

Commission Briefing Paper 4B-07

Driving Factors and Potential Impacts of Future Increases in Transit's Share of Passenger Travel

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Introduction

This paper is part of a series of briefing papers to be prepared for the National Surface Transportation Policy and Revenue Study Commission authorized in Section 1909 of SAFETEA-LU. The papers are intended to synthesize the state-of-the-practice consensus on the issues that are relevant to the Commission's charge outlined in Section 1909, and will serve as background material in developing the analyses to be presented in the final report of the Commission.

This paper presents information on the factors that may lead to an increased share of passenger travel on public transportation, and the potential impacts of an increased transit share on other modes.

Background and Key Findings

The information and findings presented in this paper are extracted from a wide variety of sources, both professional and academic. Key findings include:

- Since World War II, the markets for transit services have been undermined by increasing vehicle ownership and continuous decentralization of homes and jobs, resulting in an uninterrupted decline in transit's share of U.S. travel.
- However, public transportation use in raw numbers stabilized after 1972 and, thanks to re-capitalization and system expansion investments in the last 30 years, has grown.
- Transit's mode share has grown, naturally, in markets with the greatest transit investments. However, the fastest growing urban economies, located in the Southwestern states, have much lower transit mode shares.
- The main drivers for increased public transportation use are the "three D's" of Density, Diversity, and Design; as well as demographics and economic conditions.
- Indicators for strong and sustained growth in public transportation modes share are demographic changes (the aging of the Baby Boomer generation), and a growing desire for more urban, high-amenity living conditions in areas well served by transit.
- Increasing transit use for a variety of daily trips holds the potential to relieve pressure on the highway systems, at the margin, in the areas that have consistently good transit service, through a "leverage" effect of avoided VMT through increased transit, bicycle and pedestrian travel.

This paper represents draft briefing material; any views expressed are those of the authors and do not represent the position of either the Section 1909 Commission or the U.S. Department of Transportation.

Drivers of Transit Mode Share

The most consistent drivers of transit mode share are proximity and accessibility of good transit service,¹ proximity of destinations to the service; land use, density, and related demand factors;² and disincentives to the use of single-occupant automobiles.³ One study has characterized the leading drivers as “the 3 D’s of Density, Diversity, and Design.”⁴ There are additional supporting factors such as disposable income or level of household auto ownership, but their effects may be muted by other factors. In most analyses, holding other factors constant, high household income and high auto ownership are strong indicators for low mode share. Yet, lower-income households (usually more frequent transit users) in exurban locations with adequate auto ownership will use public transportation less frequently than higher-income households with similar auto ownership who have chosen to live near public transportation.

Another driver of transit mode share seems to be motor fuel cost, but again the impact is not necessarily explained solely by the motor fuel cost. Automobile travel appears to be relatively price inelastic in the short term. Research during the early 1990’s indicated that fuel price increases resulting from raising the motor fuels taxes by as much as 15 cents or even 25 cents per gallon had no perceptible impact on driving behavior. Research reported by the Victoria Transportation Policy Institute indicates that a 10 percent increase in fuel prices reduces driving by 1-2 percent in the short term. In fact, it was not until the more than doubling of gasoline and diesel prices in 2005 that a marked effect was noted in general travel behavior. The rate of increase in vehicle miles traveled by automobile declined in the U.S., and vehicle miles traveled actually declined overall in some countries in Europe, such as France, for the first time in twenty years. Public transportation use increased, even as the transit operators struggled to meet the cost increases resulting from higher fuel prices. Early indications are that the mode share gains for public transportation have not fallen back, even though motor fuel prices have declined considerably (but not to their prior lows) in 2006.⁵

Analysis of travel mode shares in the National Household Travel Survey (NHTS) of 1990 and 2000 reveals a steady decline in transit mode share for commuting, to around 1.6 percent in 2000. This is due in large part because vehicle miles of travel by automobile have been increasing steadily,⁶ but also to the lack of investment in transit service. One report by the Surface Transportation Policy Partnership indicates that just four percent of the nation’s 4 million miles of roads are now served by transit, either using buses or parallel rail lines. However, work trips only represent about 40 percent of transit trips, and work trips only represent about 20 percent of daily trips.

The broad national averages also mask a strong divergence in transit mode share between places. In locations with high density and good transit service, transit mode shares are between 20

¹ “Traffic Reducing Housing (TRH)”, Steve Raney, Cities 21.org, 10/19/2006.

² “FSUTMS Mode Choice Modeling: Factors Affecting Transit Use and Access”, Florida DOT, July 2002.

³ “Transit-Oriented Development in America: Experiences, Challenges, and Prospects.” Robert Cervero et al, Transit Cooperative Research Program Report 102, 2004.

⁴ Ibid.

⁵ “Ridership Gains Retained.” American Public Transportation Association, May 2006.

⁶ “A Closer Look at Public Transportation Mode Share Trends.” Polzin & Chu, Journal of Transportation and Statistics, Volume 8 No. 3.

percent and 60 percent of daily trips. Often these higher transit shares are coupled with higher walking and bicycling shares of trips. In locations with low density and poor transit service the transit mode share is correspondingly low. The differences may even be highly localized. In Los Angeles, for example, the transit mode share of daily trips is 14.4 percent in East Los Angeles, as compared with 10.6 percent in Los Angeles overall.

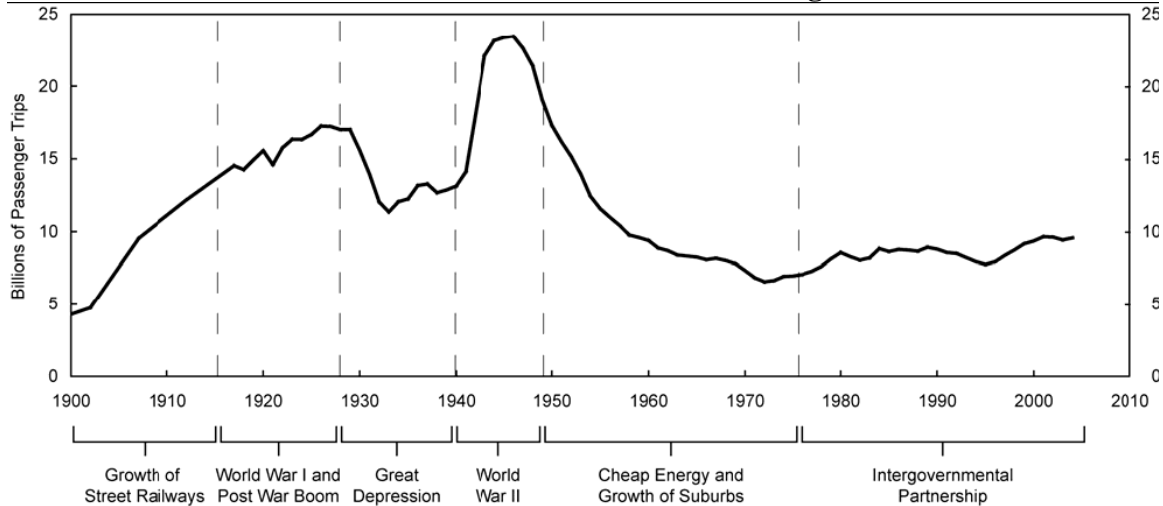
Puschkarev and Zupan conclude in *Public Transportation and Land Use Policy*, “Higher density of urban development acts both to restrain auto use and to encourage the use of public transit...Average figures from a number of urban areas in the United States suggest that: At densities between 1 and 7 dwellings per acre, transit use is minimal...A density of 7 dwellings per acre appears to be a threshold above which transit use increases sharply...At densities above 60 dwellings per acre, more than half the trips tend to be made by public transportation.” The authors also draw a strong link between residential density and auto ownership, as factors that lead to increased transit use.

Recent Trends

After decades of decline, public transportation use has begun to increase steadily. This is in part the result of steady investments in new infrastructure, as well as rehabilitation of existing systems, such as the rail systems and tunnels of New York, Chicago, Philadelphia and Boston. The new investments include major metro systems such as in Washington, DC, the Bay Area Rapid Transit in San Francisco, Baltimore, Maryland, and the Metropolitan Area Rapid Transit in Atlanta, Georgia. However, most of the investment in new systems has involved light rail or streetcar systems in such diverse places as Los Angeles, California; Denver, Colorado; Pittsburgh Pennsylvania; Jersey City, New Jersey; or Minneapolis, Minnesota. The transit mode shares in these places (from the 2000 Census) are shown in the following table.

Transit Mode Shares in 2000 Census (Daily trips)	
City	Transit Share
Washington, DC	34.5%
San Francisco, CA	32.6%
Baltimore, MD	19.9%
Atlanta, GA	15.6%
Los Angeles, CA	10.6%
Denver, CO	8.8%
Pittsburgh, PA	21.0%
Jersey City, NJ	40.3%
Minneapolis, MN	15.1%

Transit Use Trends Over The Long Term⁷

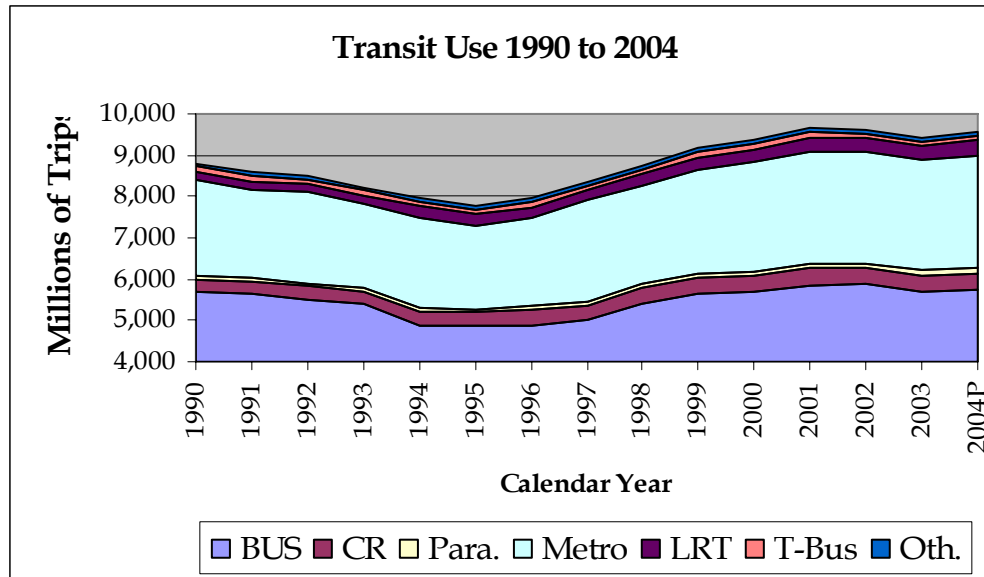


The preceding chart shows the long-term fluctuation in transit use since the turn of the 20th Century. It reveals the negative effect on transit trips of the Great Depression, as well as the positive effect of World War II, when motor fuels were rationed. After World War II, public transportation use diminished steadily as a result of many factors, including sharply rising automobile ownership, massive suburban and exurban development, and the cumulative effects of underinvestment by the predominantly private sector operators of the transit service. The low point in ridership, in 1972, corresponds to the beginning of significant Federal funding to recapitalize transit systems throughout the country, and to facilitate their acquisition by the municipalities that they served. This public sector acquisition of transit systems was essentially complete by the early 1980's.⁸ The primary purposes for ongoing investment are capital replacement and system expansion.

The following chart shows the progress of overall ridership in public transportation, by mode, from 1990 to 2004. It covers the recession of the early 1990's, as well as the subsequent recovery. Early figures for 2005 indicate that transit use nationwide has increased to over 9.6 billion trips annually – a level of transit use not seen since before 1960, but still a very low level of transit use per capita. As the transit use and trend charts show, however, public transportation use is directly affected by economic conditions.

⁷ Source: American Public Transportation Association, "Factbook 2006"

⁸ The last privately held transit system, owned by Duke Power and Light, was transferred to municipal ownership in 1994.



Influences for the Future

The primary influences on future transit mode share are likely to be driven by demographics - as modified by economic circumstances - and land use. As the baby boomers age, the makeup of the median household is changing. Where traditional, nuclear households represented 40 percent of households in 1970, they represent less than 25 percent of households today. The fastest growing segments of household types are young professionals without children, empty-nesters, young retirees, and the elderly. (See the Census Population chart below.) These also tend to be the age groups with the greatest disposable income, on average. A recent study by Reconnecting America⁹ estimated the demand for housing near transit between 2000 and 2025. In 2000, an estimated 6 million households lived within one-half mile of a rail transit or Amtrak station nationwide. That number is projected to increase to over 14.6 million households by 2025. If the rate of growth in demand simply continues through 2050, this would mean that 20.5 million households would seek to live within one-half mile of fixed transit stations.

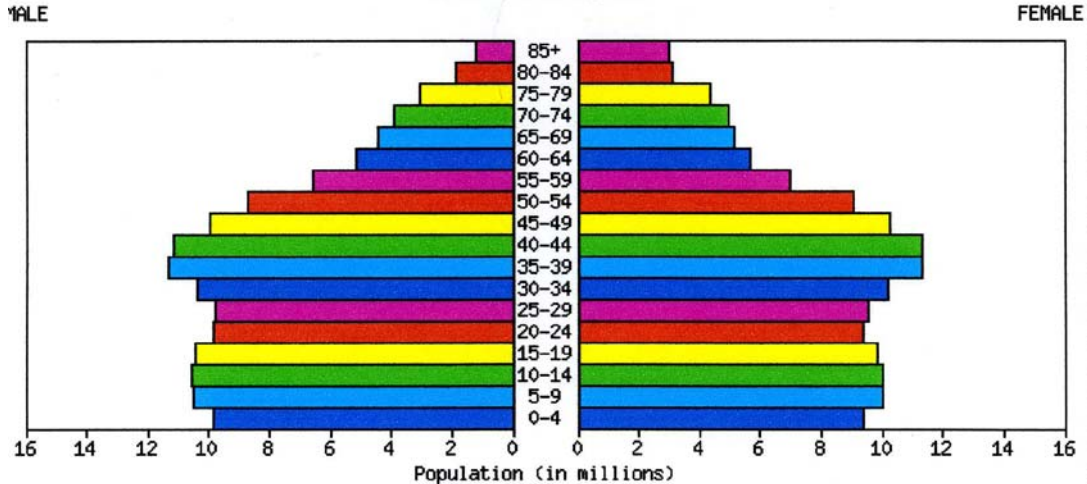
According to Catherine Ross and Anne Dunning's analysis of the 1995 National Personal Transportation Survey (NPTS), single adults with no children and households of two adults with no children were the most likely to live in urban locations. This conclusion is supported by the observation that households within one-half mile of transit stations have a lower household size than their regional averages. The household size is between 2.3 and 2.7 persons, as compared with household sizes for the overall regions of between 2.89 and 3.56.¹⁰ The segment of the population from which the early retirees and elderly will come increases to 104.9 million persons over 55 in 2025, and to 132.4 million persons in 2050. At this point, persons 55 years and older will make up 31.5 percent of the U.S. population.

⁹ "Hidden in Plain Sight: The Demand for Housing Near Transit", FTA and Reconnecting America, 2004.

¹⁰ This may be due in large part to families with children living further out in suburbs and exurbs.

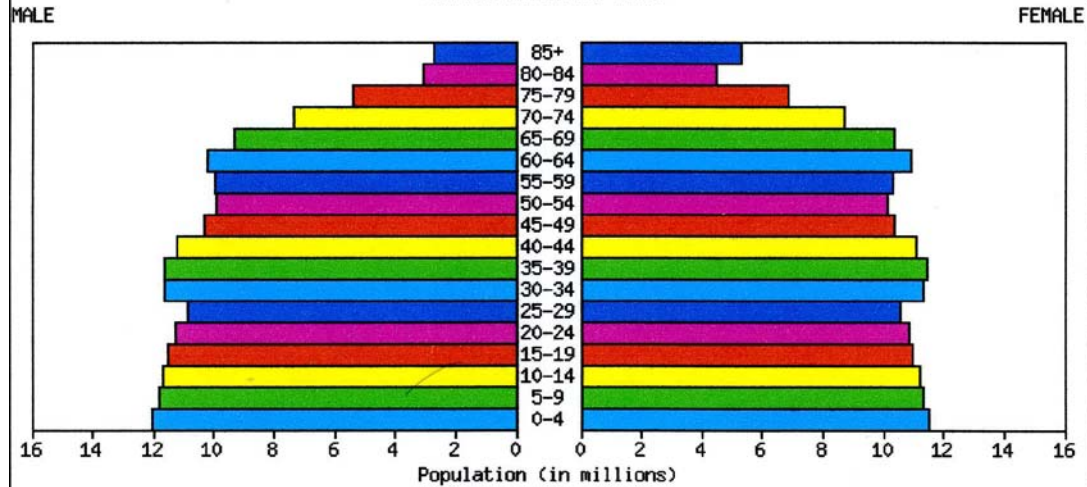
Population distribution by Age and Sex, 2000, 2025, 2050

United States: 2000



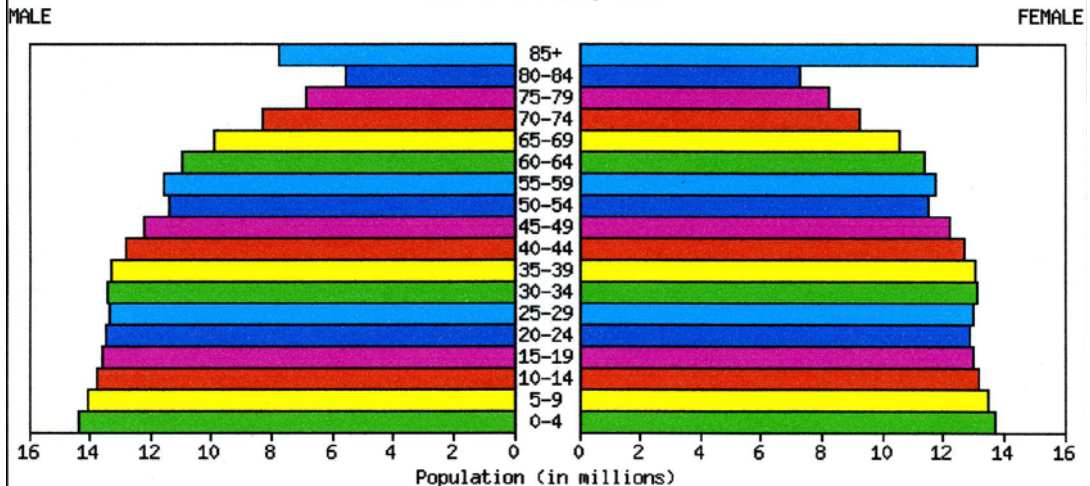
Source: U.S. Census Bureau, International Data Base.

United States: 2025



Source: U.S. Census Bureau, International Data Base.

United States: 2050



Source: U.S. Census Bureau, International Data Base.

The significance of this demographic evolution is that it is likely to fundamentally shift the way an increasing proportion of our population chooses to live and travel. Rather than moving out to suburban or exurban locations in an effort to expand their living space, empty nesters and early retirees are seeking close-in, urban locations (including “urban” suburbs like Arlington, Virginia) with more compact residential space but far more amenities, including proximity to shopping, arts, and medical care. It is these people who are turning around the great exodus from America’s city centers. Houston, for example, projects that its downtown resident population will quadruple by 2010.¹¹ While the metropolitan area of Houston comprises 5 million residents spread across several counties, such a shift in downtown in-migration is still significant.

Broad System Impacts

Taking the current number of transit passenger miles per capita and applying it to the projected population in 2025 and 2050 results in an increase in public transportation service needed of 23.9 billion passenger miles or 48.8 percent by 2050. This can be used to represent a steady state baseline. However, the preceding trend information indicates a significant change in the demographics and lifestyle choices of American households. The real estate market is recognizing a new development product, and building to meet demand for it. The new product is called Transit-Oriented Development, or TOD.

TOD is essentially what results when the “three D’s” are combined in the context of an existing or planned fixed guideway transit system.¹² The density of use is provided, generally at something greater than 7 dwelling units per acre. The diversity of use is assured by combining retail, residential, and commercial activity all in close proximity to each other and to the transit service. Design assures that streets, sidewalks, transit service, and related public spaces complement the function of public transportation, pedestrian, and bicycle travel. These factors are being combined at 11 of the 13 new stations along Denver’s Southeast Corridor light rail, for example. This has attracted over \$800 million in private sector investment along this new light rail service before it has provided its first trip.

If the Hidden in Plain Sight methodology is applied to households and lifestyle choices in 2025 and 2050, the increase in transit-oriented households rises from 6 million today to 14.6 million in 2025, and over 20.4 million households in 2050. If only 23.5 percent of trips made by these households are on public transportation (the average of the cities in Table 1), the transit mode share climbs to 5.8 percent of annual trips in 2025 and 11.5 percent of annual trips in 2050. This is an avoidance of 96.4 billion and 229.5 billion vehicle miles of travel respectively in personal automobiles (assuming 1.2 person occupancy per vehicle).

These figures are rough estimates, as the lengths of trips taken on public transportation vary greatly with the transit mode. For example, the average trip distance on buses in 2004 was 3.7 miles, on subways it was 10.8 miles, and on commuter rail it was 20.3 miles. Thus, the transit mode share for trips does not necessarily equate to the vehicle miles of travel that they represent. The household may make two out of nine trips on transit, but those two trips may be shorter or longer than trips for similar purposes in an automobile.

¹¹ “A Rise in Downtown Living.” The Brookings Institution, 1998.

¹² This may be light rail or metro, but may also include Bus Rapid Transit if it has a fixed guideway or other permanent infrastructure.

In one study, Pushkarev and Zupan quantified the ratio of transit trips to vehicle miles of travel avoided, illustrating the dramatic effect that a high-density, transit supportive environment can have on auto usage. In a study of six metropolitan areas served by rail transit, they found that "the reduction of auto travel...is much greater than that attributable to the direct replacement of auto travel by rail travel," on the order of a reduction of 4 auto trips for every 1 trip by transit.

In further research on "transit leverage," John Holtzclaw found a reduction of VMT in San Francisco of 9 miles for every passenger mile of transit service. If these relationships hold up for urban areas with good transit service, then they may point the way toward optimizing future infrastructure investments – achieving multiple objectives with a single project. This assumes the presence of transit-supportive land uses, as described above.

Rural Transit

Transit mode share in rural transportation tends to be low, given the dispersion of the population served and the destinations. Most rural residents complete their daily trips by automobile. Thus, most rural transit services are provided to the transit-dependent. Transit-dependent are those who for reasons of age, disability, or income level, do not have access to a motor vehicle for their daily needs. The type of service provided is often demand-responsive, meaning that customers call ahead to be picked up at predetermined locations. The overwhelming circumstance of this service, however, is its inability to meet demand. The dispersion of most service areas makes rural transit service expensive to provide, thus limiting the service provided to what the State and local authorities can afford.

Since 1978, the Federal Government has contributed to the financing of public transportation in rural areas, i.e., areas with populations of less than 50,000. These rural areas are estimated to account for 36 percent of the U.S. population and 38 percent of the transit-dependent population. Funding for rural transit is currently provided through 49 USC Section 5311. It is apportioned in proportion to each State's non-urbanized population. Funding may be used for capital, operating and administrative assistance to state agencies, local public bodies and nonprofit organizations (including Indian tribes and groups), and operators of public transportation services. The state must use 15 percent of its annual apportionment to support intercity bus service, unless the Governor certifies that these needs of the state are adequately met.

CONSOLIDATED COMMENTS FROM MEMBERS OF THE BLUE RIBBON PANEL OF TRANSPORTATION EXPERTS – PAPER 4B-07

One reviewer commented as follows:

A major factor in the increase of transit ridership since the early 1990s has been the construction and opening of major new start rail transit systems in a number of metropolitan areas, including Washington, the San Francisco Bay area, Portland, Los Angeles, Denver, Salt Lake City, Dallas, San Diego, Minneapolis and St. Louis. There has also been significant increase in ridership in older systems in Boston, New York, New York and San Francisco. The increase in ridership has persisted despite the drop in gasoline prices since 2006.

