

**Healthy Returns:
The Economic Impact of Public
Investment in Surface
Transportation**

Robert J. Shapiro and Kevin A. Hassett

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Executive Summary

America's highways, roads and public transportation systems contribute to virtually everything of value in our economy and lives – from linking businesses to their suppliers and customers, to bringing jobs, education, health care, recreation and government services within every American's reach. Economists have explored the economic impact of public investment for over two decades and consistently found that surface transportation systems increase economic output, reduce prices, and raise incomes and profits. Investing in this extensive network has produced enormous economic returns for virtually every person and business in the United States.

Healthy Returns measures those benefits and the costs required to achieve them. Dr. Robert Shapiro and Dr. Kevin Hassett use state-of-the-art economic analysis to determine the current return to U.S. businesses from the nation's investments in highways, roads and public transit, and the economic value of these systems to America's commuters. They compare these benefits to the costs borne by taxpayers, drivers and transit passengers to build, operate and maintain these systems, and conclude that America's surface transportation network produces over \$4 in direct benefits for each \$1 in direct costs. The report also explores some of the more indirect benefits of surface transportation, including their role supporting America's global competitiveness.

The major findings of *Healthy Returns*:

- U.S. companies and individuals derive over \$788 billion a year in **direct economic benefits** from using highways and public transportation to conduct business and commute for work.
 - *U.S. businesses derive \$314.7 billion a year in economic benefits from their use of surface transportation system, mainly through lower costs and higher productivity.*
 - *Americans as individuals derive \$473.7 billion in direct economic benefits from their use of highways and public transit, in the time they save commuting to work and the additional income they can earn by working farther from home.*
 - *Increased investment in highways and public transportation systems would increase the benefits derived by both businesses and individuals.*
- By contrast, the **direct economic costs** to Americans of building, operating and maintaining highways, roads and public transit systems total \$185.1 billion a year in taxes and other fees.
- All told, spending on America's surface transportation network generates more than **\$603 billion a year in net economic benefits**.
- This \$603 billion estimate substantially *understates* the full net benefits. For example, the estimate relies on a conservative rate of return for public infrastructure and does not include the value of surface transportation in facilitating people's access to schools, medical facilities and other non-work-related destinations. The estimate also may not capture all of the ways in which highways and public transit support economic growth and help U.S. workers and companies compete in global markets.

Healthy Returns: The Economic Impact of Public Investment in Surface Transportation¹

I. Introduction

The prosperity, wealth and free movement that Americans enjoy today could not exist without decades of public investments in highways, roads, and bus and rail systems. The markets that make up the economy could not operate efficiently without the extensive networks of surface transportation systems that link businesses to their suppliers and customers, and give every American access to a wide range of goods, services and jobs. Moreover, the impact of transportation investments are not limited to the economy; they also bring education, health care, recreation, government services and more within virtually every American's reach.

This study measures the economic benefits of the American surface transportation system and the direct costs entailed to achieve them. We have found that America's businesses and people derive nearly \$790 billion a year in direct economic benefits from their use of the nation's highways and transit systems. Based on new analysis developed for this study, highway and transit spending produce \$314.7 billion in direct, annual economic benefits for businesses, principally by reducing their costs and promoting higher productivity. Surface transportation investments also generate \$473.7 billion a year in direct economic benefits to individual Americans, in the value of the time they save commuting to work and the higher income they can earn by working further from home.

These benefits involves costs as well: Americans pay \$185.1 billion a year in taxes, fares, tolls, and other fees to build, operate and maintain the highway and transit networks that generate those returns. *Taking account of both the direct benefits and direct costs associated with America's use of surface transportation, we find that public investments in highways and public transit produce \$603.3 billion a year in net benefits for Americans and U.S. businesses.*

These figures almost certainly *understate* the true net benefits. Our calculation of nearly \$315 billion in annual, direct benefits to businesses, for example, assumes a lower rate of return on public infrastructure than many other analysts use. Our finding that highways and transit generate almost \$474 billion a year in economic returns to individuals covers benefits related to work but not the value people derive from greater access to schools, medical facilities, and other destinations. These calculations also do not capture all of the ways in which surface transportation systems support stronger economic growth and help American businesses and workers compete successfully in global markets.

Even without counting these more indeterminate benefits, the hard data speak for themselves: A strong commitment to surface transportation and the spending to support it make basic economic sense.

¹ This study was supported and sponsored by the private sector business members of the American Public Transportation Association.

II. The Economic Benefits of Highways and Public Transportation

The public roadways and mass transit systems that make up America's surface transportation network are a basic and substantial factor in the country's economic growth, productivity and overall welfare. For everyone but the most intrepid walkers, virtually every activity that occurs outside the home – from work and school to medical care and recreation – depends on surface transportation. Virtually everything we use and enjoy inside our homes and in our workplaces – from food and furniture to medicine and security – similarly depends on highways and public transportation. The funds used to build, maintain and operate the nation's highways, roads and public bus and train systems are critical investments in our rising living standards and improving quality of life.

Surface Transportation and Global Competitiveness

Economists have explored the economic impact of public investment for over two decades and consistently found that surface transportation systems increase economic output, reduce prices, and raise incomes and profits.² For example, efficient roads and transit systems lower a firm's transportation costs, raising its productivity and the return on its private investment, which further increases investment, productivity and incomes.

In this sense, sub-par surface transportation can affect economic activity much like a high tax: If a firm has to bear the costs of slow transport of its products (or workers) compared to competitors in other places, the additional cost acts much like a tax. Some nations use low taxes to attract new production, often with considerable success; and one recent study found that major tax havens with less than one percent of the world's population (outside the U.S.) and 2.3 percent of global GDP “host 5.7 percent of the foreign employment and 8.4 percent of foreign property, plant and equipment of American firms.”³ Accordingly, the quality of a nation's road and public transit systems can affect its attractiveness as a site for investment and business, and the global competitiveness of its firms and workers.

Moreover, research has demonstrated clearly that public investments in highways and public transit can raise an economy's underlying growth rate. One leading study found that a one percentage-point increase in a country's total public capital stock raises its growth by about 0.3 percentage-points, and for a lengthy period of time.⁴ Other research has shown the other side of this relationship: Poor infrastructure constrains growth and increases congestion by channeling and often limiting a nation's economic development to its largest cities. Conversely, public spending on highways and public transportation systems that relieve congestion and disperse economic activity can boost a nation's growth, especially in countries actively engaged in international trade.⁵

² For a survey of these studies, see M. Ishaq Nadiri and Theofanis Mamuneas, “Contributions of Highway Capital to Output and Productivity Growth in the U.S. Economy and Industries,” Federal Highway Administration Office of Policy Development, Department of Transportation, September 1998.

³ James R. Hines Jr., “Do Tax Havens Flourish?,” NBER working paper 10935, November, 2004.

⁴ David Aschauer, “Public Capital and Economic Growth: Issues of Quantity, Finance, and Efficiency,” Working Paper No. 233, The Jerome Levy Economics Institute, April 1998.

⁵ Vernon Henderson, “The Effects of Urban Concentration on Economic Growth,” National Bureau of Economic Research, NBER Working Paper No. 7503, January, 2000.

These findings point to other links between a country's infrastructure spending and its international competitiveness. For example, while advances in transportation and other technologies enable firms to shift production to distant places, a country can make itself an attractive location for economic activity by improving its surface transportation systems. There are also strong connections between a nation's competitiveness and its capacity for innovation, especially in geographical "clusters" such as Silicon Valley where knowledge, capabilities and resources are highly concentrated.⁶ These clusters rely on extensive transportation networks to both facilitate their own development and export their innovations to foreign markets. In these ways and others examined below, a nation's commitment to finance advanced surface transportation system plays an important role in its overall global competitiveness.

Measuring the Economic Return on Public Investments in Surface Transportation

We can estimate the economic value of surface transportation with some precision by simply approaching it like any other investment. Most studies show that while the yields from investments, public and private, vary from very small to very large, investment in public infrastructure as a whole has generally produced higher returns than private investment as a whole. One study conducted for the Federal Highway Administration (FHWA) found that the net return on highway capital averaged 32 percent from 1960 to 1991, ranging from 54 percent in the 1960s to 16 percent for the 1980s. By comparison, private capital over that period produced an average net return of 17 percent.⁷

Economists do not agree on the precise level of these overall benefits, with results varying based on factors such as how they measure returns and the time period covered. Here, we adopt a conservative approach in order to establish a floor or the *absolute minimum benefits* for the economy from public spending on surface transportation: We adopt the lowest yield found by the FHWA – a 16 percent net social rate of return on highways in the 1980s.

Our analysis begins with estimates of the "current-cost net-capital stock" of the various assets of surface-transportation systems, which represents the market value of those assets and is equivalent to the value today of the expected future services derived from the assets. The Bureau of Economic Analysis (BEA) calculates the current-cost net-capital stock of most public fixed assets and reports that the value of the assets that comprise U.S. highway, road and street systems was nearly \$1,603.7 billion in 2003, with federal highway assets accounting for \$39.6 billion, and state and local highways and streets accounting for \$1,564.1 billion.⁸

The BEA does not calculate the value of public transportation assets, so we have constructed our own estimates (Table 2, below) using the following method. We start

⁶ Miroslav Jovanovic, "Local versus Global Location of Firms and Industries," *Journal of Economic Integration*, 18 (1), March 2003.

⁷ M. Ishaq Nadiri and Theofanis Mamuneas, *op. cit.*

⁸ Bureau of Economic Analysis, *Standard Fixed Assets Tables*, Table 7.1b, "Current-Cost Net Stock of Government Fixed Assets, 1997-2003," November 2004, www.bea.gov/bea/dn/FA2004.

with the basic elements of capital spending by all transit authorities: Rolling stock (buses, railroad engines and passenger cars); investments in equipment and structural facilities (industrial equipment, information technologies, office buildings, industrial buildings and railroad structures); and other capital spending (vehicles, structures, and equipment). Next, we identify corresponding assets from the private sector and the ratio of annual private capital spending on each of these asset classes and its current-cost net-capital stock as determined by the BEA. We apply these ratios to corresponding capital spending on similar assets by public transit authorities and thereby derive new estimates of the current-cost net-capital stock for public transportation in the United States.

Using this method, we estimate that the value of all of the current assets in U.S. public transportation systems came to more than \$363 billion in 2003: More than \$37 billion for public bus systems and more than \$326 billion for public rail systems.⁹

Table 1. Current-Cost Net Capital Stock, Public Transportation Systems, 2003

Asset	Investment (\$ billions)	Ratio, Investment to Capital Stock ¹⁰	Net Capital Stock (\$ billions)
Rolling Stock	\$3.7301		\$33.957
<i>Bus Systems</i>	<i>\$1.8829</i>	<i>0.2740</i>	<i>\$6.872</i>
<i>Rail</i>	<i>\$1.8472</i>	<i>0.0682</i>	<i>\$27.085</i>
Facilities: Equipment/ Structures	\$8.4685		\$319.363
<i>Bus Systems</i>	<i>\$1.6756</i>	<i>0.3185/0.1163/0.0495</i>	<i>\$25.751</i>
<i>Rail</i>	<i>\$6.7929</i>	<i>0.3185/0.1163/0.01390/ 0.0495</i>	<i>\$293.612</i>
Other: Vehicles/ Structures/Equipment	\$1.0414		\$9.973
<i>Bus Systems</i>	<i>\$0.4432</i>	<i>0.3185/0.2631/0.0495</i>	<i>\$4.589</i>
<i>Rail</i>	<i>\$0.5982</i>	<i>0.3185/0.2631/0.0495</i>	<i>\$5.384</i>
Total Bus Systems	\$4.0017		\$37.212
Total Rail	\$9.2383		\$326.081
TOTAL	\$13.240		\$363.293

Adding to this total the value of highway and road assets calculated by the BEA, we find that the total net capital stock of all surface transportation comes to \$1,967 billion (Table 2, below). Applying to this net capital stock the FHWA calculation of a 16 percent return on highway capital in the 1980s, the most conservative return available, we find that America's surface transportation system produces direct annual economic benefits to U.S. businesses totaling, at a minimum, nearly \$315 billion.

⁹ Data: Capital spending, transit: American Public Transportation Association; Private sector capital stock: Bureau of Economic Analysis, *Standard Fixed Asset Tables*, *op. cit.*, Table 2.1; Business Investment: Bureau of Economic Analysis, *National Income and Product Accounts*, Gross Domestic Product.

¹⁰ The ratios of investment to net capital stock in facilities: information technologies, 0.3185; industrial equipment, 0.1163; buildings, 0.0495; railroad structures, 0.0139. The ratios of investment to net capital stock in other investments: information technologies, 0.3175; automobiles, 0.2631; buildings, 0.0495.

Table 2. Economic Benefits of Surface Transportation for U.S. Business, 2003

Capital Asset	Net Capital Stock (billions)	Economic Benefits (billions)
Roadways	\$1,603.7	\$256.6
Public Transit Systems	\$363.3	\$58.1
Total	\$1,967.0	\$314.7

This estimate covers only the returns derived directly by businesses; it does not include other “consumer benefits,” such as the value of the time people save by using highways and public transit to commute to and from work or school, receive medical care, go shopping, and so on. There are no rigorous economic analyses in this area, but we can measure the likely magnitude in at least the case of people commuting to work.

Again, we begin with conservative assumptions in order to establish a floor or minimum level of these consumer benefits. In particular, we do not try to include the vast benefits people derive from using surface transportation for purposes other than commuting to and from work. Instead, we simply posit that the use of highways, roads and public transit to travel to and from work saves an average worker the economic value of one working hour per day, in both time saved directly and the additional earnings derived from being able to work at some distance from their homes. Based on three pieces of data -- 101.7 million Americans drove to and from work in 2003 and another 5.1 million commuted to work using public transportation;¹¹ Americans earn on average \$17.75 per hour (2003); and, Americans work on average 250 days per year¹² -- we can estimate that Americans derive some \$474 billion in annual benefits from using surface transportation to commute to and from work.

Table 3. Economic Benefits of Surface Transportation to Commuters, 2003

	Number	Earnings	Hours	Value (billions)
Automobile Commuters	101,664,000	\$17.75/hour	250	\$451.1
Transit Commuters	5,081,000	\$17.75/hour	250	\$22.6
TOTAL	106,745,000	\$17.75/hour	250	\$473.7

Taken together, American businesses and commuters derive a minimum of \$788 billion a year in direct economic benefits from public spending on highways, roads and public transportation (Table 4, below).

¹¹ *National Transportation Statistics, 2004*, Bureau of Transportation Statistics, Department of Transportation, Table 1-38.

¹² *National Compensation Survey: Occupational Wages in the United States*, Bureau of Labor Statistics, Department of Labor, July 2003, Table 1.

Table 4. Total Economic Benefits of Surface Transportation, 2003, \$ billions

	Highways	Public Transportation	Total
Business	\$256.6	\$58.1	\$314.7
Commuters	\$451.1	\$22.6	\$473.7
Total	\$707.7	\$80.7	\$788.4

Once again, this overall estimate relies on a *lower* rate of return on infrastructure than found by many studies, and assumes a minimal amount of travel time saved by commuters by using surface transportation. It also does not include many uses of surface transportation that produce returns for hundreds of millions of people, such as access to health care, discount shopping, recreation and other activities. It is virtually certain that the total annual economic benefits produced by public spending on roads, highways and transit substantially exceed \$788 billion. Moreover, as in the private sector, higher levels of investment in surface transportation networks will produce greater benefits for American businesses and individuals.

III. The Direct Costs of the Surface Transportation System

Surface transportation system involve substantial direct costs, covering the taxes, fares, tolls, and other receipts that support the capital and operating expenses for highways, roads and public transit systems. *Taken together, the annual costs of building, operating and maintaining the nation's surface transportation systems come to less than one-fourth of the direct benefits generated by these systems.*

In 2003, American government at all levels spent \$185 billion on surface transportation, including nearly \$144 billion on federal, state and local highways and roads, and a little over \$41 billion on public transit systems.¹³ We avoid double counting by classifying federal grants to states and cities as federal spending only and attributing transfers between state and local governments to the originating level of government.¹⁴

Table 5. Spending on Surface Transportation, All Levels of Government, 2003

	Amount	Share
Highways	\$143.8 billion	77.7%
Capital Outlays	<i>(\$69.9 billion)</i>	<i>(37.7%)</i>
Operating Expenses	<i>(\$35.5 billion)</i>	<i>(19.2%)</i>
Other	<i>(\$38.5 billion)</i>	<i>(20.8%)</i>
Public Transportation	\$41.3 billion	22.3%
Capital Outlays	<i>(\$13.2 billion)</i>	<i>(7.2%)</i>
Operating Expenses	<i>(\$28.1 billion)</i>	<i>(15.2%)</i>
TOTAL	\$185.1 billion	100.0%

¹³ *Highway Statistics 2001*, Federal Highway Administration, Department of Transportation, Table HF-2, Table MT-2A, Table MT-2B.

¹⁴ We exclude funds used to refinance bonds, retained in the Highway Trust Fund or held in state reserves.

The federal government spends less on surface transportation than either states or localities (Table 6). State support just for highways accounts for nearly 39 percent of all spending for surface transportation, while federal spending for both highways and public transit accounts for roughly the same amount as localities spend on highways alone.

Table 6. Spending on Surface Transportation by Level of Government, 2003

	Amount	Share
Federal Spending	\$39.9 billion	21.6%
Grants – Highways	(\$30.6 billion)	(16.5)
Federal Highways, Other	(\$2.4 billion)	(1.3%)
Grants – Transit	(\$6.9 billion)	(3.7%)
State Spending – Highways	\$71.7 billion	38.7%
Local Spending – Highways	\$39.1 billion	21.1%
State/Local – Transit	\$34.4 billion	18.6%
Total	\$185.1 billion	100.0%

The funding for highways and public transit comes from many sources, including fuel taxes, property and income taxes, highway tolls, bus and rail fares, other operator receipts, and bond issues (Table 7). Motor fuel taxes are the largest source of funding for highways and roads, especially state gasoline taxes. By contrast, public transit derived most of its support from local revenues and fares.

Table 7. Financing Surface Transportation: Taxes and Other Revenues, By Level of Government, 2003

	Amount (\$ billions)	Share of Total Receipts
Highways	\$143.87	77.7%
Federal Fuel and Vehicle Taxes	\$27.7	15.0%
Other Federal Revenues	\$5.3	2.9%
State Fuel and Vehicle Taxes	\$43.7	23.6%
Other State Highway Taxes and Tolls	\$5.0	2.7%
Other State Receipts	\$23.0	12.4%
Local Fuel and Vehicle Taxes	\$2.2	1.2%
Other Local Receipts	\$41.33	22.3%
Transit	\$30.31	18.7%
Federal Fuel Taxes and Other Receipts ¹⁵	\$6.9	3.7%
State Fuel Taxes and Other Receipts	\$8.3	4.5%
Local Receipts	\$14.4	7.8%
Fares and Operator Receipts	\$11.7	6.3%
TOTAL	\$185.1	100.0%

¹⁵ The Federal Transit Administration provided \$5.14 billion for public transit in 2000, of which 80 percent or \$4.11 billion came from federal fuel taxes; the remaining 20 percent or \$1.03 billion, came from general revenues, as did an additional \$0.11 billion (totaling \$1.14 billion from “Other Federal Revenues.”)

IV. Conclusion

By every economic measure, public spending for America's highways and public transportation systems has been a very sound investment. These surface transportation systems contribute to virtually everything of value in our economy and lives -- from transporting goods and people for business purposes, to educating our children, treating illness and enjoying leisure time. They are important factors in determining the nation's overall growth rate and affect our capacity for innovation and global competitiveness.

For this study, we have quantified some of those benefits by calculating the annual economic returns derived by American businesses and individuals from past investments and current spending on surface transportation. We found, first, that U.S. businesses in 2003 derived \$314.7 billion in direct economic benefits from the use of highways and public transportation, chiefly in lower costs and higher productivity. We further found that individual Americans derived nearly an additional \$473.7 billion in benefits in 2003 from using highways and public transit to commute to work, chiefly in the time they saved and the higher pay they could earn by working further from home.

To secure these \$788 billion in annual benefits, Americans in 2003 spent \$185.1 billion in taxes, fees, fares and other charges to build, operate and maintain the nation's highways, roads and public transportation systems. Taking full account of these costs, we conclude that America derived more than \$603 billion in net economic benefits from surface transportation in 2003. Furthermore, higher investment in surface transportation should produce larger net benefits for both U.S. businesses and individual Americans.

This conclusion almost certainly *understates* the true net benefits of our investments in highways and public transportation. The estimate of nearly \$315 billion for the annual, direct benefits to the business sector assumes a lower rate of return on public infrastructure than that used in many other studies. Similarly, the finding that highways and public transit generate nearly \$474 billion a year in returns to individuals does not include the economic benefits that people derive from easy access to schools, medical facilities, and other destinations other than their workplaces. These findings establish clearly that strong commitments to surface transportation and the spending required to support it well serve America's economic interest.

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