Commission Briefing Paper 4B-06

Forecasts of Economic Variables that Impact Passenger and Freight Demand and the Implication of Alternative Economic Assumptions on Modal Travel Demand

Prepared by: Battelle
Date: January 12, 2007

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 forecasts of economic variables that have been shown statistically to impact passenger and freight demand. These variables were identified through a review of major transportation and energy demand models. Economic and transportation demand variables were forecast through 2030, and the findings were analyzed to detect trends concerning changes in the structural relationship between economic growth and passenger and freight demand. Alternative forecasts of modal travel demand were assessed and the impact of economic factors that impact modal travel demand were considered.

Background and Key Findings

- In the U.S., historic growth in passenger and freight demand has been largely driven by economic activity. The nature of these relationships and the trends that could impact them are examined within this paper. Major findings include:
- The most significant economic variables driving passenger and freight demand include: real gross domestic product (GDP), consumer prices, motor fuel prices, non-farm employment, and real disposable personal income.
- From 2004 to 2030, real GDP and real personal disposable income are forecast to grow at average annual rates of 2.9 percent and 3.1 percent, respectively. Non-farm employment and population are forecast to grow at roughly 1 percent annually.
- Historically, indicators of transportation demand such as vehicle miles traveled (VMT) and freight tonnage have grown in lockstep with economic variables (e.g., GDP, income). However, the relationship between economic activity and transportation demand has changed in recent years and this change is forecast to continue through 2030. Reasons cited in the literature for this phenomenon include: growth in the U.S. services sector, enhanced productivity in the transportation sector resulting from deregulation and technology deployment, and the aging of the U.S. population.
- The introduction of just-in-time delivery systems and the globalization of markets have changed the nature of transportation demand for U.S. companies, and increasingly greater

emphasis is being placed on rapid, dependable, and flexible transportation options. This has resulted in a shift towards more reliance on air transport and intermodal options.

- With few exceptions, passenger and freight demand are not price sensitive. Exceptions include air and rail leisure travel and markets that are subject to intermodal competition – e.g., assembled automobiles, corn, wheat, primary metals.
- Families earning more than $75,000 per year register more than twice the miles traveled by families compared to those with incomes of less than $25,000.[1] The opposite trend holds for public transportation where families with incomes below $20,000 comprise 50 percent of total ridership on the public transportation network.[2]

Staff Comments

This commission briefing paper is one of several that examine trends and consequences of commodity flows. Paper 01 reviews trends in international trade and trading partners. Paper 02 estimates shifts of trade through West Coast Ports to East Coast ports if trading partners change. Paper 03 investigates the role of Canadian and Mexican ports in handling U.S. foreign trade. Paper 09 considers the role of short sea shipping in foreign and domestic trade. Paper 10 outlines forecasts of future commodity flows by geography and mode, and paper 06 describes economic forecasts that underlie the commodity flow predictions. Forecasts presented in these papers are based on common methods, but in some cases use different years, commodity classification systems, and geography.

Major Transportation and Energy Models

The Federal Government and some States have developed models that forecast: passenger and freight demand, VMT, motor fuel consumption, or motor fuel tax revenues. These models forecast and detect trends in passenger and freight demand by identifying and examining the economic variables that drive their growth. These models vary in parameter, scope, and data used but generally agree on the economic variables that most directly drive demand. Models reviewed for this briefing paper included:

- National Energy Modeling System (NEMS). The United States Department of Energy's (US DOE's) NEMS forecasts production, conversion, consumption, and imports of petroleum products, as well as energy prices conditional on relationships between macroeconomic and financial factors, world energy markets, resource availability and costs, behavioral and technological choice criteria, cost and performance characteristics of energy technologies, and demographics.
- Highway Revenue Forecasting Model (HRFM). The Federal Highway Administration's (FHWA) HRFM, estimates fuel consumption through parallel projections of VMT and miles per gallon (MPG) for vehicles differentiated by class and operating weight.
- Freight Analysis Framework (FAF). The FHWA's FAF tracks commodity flows and related freight transportation activity at the national, State, and regional level for the air, truck, water, highway, and intermodal modes. The original FAF[2] provided forecasts of freight flows by mode to 2020. The updated FAF provides forecasts of

[1] United States Department of Transportation. *2001 National Household Travel Survey.* 2001. Washington, D.C.
[2] Federal Highway Administration. *2002 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance Report to Congress.* 2002. Washington, D.C.

freight flows to 2035. FAF relies on the Commodity Flow Survey and economic forecasting models to forecast future domestic and international freight flows.

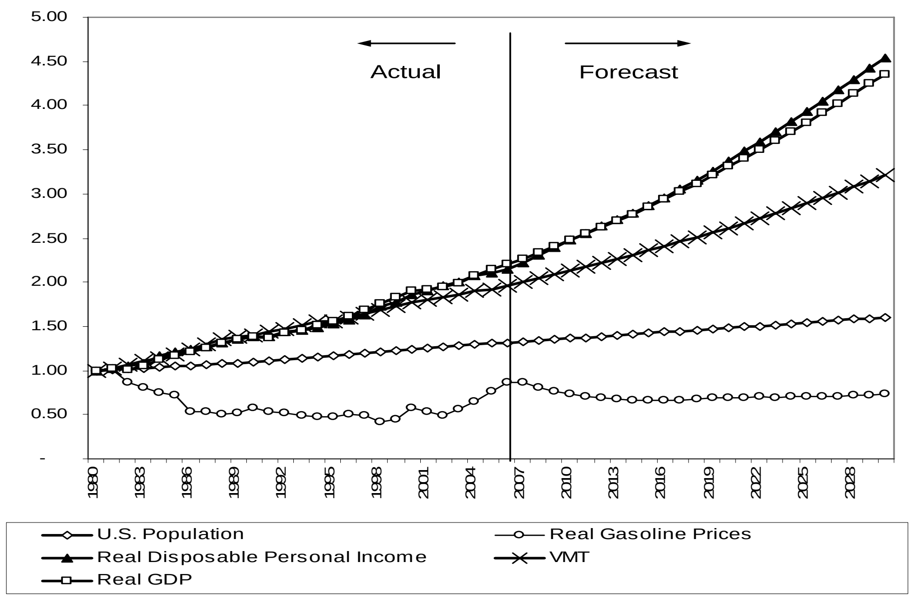
- Highway Performance Monitoring System (HPMS). HPMS is an FHWA database utilizing state-supplied data to monitor the condition, performance, use, extent, and operational characteristics of the Nation's highway system. As States update the HPMS database, they build section-specific average annual daily traffic (AADT) forecasts, which are used to generate nationwide 20-year VMT forecasts.

These models and the economic forecasts underlying them were identified and examined in order to capture those variables that drive forecasts of passenger and freight demand.

Economic Variables that Impact Passenger and Freight Demand

Figure 1 illustrates the historic and forecast relationship between many of these variables. Through the mid-1990's the relationship between economic variables, such as real disposable personal income and real GDP, and growth in VMT was exceedingly strong. From 1980 to 1996, real disposable income grew by 58 percent, real GDP grew by 61 percent, and VMT grew by 60 percent. Since that time, however, the lockstep link has diminished between economic variables and VMT growth. Economic forecasts underlying the models outlined in the previous section suggest that this trend will continue through 2030. These models also forecast change in the relationship where the average annual growth in real GDP of 2.9 percent[3] is fueled by a 2.0 percent annual growth in freight tonnage over the 2004-2030 time period.[4]

Figure 1. Annual Indices of U.S. Population, Real Disposable Personal Income, Real Gross Domestic Product, Real Gasoline Prices, and Vehicle Miles of Travel - 1980 – 2030, 1980 = 1.0



Source: Historic US Population – U.S. Census, Census of Population and Housing; Historic Real GDP and Real Disposable Personal Income – Bureau of Economic Analysis, National Income Product Accounts; Historic Real Gasoline Prices – US DOE, Petroleum Marketing Annual; Historic VMT – FHWA, Highway Statistics; Forecast VMT – FHWA HPMS; Other Forecast Variables – U.S. DOE, Annual Energy Outlook.

---

[3] United States Department of Energy, Energy Information Administration. *Annual Energy Outlook 2007 (Early Release)* 2006. Washington, D.C.
[4] Alam, Mohammed. E-mail communication. December 27, 2006.

Although real gasoline prices have increased significantly since 2002, real gasoline prices were 16 percent lower in 2006 relative to 1980, and the rise and fall of real gasoline prices has had a limited impact on VMT growth rates.

The Changing Relationship of Economic Growth and Transportation Demand

There is a small but growing body of literature relating to the changing relationship of economic activity and transportation demand. While transportation demand has historically moved in lock-step with economic growth, there are a number of factors cited in the literature examining the new and emerging relationship, including: the expansion of the services sector in the U.S. economy, enhanced productivity in the transportation sector resulting from deregulation and expanded technology deployment. Additionally, demographic factors may impact the relationship between GDP and VMT, including the aging of the U.S. population. This paper focuses on the economic factors.

One trend changing the relationship between economic growth and transportation demand is growth in the services sector of the U.S. economy. During the 1990s, the services sector added 19 million jobs while the goods-producing sector was relatively stagnant. Moreover, the good-producing industries' share of total GDP has fallen by nearly half in the past 50 years.[5] Increasingly, information technology and globalization are accelerating the shift within the U.S. economy towards service industries. From 1986 to 1995, energy intensity, or the energy (including motor fuels) consumed per dollar of GDP, declined roughly one percent per year but declined by 3 percent in both 1997 and 1998. Further, a report prepared by the Environmental Protection Agency (EPA) and Argonne National Laboratory found that one third of the improvements in energy intensity are due to structural shifts towards less energy intensive largely service-oriented industries.[6] This shift has a dampening impact on VMT and freight tonnage growth.

Labor productivity growth in the transportation sector has been higher than in the U.S. business sector generally. This trend is highlighted because transporting goods in a more efficient manner contributes to the decoupling of economic growth and transportation demand. Figure 2 shows that several modes had considerably higher gains in labor productivity relative to the average for all business, with annual growth in labor productivity in local trucking, railroad transportation, and petroleum pipelines growing by 5.2 percent, 5.1 percent, and 3.3 percent, respectively.[7] These gains have been realized through increasing capital inputs in production, enhanced technology deployment within the sector and regulatory changes.

Deregulation has had profound impacts, including the restructuring of the industry and expansion in the number of motor carriers. From 1978 to 1987, the number of for-hire carriers grew from 67,038 to 89,677.[8] As a result of deregulation, private carriers obtained backhaul authority and

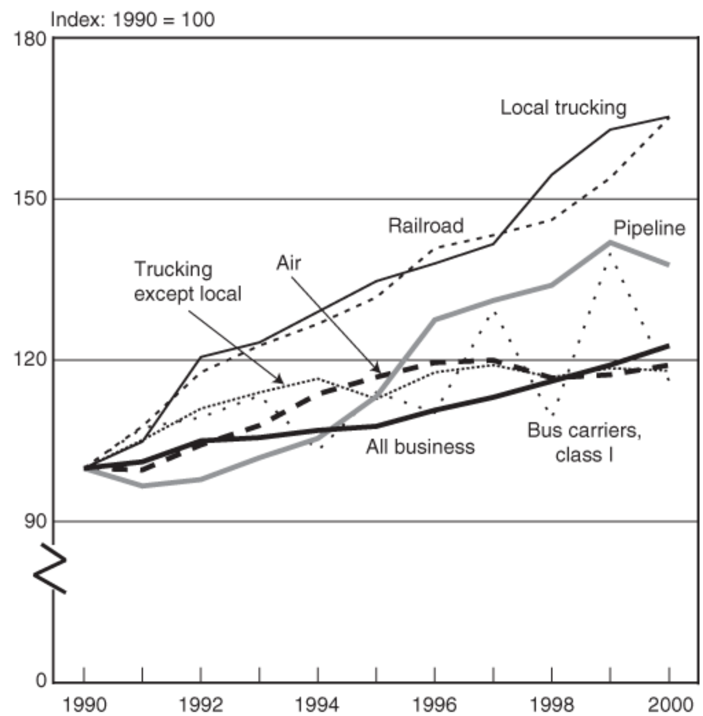
---

[5] Tripplett, J. and Bosworth, B. *Productivity in the U.S. Services Sector: New Sources of Economic Growth.* 2004. Brooking Institution Press. Washington, D.C.
[6] Romm, J., Rosenfeld, A. and Herrmann, S. *The Internet Economy and Global Warming.* Prepared for the Center for Energy and Climate Solutions. 1999. Arlington, Virginia.
[7] Bureau of Transportation Statistics. (http://www.bts.gov/publications/issue_briefs/number_10/html/figure_01.html)
[8] U.S Department of Transportation. *Comprehensive Truck Size and Weight Study.* 2000. Washington, D.C.

more small owner-operators entered the trucking industry. Following the Staggers Rail Act of 1980, railroads realized large gains in labor productivity as they consolidated operations, reduced excess capacity, improved line-haul and yard operations, abandoned unprofitable lines, and eliminated excess staff.[9]

Application of enhanced technology has increased the flexibility and reliability in the transportation sector, and has reduced operating costs. Some of the most significant technologies deployed in recent years in the transportation sector include: personal computers, bar codes, electronic data interchange (EDI), electronic funds transfer (EFT), geographic information systems (GIS), material-handling systems, intermodal containers, and double-stack trains. These technology systems have reduced operating costs and expanded the capabilities of the rail and trucking industries.

Figure 2.
Transportation Labor Productivity by Mode



Source: Bureau of Transportation Statistics
(http://www.bts.gov/publications/issue_briefs/number_10/html/figure_01.html)

A cursory review of Figure 1 could lead to the mistaken conclusion that growth in GDP is not reliant upon transportation – this would be a serious error. The forecast shows a change in the characterization of passenger and freight transportation demand but a large integrated transportation network continues to support GDP growth.

[9] Tripplett, J. and Bosworth, B. 2004.

Economic Forecasts

Table 1 presents forecasts through 2030 for many of the significant economic variables for passenger and freight demand growth in the major models. Table 1 shows that real GDP is forecast to grow from $10.7 trillion in 2000 dollars to $22.5 trillion by 2030, representing an average annual increase of 2.9 percent. Real personal disposable income is also forecast to double, from $8.0 trillion to $17.5 trillion.

Table 1.
Economic Variables, Population, and Passenger and Travel Demand Forecast Average Annual Growth Rates, 2004 – 2030

Variable	2004	2030	Average Annual Growth (2004-2030)
Real GDP[1]	10,703.5	22,494.2	2.9%
CPI All-Urban[2]	1.9	3.2	2.1%
Wholesale Price Index Fuel and Power[2]	1.3	2.4	2.5%
Population[3]	294.2	364.9	0.8%
Nonfarm Employment[3]	131.4	169.2	1.0%
Real Disposable Personal Income[1]	8,010.8	17,535.0	3.1%
FAF[2] Freight Demand[4]	20,136.5	33,664.8	2.0%
VMT Forecast[3]	2,964,788.0	4,989,948.0	2.0%

[1]Billions of 2000 chain-weighted dollars.
[2]1982-1984 = 1.0
[3]Millions
[4]Millions of short tons. Estimates based on FAF2 long-range (2002-2035) 2.0 percent growth rate held constant over forecast time period.

Source: VMT - FHWA HPMS, FAF[2] Freight - E-mail Communication with Mohammed Alam
All Other Variables - US DOE NEMS

While real GDP and real disposable personal income are forecast to grow at rates hovering around 3 percent, state-supplied VMT forecasts and the freight demand forecasts provided by the FAF[2] model suggest demand for passenger and freight transport will grow at an average annual rate of approximately 2.0 percent. This rate of growth is lower than that experienced during the 1993-2002 time period when VMT grew at an average annual rate of 2.5 percent.

Modal Demand Forecasts and Implications of Alternative Economic Assumptions

Table 2 presents forecasts of freight tonnage or ton-miles by mode. These forecasts were produced by the Bureau of Transportation Statistics (BTS)[10], the American Association of State and Highway and Transportation Officials (AASHTO)[11], the American Trucking Associations (ATA)[12], ICF Consulting[13], and FHWA[14]. The time periods vary by forecast, with the ATA's

---

[10] U.S. Department of Transportation, Bureau of Transportation Statistics. *The Changing Face of Transportation.*BTS00-007. 2000. Washington, DC.
[11] The American Association of State Highway and Transportation Officials. *Investment in America: Freight-Rail Bottom Line Report.* 2003. Washington, D.C.
[12] American Trucking Associations. *U.S. Freight Transportation Forecast to 2014.* 2003. Washington, D.C.

forecast extending only to 2014 and the FAF[2] model forecast extending out to 2035. Growth rates were calculated for each of the following modes: truck, rail, water, and air. Each forecast uses either total tonnage or ton-miles as the unit of measure.

Table 2. Comparison of Freight Forecasts

		Forecasts (compound annual growth rate)					
		BTS	AASHTO	ATA	ICF	FAF	FAF2
	Historic Growth (ton-miles)	(ton-miles)	(ton-miles)	(tons)	(ton-miles)	(tons)	(tons)
Mode	1990-2000	2000-2025	2000-2020	2002-2014	2000-2020	1998-2020	2002-2035
Truck	3.9%[1]	2.6%[1]	2.30%	2.20%	2.50%	2.60%	2.1%
Rail	3.60%	0.20%	1.90%	1.70%	2.00%	2.00%	1.9%
Water	-2.50%		0.70%	1.60%	0.70%	1.70%	1.2%
Air	5.20%	3.10%	5.70%	4.40%	4.00%	4.80%	3.7%[2]

Notes 1: Intercity truck only, 2: Includes highway/air intermodal component.

Source: Modified from ICF Consulting (2004)

Each forecast shows the trucking industry continuing to serve as the foundation of the freight transportation network. In 2002, trucks transported 12.1 billion tons of cargo, or 62.7 percent of the total. The FAF[2] model forecasts freight transported by trucks to roughly double between 2002 and 2035, expanding to 24.2 billion tons or 65.5 percent of total tonnage. In each forecast, air is expected to grow at the most rapid pace (3.1 – 5.7 percent average annual rate of growth) but will continue to carry the smallest share of tonnage (less than 1 percent). Rail and water are forecast to continue their decline in terms of the overall share of freight tonnage.

Intermodal transportation is becoming increasingly important. Today, trucks not only serve shippers directly at both the point of origin and destination but also serve as a vital link between the modes. Trailers are often transported by rail and pulled by local trucks to their ultimate destination. Intermodal trains can carry both semi-trailers for trucks and containers for Ocean vessels. In recognition of the increasing importance of intermodalism, the FAF[2] forecasts now include the following modes: air and truck, other intermodal, pipeline and unknown, rail, truck, truck and rail, and water.

It is important to note that there is an implicit assumption made in the models that generated the forecasts presented in this paper that capacity will grow in a manner that will not constrain output in the trucking or rail industries. Thus, the model output should be viewed in the context of demand for freight and passenger transportation. Whether the supply in terms of capacity can meet the demand remains to be seen. Moreover, these forecasts assume that the relative prices of modes will remain constant.

[13] ICF Consulting, *2010 and Beyond: A Vision of America's Transportation Future, 21st Century Freight Mobility.* NCHRP Project 20-24(33) A, Final Report, August 2004. Fairfax, Virginia.
[14] http://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm

There are a number of factors that could impact the demand for transportation and mode split. Changes in the relative price by mode would impact the decisions made both by shippers and passengers. When considering price sensitivity, a product is considered relatively price sensitive (elastic) if the change in price generates a proportionally greater percentage change in quantity demanded. A product is relatively insensitive (inelastic) to prices if a change in price yields a less than proportionate change in quantity demanded. A recent survey of studies estimating price sensitivity for transport found[15]:

- Overall, transportation demand is relatively price insensitive.
- Automobile and transit passenger transportation are relatively insensitive to prices, with a one percent increase resulting in a 0.1 to 1.1 and 0.1 to 1.3 percent reduction in demand, respectively. The demand for peak period travel is even less sensitive to prices with a one percent increase in prices generating a 0.1 to 0.7 reduction in demand for both modes. However, one study found that price sensitivity with respect to mode choice was higher for automobiles, indicating that some motorists forgo highway travel in favor of public transport when user costs are exceedingly high.
- Air and rail leisure travel are relatively sensitive to prices with one percent increases in prices resulting in 1.1 percent and 2.1 percent reductions in demand, respectively.
- Freight transport is not very sensitive to prices, with the exception of markets that are subject to intermodal competition – e.g., assembled automobiles, corn, wheat, primary metals, paper products.

Though passenger and freight transportation are relatively insensitive to prices, this does not suggest that the marginal impact of congestion pricing would not be significant. Even when a one percent increase in prices results in a less than proportional (e.g., -0.5 percent) impact on travel demand, the impact could still have a significant impact on congestion levels.

Evidence suggests that in recent years, the high growth in motor fuel prices caused a slight reduction in passenger demand and a minor shift towards public transit. For the first time since 1980, the average number of miles traveled by motorist declined in 2005.[16] Further, following a two-year decline in ridership, the number of passengers reported by the Nation's transit agencies in 2004 through 2006 grew by 7.1 percent.[17] There is also evidence to suggest that higher fuel prices may provide more incentive to buy fuel efficient cars without reducing VMT. In 2005 and 2006, the new purchase of light trucks declined for the first time since the 1980s.

The relative price of modes can be affected through operational changes and relative congestion levels. For example, when truck size and weight limits are extended, motor carriers are able to spread fixed costs over a relatively larger load, thus reducing operating costs and the price to shippers. Other operational improvements, including double-stacked trains, fewer empty backhauls, and technology enhancements could reduce costs and impact modal competition. Congestion, on the other hand, effectively increases the price of trucking, and to the extent that highway investment reduces congestion levels, the speed and relative cost of trucking would also

---

[15] Oum, T, Waters, W, and Yong J. *A Survey of Recent Estimates of Price Elasticities of Demand for Transport.* Prepared for The World Bank. 1990. Washington, D.C.
[16] Federal Highway Administration. Highway Statistics. 2005. Washington, D.C.
[17] American Public Transportation Association. *APTA Ridership Report.* Washington, D.C. 2002-2006.

be reduced and demand for trucking would increase. This statement is supported by a recent FHWA study, which found that a 10 percent reduction in measured congestion would result, on average, in a 0.07 percent to 1.00 percent increase in the demand for trucking.[18]

Sensitivity analysis is performed on the FAF-generated forecasts by varying the economic assumptions underlying the projections. The economic assumptions used are developed within the long-term optimistic and pessimistic economic forecasts produced by Global Insight. These forecasts vary productivity growth, real oil prices, wholesale farm prices, productivity, real GDP, and general prices as measured through the CPI. In the current forecasts, annual GDP growth varies from 2.3 percent (pessimistic) to 3.3 percent (optimistic), as compared to the 2.8 percent baseline. The CPI is varied from 1.8 percent (optimistic) to 4.2 percent (pessimistic).[19] When the Global Insight optimistic and pessimistic assumptions were applied to the freight flow forecast provided by FAF, forecast long-term freight demand (1998 to 2020) dropped by 0.4 percent annually under the pessimistic scenario but exceeded the baseline by 0.5 percent annually under the optimistic scenario. When removing the FAF assignment of cargo to international shipments moved by pipeline and other unspecified modes, varying the economic assumptions had very little impact on mode split. Thus, general growth in economic activity would not appear to be the driving factor in mode split. What significantly drives mode split is where the growth occurs within the economy, and the modes used by the growth sectors. Based on current economic trends, FAF^2 forecasts that highway freight will grow at a rate that outpaces rail with annual growth of 2.1 percent. Rail freight is forecast to grow by 1.9 percent annually.

Historically, the growth registered in VMT has tracked extremely well with growth in real disposable income. From 1983 through 2001, real disposable income grew at 3.2 percent annually while VMT growth registered 3.6 percent annual rates.[20] Though this trend has wavered in recent years, it is clear that higher income translates to higher levels of travel. The 2001 National Household Travel Survey (NHTS) found that families with annual incomes in excess of $75,000 traveled on average 31,000 miles annually as compared to 16,400 miles for families with annual incomes of between $20,000 and $24,999 and 13,300 miles for families with annual incomes of less than $5,000.[21] While individuals with higher incomes do spend more on transportation and travel more than those with lower incomes, it is important to note that demand for travel does not increase in proportion with income. Thus, the income elasticity of demand (or the percentage change in quantity demanded in response to a percentage change in income) for transportation, is less than one.

With respect to the demand for public transportation, data collected through the Transit Performance Monitoring System (TPMS) indicate that transit plays a much larger role in the lives of lower-income Americans. Of the public transit trips surveyed, approximately 50 percent

---

[18] ICF Consulting and HLB Decision-Economics. *FHWA Freight Benefit-Cost Analysis Study: Summary of Phase II Results.* Prepared for the Federal Highway Administration. 2004. Washington, D.C.
[19] PB Consult, Inc. *Technical Memorandum Task 4: Demographic, Economic, and Travel Demand Projections.* NCHRP Project 20-24 (52): Future Options for the National System of Interstate and Defense Highways. 2006. Washington, D.C.
[20] United States Department of Energy, Energy Information Administration. *Household Vehicles Energy Use: Latest Data and Trends.* 2005. Washington, D.C.
[21] US DOT. 2001. United States Department of Transportation. *2001 National Household Travel Survey.* 2001. Washington, D.C.

were taken by users with incomes under $20,000. Riders with incomes between $20,000 and $39,999 accounted for approximately 29 percent of the trips. Thus, riders with incomes of $40,000 or more accounted for only 21 percent of total ridership.[22] Based on this evidence, it would appear that higher than anticipated income growth would result in higher than anticipated travel demand and a mode shift from public transportation to personal vehicles.

CONSOLIDATED COMMENTS FROM MEMBERS OF THE BLUE RIBBON PANEL OF TRANSPORTATION EXPERTS - PAPER 4B-06

One reviewer commented as follows:

On pages 2-3, the FHWA's Freight Analysis Framework (FAF) and the Commodity Flow Survey (CFS) are mentioned. This commentator would note that the FAF uses the 2002 Commodity Flow Survey (CFS) as a starting point for base freight flows. However, the CFS, which is based on a shipper survey, does not capture a significant portion of rail intermodal freight. This is so because many shippers often only know that a truck was involved in pickup or delivery — and thus report a movement as "truck"— even though the freight may have moved by rail for part of its movement. CFS truck ton-miles are therefore overstated and TOFC/COFC rail figures are understated. Rail intermodal tonnage is probably also understated, potentially substantially.

On page 7, table 2, BTS has forecast a growth rate for rail ton-miles of only 0.20%. This is likely a typo (perhaps should be 2.0%?) Class I ton-miles for 2000-2005 have grown at an average annual rate close to 3%.

Page 8 states: "A recent survey of studies estimating price sensitivity ... Freight transport is not very sensitive to prices, with the exception of markets that are subject to intermodal competition — *e.g.*, assembled automobiles, corn, wheat, primary metals, paper products." This commentator would note that the survey of studies referenced is from 1990, which is not "recent." Moreover, the claim that only freight subject to competition from other modes is sensitive to prices is completely wrong.

Another reviewer commented as follows:

On page 4 -- While the "decoupling" of freight transportation seems intuitive, the paper does not provide a great deal of empirical proof that this is occurring. A study of import/distribution and the service industry requirements versus various types of manufacturing, extractive industries (mining/forest products and agricultural) would be very enlightening.

On page 5 -- One would think that the growth of labor productivity would have been greater in line-haul trucking than in local trucking. Was the graph in Figure 2 mislabeled or did productivity jump by nearly 75% in ten years? If so, why? Was it the opening up of more rational service territories, i.e., beyond the traditional commercial zones, or the replacement of

[22] FHWA. 2002. Federal Highway Administration. *2002 Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance Report to Congress.* 2002. Washington, D.C.

unionized carriers by non-unionized labor? There has been virtually no literature on this phenomenon.

On pages 3-8 – Although there are a few inconsistencies and conflicts with other papers, this paper provides a rationale for the decoupling of GDP and freight transportation. The paper does not do such a thorough job explaining the case why this should happen for private, passenger car VMT. This is especially puzzling in light of the statement on page 4 that there has been only limited impact of VMT growth rates from higher fuel prices. And also in light of the statistic on page 9 that higher income translates to higher levels of travel. It is pointed on page 9 that the demand for travel does not increase proportionately with income, the income elasticity of demand is less than one. Yet this still would not explain that according to the graph in Figure 1 on page 3, and the growth rates in Table 1 on page 6, that real disposable income will grow at 3.1% while total VMT will only grow at 2.0%. Why is this the case? Is the difference explained by the statement on page 4 "Additionally, demographic factors may impact the relationship between GDP and VMT, including the aging of the U.S. population"? If this is the case, are there some statistics to prove that VMT will decline substantial because an older population drives less? What role has working from the home and telecommuting, due to the growth of personal computers and the internet, had on the relationship of VMT and the GDP?

On pages 3-5 -- The paper credits deregulation of the trucking industry and the concurrent productivity gains for reducing ("decoupling") VMT's and economic growth. If this is the case, why did the trend lines for GDP growth and VMT's only start to diverge in 1998, according to the graph in Figure 1 on page 3. Trucking was effectively deregulated with the passage of the Motor Act of 1980. Why would there be virtually no discernable effect for 18 years?

General. There is no breakdown between truck VMT's and passenger VMT's. This is a deficiency because it makes it difficult to assign a cause and effect relationship to the trends which are discussed.

Many of the factors cited for a reduction in annual VMT seem not to fit well with some of the statements in other papers. For example paper 4B-05, "Impacts of Just-In-Time Freight Logistics" notes that according to the Vehicle Inventory and Use Survey- Freight Facts and Figures, FHWA, 2006, " This shift to more vehicles carrying less per vehicle has contributed to the 49 percent growth in trucks over 10,000 pounds and 62 percent growth in their vehicle miles of travel over the last 15 years." There also seems to be a disconnect with this statement in paper 4B-01 "Impacts of Changes in Business Practices and Industrial Locations on Freight Movement, Modal Demand and Transport Industry Structure," which states "Simultaneous industries of almost every type have been migrating to low inventory, high speed logistic plans and this makes them especially sensitive to the performance of the transportation system."