

Commission Briefing Paper 4A-06

Implications of Rising Household Income on Passenger Travel Demand

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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.

The past 50 years have seen an unprecedented growth in travel due to several factors, one of which is demographic change. There are myriad unforeseeable influences that will shape the future of transportation planning and there are strong indications that the key factors (such as vehicle ownership) that have had a direct relationship on travel demand in the past may be less influential in the future. This paper uses current travel behavior to examine future potential travel demand based on demographic change alone and assumes all other factors are held constant.

The paper presents information on the trends of increasing incomes on travel demand, through such factors as number of zero-vehicle households, multiple vehicle households, differences in mode choice by income class, and differences in the number of trips and trip length. The paper also discusses possible impacts of increasing income on future travel demand and why those impacts might not be as large in the future as they have been in the past.

Background and Key Findings

Historically, passenger travel has been growing much faster than population. One of the principal factors contributing to the rapid growth in passenger travel has been increasing real incomes. As incomes increased, there was a demand for additional and higher quality transportation services. This increased demand manifested itself in a variety of ways, including more individuals and households acquiring personal vehicles, an increasing proportion of multiple vehicle households, families moving to larger and more comfortable housing in the suburbs increasing commuting trip distances, and making more, as well as longer, discretionary trips.

For at least the last fifteen years there have been predictions that the effects of rising incomes on travel demand would begin to diminish.¹ However, passenger travel continued to increase

¹ Lave, C. 1991. *Things Won't Get a lot Worse: The Future of U.S. Traffic Congestion*. Working Paper No. 33, The University of California Transportation Center, University of California, Berkeley, CA.

rapidly. Recently, vehicle travel has started to slow down and there is some indication that rising income may not be having as strong an effect on travel as it had in the past.

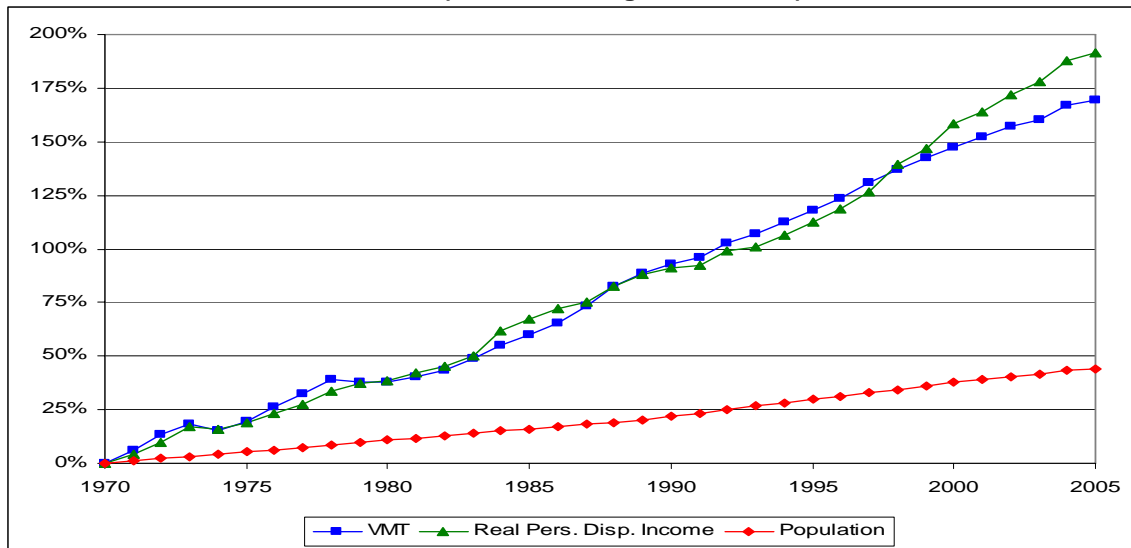
Key Findings:

- Historically vehicle miles traveled have grown at about the same rate as personal income.
- Personal income influences travel behavior through vehicle ownership, mode choice, trip purpose, and the number and length of trips.
- There are indications that rising income will have a smaller impact on travel behavior in the future and therefore a moderating influence on the growth of passenger travel in the future.

Historical Population, VMT, and Income Trends

Historically vehicle miles traveled (VMT) and real personal income have grown at about the same rate, and at a much higher rate than population. Both also exhibit very similar patterns during periods of economic recessions and expansions. However since 2000, a widening gap has emerged between the trends in real personal income and VMT. This gap can be noted visually in Figure 1. The growth in VMT appears to be slowing down even though personal income continues to increase at about its historical trend. More detailed discussion of changes in the trend of VMT growth is given in Briefing Paper 4A-01.

Figure 1 – Trend in U.S. Vehicle Miles Traveled, Real Personal Income and Population (Percent Change since 1970)



Source: Calculated from U.S. Department of Transportation, Federal Highway Administration, Highway Statistics, Table VM-1, various years. U.S. Department of Commerce, Bureau of Economic Analysis, Table 2.1 Personal Income and Its Disposition. U.S. Census Bureau, Annual Population Estimates for the United States, as of July 1 of each year.

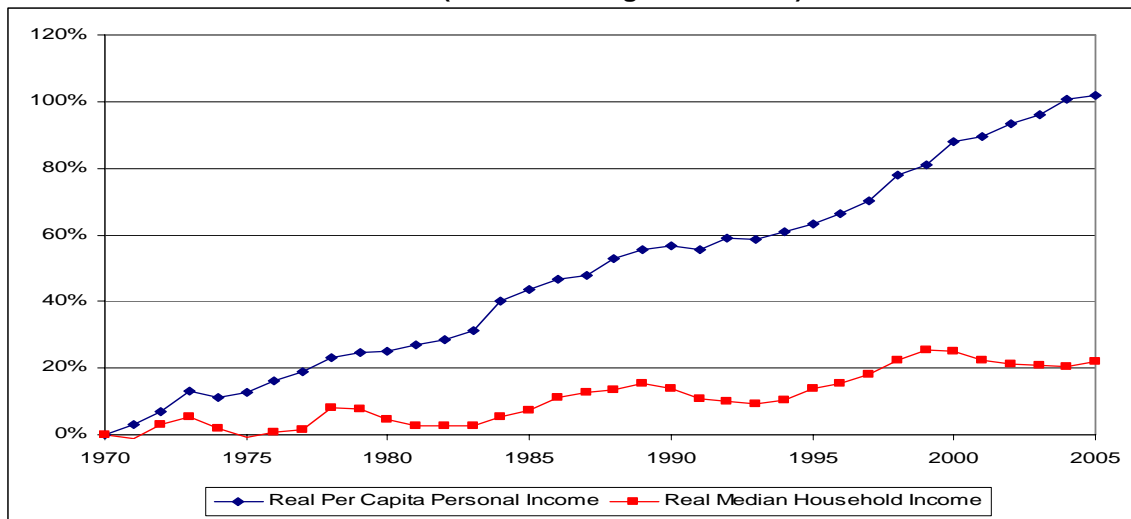
While personal income has grown at about the same rate as VMT, this is not the case with household income. Per capita personal income has been growing much faster than median household income. Since 1970, real per capita personal income has about doubled, while real median household income has increased only about 20 percent. The Census Bureau looked into the issue and concluded that two main factors accounted for most of the difference. First, income inequality has increased. Incomes of households above the median have gone up much

Income inequality and household composition have had a higher impact on household income than the increased labor force participation of women.

faster than incomes of households below the median. Second, the composition of households has changed. There has been a relative decline in the number of married-couple households with children, and an increase in the number of households both with children and no spouse, and one-person households. These factors have had a bigger impact on household income than the increased labor force participation of women, and subsequent increased two wage earner households.²

It appears from the literature review that the differences in the various measures of income (i.e. personal income and household income) and how they relate to the historical growth in VMT has not been investigated in detail. It certainly would be of interest to determine which measure is the most appropriate to use in looking at travel demand, both historically and projected future demand.

Figure 2 – Trend in Real Per Capita Personal Income and Real Median Household Income (Percent Change since 1970)



Source: U.S. Department of Commerce, Bureau of Economic Analysis, Table 2.1 Personal Income and Its Disposition. U.S. Census Bureau, Historical Income Tables – Households, Table H-5.

Travel Behavior Trends

One of the most important factors influencing the historically rapid increase in VMT has been vehicle availability. Not surprisingly, income is a major determinate of the number of vehicles in a household. The National Household Travel Survey (NHTS) in 2001 found that overall, only about 7 percent of households do not have a vehicle. However, zero-vehicle households are almost all in the lowest income class of less than \$25,000, where about 20 percent of those households do not have a vehicle. In other income classes, 95 percent or more of

20 percent of low income households do not have a vehicle

² McNeil, J. 1998. *Change in Median Household Income: 1969-1996*. Current Population Reports Special Studies, P23-196, Bureau of Census, U.S. Department of Commerce. July.

households have at least one vehicle. Only about a third of the less than \$25,000 households have more than one vehicle, compared to almost 90 percent for the highest income class of \$100,000 and above.

Another important observation from Table 1 is the relatively similar distributions of vehicles for higher income classes. The lowest income class is very different from the other income classes. The income classes from \$25,000 to less than \$75,000 are transitional ranges going from predominantly zero or one vehicle households to multiple vehicle households. The two highest income classes, households above \$75,000, have almost identical distributions. For household incomes above \$50,000, higher income households increase the number of household vehicles by only modest increments. That would imply that increased incomes would potentially have the greatest impact on lower income households. Increased incomes for higher income classes would likely have a much smaller impact.

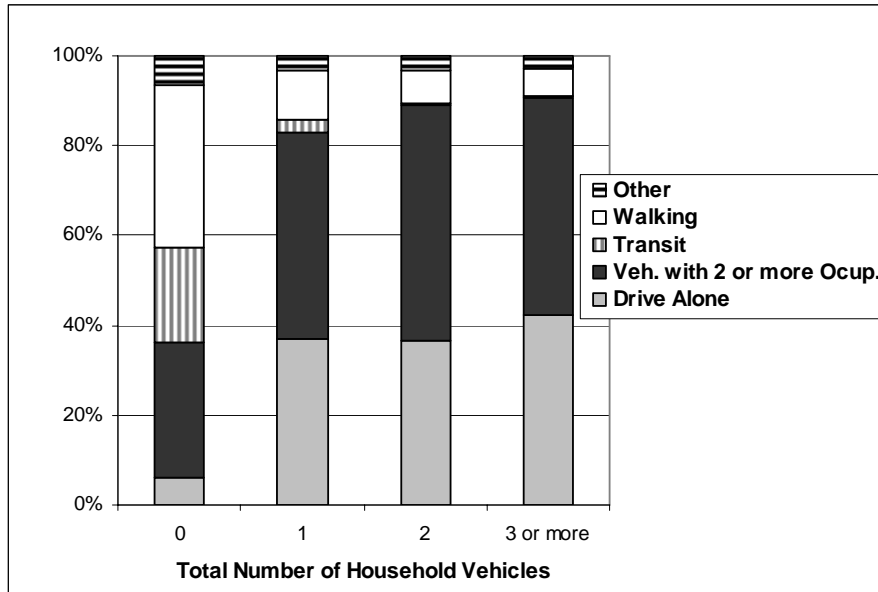
Table 1 – Distribution of Households by Number of Household Vehicles, for Each Income Class

Household Income Class	Number of Household Vehicles				Total
	0 Vehicles	1 Vehicle	2 Vehicles	3+ Vehicles	
\$0-\$24,999	19.5%	47.9%	22.2%	10.4%	100.0%
\$25,000-\$49,999	3.3%	33.7%	40.6%	22.5%	100.0%
\$50,000-\$74,999	1.4%	20.6%	45.7%	32.4%	100.0%
\$75,000-\$99,999	0.8%	11.8%	47.9%	39.5%	100.0%
\$100,000 +	1.3%	9.6%	48.2%	40.9%	100.0%
All Incomes	7.2%	30.8%	37.7%	24.3%	100.0%

Source: Calculated from the 2001 National Household Travel Survey, Household File, U.S. Department of Transportation.

Auto availability has a dramatic effect on the mode used to make trips. Zero-vehicle households make a much larger proportion of their trips using transit or walking than do households with one or more vehicles. Households with a vehicle primarily use that vehicle(s) for most travel. Households with more than one vehicle have similar modal use patterns with a modest increase in driving alone and less walking trips as the number of vehicles in the household increases. These households make almost no transit trips and few walking trips.

Figure 3 – Distribution of Trips by Mode and Number of Household Vehicles



Source: Calculated from the 2001 National Household Travel Survey, Day Trip File, U.S. Department of Transportation.

Income also affects the number of trips individuals take, as well the distance traveled in each trip. Table 2 shows the average number of trips per person per day and the average length of those trips by income class. Higher income households make substantially more trips and travel more miles than lower income households. Households in the highest income class make about 30 percent more trips than those in the lowest income class and each of those trips is on average over 40 percent longer for the highest income class compared to the lowest income class.

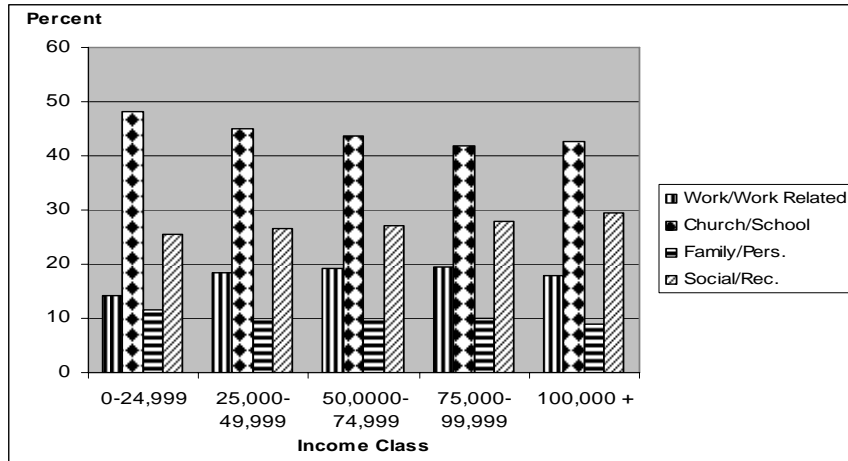
Table 2 – Number of Person Trips and Average Trip Length, for Each Income Class

Household Income Class	Average Number of Trips per Day	Average Trip Length (miles)
\$0-\$24,999	3.5	8.2
\$25,000-\$49,999	4.1	9.5
\$50,000-\$74,999	4.3	10.4
\$75,000-\$99,999	4.4	11.1
\$100,000 +	4.6	11.8
All Incomes	4.1	10.0

Source: Calculated from the 2001 National Household Travel Survey, Person and Day Trip Files, U.S. Department of Transportation.

The type of trips individuals take is also influenced by income levels. Figure 4 gives the distribution of trips by trip purpose for each income class. Several of the trip purposes are influenced by household income. As household income increases, there is a higher proportion of trips taken for work or work related activities (except for the highest income class), and well as for social/recreational activities. On the other hand, the proportion of trips for church/school activities declines at higher income classes, except for the highest income class.

Figure 4 – Distribution of Person Trips by Trip Purpose, for Each Income Class

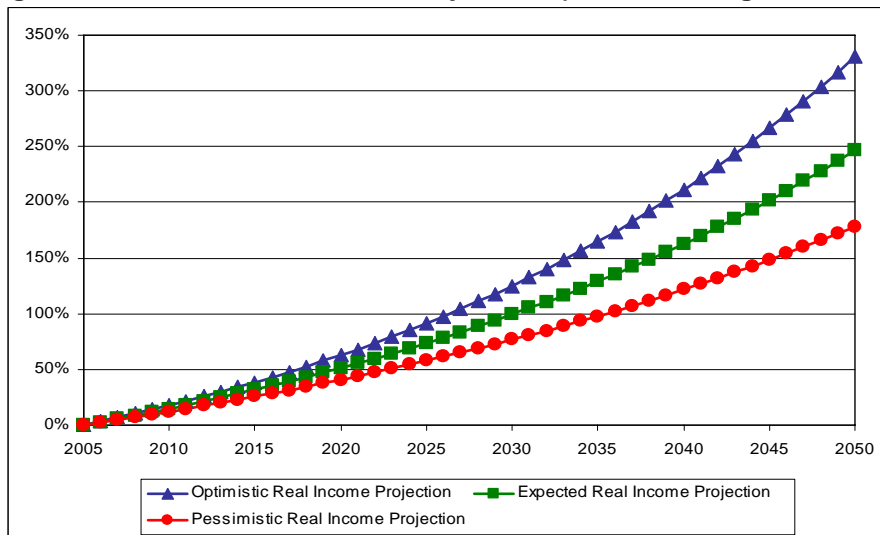


Source: Calculated from the 2001 National Household Travel Survey, Day Trip File, U.S. Department of Transportation.

Income Projections

Projections of real personal income to 2050 are not readily available. However forecasts of Real Gross Domestic Product (GDP) are available from several sources. Since growth in real income closely tracks growth in real GDP, GDP projections are used here as a proxy for projecting income. One recent set of real GDP projections are given in a technical memorandum from a National Cooperative Highway Research Project.³ Global Insights gives three sets of projections, an expected real GDP growth of 2.8 percent per year, an optimistic projected GDP growth of 3.3 percent per year, and a pessimistic projected GDP growth of 2.3 percent per year. These growth rates are used to calculate the three scenarios of income projections shown in Figure 5. Conservative estimates used in the pessimistic scenario indicate that real personal income will almost double by 2050, and it is likely to increase more.

Figure 5 – Real Personal Income Projections (Percent Change from 2005)



Source: Calculated from GDP growth rates given in NCHRP Project 20-24 (52), Technical Memorandum Task 4: Demographic, Economic, and Travel Demand Projections.

³ National Cooperative Highway Research Project 20-24 (52), FY 2006. *Technical Memorandum Task 4: Demographic, Economic, and Travel Demand Projections*. Transportation Research Board, Washington D.C.

Potential Impacts on Travel Demand

Real personal income is projected to continue to increase in the future. However that does not mean that income will necessarily continue to exert as strong an influence on rising travel demand. There are indications and predictions that those income related factors influencing travel demand may moderate in the future.

A widely cited report by Steven Polzin makes the case for moderate future growth in VMT.⁴ He points out that vehicle availability may be reaching a saturation point. The number of zero-vehicle households is already very low and while

Real personal income will almost double by 2050, and it is likely to increase more.

economic growth may continue to lower that number somewhat, there will always be some part of the population with limited means and others with limitations of a legal, mental, or physical nature that would not require a vehicle. There are also others that voluntarily do not wish to own a vehicle or as many vehicles that their income could support. He estimates that there are only about 25 percent of the households in the U.S. with a vehicle deficiency, that is, more adults in the household than vehicles. As a result the impacts of vehicle availability on VMT growth will not be large in the context of historical increases.

Polzin also points out other income related factors will also be moderating; the number and length of trips will no longer be increasing, due to the expected end to declines in the cost of travel. There may also be constraints on additional time available to devote to travel, though he found no evidence that the trend in increasing time devoted to travel has begun to slow down. Polzin predicts that the number of trips per person and trip length will only increase at only about a third as fast in the future as they have historically. As a result of these moderating influences, he predicts overall VMT will grow at about 2 percent per year.⁵ Historically VMT has grown, on average, by about 2.9 percent annually since 1970.

Litman makes an even stronger prediction that growth in travel demand as a result of higher incomes will level off and even decline.⁶ He bases this conclusion on the saturation of vehicle ownership and anticipated improved travel and location options. He predicts that one effect of increased incomes in the future will be improved transit services, based upon an analysis of other developed countries. Litman also anticipates that rising vehicle costs and lower speeds will discourage additional travel, along with improved land use patterns reducing per capita mileage. He does see an increasing demand for air travel as incomes increase, as well as a higher quality public transit.

However one factor neither Polzin nor Litman looked at is the potential impact of new immigrant households. A significant portion of future population growth is projected to be new immigrants who are typically just starting the process of growth in household income and vehicle

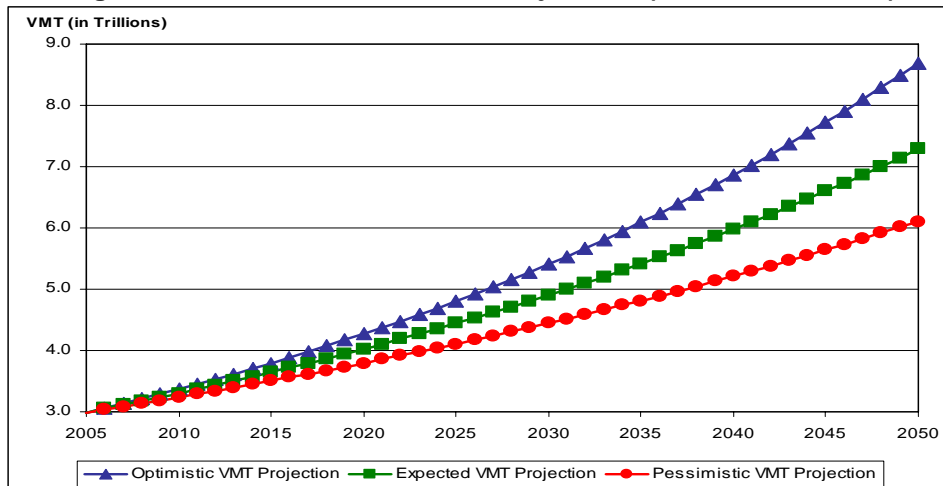
⁴ Polzin, S.E. 2006. *The Case for Moderate Growth in Vehicle Miles of Travel: A Critical Juncture in U.S. Travel Behavior Trends*. Center for Urban Transportation Research, University of South Florida, Tampa, FL, April.

⁵ Polzin predicts that the number of trips will decline as a factor in increasing VMT from 49 percent historically (1977-2001) to a much lower 16 percent in the future (2001-2025). Trip length will also decline as a factor in increasing VMT from 17 percent (1977-2001) to only 5 percent in the future (2001-2025), Figure 36, p. 32.

⁶ Litman, T. 2006. *The Future Isn't What it Used to Be, Changing Trends and Their Implications for Transport Planning*. Victoria Transport Policy Institute, Victoria, BC.

acquisition. This may be a source of additional vehicle demand not accounted for in VMT growth projections. A more detailed discussion of impacts of immigration on travel demand is given in Briefing Paper 4A-03.

Figure 6 – Vehicle Miles Traveled Projections (From 2005 to 2050)



Source: Calculated from VMT growth rates given in NCHRP Project 20-24 (52), Technical Memorandum Task 4: Demographic, Economic, and Travel Demand Projections.

In addition to immigration effects on future travel demand, other alternative travel behavior projections are common. For example, Briefing Paper 4A-05 posits that the continued absorption of rural areas into metropolitan areas will increase trip distances and reliance on personal vehicles as there is increased specialization of services and continued movement of households across metro and rural areas.

Global Insights has made predictions of overall VMT growth, based largely upon their predicted growth in GDP. They give a range of VMT growth rates, with an expected growth of 2.0 percent per year, an optimistic growth of 2.4 percent per year, and a pessimistic growth of 1.6 percent per year.⁷ VMT projections based upon these growth rates are shown in Figure 6. Their expected VMT growth of about 2 percent per year is the same as Polzin predicts and is similar to the projections in U.S. Department of Transportation 2004 Conditions and Performance Report.⁸

Conclusion and Policy Implications

While it is difficult to predict how individuals will use increases in their real income in the future, it is clear that historically some of that increase has been used to travel more and for longer distances. However there are several indications that income as an indicator of future travel has begun to moderate and is expected to continue to moderate into the future.

The transportation system in the United States is currently under some stress resulting from capacity constraints and increased maintenance needs. The demand for improved performance and reliability are increasing. This will have broad impacts on the level and type of

⁷ National Cooperative Highway Research Project 20-24 (52), FY 2006, op. cit.

⁸ U.S. Department of Transportation. 2006. *2004 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance*. p. 9-10.

transportation services demanded as incomes continue to rise. It is likely that individuals with high incomes will be willing to pay for higher quality and more reliable transportation services in the future. Some of the ways that changing demand could manifest itself are listed below.

- A continuing increase in vehicle availability, principally from low-income households and new immigrants. Though the trend will slow down from historical patterns, there will be additional households moving out of the zero-vehicle category, and one-vehicle households moving to multiple vehicle households.
- A slowing in the growth of the number of trips and the length of trips, with increased demand for home delivery services, closer employment locations, and more convenient goods and services locations.
- An increasing demand for tolled facilities providing improved travel times and better reliability. One way individuals can obtain improved transportation services is to pay a premium for those improved services. Tolled facilities provide that mechanism, providing they are designed and operated to provide superior service.
- An increasing demand for higher quality and more convenient public transit. There will likely be some pressure to provide some public transit that caters to higher income individuals offering higher quality and more convenience.
- An increasing demand for faster transportation services, high-speed rail and air. As individual incomes rise, their value of time also rises. Individuals with higher values of time are willing to pay for services offering less travel time. This will increase the demand for such services as high-speed rail and air travel.
- A continuing low use of mass public transit. While the type of service demanded may change, with higher demand for faster, better quality and more reliable services, increases in real income will tend to discourage significant increases in overall transit use. This will be reinforced by the continuing decline in zero-vehicle households.