TRANSPORTATION AND THE ECONOMY

national and state perspectives
May 1998
The American public understands that transportation is important to the economy and to our daily lives. But the full power and importance of transportation’s role in the nation’s economy has never been understood — until now.

In the past months, many years of research and data collection have begun paying off in a rich series of analytical studies paving the way for a strong, rigorous and quantitative explanation of transportation’s role in the economy and the power of transportation investment in advancing national competitiveness and productivity. This document identifies some of this new research and the guidance it provides to public investment decision making. This document also addresses some of the tasks that lie ahead to complete the work that is now showing such substantial rewards.

Among the important research results:

- An AASHTO and National Governors’ Association report documents the new world in which modern freight transportation operates: one centered on the highly reliable movement of high value goods in a just-in-time environment and dominated by world-wide competition in which transportation costs can determine market success or failure;

- University research sponsored by the Federal Highway Administration quantifies the relationship between highway investment and the economy based on reductions in business costs; and

- A statistical analysis based on new freight flow data demonstrates that the Woodrow Wilson Bridge carries over one and one half percent of the nation’s freight measured by value, establishing a clear framework for defining national importance.

What does such research prove about the economic value of transportation?

- Investments in the total highway system by all levels of government over the period 1980 to 1991 averaged an amazing net rate of return of 14.6 percent. This was above the average rate of return typical for all private investment. Annual rates of return on only investments on the National Highway System were above 20%;
Almost one-fifth of the increase in productivity in the U.S. economy between 1980 and 1991 was attributable to investment in highways;

A new accounting tool, called the Transportation Satellite Account (TSA), now provides a way to measure both in-house and for-hire transportation services. The TSA reveals that when in-house functions are incorporated, transportation, accounts for five percent of the Gross Domestic Product. In-house transportation services alone account for nearly 2 percent of the GDP, a larger share than the direct contribution to the economy than agriculture or the computer industry; and

While these benefits alone justify an extensive highway investment, they represent only the benefits of freight transportation. The case for highway investments will be made even stronger as further research examines the benefits accruing to passenger travel.

The State Perspective

Research by the Federal Reserve Bank of Chicago and the University of Illinois suggests that in the mid-west region of the U.S., encompassing Michigan, Ohio, Indiana, Illinois and Wisconsin, trade activities take on new character. This evolution of trade is spurred by two forces, a significant reduction in the cost of transportation and communications in general, and the integration of the regions into a global economy. Key in this development is the increasing impact of each additional dollar invested in transportation on lowering production costs. Firms search more widely for the highest quality and lowest cost inputs knowing that transportation investments have significantly broadened the effective geography within which they can search;

Wisconsin in 1988 introduced a Corridors 2020 plan to create a statewide network of two and multi-lane state highways connecting all communities of over 5,000 people. Research on the new and expanding manufacturing establishments in the state has found that 86 percent of the manufacturing jobs in the state in 1996 were located in communities within five miles of a Corridor 2020 route;

Work now underway by the Maryland Department of Transportation and Towson University parallels at the state level the FHWA analyses of the impact on private sector production costs of highway investments. The research shows that between 1982 and 1996, highway investment substantially reduced the private cost of production. Over the entire period highway
investment reduced the wage and capital costs of industry in the state by 3 percent or about $1 billion. Preliminary work shows that highway investment was responsible for eight percent of productivity growth in the state in that period; and

■ A very recent product of the U.S. Department of Transportation’s Bureau of Transportation Statistics and the Bureau of Economic Analysis of the Department of Commerce, called a Transportation Satellite Account, raises the estimate of transportation services in the Gross Domestic Product from a 3 percent to a 5 percent share. Large parts of this increase are in-house trucking fleets, emphasizing the importance of the highway-truck relationship. This work, still going on, shows that transportation costs are a more critical factor in our international competitiveness than previously recognized.

There has been tremendous synergy between the new data collection programs linked with new analytical methods. The work has just begun. Future efforts will complete and expand the studies mentioned here and link them to work going on to measure the capital stock of highways, transit facilities, and terminals, and integrate them with asset management systems.

Building a New Understanding of the Economic Dimensions of Transportation

Transportation is both a key business cost and a basic enabler of economic activity. It should be at the heart of strategies to ensure the economic health of the nation, individual states, and localities. Understanding the economic dimensions of transportation is essential in many ways: to determine effective public and private investment in transportation infrastructure; prioritize transportation projects; estimate the number of jobs created by transportation spending; understand regulatory costs; monitor competitiveness and the economic health of the transportation sector; and forecast revenues from transportation facilities and activities. This understanding requires data on how much transportation buys from other industries, how much other industries spend on transportation, the value of transportation capital, and transportation’s role in productivity.

Increased knowledge of these economic issues will permit states to produce the greatest benefits from the expanded resources from the reauthorization of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. States can use such knowledge to determine:

1. What is the appropriate level of investment in transportation to encourage economic health?
   This question requires a broad and comprehensive understanding of the linkages between transportation and the economy in the
nation and in individual states. The importance of this question is underscored by analyses that supported reauthorization of ISTEA and that will be needed to support subsequent legislative proposals involving transportation finance in several states;

2. How should projects be prioritized within a multimodal transportation program?
The answer to this question requires the development of cost and benefit measures that can be applied across modes, involving both passenger and freight transportation. The need for better measures of transportation benefits was emphasized in the International Conference on Measuring the Full Social Costs and Benefits of Transportation; and

3. How much revenue is likely to flow from traditional use charges, tolls, region-wide taxes, and other sources?
The need for better revenue forecasting models was emphasized in the AASHTO supported National Conference on Information Needs to Support State and Metropolitan Transportation Decision making into the 21st Century.

This report highlights recent developments at the national level that will help answer the first question, as well as current state efforts on the same subject. By expanding current efforts, national and state transportation agencies will be better able answer all three questions.

New Tools and Data at the National Scale

Transportation is a major component of the economy as illustrated by the following facts:

- Transportation accounted for eleven percent of gross domestic product in 1995 (see chart on following page);

- The average household spent just over $6,000 on transportation in 1995, one-fifth of its total expenditures. This compares with $10,500 for housing, $4,500 for food, $3,000 for insurance (excluding vehicle insurance) and pensions, and $1,700 for health care (see figure on page 6);

- About 94 percent of household transportation expenditures go to purchase, run, and maintain private vehicles. Airline fares were the second largest category at 4 percent of expenditures, and mass transit ranked third at 1 percent;
Governments spent $116.5 billion on transportation in 1993. About 31 percent was the federal share, which included grants to state and local governments. Of the total, 60 percent of these expenditures were for highways, 19 percent for mass transit, and 15 percent for aviation;

Transportation-related revenues of federal, state, and local governments reached $85 billion in 1993. States collected nearly half of all transportation-related revenues, with 32 percent collected by the federal government, and 19 percent by local governments;

In 1995, approximately 9.9 million people worked in transportation-related activities, about 7 percent of the total civilian labor force; and

U.S. Gross Domestic Product by Major Social Category - 1995

Source: U.S. Department of Transportation, Bureau of Transportation Statistics,
Transportation in the United States: A Review (Washington D.C. 1997)figure 1

transportation accounted for eleven percent of gross domestic product in 1995
the average household spent $6000 — one fifth of its total expenditures — on transportation in 1995.

Average Household Expenditures by Major Category - 1995

Labor productivity in the for-hire transportation industry (as measured by value-added per worker) was 19 percent higher than the average for the economy as a whole in 1992.

The economic importance of the U.S. transportation system goes well beyond its borders. It affects the ability of U.S. businesses to compete in the expanding global economy. Over time, international trade has grown in importance as a component of the U.S. economy. In 1995, total exports and imports of goods and services amounted to 24.7 percent of the nation’s Gross Domestic Product, compared with only 11.3 percent in 1970. Commodities trade, which is more closely related to freight movement, also more than doubled in relation to GDP — rising from 8.1 percent in 1970 to 19.5 percent in 1995. The volume of trade also grew rapidly in absolute terms: for example, waterborne commerce in the United States involving foreign trade increased from 581 million tons in 1970 to over 1.1 billion tons in 1995.

The relationship between transportation and the economy has long been recognized. Distance is a factor in our lives and transportation costs money and contributes to the cost of goods. But we have lacked a more definitive understanding of the linkages. Recent groundbreaking by Professor Ishaq Nadiri of New York University quantifies the relationship between highway investment and the economy based on reductions in business costs.

Professor Nadiri’s research which was funded by the Federal Highway Administration examined the effects of highway capital on the costs of production, level of output, and demand for labor, capital, and materials in 35 industries comprising the production sector of the U.S. economy between 1950 and 1991. The research found that:

1. Average annual returns on investment in the sixties, the early days of the Interstate System Construction were astronomical, at the level of 40 percent;

2. Although, as would be expected, rates of return declined in later periods, the average net rate of return on investments in the total highway system by all levels of government over the period 1980 to 1991 was still 14.6 percent. (This exceeded the average rate of return typical for all private investment);

3. The average net rate of return on investments in the total highway system by all levels of government in 1990 was 11.7 percent and 10 percent in 1991;

4. The return for the “non-local” road system, that is roughly the 935,000 mile Federal-Aid Highway System, was on the order of 16.5 percent. The return for the National Highway System was about 20 percent;
5. A one percent increase in highway capital reduced industry production costs by seven-hundredths of a percent and increased output by one tenth of a percent; such values seem small but represent large economic gains. These percentages relate to the gross output of the economy, roughly 1.5 times the GDP; and

6. The contribution of total highway capital to total factor productivity growth during the period 1980 to 1991 was 18 percent. That is, almost one-fifth of the increase in productivity in the U.S. economy between 1980 and 1991 was attributable to investment in highways.

All of these benefits are related the business sector. The benefits to private citizens and to governments have not been included. Further work will focus in that area.

While these facts are impressive, they do not provide detailed guidance on how much should be spent on transportation in a particular situation and how those expenditures will affect individual parts of the economy in specific times and places. Research will be needed to further develop these tools.

The Data Linkages

Our new understanding of the economic impacts of transportation has been made possible or substantially enhanced by the availability of major new highly detailed data developed by the Bureau of Transportation Statistics under ISTEA. In almost every example cited, new insights have been opened up by important new statistical programs, most notably the Commodity Flow Survey (CFS).

BTS has also measured the physical movements of people and goods among states, which can be used in the same way as the Truck Inventory and Use Survey to understand economic flows among states. Goods movements are covered by the Commodity Flow Survey (CFS), conducted of more than 100,000 shippers nationwide in manufacturing, mining, and wholesale, to measure what they shipped, where the goods went, and how they got there. Passenger movements are covered by the American Travel Survey (ATS), conducted of more than 80,000 households to measure where they traveled, why they traveled, and how they got there. The CFS was conducted in 1993 and 1997, and the ATS in 1995.

The survey results which have proven to be effective tools at the national scale will prove just as valuable in the future when employed by states as they address their transportation investment challenges. The two maps on the opposite page demonstrate the surveys’ analytical power.

The first shows the flows of truck tonnages within, to, from and through the states. The second map shows a parallel data set for long distance (greater than 100 mile) passenger travel.
In a recent application of the Commodity Flow Survey, the survey commodity origin destination patterns were routed over the highway network by computer simulation and used to determine the composition of flows over the Woodrow Wilson Bridge. A brief description of that effort appears on page 24.