverse effects on humans.[20] Using this 3¢ figure, commuter rail saves **$103.2 million** in environmental costs annually.

Commuting Cost Comparison

Numbers are rounded.

Daily Cost Comparison		Compact Car	Full-Size Car
Operating Costs	per mile	$0.08	$0.11
Trip Length	miles	48.0	48.0
Trip Cost		$3.84	$5.18
Depreciation Costs	11,000 mi/yr	$6.20	$7.04
Total		$10.04	$12.22
Commuter Rail Fare	roundtrip	$6.26	$6.26
	w/subway	$8.24	$8.24
Price Difference	roundtrip	$3.78	$5.96
	w/subway	$1.80	$3.98

Rail Commuter Savings
vs. Auto commuting



a commuter rail rider saves $450 to $1,491 a year by leaving the automobile behind

Benefits to the Rail Rider

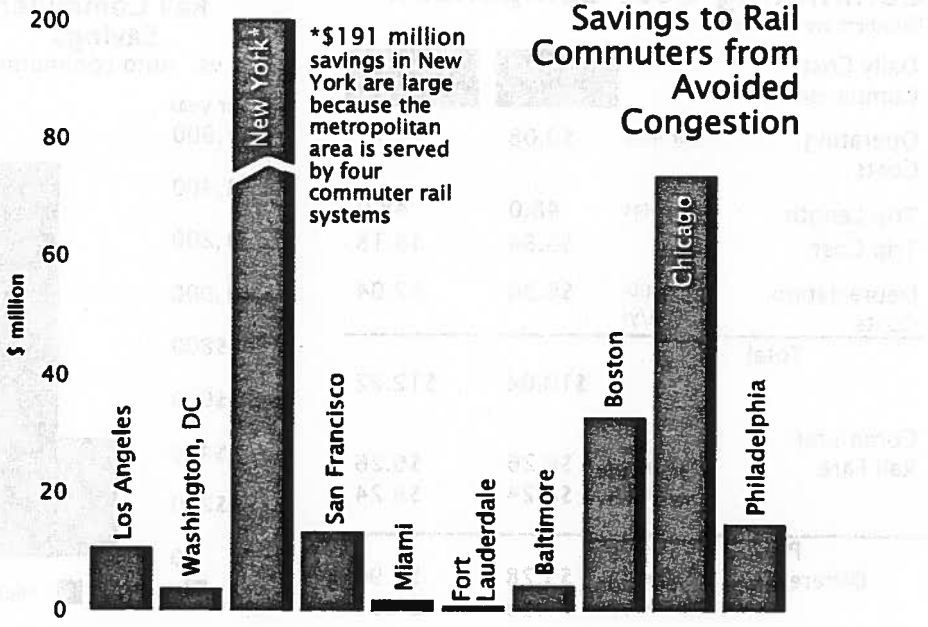
Commuter rail generates economic benefits by lowering costs and making low-cost options available to businesses and/or commuters. This may apply to the service itself, or outside the service to non-rail commuters.

For the average commute to work, commuter rail is more cost-effective than driving solo. Using commuter rail, the rider who owns a car will save $1.80 to $5.96 a day, when comparing the average commuter rail fare with automobile operating costs over the average commuter rail trip (24 miles twice a day) plus the automobile's depreciation for added miles incurred while commuting.[21] This example excludes parking, which in many metropolitan areas is the single most-expensive cost of commuting.[22] Downtown parking costs range from $5 to $25 a day in cities served by commuter rail.

If riding commuter rail removes the need for an automobile, then the savings to the commuter increase dramatically because the costs of owning an automobile, such as insurance and registration fees, are avoided. Commuters who do not buy a car because of rail commuting save $13.76 to $20.98 per day, again not including parking. Over a year, a rail commuter who owns a car saves between $451 and $1,491, while a commuter for whom rail service replaces the need to own a car saves between $3,441 and $5,246. When cost savings compared to automobile commuting are applied to all commuter rail riders, total annual savings range from a low estimate of **$288.6 million** to a high of $1.2 billion.

These savings are mirrored in the commuter rail rider's own perception of cost-effective service. Responding to an on-board survey, 75

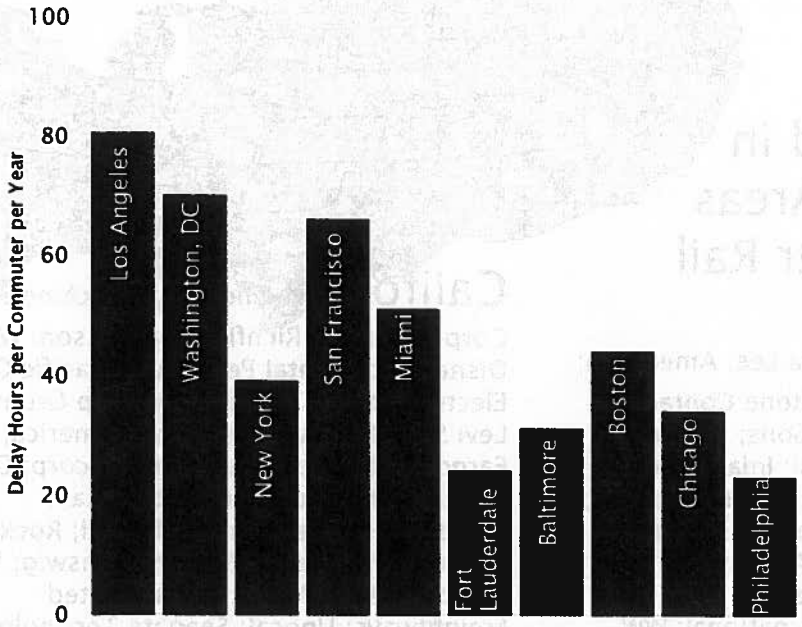
avoiding congestion saves rail commuters an estimated $340 million per year



percent of the Southern California Regional Rail Authority's (SCRRA) passengers rated Metrolink's fares the same or a better value than other forms of transportation. To ensure fairness to their riders, almost all systems utilize a zone-pricing scheme whereby commuters farthest out pay more than commuters close to their destinations. Zone pricing equalizes the per-mile cost among commuters on the basis of distance-to-destination.

Commuter rail provides passengers the mobility to take advantage of cost savings and higher wages in different locations while producing a relaxing means of travel. Traffic congestion is believed to sap drivers' patience, and increase blood pressure, frustration and aggressive driving.[23] Besides monetary cost savings, there are intangible elements behind a person's or family's choice of residence and mode of commuting. Some people may prefer the suburban lifestyle while others crave the bustle of the city. In these situations, people receive benefits that are of great value but defy quantification.

Traditionally, commuter rail allowed commuters to buy suburban houses while earning wages in the central city. Today, commuter rail is providing central city residents the opportunity to work in the suburbs. In the 1990s and into the next century, commuter rail lines will link regional residents to multiple business centers in addition to the traditional downtown. SCRRA's Metrolink in Southern California links residents in Orange, San Bernardino, Riverside, and Ventura Counties to downtown Los Angeles, Irvine, and Burbank. Metra, serving the Chicago metropolitan area, has proposed a suburb-to-suburb rail line. No matter what the arrangement, commuter rail affords riders the ability to obtain employment conveniently and cost-effectively.



traffic congestion costs thousands of hours of delay for commuters

Another benefit to rail commuters is time saved by avoiding traffic congestion. The Texas Transportation Institute (TTI) annually estimates traffic delays in 50 of the nation's cities, including cities with commuter rail systems. For instance, in the Los Angeles region, traffic congestion caused 80.5 hours of delay per commuter in 1993, while traffic congestion in the Philadelphia area caused 23 hours of delay per commuter. TTI estimated the cost to riders in terms of time and fuel wasted at $10.75 an hour in 1993.[24]

Overall, rail commuters avoiding traffic congestion save between $247 and $865 per year. Savings from averted congestion costs for all commuter rail riders are estimated at **$346.7 million** annually. Annual congestion savings range from $2.6 million in South Florida to $191.2 million in the New York metropolitan area.

How Commuter Rail Benefits U.S. Business

Business benefits from commuter rail in several ways. Commuter rail service enables companies to draw labor and customers from a larger geographical area, resulting in more sales opportunities and a higher-skilled work force.

A recent *Fortune* magazine article, ranking the 17 top cities for business, emphasized the importance of providing a high-quality living environment to attract and retain businesses:

Fortune 500 Companies Headquartered in Metropolitan Areas with Commuter Rail

Chicago
Amoco; Sara Lee; Ameritech; First Chicago NBD Corp.; Stone Container; Unicom; R.R. Donnelley & Sons; Quaker Oats; Navistar International; Inland Steel Industries; FMC; Aon; Morton International; Tribune; USG; Cotter; General Instrument; Sears Roebuck; Motorola; Allstate; UAL; Baxter International; Household International; Premark International; WW Grainger; Illinois Tool Works; Brunswick; Dean Foods; Ace Hardware; McDonald's

New York
AT&T; Philip Morris; Citicorp; Metropolitan Life Insurance; American International Group; Merrill Lynch; Loews; Travelers Group; New York Life Insurance; RJR Nabisco Holdings; American Express; Chemical Banking Corp.; J.P. Morgan & Co.; Bristol-Myers Squibb; Lehman Brothers Holdings; NYNEX; Viacom; Teachers Insurance & Annuity; Chase Manhattan Corp.; Morgan Stanley Corp.; Pfizer; Salomon; Bankers Trust New York Corp.; Colgate-Palmolive; Woolworth; Time Warner; College Retirement Equities Fund; Dean Witter Discover; Amerada Hess; Consolidated Edison of New York; Guardian Life Insurance Co. of America; Loral; Bank of New York Co.; Paine Webber Group; Avon Products; Marsh & McLennan; Bear Stearns; Dover; Westvaco; Turner Corp.; Asarco; McGraw-Hill; Reliance Group Holdings; Estee Lauder; Republic New York Corp.; Allegheny Power System; IBM; Texaco; PepsiCo; International Paper; Melville; ITT Industries; Avnet; Readers Digest Association

Baltimore
USF&G; Black & Decker; Baltimore Gas & Electric

Miami
Ryder System; Knight-Ridder

California
Chevron; BankAmerica Corp.; Atlantic Richfield; McKesson; Walt Disney; Occidental Petroleum; Pacific Gas & Electric; Pacific Telesis; Northrop Grumman; Levi Strauss Associates; Transamerica; Wells Fargo & Co.; First Interstate Bancorp; Gap; Times Mirror; Southern Pacific Rail; Teledyne; Hewlett-Packard; Intel; Rockwell International; Fluor; Bergen Brunswig; Sun Microsystems; Apple; Consolidated Freightways; Unocal; Seagate Technology; Merisel; Vons; H.F. Ahmanson; Dole Food; FHP International; Mattel; PacifiCare Health Systems; Great Western Financial Corp.; Computer Sciences; Food 4 Less Holdings; Litton Industries; Avery Dennison; WellPoint Health Networks; Applied Materials; Oracle; Fleetwood Enterprises; Health Systems International; AST Research; Advanced Micro Devices

Boston
Fleet Financial Group; Liberty Mutual Insurance Corp.; Gillette; John Hancock Mutual Life Insurance; Bank of Boston Corp.; State Street of Boston Corp.; Raytheon; TJX; Waban; Reebok International; Harcourt General; Allmerica Financial; Staples

Philadelphia
Cigna; Bell Atlantic; Sun; ARAMARK; Crown Cork & Seal; PECO Energy; Rohm & Haas; Conrail; Comcast; Corestates Financial Corp.; Unisys; U.S. Healthcare

Connecticut
General Electric; GTE; Xerox; Tenneco; Tosco; General Re; Champion International; Union Carbide; Pitney Bowes; Olin; Praxair; Pittston; Caldor; Ultramar

Washington DC
Federal National Mortgage Association; MCI Communications; Marriott International; Student Loan Marketing Association; GEICO; Giant Food

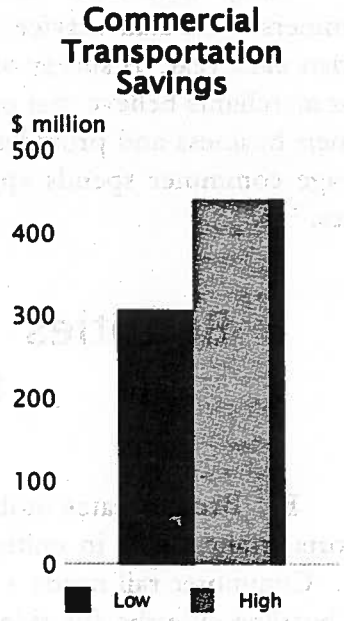
> "...it better be a nice place to live. Top-quality workers demand a top-quality living environment. That means affordable housing, good infrastructure, and plenty of opportunities for recreation and culture. Lifestyle matters to talented people who have a choice of locations—as nearly all do."[25]

For employees, commuter rail is the link between jobs, housing, and opportunities for recreation and culture. For example, affordable housing in an area in which a prospective employee would like to live may require an hour's commute in rush-hour traffic in city A; while in city B, similar housing is only an half-an-hour away. A commuter rail line in city A may cut the commute time to a half-hour or less. According to one commuter, "it would have taken me two hours in rush hour [to get to work]," but the commuter rail ride is about one hour and 20 minutes.[26] The commuter rail line may make the difference in the prospective employee's decision as to where to live and work.

The ability to draw upon a large labor pool should not be underestimated. Large businesses rarely draw their entire work force from the local community. While most employees prefer to live a short distance from work, employees are usually spread over a wide area. Therefore, a readily accessible location with good transportation infrastructure is vital for business. According to Genevieve Guiliano, the empirical evidence shows that for non-market-sensitive businesses, or businesses that are not dependent upon the consumer's location, labor force and infrastructure availability are the main considerations, followed by the desire to take advantage of agglomeration economies and the location preferences of corporate leaders.[27] Commuter rail is the infrastructure that transports labor to these businesses.

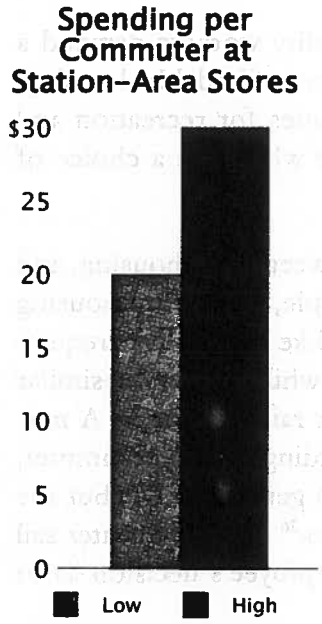
facing page: over 180 Fortune 500 companies are headquartered in metropolitan areas served by commuter rail systems

Additional benefits accrue from savings to motor freight transportation, long-haul carriers, and other businesses from reduced congestion. Federal Express and UPS report that their annual cost of five minutes a day in traffic delays is $40 million.[28] Janet Rothenburg-Pack estimated that reducing commuter times for commercial trucks and other vehicles in the Philadelphia area resulted in social benefits between $34 million and $49 million per year. Using the same number for other cities served by commuter rail systems results in savings of approximately **$306 million** to $441 million a year.[29]



commuter rail saves the truck and freight industry $300 to $450 million per year

spending near commuter rail stations is estimated at between $20–$30 a week per person



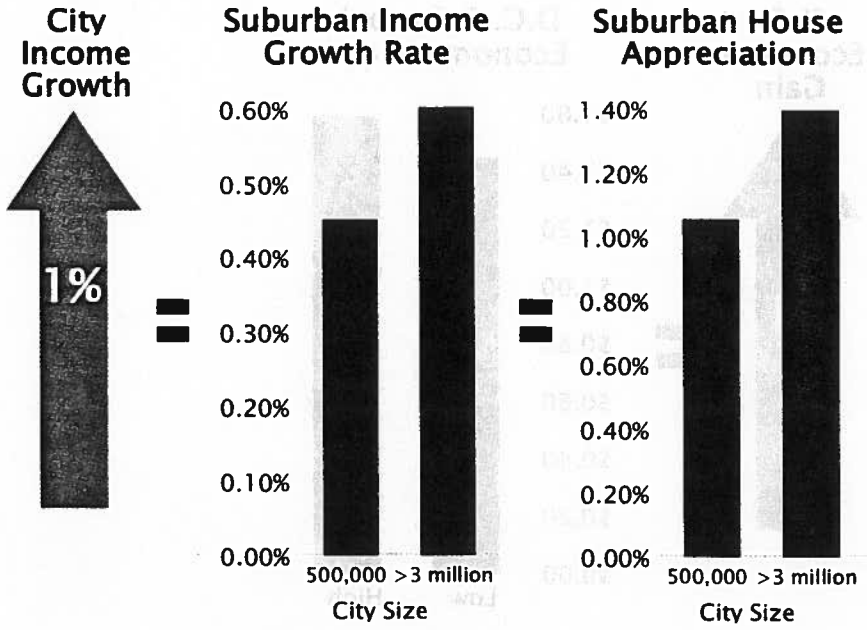
Businesses save in other ways. A larger employment pool may result in competitive wage/salary pricing, therefore reducing the firm's labor costs. If the company covers commuting-related expenses such as parking, employers accrue additional savings when employees use commuter rail. For example, if an employer in the city needed to pay an extra $2,000 in salary for parking costs to lure a prospective employee, the employer's total cost would be $4,400, including taxes, pension, and insurance above the salary increase. Using commuter rail, however, the employer saves this amount.[30] Employees may also be more productive because they arrive at work more relaxed than if they battled rush-hour traffic.

Reverse-commuting opens new possibilities for business cost savings. Firms may enjoy a lower tax burden or take advantage of lower land prices outside the central city. The movement of businesses away from the skyscraper to campus-style offices finds a perfect connection in the suburbs along a commuter rail line. In the Chicago area, communities surrounding Metra's Lake Cook Road station shuttle reverse-commuting employees to and from the station. Similarly, along the train tracks from San Francisco to San Jose, shuttles transport employees from the campuses of high-tech companies to CalTrain stations.

Many businesses are benefitting from serving commuter rail customers. Tri-Rail service in South Florida carries a large number of tourists each year. A survey of businesses and Metra commuters found that most merchants believe that proximity to a commuter rail station is of value to their business and provides the area with a comparative advantage. An average commuter spends approximately $20-30 per week at station-area stores.[31]

Both Cities and Suburbs Benefit from Commuter Rail

Because it creates mobility for the labor force, commuter rail is an important ingredient in cultivating a vibrant economy in a metropolitan area. Commuter rail needs a healthy central city, strong business centers, and bustling suburbs for ridership.



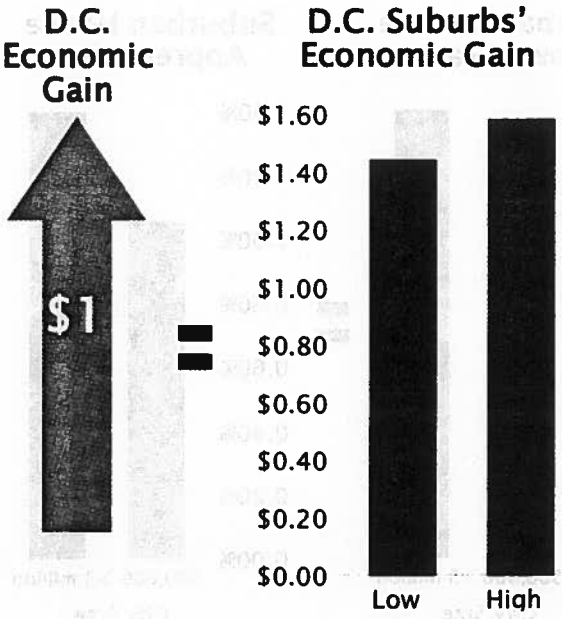
studies suggest the economic relations between city and suburbs are complementary: increases in city income growth accelerate suburban income growth

Commuter rail investments spur business development in and around cities. NJ Transit's commuter rail service has been instrumental in spurring office development at the Newark-Penn Station. Investing more than $25 million at the station over the past 15 years, the area has gained an additional four million square feet of office space. At NJ Transit's Metro-Park station on the Northeast Corridor, more than three million square-feet of office space have been developed within walking distance of the station since its opening in the early 1970s. Major commercial developments are also planned for NJ Transit's stations in Hoboken and Elizabeth.

While economic interaction between cities and suburbs are complex, numerous studies have indicated a clear link between the economic health of cities and their suburbs. These studies have found that the economic status of cities and suburbs tend to move in the same direction. Evidence shows that city population growth is positively related to suburban population growth; and city employment growth was positively related to suburban employment in the 1980s.[32] The old view was that suburbs benefit from central city decline, as residents and businesses flee to the suburbs. Richard Voith of the Philadelphia Federal Reserve Bank points out, however, that--in the long run--the city's decline adversely affects the region, reducing the rate of suburban growth.

Voith offers evidence that city income growth enhances suburban growth in income and house price appreciation.[33] In a central city of approximately 500,000 residents, Voith estimates that a 1.0 percent increase in the city's income growth rate would increase the suburban income growth rate 0.45 percent and increase suburban house appreciation 1.05 percent. In central cities of three million or more residents, the increase in suburban income growth rate is 0.6 percent and the increase in house

a study of Washington D.C.'s economy revealed that for every $1.00 in economic gain to the city, the suburbs experienced an economic gain of $1.44 to $1.58.

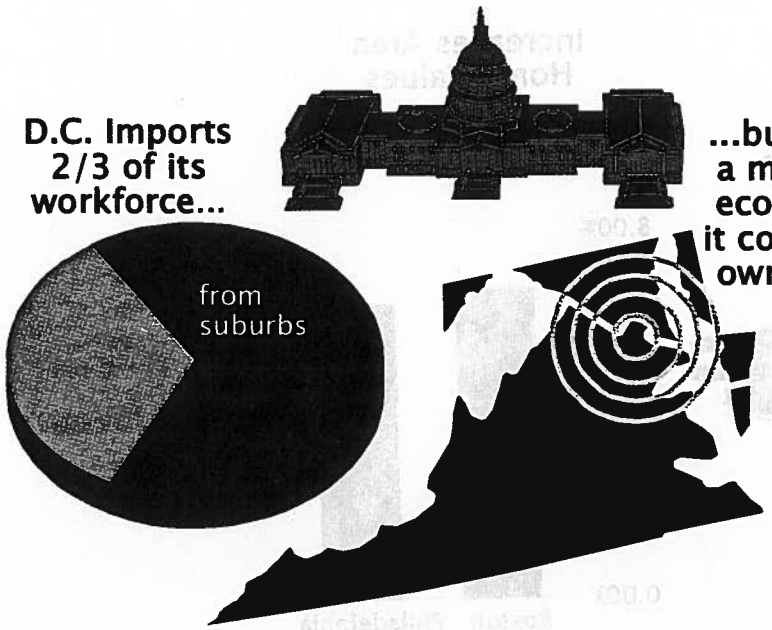


appreciation is 1.39 percent. In short, healthy, growing cities foster faster-growing suburbs; cities and suburbs are complementary in nature.

Stephen Fuller's recent study of the Washington D.C. metropolitan area's economy found similar results. Under different scenarios, Fuller found that for each $1.00 gain in the District's economy, suburban economies gained anywhere from $1.44 to $1.58. One conclusion Fuller draws is that the suburban economies could not have maintained their high growth rates without strong linkage to the District's economy. Fuller also asserts that, in terms of the metropolitan economy, the whole becomes larger than the sum of its parts.[24]

An important implication of these findings is that continued suburban growth may be dependent upon the entire region's desirability, rather than from shifts away from the central city. This is consistent with commuter rail's effect on a region's economy. According to Huddleston and Pangotra, transportation investments may cause an area's overall population base to expand beyond what it would have been without the investment, either through reduced out-migration or increased in-migration.[35] Commuter rail is an important factor in making that expansion possible, as it increases the metropolitan area's overall attractiveness by providing residents access to either suburban or urban living.

Fuller's study on the economic interdependence between Washington, D.C. and its suburbs illuminates some of the benefits of an suburban/urban link. In 1990, suburban residents accounted for two-thirds of all jobs in Washington, D.C. Without these non-local labor sources, the city's economy would be substantially smaller. Conversely, with suburban labor, the city can support an economy much larger than its resident population would otherwise permit.

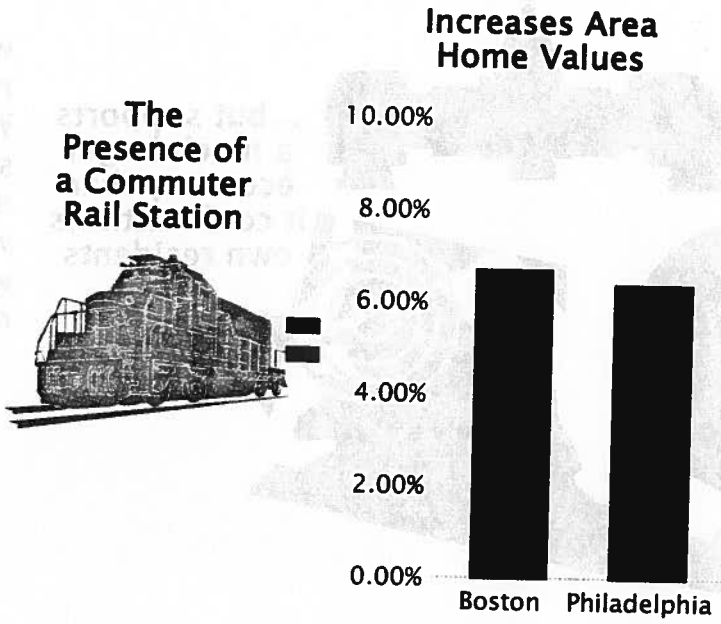


with suburban residents, Washington D.C. supports a larger economy than would be possible with its own residents

Strong economic links to the suburbs also enhance the spending multiplier effect in the city and region because locally generated income and spending does not "leak out" to other regions and metropolitan areas.[36] With transit in general, and commuter rail in particular, the local community is the beneficiary of transportation expenditures rather than automobile and fuel expenditures that often "leak out."[37] Only 15 percent to 50 percent of gasoline expenditures remain in the regional economy, depending on the region's industrial composition. In terms of the multiplier effect, or the amount of additional economic activity that a particular industry or expenditure creates in a region, money spent on petroleum is less productive than if it were spent on general goods and services. Petroleum expenditures result in an economic multiplier of 1.8, compared to a multiplier of 2.7 for general goods and services. Shifting personal expenditures away from petroleum, (e.g. when more people use commuter rail instead of driving to work) results in increased economic benefits for the regional economy.

Commuter rail systems can also promote long-term stability by stemming migration out of the metropolitan area. To this end, reducing the time spent in commuting is essential. Zax and Kain found that "moves" (voluntary changes in residence) are significantly less likely and "quits" (voluntary changes in employment) are much more likely the longer the commute.[38] Goldstein and Mayer, and Engleman, also show that those who reduce their commute time are less likely to quit, compared with those who increase their commute time.[39] As delays from traffic congestion continue to rise, commuter rail is a vital ingredient to maintain jobs in the metropolitan area.

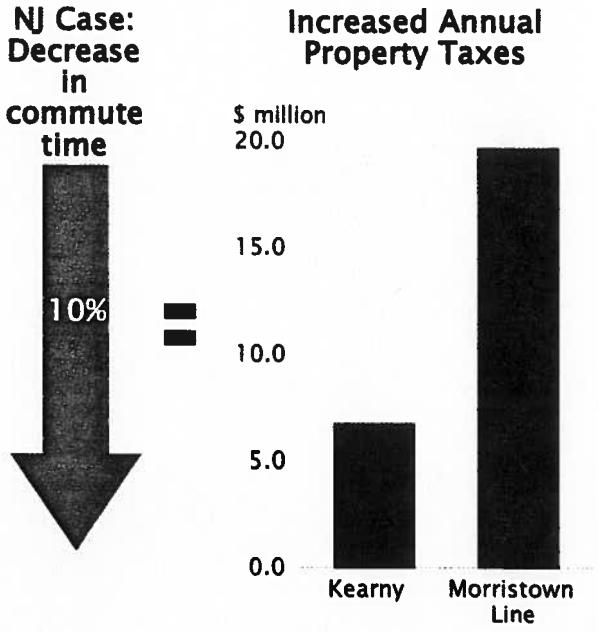
studies of residences along commuter rail lines have shown increases in home values



In addition, commuter rail allows families to afford homes, which increases the likelihood that they will stay in the metropolitan area. According to the Census Bureau, renters have much higher mobility rates than homeowners. Almost one-third of persons living in renter-occupied housing had moved in the previous year, whereas only nine percent of persons in owner-occupied housing had moved in the same period.[40] VRE's ridership survey found that 30.2 percent of respondents said that a VRE station was a major consideration in the location of their new home, while another 16.6 percent gave it some consideration.

Many studies have found that commuter rail lines raise area property values. Studying the Boston metropolitan area, Richard Armstrong found that a 10 percent increase in travel times reduced property values 1.37 percent. Conversely, the presence of a commuter rail station, according to Armstrong, increased the value of a nearby home 6.7 percent. Richard Voith found similar results in the Philadelphia area (6.4 percent) served by SEPTA commuter rail.[41]

In a study of its proposed Kearny Connection and the existing Morristown and Gladstone branch, NJ Transit used the converse: a 10 percent *decrease* in travel times *increases* property values 1.37 percent. Using this ratio, NJ Transit determined that the Kearny Connection would raise the value of owner-occupied housing in the corridor by 2.2 percent, or $300 million. That translates into an annual increase of $6.7 million in municipal and school property taxes. NJ Transit's Morristown and Gladstone branch was found to add $915 million to the value of residential property in the 20 municipalities with rail stations. These municipalities receive an additional $19.6 million in property tax revenues.[42]



NJ Transit estimated that improvements in its Kearny connection would raise annual property taxes by $6.7 million per year, while its Morristown Branch line generates $19.6 million in revenue annually for the towns along the line

In addition to higher property values, commuter rail stations often are a lure for business and residential development as well. Motorola is building a new cellular phone factory in Harvard, Illinois, a town located at the end of Metra's Union Pacific line.[43] Housing developments are similarly attracted to areas surrounding commuter rail facilities. The village of Grayslake is planning its community around Metra's station, including 66,000 square feet of retail space, 80 town houses, 144 single-family homes and more than 31 acres of parks, bike trails, wetland areas, wooded areas and other open spaces.[44]

Commuter Rail: A Wise Investment for Taxpayers

Commuter rail is financially supported from riders' fares and assistance from local, state, and federal governments. In this fiscally-conservative era, subsidies must be scrutinized. The appropriate criteria by which programs should be evaluated are offered by Paul Weyrich and William S. Lind: which are efficient and which are not?[1] Given the economics of commuter rail and the benefits it confers on commuters and non-commuters alike, taxpayer assistance to commuter rail is warranted and cost-effective.

The Rationale for Commuter Rail Support

Commuter rail receives financial support from local, state, and federal sources for capital expenditures and to support operations. Critics have viewed assistance to public transit as maintaining services that would otherwise disappear in favor of the automobile. But, as Weyrich and Lind point out, the notion that public transit would disappear without government intervention is a myth. They find that the predominance of the automobile in the United States is the result of large-scale government funding of highways as well as the automobile's relative convenience. Subsidies to commuter rail are not props to unpopular services; they serve a sound economic purpose.

Commuter rail is characterized by scale economies with high initial capital investments. Characteristic of scale economies are decreasing marginal costs, in other words, the cost to add one additional rider. Highways are considered the typical example of high capital investment and

very low marginal costs: once the roadway has been completed, the cost to add an additional car quickly falls close to zero. Commuter rail is similar with a number of exceptions. For instance, the initial capital investment includes purchasing tracks and rolling stock (locomotives and passenger cars). Commuter rail can add additional riders for little marginal cost up to and sometimes even exceeding train capacity.[2] To service growing ridership, commuter rail systems periodically make investments in additional trains, investments that raise marginal cost for a time. Track, signal equipment, and other capital investments, however, are maintained for a nominal cost. Over the long run, marginal costs decline as more trains operate with more passengers.

The economic implications of declining marginal costs raise the question of who pays and how much they should pay. In the case of highways, these are difficult theoretical questions: should the person who drives on the road once a month pay the same price as a person who drives it 20 times a month? Should trucks, with their greater weight, pay more than lighter vehicles? Who is receiving the greatest economic benefit from the road, and therefore who has the greatest willingness to pay? How do we receive payment? These are complicated and sometimes unanswerable questions. Among other reasons, governments intervene to provide services, paid by taxation, when these questions will never be answered to everyone's satisfaction.

Closely tied to the question of who should pay is how much they should pay? Declining marginal costs create a disparity between what price will cover costs and what price passengers will pay. Theoretically, the operator of the commuter rail service will set fares at the point where demand equals average total cost, or the point where the system will recover its costs. Pricing at this point, however, excludes potential passengers who would be willing to pay the fare priced below average total cost and above marginal costs.

Why is it important to lure these riders onto the system? Precisely for the reasons noted in the previous section: the benefits conferred on society as a whole. Governments, whether local, state, or federal, support the operation and capital improvements of commuter rail systems to realize the social benefits. To these ends, government intervention in the form of subsidies, tax policy, control over monetary policy, and other instruments is justified. The concept of "externality" is closely tied with the efficient allocation of resources. Externalities are costs (negative externalities) or benefits (positive externalities) not captured in the price of a good or service. An example of a negative externality noted in the previous section is the congestion costs new drivers impose on other automobile commuters. Commuter rail is an effective means of mitigating traffic congestion since it is a non-congestible mode of transportation. Automobiles, in contrast, are

congestible as any picture of rush-hour will aptly show. Other examples of externalities include environmental and noise pollution costs associated with automobile commuting. Subsidies to commuter rail are a means of mitigating these externalities.

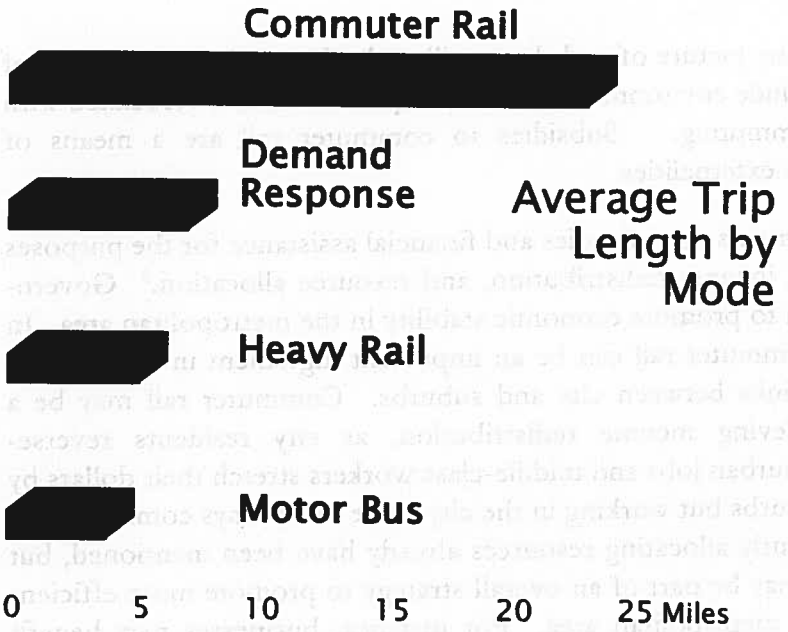
Governments use subsidies and financial assistance for the purposes of stabilization, income redistribution, and resource allocation.[3] Governments may wish to promote economic stability in the metropolitan area. In this context, commuter rail can be an important ingredient in maintaining the economic links between city and suburbs. Commuter rail may be a means of achieving income redistribution, as city residents reverse-commute to suburban jobs and middle-class workers stretch their dollars by living in the suburbs but working in the city. The many ways commuter rail assists in efficiently allocating resources already have been mentioned, but commuter rail may be part of an overall strategy to promote more efficient land-use in the metropolitan area. For instance, businesses may benefit from agglomeration economies (increasing output per unit of input as aggregate labor market size increases) by virtue of their downtown location while experiencing lower costs for providing public services.

Commuter Rail as Part of a Regional Transportation System

Commuter rail is part of extensive and sophisticated transportation systems in the cities and suburbs they serve, systems composed of complementary parts. The efficiency with which commuter rail performs is partly attributable to its being part of these systems. A typical commute for many rail riders may be as follows: walk or drive to the commuter rail station to catch the morning train, either into the city or out to the suburbs. After arriving, walk to work, or take the subway or a bus. The commute home may be more of the same, or the commuter may return home by bus or be picked up by his or her spouse.

The complementary nature of this transportation system is exemplified in the average trip length among the various transportation modes. For bus and light rail lines in 1993, the average trip length was 3.7 miles and 3.8 miles, respectively. Heavy rail's average trip length in 1993 was 4.9 miles, while demand response averaged 6.7 miles. In contrast, the average trip length for commuter rail during that same year was 21.5 miles.[4] Used effectively, each of these modes maximizes its inherent characteristics: commuter rail's ability to transport many people over long distances; heavy rail's ability to move people rapidly over short distances; and the flexibility of buses to operate over various routes. Most commuter rail systems offer

commuter rail's role of transporting people over long distances is illustrated when comparing its average distance against other transit modes

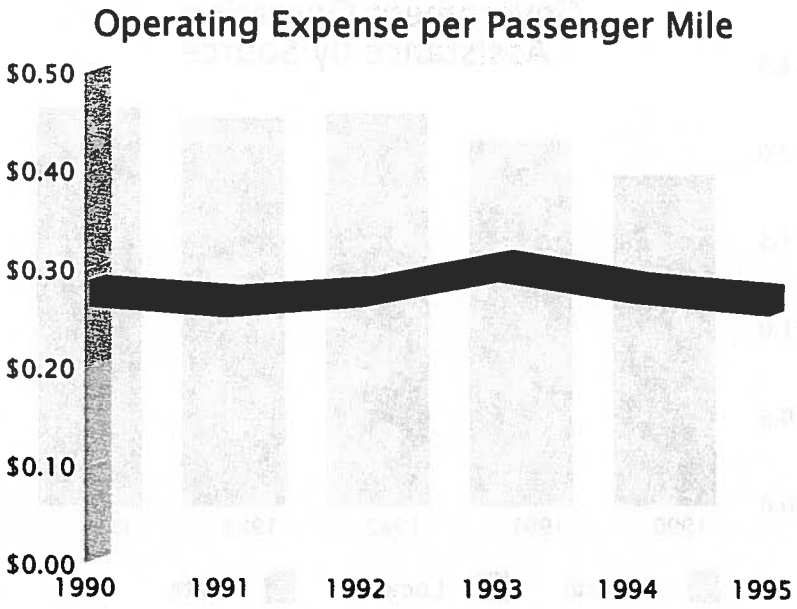


transfers to bus and subway, or fares that discount the price of connecting transit service. Rarely do these modes compete against one another. Instead, they work in conjunction to move people efficiently and effectively.

Investment in Commuter Rail is an Efficient Use of Public Funds

Over the past 10 years, existing commuter rail systems have expanded and upgraded, while new systems have started operations in the Washington, D.C. metropolitan area, South Florida, Southern California, and Connecticut. Commuter rail service recently began in Dallas and Fort Worth. Whether expansion or new service, commuter rail has used existing freight rail infrastructure and corridors, rather than building new tracks. Through finding a new use for underused or unused freight infrastructure, commuter rail provides service in a very cost-efficient manner.

If the acquisition of existing tracks and rights-of-way is required to implement service, it has been a low cost solution along high-density corridors. Per-mile purchases of track have ranged from approximately $890,000 to $4.7 million, depending upon the track's utilization and property values in the corridor. The purchase of tracks and rights-of-way has also included trackage rights for the commuter rail authority. SCRRA's purchase of 240 miles of line from the Santa Fe Railroad included 70 miles of trackage rights along the line that are an immediate source of revenue from other carriers using the route.[5] Even if the purchase does not include trackage rights, the cost is still below the average cost-per-highway-lane mile



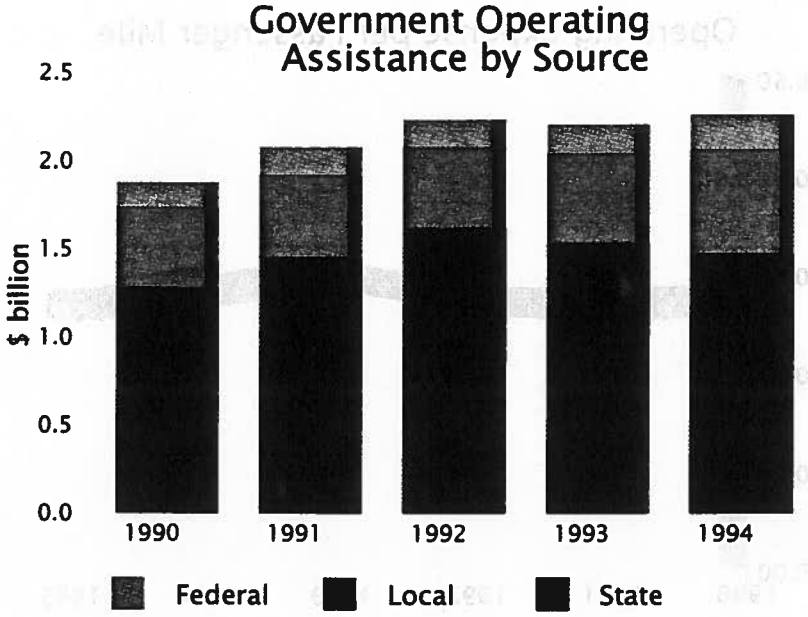
commuter rail's low operating expenses per passenger-mile have remained stable despite new systems coming on line

of $15.2 million.[6] Commuter rail authorities also avoid additional costs by maintaining lines that would require exorbitant sums to replace. Among other improvements, SCRRA added 36 miles of double-track on the Los Angeles-Riverside route, expanding in a heavily populated corridor.[7]

In most cases, commuter rail and freight railroads enjoy mutually beneficial relationships in which they share operating expenses and capital improvements. Many freight-commuter rail arrangements are cost-sharing agreements. In northeast Illinois, Metra (in addition to directly owning and operating portions of its system) has extensive relationships with individual freight carriers, including Union Pacific, Burlington Northern-Santa Fe, Wisconsin Central, Norfolk and Southern, and Illinois Central Gulf. Through mutually-funded capital assistance programs and operating agreements, the region has enjoyed an on-time performance record of over 97 percent per year over the last decade. The Maryland Transit Administration's Maryland Rail Commuter service (MARC) operates on routes shared with CSX's freight traffic. Many commuter rail authorities such as MBTA and SCRRA contract with Amtrak to provide commuter service. Freight railroads and commuter rail often pool resources to produce a far better system for all parties involved.

While commuter rail authorities have expanded service in a cost-effective manner, rail operations are also provided efficiently. Commuter rail service is provided at low per-mile costs that have remained relatively stable over the past few years. In 1990, commuter rail per-passenger-mile operating costs were 27.4¢, and decreased to 26.7¢ in 1995.[8] An established service like ConnDOT's and Metro-North's New Haven line has increased its farebox recovery from 60.4 percent in 1987 to 72.9 percent in 1996. MBTA's recovery of operating expenses from passenger fares rose from 27.3 percent

federal funds represent a small fraction of commuter rail operating assistance



to 47.2 percent over the past 10 years. Increasing farebox recovery stems from the mix of increased ridership, cost-cutting, and fare increases. New-start commuter rail systems have increased farebox recovery as well: SCRRA's farebox recovery has increased from 19 percent to nearly 50 percent in 1996. In 1995, commuter rail systems recovered on average 48.9 percent of operating expenses.[9]

Beneficiaries Pay Most of the Costs

Those who do benefit from commuter rail pay their fair share. Through fares, rail riders pay a sizable portion of operating costs. Even new-start systems recover significant portions of operating expenses: SCRRA recovered 46.7 percent of operating expenses just a few years after beginning operations.

A substantial portion of taxes used for commuter rail originate locally. In 1994, local and directly-generated sources of commuter rail capital funding accounted for 6.7 percent and 25.1 percent, respectively, of total capital funding. Over one-quarter of public assistance for operating funds originate from local sources, while state sources supplied 65.5 percent. Federal funds contributed 45.2 percent of capital funds, but accounted for only 8.3 percent of public funds used for operating expenses.[10]

Commuter Rail and Highways

track three

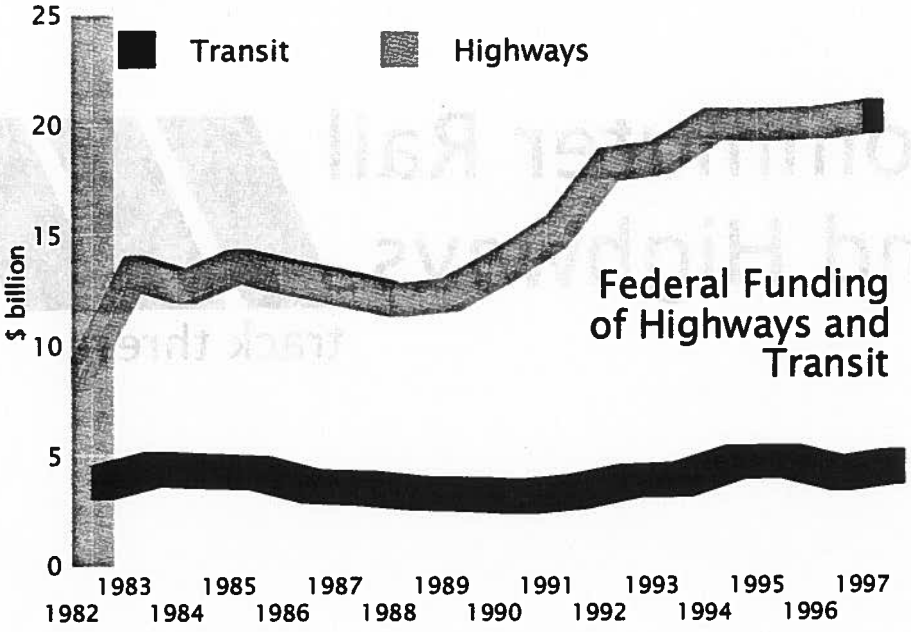
This report has outlined many reasons why investments in commuter rail make sound economic sense, are productive investments, and produce benefits for metropolitan areas, regions, and the nation. Highways also perform a similar service for the nation's economy, especially in providing the backbone for freight transportation and delivery. This section will explore how commuter rail and highway can complement one other to create a transportation network to meet the challenges of future suburban/urban growth.

Economic ties between suburban and urban economies are strengthening to create a new, dynamic national economy. Transportation investments must serve this changing environment. Only through cooperation between urban and suburban authorities can coordinated transportation modes do this. Highways paved the way into the suburbs and have created an intricate network that benefits the U.S. economy. The proper functioning of the new suburban/urban economy, however, requires transportation solutions that meet the demands of a new century and mitigate the congestion, environmental, and other costs associated with highways and sprawl.

Highways and Commuter Rail: How Did We Get Here and Where Are We Going?

Because commuter rail and highways have overlapping functions, the ways in which they complement one another are often overlooked. Commuter rail quickly and efficiently speeds commuters to and from work at higher capacity than the average capacity of a several-lane highway. Utilizing each transportation mode to its advantage will create a more rational and productive overall system.

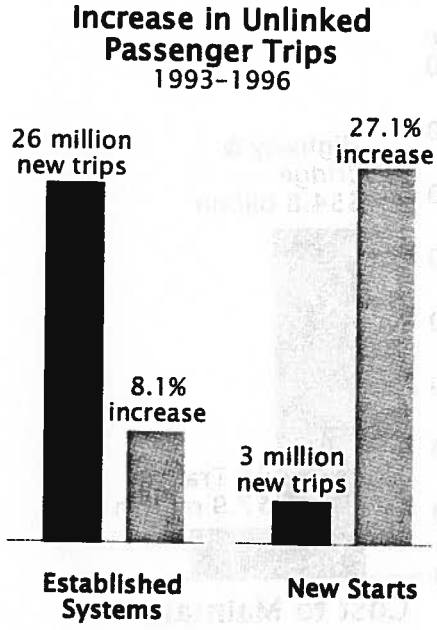
federal funding of highways far exceeds federal funding of *all transit*, let alone commuter rail



Maximizing the complementary nature of commuter rail and highways will be possible only with more balanced federal government funding. The federal government has historically funded highways at levels far exceeding--and at the expense of--all other forms of transportation, including commuter rail. This bias in funding, combined with poor land-use policies, has resulted in an automobile-dominated transportation landscape. Now, however, highways are becoming a victim of their success. Congestion, pollution, and land use requirements are making suburban/urban America look elsewhere for transportation solutions. Creating a more equitable mix of highway and transit funding would increase funding available to commuter rail, which can play a vital role in achieving positive metropolitan land-use patterns and fueling the suburban/urban economy.

The federal government should support commuter rail because of the benefits commuter rail confers on the nation, and the federal government's history of financial support that has promoted automobile use to the detriment of commuter rail. Weyrich and Lind note that many critics of commuter rail and public transit in general argue that "mass transit is a government creation." These critics argue that in a "free" market, people would overwhelmingly choose the automobile.[1] Weyrich and Lind describe, however, how the federal government has had a central role in making highways and America's preference for automobiles a "government creation."

Americans' choice of the automobile has been conditioned by over 70 years of federal, state, and local government subsidization to the highway system. Weyrich and Lind point out that in 1940, government subsidies to highways amounted to $2.7 billion, dwarfing the $661 million in total operating expenses of the nation's transit systems. Only after World War II, when government financing of highways had severely crippled transit systems, was federal funding



commuter rail ridership is on the rise, with established systems adding the most riders, while new-starts' ridership grows rapidly

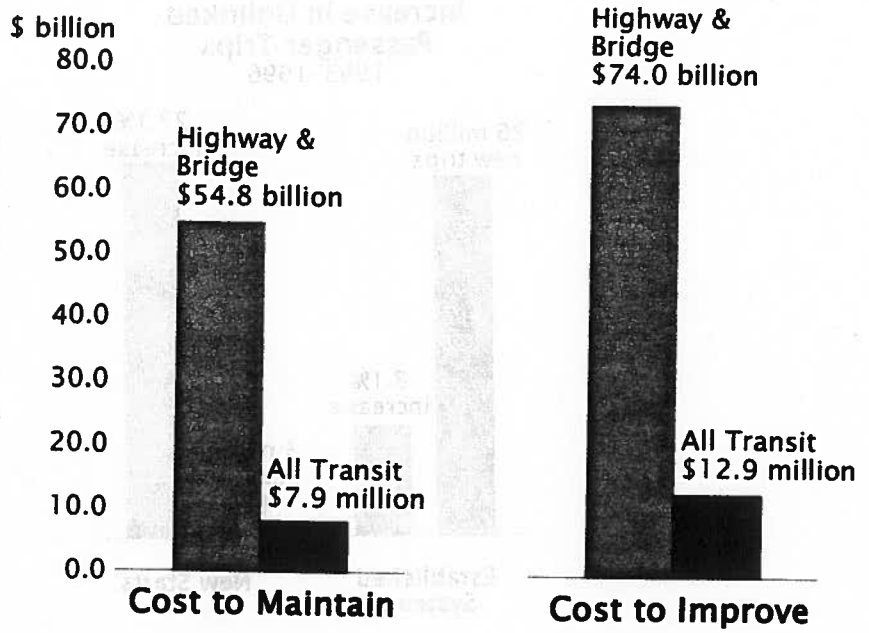
available to support transit systems. While the Highway Trust Fund was created in 1956, not until recently was a federal transit trust fund established.

Government assistance to highways still far outpaces funds provided to transit. In 1997, Congress appropriated $20.3 billion for highways, while appropriating only $4.4 billion for transit. Highways received $4.63 for every $1 given to transit last year. On current-dollar basis, appropriations for transit in 1995 equaled transit appropriations in 1981. On a constant-dollar basis, the value of transit appropriations has declined since 1981. Federal government appropriations for highways have increased in both current and constant terms.[2]

Highways and commuter rail are highly complementary. Utilizing each mode according to its respective strengths creates a more efficient, cost-effective transportation system. Commuter rail provides safe, fast, reliable passenger service over relatively long distances. From 1993 to 1994, migration into the suburbs grew by 31 percent.[3] As the suburbs continue to grow, commuter rail will become more important to regional economies. Thus, if the purpose is to transport more people to and from work, commuter rail makes economic sense because adding enough highway capacity to alleviate congestion would be prohibitively expensive and not wholly effective.

Commuter rail also has demonstrated its ability to attract and maintain riders. Commuter rail's rising ridership refutes the criticism that dependency on government funds has made transit systems unresponsive. Overall commuter rail ridership has increased 8.8 percent from 1993 to 1996. Established systems added the most riders during this period: over 26 million more unlinked passenger trips. New-starts have grown 27.1 percent over the same period.[4] These figures are remarkable given that commuter rail annually turns over 15 to 20 percent of ridership due to retirement, and job and home relocation, among other factors.

according to U.S. DOT, $55 billion per year will be required simply to maintain current highway performance

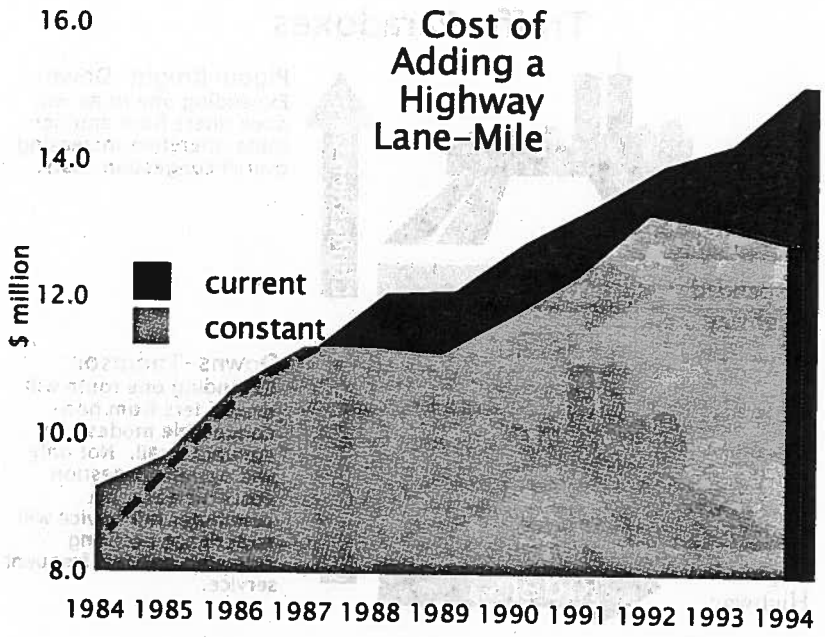


Moreover, with reverse-commuting, special event service, and proposed suburb-to-suburb links, commuter rail is meeting the needs of both urban and suburban residents.

Passenger surveys of commuter rail riders reveal more information than rising ridership statistics can tell. A VRE ridership survey found that 72.2 percent of riders had formerly ridden in cars for all or a major part of their trip before VRE. SCRRA's Metrolink riders overwhelmingly said (91 percent) they will continue to ride even after roadway repairs are complete. In South Florida, 57 percent of Tri-Rail riders said they could use their cars but chose to ride Tri-Rail, while another 16 percent said they would not make the trip were it not for Tri-Rail.

Commuter rail's recovery of operating expenses compares favorably with highways recovery of "user-fees." According to Douglas Lee, highway capital, maintenance, and administrative costs total $178 billion, but user revenue is approximately $50 billion, or only 28.1 percent of total costs.[5] In addition, providing highway services such as traffic management, highway patrols, emergency responses to traffic accidents including fire-fighters, paramedics, and police, investigations of auto accidents and thefts, and routine street maintenance add another $68 billion (1989 dollars).[6] Highway user taxes cover capital, maintenance and operating costs only when supplemented with general tax revenues. Arthur C. Nelson points out that using general taxes as user fees is inconsistent with public finance theory because consumers would not change their automobile use if general taxes rose or fell. However, a rise or fall in user taxes would result in changes in the consumer's automobile use.[7]

Commuter rail service is also a cost-effective investment in transportation capacity compared with highways. VRE did an investment analysis of commuter rail service compared to adding another highway lane.



in both current and constant dollars, the cost of adding additional highway lane-miles is increasing

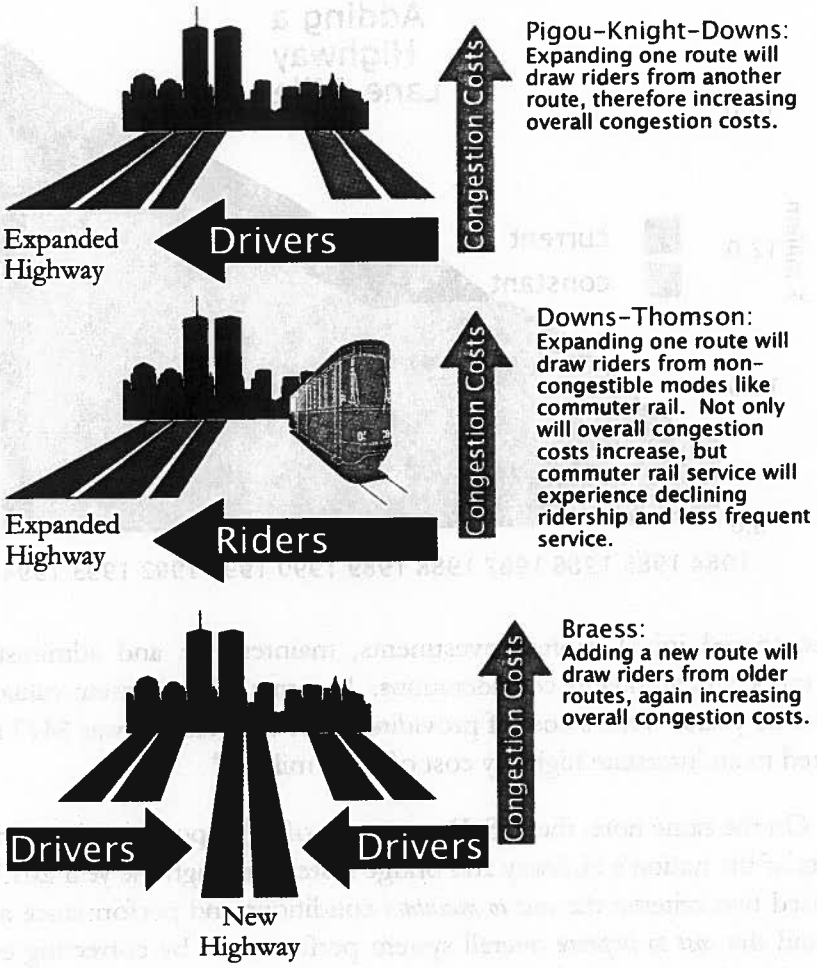
They compared initial capital investments, maintenance and administration, service costs, and air quality considerations. In terms of net present valuation of cost over 20 years, VRE's cost of providing equivalent service was $417 million compared to an interstate highway cost of $681 million.[8]

On the same note, the U.S. Department of Transportation has estimated the costs of the nation's highway and bridge system through the year 2013. U.S. DOT used two criteria: the *cost to maintain* conditions and performance at 1993 levels, and the *cost to improve* overall system performance by correcting existing and accruing shortcomings.[9] From 1994 to 2013, the U.S. DOT estimated the cost to maintain the current highway and bridge system at $54.8 billion per year, while it estimated the cost to improve the system at $74.0 billion per year. For comparison, U.S. DOT estimated that the annual cost to maintain *all* transit, not just commuter rail, at $7.9 billion annually through 2013. The annual cost to improve all transit through 2013 is estimated at $12.9 billion. Government expenditures on highway capital in 1994 were $42.1 billion. Government expenditures on commuter rail capital projects and operations were just a fraction of these costs, $1.8 billion and $1.7 billion, respectively.[10]

Not only do highway costs exceed that of commuter rail, but highway costs continue to increase. Acquisition costs of right-of-way have increased since 1987 at both the state and local level. From 1987 to 1995, total costs at the local level have increased almost four-fold, and their proportion of total capital outlay has increased from 3.7 percent to 5.3 percent.[11] These cost escalations occur even under government programs designed to hold down acquisition costs. The cost to add one lane-mile of highway capacity also has been rising in both current and real terms. In current dollars, the per-mile cost of adding highway capacity has increased 33.9 percent since 1987 to $15.1 million, while in real terms, the per-mile cost has increased to $12.8 million, a 13.7 percent increase since 1987.[12]

investigations into traffic flows have shown that adding highway capacity may not alleviate congestion and may increase costs for all commuters

Traffic Paradoxes



As noted, commuter rail has acquired right-of-way at low per-mile costs through either track-sharing agreements with freight rail lines or outright purchases of existing tracks that cut through high-density areas. Although total commuter rail operating costs have increased over 20 percent because of the entrance of new commuter rail systems, commuter rail operating costs per passenger mile have remained stable since 1990. Per-passenger-mile operating costs for commuter rail were 27.4¢ in 1990 and decreased to 26.7¢ by 1995. On an average basis, commuter rail service is more cost-effective than automobile commuting. Commuter rail's per-passenger-mile operating costs at 26.7¢, compare favorably to the American Automobile Association's (AAA) calculated average automobile operating cost of 37¢ to 47¢ per mile.[13] AAA's figure is for a car traveling 15,000 miles per year, whereas commuting via automobile adds mileage above the normal annual amount, resulting in increased depreciation costs.

Not only is adding new highway capacity becoming more expensive, studies show that this new capacity will most likely *not alleviate* traffic congestion. One reason for this lies in the phenomenon of latent demand. Rush hour traffic,

while inconvenient for those trapped in its midst, discourages many potential vehicle trips or diverts drivers to alternate routes or modes of transportation such as commuter rail. Any added highway capacity encourages those who would have rescheduled or canceled their trips to drive during rush hour, or use routes they normally would have avoided. Therefore, latent demand could undo expensive highway improvements.

Traffic paradoxes will also foil capacity expansions intended to reduce traffic congestion.[14] The Pigou-Knights-Downs paradox illustrates how, if there were two routes, one a fast, direct route and the other a longer, circuitous route, highway capacity expansions below a certain threshold would not reduce congestion. The expansion would draw drivers from the longer route, quickly returning congestion to pre-expansion levels and trapping more commuters. The Downs-Thomson paradox describes how capacity expansions below certain thresholds will draw drivers to the expanded route from a non-congestible transportation mode such as commuter rail. In this scenario, not only does traffic congestion remain, but the shift to the new route reduces commuter rail service because less demand will force cutbacks in service. Finally, the Braess paradox explains how adding an additional link, such as a new causeway or roadway between two points, can add to the time and costs of all drivers.

Essential to traffic paradoxes is the notion of externalities mentioned earlier in this report. New highway drivers impose costs not on themselves, but on other highway commuters who wait longer in traffic because of each additional driver. Commuter rail riders do not impose costs on other riders; instead, they confer benefits through decreased waiting times for trains, reduced congestion, and other benefits for rail and non-rail commuters alike. The Downs-Thomson paradox is particularly perverse because additional costs are imposed not only on automobile commuters but also on rail commuters who must wait longer for rail service.

To examine an alternative scenario, what if commuter rail service was removed from a major metropolitan area? The Urban Institute and Cambridge Systematics, Inc. performed such an analysis on the Philadelphia region when they assessed the implications of eliminating SEPTA, the regional transit authority that includes bus and subway service as well as commuter rail service. The study found that eliminating SEPTA would double the number of automobiles entering downtown Philadelphia from the south, triple those from the north, and quadruple those from the west during the morning commute. Not only would traffic increase, but the study also found that SEPTA's elimination would result in increased cost of doing business; reduced business access to labor markets; increased cost of living; reduced "quality of life;" lost jobs; shifts in personal spending patterns resulting in more leakages outside the regional economy; and reduced tourism.[15]

Commuter Rail in the Next Century

A new suburban/urban economy is being forged. Bedroom communities are melding with commercial centers throughout a metropolitan area. Commuter rail serves hard working people in the new suburban/urban form though traditional suburb-to-city service, city-to-suburb reverse-commutes, and suburb-to-suburb service.

Commuter rail generates economic benefits for the communities they serve and the nation as a whole. Commuter rail capital spending since 1985 has generated 420,000 jobs and tax revenues of $3.5 billion. Annually, commuter rail operations generate social benefits of $5.2 billion. These benefits are in the form of cost savings to all commuters, businesses, and the public alike, employment, and added tax revenue.

Given federal, state, and local assistance of $3.5 billion a year, the yearly benefits of commuter rail are an excellent return on taxpayer investment. While government assistance to public transit has come under fire, it is important in generating greater benefits for society.

Commuter rail is an efficient use of public funds. System have expanded in recent years to meet an eight percent increase in ridership. For this expansion, systems often have used underutilized freight rail infrastructure. Cooperative arrangements with freight rail and efficient service has maintained per-passenger mile operating expenses at low levels.

Commuter rail is part of an integrated transportation system that includes highways, motor buses, and light and heavy rail. Highways and commuter rail are complementary transportation modes to service a metropolitan area. With highways becoming increasingly congested, the cost of adding highway lane-miles increasing, and the inability of capacity expansions to mitigate traffic congestion, commuter rail is the best alternative for commuters, while highways remain the freight and trucking backbone of the metropolitan area.

As the metropolitan economy evolves throughout the 21st century, commuter rail is uniquely poised to service this changing environment.

Notes

Track One

[1]For recent studies on methodologies for assessing transit benefits, including a complete accounting of the benefits (and disbenefits) from transit in general, please refer to Cambridge Systematics, Inc. and Apogee Research, Inc. (1996) and Litman (1996).

[2]Jobs estimates were generated using Input/Output (I/O) analysis. Due to the nature of the data available, capital expenditure figures were compiled for 1986-1995, rather than each year within that time frame. Therefore, throughout the report, "job" will refer to one "person-year" of employment when used in connection with I/O employment estimates. A person-year depends upon the length of time employed. For instance, there may be 300,000 different people employed for one year at a time, or 30,000 people employed for 10 years. For a complete discussion of employment estimates and I/O analysis, please refer to the Technical Appendix.

[3]The average annual compensation figures presented are in 1987 dollars to maintain consistency with the Input/Output Tables and the Economic Census data.

[4]These job figures also refer to person-years.

[5]These benefits focus only on commuter rail capital expenditures, and are not compared to the benefits generated from funding alternatives to commuter rail. According to Todd Litman (personal communication), transit in general does provide more jobs per unit of expenditure at the regional level than automobile inputs such as vehicles, parts, and fuel. While Litman's analysis would have to be repeated for commuter rail specifically, he finds that spending a million dollars on transit produces approximately 21 local jobs, compared with spending a million dollars on petroleum or automobiles, which produces about two and seven local jobs, respectively.

[6]Bureau of Labor Statistics (1994).

[7]U.S. Internal Revenue Service (1993).

[8]Nelson (1997) cites studies on the total annual social costs of the "personal occupancy vehicle" performed by Hanson (1992), the American Public Transit Association (1990), MacKenzie, Dower, and Chen (1992), and Ketcham (1991).

[9]Using the average annual compensation of local and interurban passenger transit employees ($41,220 in 1993), the total was multiplied by the average farebox recovery ratio of 44.6 percent to reflect the economic value above and beyond public-subsidies (23,000*$41,220=$948.1 million*44.6%=$422.8 million).

[10]This figure includes an estimate of tax revenues generated in a single year ($3.5 billion/11 years=$318 million per year).

[11]The economic gain is the activity above the initial investment, as determined in the multiplier. If the multiplier is 1.61 (excluding household income), the gain would be 0.61. If we assume capital spending of $2.18 billion in a given year ($24.0 billion/11 years), the economic gain would be an estimated $1.3 billion annually.

[12]National Transit Database (1994). The figures for applied funds may overstate the monies commuter rail received in a given year since it includes all funds received by systems such as MARC and SEPTA for all their transit modes, not commuter rail exclusively. The term "applied" is used to denote monies spent (rather than appropriated or granted) in that year, but as noted above, determining the exact year when public funds for capital projects are spent is difficult (if not impossible) given many transit authorities' accounting methods.

[13]Texas Transportation Institute (1996).

[14]Rothenburg-Pack (1990).

[15]Bureau of Transportation Statistics (1996b). Also, Litman (1996) summarizes the two methods for measuring accident costs, while also noting the work of Miller (1991), Miller, et al. (1994) and Jansson (1994) in estimating those costs.

[16]Commuter rail is not included in the Environmental Protection Agency's pollution statistics. Therefore, railroads were used as a proxy.

[17]Bureau of Transportation Statistics (1996).

[18]Litman (1996) also notes that tailpipe emissions are not the sole source of air pollution. Road dust, brake liners and tires also produce particulates that pose health hazards.

[19]Rothenburg-Pack, *ibid.*

[20]Small and Kazimi (1995).

[21]Figures for 1995 automobile operating costs are from the American Automobile Association (1996). Commuter rail and other transit commuting costs are

from the APTA Transit Fact Book (1997). Please refer to the Technical Appendix for specifics on this analysis.

[22]Litman (1996) notes that there are additional opportunity costs associated with parking including land and development costs

[23]Raymond Novaco as quoted in *Time* (September 12, 1988).

[24]Texas Transportation Institute, *ibid.*

[25]Barlyn (November 11, 1996).

[26]Babwin (April 19, 1997).

[27]Guiliano (1986).

[28]Federal Transit Administration (1996).

[29]This figure is derived without adjusting the figure for the Philadelphia metropolitan area. In terms of population alone, New York City is 4.7 times larger than Philadelphia, while Los Angeles is 2.2 times larger and Chicago is 1.8 times larger. The aggregate population difference between cities larger than Philadelphia is almost twice the number of cities whose population is smaller than Philadelphia. Therefore, the estimates of commercial truck and freight service are deemed conservative.

[30]Adapted from Metropolitan Washington Council of Governments (1991). The employer could offer free parking and not pay taxes on the fringe benefit, but that would still cost the employer $2,000 in parking expenses that are avoided when the employee uses commuter rail.

[31]Camiros, Ltd. (1994).

[32]Voith (1994) recounts the findings of Bradbury, Downs, and Small (1982), Linneman and Summers (1990) and Summers and Linneman (1990).

[33]Voith, *ibid.*

[34]Fuller (1996).

[35]Huddleston and Pangotra (1990).

[36]Fuller, *ibid.*

[37]Litman recounts the findings of Montgomery (MD.) Dept. of Environmental Protection (1985) and the L.A. County Transportation Comm. (1979).

[38]Zax and Kain (1992) as quoted in Zax (1994).

[39]Zax notes the findings of Goldstein and Mayer (1964) and Engleman (1977).

[40]U.S. Bureau of the Census (1995).

[41]Quoted in Marchwinski (1994).

[42]*Ibid.*

[43]Lowe (April 9, 1994).

[44]Tucker (November 18, 1994)

Track Two

[1]Weyrich and Lind (1995).

[2]For example, NICTD averages 100.3 percent capacity on some trains. Passengers may stand in commuter rail cars like on subways or buses, allowing the number of passengers to exceed capacity.

[3]Musgrave (1959).

[4]Bureau of Transportation Statistics, *ibid.*

[5]Middleton (November 1994).

[6]Bureau of Transportation Statistics (1996).

[7]Middleton, *ibid.*

[8]APTA Transit Fact Book, *ibid.*

[9]Federal Transit Administration, *ibid.*

[10]Federal Transit Administration (1994).

Track Three

[1]Weyrich and Lind, *ibid.*

[2]Provided by APTA from appropriations legislation.

[3]U.S. Bureau of the Census (1995).

[4]American Public Transit Association (1996).

[5]Lee (1996) as quoted in Nelson (1997).

[6]MacKenzie, Dower, and Chen (1992) extrapolate figures estimated by Hart (1986).

[7]Nelson (1997).

[8]Benton (1995).

[9]The urban only cost estimates are $38.3 billion to maintain, and $49.8 billion to improve.

[10]U.S. Department of Transportation (1995).

[11]Federal Highway Administration (1995).

[12]Bureau of Transportation Statistics (1996).

[13]American Automobile Association (1996). This assumes a single occupant, which is reasonable based on surveys that find auto-occupancy rates of 1.07-1.14 during peak times.

[14]For a complete description of traffic paradoxes, please see Arnott and Small (1994).

[15]The Urban Institute and Cambridge Systematics, Inc. (1991).

References

American Automobile Association, "Your Driving Costs," Heathrow, FL, 1996.

American Public Transit Association, *Developments*, Vol. 1, No. 2, Spring/Summer 1990.

_____, *Transit Fact Book*, 1997.

_____, *Transit Ridership Report*, various issues.

Arnott, Richard and Kenneth Small, "The Economics of Traffic Congestion," *American Scientist*, Vol. 82, September-October 1994. pp. 446-455.

Babwin, Don, "The Growth Engine," *Chicago Tribune*, April 29, 1997.

Barlyn, Suzanne, "Fortune's Best Cities for Business," www.fortune.com, November 11, 1996.

Benton, Kathleen, *Investment Analysis: Virginia Railway Express Versus Equivalent Highway Capacity*, Northern Virginia Transportation Commission, April 24, 1995.

Bradbury, Katharine, Anthony Downs, and Kenneth A. Small, "Urban Decline and the Future of America," *The Brookings Institution*, 1982.

Cambridge Systematics, Inc. and Apogee Research, Inc., "Measuring and Valuing Transit Benefits and Disbenefits," Transportation Research Board, TCRP Report 20, 1996.

Camiros, Ltd., *Local Economic Impacts in Commuter Rail Station Areas*, December 1994.

Engleman, S.R., "The Move into Council Housing: The Effect on Quit Rates," *Urban Studies*, No. 14, 1977. pp. 161-168.

Fuller, Steven, "The Economy of the District of Columbia and its Impact on the Metropolitan Washington Area and its Suburbs," Center for Regional Analysis, George Mason University, in www.washingtonpost. com, 16 December 1996.

Goldstein, S. and K. Mayer, "Migration and the journey to work," *Social Forces*, No. 42, 1964. pp. 472-481

Guiliano, Genevieve, "Land Use Impacts of Transportation Investments: Highway and Transit," in *The Geography of Urban Transportation*, Susan Hanson (ed.), New York: The Guilford Press. 1986.

Hanson, Mark E., "Automobile Subsidies and Land Use: Estimates and Policy Responses," *Journal of the American Planning Association*, Vol. 58, No. 1, 1992.

Hart, Stanley, "Huge City Subsidies for Autos, Trucks," *California Transit*, September 1986.

Huddleston, Jack R. and Prem P. Pangotra, "Regional and Local Economic Impacts of Transportation Investments," *Transportation Quarterly*, Vol. 44, No. 4, October 1990. pp. 579-594.

Ketchum, Brian T., "Making Transportation a National Priority," Panel discussion: Transportation as a Matter of Choice, Snomass, CO, October 6, 1991.

Lee, Douglas B., *Full Cost Pricing of Highways*, Cambridge, MA: Volpe Transportation Systems Center, U.S. Department of Transportation, 1996.

Linneman, Peter D. and Anita A. Summers, "Patterns of Urban Population Decentralization in the United States 1970-1987," Wharton Real Estate Center Working Paper, University of Pennsylvania, 1990.

Litman, Todd, "Defining and Quantifying Public Transit Benefits," Victoria Transportation Policy Institute, 15 April 1996.

_____, "Land Use Impact Costs of Transportation," *World Transport Policy and Practice*, Vol. 1, No. 4, 1995. pp. 9-16.

Los Angeles County Transportation Commission, *Transportation Energy Conservation in Los Angeles*, November 1979.

Lowe, Frederick H., "Harvard Gets the Call," *Chicago Sun-Times*, April 9, 1994.

MacKenzie, James J., Roger C. Dower and Donald D. T. Chen, *The Going Rate: What it Really Costs to Drive*, World Resources Institute, June 1992.

Marchwinski, Thomas, "Impact of Kearny Connection and Morristown Line Service on Residential Real Estate Values and Local Property Tax Revenues," NJ Transit Business Planning, August 1994.

Metropolitan Washington Council of Governments, "Commuter Parking Cost Study," 1991.

Middleton, William D., "Freight railroads welcome commuter rail—sort of," *Railway Age*, November 1994.

Montgomery County (MD) Department of Environmental Protection, *Montgomery County Energy Study*, 1985.

Musgrave, Richard A, *The Theory of Public Finance*, New York: McGraw-Hill, 1959.

Nelson, Arthur C., "Social Benefits of Transit: Case Study of Metropolitan Atlanta Rapid Transit Authority," Transportation Research Board Paper No. 97-0139, 1997.

Rothenburg-Pack, Janet, "Regional & Local Economic Impacts of Transportation Investments," *Transportation Quarterly*, October 1990. pp. 574-594.

Small, Kenneth and Camilla Kazimi, "On the Costs of Air Pollution from Motor Vehicles," *Journal of Transportation Economics and Policy*, January 1995.

Summers, Anita A. and Peter D. Linneman, "Patterns and Processes of Urban Employment Decentralization in the U.S., 1976-1986," Wharton Real Estate Center Working Paper, University of Pennsylvania, 1990.

Texas Transportation Institute, Texas A&M University, *Roadway Congestion Index*, 1996, as noted in *USA Today* "Commuters' time is lots of money," by Carol J. Castaneda, 11 December 1996.

Tucker, Neal, "Community Planned Around Train Station," *Grayslake Times*, November 18, 1994.

U.S. Department of Commerce, Bureau of the Census, *Current Population Survey*, at www.census.gov/population/socdemo/migration, September 30, 1996.

U.S. Department of Commerce, Bureau of the Census, *Population Profile of the United States*, P23-189, 1995. p. 19.

U.S. Department of Labor, Bureau of Labor Statistics, *Consumer Expenditure Survey,* August 20, 1996.

U.S. Department of Transportation, *1995 Status of the Nation's Surface Transportation System: Conditions and Performance: Report to Congress,* 1995. pp. 27-36.

U.S. Department of Transportation, Bureau of Transportation Statistics, *National Transportation Statistics,* 1996, pp. B13, 46, 87, 92, 115, 130, 172.

U.S. Department of Transportation, Bureau of Transportation Statistics, *Transportation Statistics Annual Report,* 1996. p. 253.

U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics,* 1988-1995. Tables SF-4C & LGF-2.

U.S. Department of Transportation, Federal Transit Administration, *National Transit Database,* 1994, Tables 1 & 5.

U.S. Department of Transportation, Federal Transit Administration, "1996 Report: An Update."

U.S. Department of Treasury, U.S. Internal Revenue Service, *Statistics of Income,* 1993, Table 2.1.

Urban Institute and Cambridge Systematics, "Public Transportation Renewal as an Investment: The Economic Impacts of SEPTA on the Regional and State Economy," April 1991.

Voith, Richard, "Do Suburbs Need Cities," Federal Reserve Bank of Philadelphia, Working Paper No. 93-27/R, November 1994.

Weyrich, Paul M. and William S. Lind, *Conservatives and Mass Transit: Is It Time for a New Look?* Free Congress Research and Education Foundation, 1995.

Zax, Jeffrey S., "When is a Move a Migration?" *Regional Science and Urban Economics,* 24, 1994. pp. 341-360.