1.0 Introduction

1.1 Background

Transportation is a vital part of the nation’s economy. Business, consumer, and government spending on transportation represents 10% of gross domestic product (GDP) by most estimates.\textsuperscript{1} But if household contributions and other missing components are included, transportation is estimated to be as much as 16% to 18% of the economy.

Substantial population and economic growth is forecast for the coming decades. Over the next 30 years, the U.S. population is projected to grow by 80 million people, from 300 million today to 380 million in 2035. The economy is projected to grow faster, at about 2.8% per year in real terms over this period.\textsuperscript{2} To support this population and economic growth, the demand for freight transportation is projected to nearly double by 2035.\textsuperscript{3}

Recent studies and testimony show that as a nation we are underinvesting in our transportation systems. We are not adequately maintaining the transportation systems we already have, we are not providing sufficient capacity to meet today’s demand, and we are not planning and making the improvements required to support a 21st century economy. The American Society of Civil Engineers (ASCE) recently gave the nation’s overall transportation network a grade of D and cited the need to invest $1.6 trillion in upgrades over the next 20 years.\textsuperscript{4} The U.S. Chamber of Commerce’s *Future Highway and Public Transportation Finance Study* found that we need to invest an additional $50 billion a year in our highway and public transportation systems just to maintain their current performance, and more than $100 billion annually to improve the performance of the highway and transit systems.\textsuperscript{5} Ports need to accommodate a near doubling of cargo volumes by 2020, with some ports facing a tripling or quadrupling of container volumes moving across their piers. ASCE estimated it would require $125 billion to replace the locks on our aging inland waterway system.

\begin{itemize}
  \item \textsuperscript{1} Table M-6, *Transportation Statistics Annual Report 2006*. U.S. DOT, BEA Accounts Data, 2005–2006. The statistics cited are for transportation final demand. Additional measures illustrating the relationship between transportation and GDP are presented in Appendix A.
  \item \textsuperscript{2} *Future Options for the National System of Interstate and Defense Highways*. NCHRP 20-24(52), Transportation Research Board, 2007, based on forecasts prepared by Global Insight, Inc.
  \item \textsuperscript{3} AASHT0, *Freight Transportation Bottom Line Reports*. Cambridge Systematics, Inc., based on forecasts prepared by Global Insight, Inc.
  \item \textsuperscript{4} American Society of Civil Engineers, Infrastructure Report Card, 2005.
\end{itemize}
The Association of American Railroads (AAR) estimates that an investment of $148 billion is needed just to keep pace with economic growth and ensure that the freight railroads can carry the volume of freight forecast for 2035. Projections developed by the U.S. Department of Transportation (DOT) indicate that as early as 2013, 16 airports and seven metropolitan areas will need additional capacity to meet the expected demand for air travel. The Federal Aviation Administration (FAA) estimates that $41 billion of Airport Improvement Program (AIP)-eligible infrastructure development will be needed in the next five years. The Airport Council International/North America projects that during this same period, more than $87 billion will be needed for aviation infrastructure, including projects not eligible for AIP support. In addition, $15 billion to $22 billion will be needed over the next 15 years for the NexGen air traffic control system.

Underinvestment in transportation systems is costing us time and money. The Texas Transportation Institute (TTI) recently reported that congestion forced Americans to travel an extra 4.2 billion hours and purchase an extra 2.9 billion gallons of fuel for an annual congestion cost of $78 billion in 2005. The Federal Highway Administration (FHWA) calculated that delays caused by highway bottlenecks cost freight trucks alone more than $8 billion a year. These costs are ticking upward as the price of oil increases. The cost of delays to each individual car, truck, rail, ship, and air movement is modest, but the cumulative effect is large. Delays make commuter trips, business travel, and industry supply chains less cost-effective, and drive up the cost of doing business and the cost of living in the United States.

We need to reexamine our transportation investment policies and programs. We must ensure that our transportation policies and programs serve our economic, social, and environmental goals. As noted in the recent Center for Strategic International Studies’ report, “It is time to reexamine priorities for the nation’s infrastructure.”

_Underinvestment in transportation systems is costing us time and money._

Source: Center for Strategic International Studies, PUBLIC WORKS, PUBLIC WEALTH: New Directions for America’s Infrastructure, November 2005.

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What is at stake is simple and stark, as Thomas Donohue, president of the U.S. Chamber of Commerce, pointed out when he launched the Chamber’s *Let’s Rebuild America Initiative*:

Decades ago we built the best infrastructure system the world has ever known and then proceeded to take it for granted.

Our global competitors are building and rebuilding while America is standing still. China, India, and the developing world are building at a staggering pace. China spends 9 percent of its GDP on infrastructure; India, 5 percent and rising. While they start well behind us, they are catching up fast!

What’s at stake is simple and stark. If we fail, we will lose jobs and industries to other nations. If we fail, we will pollute our air and destroy the free, mobile way of life we cherish. If we fail, we will see more senseless deaths across our bridges, on our roads, and, yes, in the skies above our cities.

And so, we must not fail. We must embrace a bold vision for the future and start building on it today.

We cannot treat infrastructure like other problems or programs where you can wait until the very last minute…and then write a big check. Infrastructure projects require foresight and years of careful planning. It shouldn’t take a disaster like the bridge collapse to focus the nation’s attention on our vast infrastructure challenges. But now that we have that focus, we must not lose it.


### 1.2 Purpose and Structure of Report

Transportation plays a critical role in the nation’s economy. This report examines the relationships between transportation investment and long-term economic productivity, growth, and competitiveness. Section 1.3 begins with a brief summary of the literature addressing the effects on the economy resulting from investments in transportation infrastructure. Following that,

- **Section 2.0: The Economy and Transportation** examines the changing structure of the U.S. and global economies. The U.S. economy is rapidly becoming a services- and knowledge-based economy supported by a large and increasingly automated manufacturing sector. Much of the developed and developing world also is moving in this direction. These structural changes in the U.S. and global economy are changing the demand for transportation.

- **Section 3.0: Industries and Transportation** explores changes in four major sectors of the U.S. economy—manufacturing, retail, services, and agriculture and natural resources—looking at how they use transportation today and how the nation’s transportation systems are helping and hindering them. It also examines the transportation industry itself.

- **Section 4.0: Transportation Systems and Services** reports on the performance of the nation’s transportation systems—the condition and performance of the highway, public transit, rail, port, and waterway systems that serve international trade, national production and distribution, urban commuting, and business and recreational travel.
• **Section 5.0: Emerging Transportation Policies and Programs** reviews the emerging transportation visions and proposals for new federal surface transportation programs.

• **Section 6.0: Conclusions and Next Steps** presents the conclusions of the study with recommendations for next steps by the U.S. Chamber of Commerce.

### 1.3 The Linkages Between Transportation Investment and Economic Growth

The linkages between transportation investment and economic growth are illustrated in Figure 1.1. Similar to land, labor, technology, and capital, transportation is a key input to production and economic activity. Investment in transportation—whether to increase capacity or to improve service—reduces travel time, lowers trip cost, and improves travel-time reliability. For individuals as well as for businesses, these improvements translate into greater productivity and better access to labor and markets, making industries more competitive and enabling economic growth.

**Figure 1.1 Linkages Between Transportation Investment and Economic Development**

![Diagram showing linkages between transportation system investment and economic growth](source: Cambridge Systematics, Inc.)

Numerous domestic and international studies, summarized in Appendix B, have looked at the relationship between public infrastructure investment and GDP growth. According to a recent British study, these studies indicate that, on average, a 10% increase in public infrastructure capital stock increases GDP by around 2%.⁹

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Numerous domestic and international studies demonstrate that transportation investments have significant measurable benefits to national and regional economies. Public investments in regionally and nationally significant transportation projects offer rates of return equal to or exceeding private rates of return. The studies also report that we are underestimating the industry logistics and trade benefits of these investments because of the difficulty of measuring them.

The types of benefits related to transportation investments are detailed in a publication released by the Transportation Research Board in 2002. Benefits were grouped into eight broad categories:

1. **Transportation investment boosts industry competitiveness and productivity.** A strong transport network reduces costs of production and distribution. It does so by lowering barriers to mobility; giving the manufacturing, retail, and services sectors access to varied, specialized, and productive sources of labor; providing a diverse selection of inventory and raw materials; and ensuring a broad customer base, both at home and abroad.

2. **Transportation investment enhances household well-being.** A strong transport network gives households access to a broader range of higher-paying jobs, a wider selection of competitively priced consumer goods and housing options, and a convenient selection of health and human services. Well-maintained roads can reduce personal vehicle repair costs, while efficient public transport networks reduce costs associated with driving and automobile ownership.

3. **Transportation investment strengthens local, regional, and state economies.** The benefits of transportation investment are not limited to the microeconomic level—that is, the level of firms and households. Transportation spending benefits local, regional, and state economies as well by energizing city centers, breaking the isolation of rural areas, and boosting employment.

4. **Transportation investment boosts state tax revenues.** The additional economic activity brought on by highway investment can generate additional tax collections for a region. Transportation investment reduces the cost of production and distribution for businesses, allowing them to expand and hire additional workers. This additional economic activity brings in additional state tax revenues.

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activity increases federal, state, and local revenue from personal income, sales, motor fuel, and corporate/business taxes.

5. **Transportation investment facilitates business and leisure travel.** Both business and leisure travelers depend on transportation infrastructure for access to activities and destinations such as conferences, trade shows, parks, shoreline resorts, and everyday business meetings and social events.

6. **Transportation investment reduces economic losses associated with accidents.** Each year, traffic accidents create significant costs in lost productivity, property damage, and medical expenses in the United States. Investments to improve the safety of the nation’s transportation infrastructure can mitigate these losses.

7. **Transportation investment reduces economic losses associated with congestion.** The costs of time delays and fuel consumption associated with congestion in the nation’s largest urban areas reached $78 billion in 2005. Investments that reduce traffic delays benefit businesses and households alike.

8. **Transportation investment creates jobs.** Nearly 18 million people are employed in for-hire transportation and transportation-related industries in the United States—13.5% of total U.S. employment.

The most notable empirical research on the relationship between investment in highways and industry economic growth rates was done by Professor Ishaq Nadiri of New York University for the FHWA. Dr. Nadiri showed that each dollar invested in the nation’s highways generated about 30 cents of production cost savings to businesses per year over the life of the improvement, generally exceeding the initial investment in four years.\(^\text{11}\) Highway investments were estimated to have contributed an average of 25% of total productivity growth nationwide during the Interstate era. The average annual rate of return for highway investments was estimated at 16% nationwide, although returns were lower in later years as the network matured.

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**The performance of the UK’s transport networks will be a crucial enabler of sustained productivity and competitiveness... The case for targeted transport intervention is compelling, even after taking account of environmental effects. Interventions targeted on the worst problems and bottlenecks caused by competing demands on the transport system, such as surface access links and corridors close to major urban areas, are likely to offer some of the highest returns... Even in a world with carbon pricing and widespread congestion-targeted road pricing there seems to be a good case for more transport infrastructure.**


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In a review for the United Kingdom government, Sir Rod Eddington found that “a five percent reduction in travel time for all business travel on the roads could generate around 2.5 billion pounds of cost savings—some 0.2 percent of GDP.” The Eddington report also highlighted positive economic effects that are not captured by most project cost-benefit assessments, such as impacts on business location decisions. For some regionally significant projects, the Eddington report estimated that between 30% and 50% of economic benefits are not accounted in current benefit analyses. The research also stressed the importance of transportation networks and corridors to the productivity and success of metropolitan areas, in particular in providing access to larger labor and product markets. Finally, it highlighted that transportation improvements are critical to trade flows and the competitiveness of a country’s exports and imports.

It is estimated that passenger and freight border delays in the Imperial Valley of southern California caused economic output losses of more than $7 billion for Mexico and the U.S. combined in 2007.

Source: San Diego Association of Governments.

In related international research, Rene Prud’homme and C. W. Lee described the link between transportation performance and the economies of metropolitan areas. Increasing transportation speeds in a city by 10% increases productivity by 2.9%. Further, the study found that a 10% increase in travel speed leads to a 15% to 18% increase in the labor market size, benefiting both workers and regional economies.

Numerous studies have been conducted of the economic impacts of transportation investments on specific states and regions. One of the most comprehensive studies addressed the transportation needs of the Portland, Oregon, metropolitan area, and found that without adequate investment in infrastructure, the regional economy could lose 6,500 jobs and $844 million in output annually by 2025. In addition, the study reported how industries have been negatively impacted by worsening travel conditions:

- Intel changed its chip shipment schedule in order to avoid peak-period congestion.
- Sysco Food opened a new regional food distribution center because the old central facility in Portland could not serve the entire area in a timely manner.
- OrePac increased inventory levels by 7% to 8% to compensate for congestion delays.
- Other companies are planning to either adopt different delivery schedules or acquire new warehousing facilities in order to offset the cost of delays on congested highways.

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13 Ibid.
Sound infrastructure forms the backbone that is critical to maintaining and enhancing regional economic growth, competitiveness, productivity, and quality of life. For businesses, infrastructure has the greatest influence on location after tax rates, the availability of an educated workforce, and low crime. Where time is money, moving people to and from jobs, facilitating deliveries and shipments, freedom from business interruptions like loss of power, and ample telecommunications capacity all enter the equation. Prime access to ports and airports along global pathways becomes more essential for expanding enterprise and profits. Congestion and transport bottlenecks, meanwhile, can threaten regional sustainability.


These delays impact the cost structure of businesses, and ultimately prices, for consumers.

As highlighted in the Portland study and similar international work, an important function of good transportation is expanding the effective size of a metropolitan region’s labor market. Good access to workers is correlated with improved labor and business productivity. Studies in Philadelphia, Chicago, and New York have shown that investments in transit provide a return as high as six to one for overall regional economies. The recent TTI State of Congestion report highlighted the importance of public transportation improvements, particularly in congested corridors and in serving major activity centers during times of the day when there are no viable options to increase the capacity of the street and highway system for single-occupant vehicle travel. TTI concluded that if there had been no public transportation service and travelers used their cars instead, in 2005 there would have been an additional 493 million hours of delay and $9 billion in costs due to congestion in the regions with more than one million population.16
For the past four centuries, transportation has been a key factor in the growth and competitiveness of the U.S. economy. East Coast ports and harbors provided links between the Colonies, Europe, and the West Indies for flows of trade, immigrants, and capital. The Mississippi River and Great Lakes waterway systems connected the Midwest and Great Plains to the rest of the nation and world, creating America’s Breadbasket and later the Rust Belt. The transcontinental railway system enabled flows of freight and people between the East and West Coasts. In the 20th century, the nation invested in a national Interstate network of highways to link communities and enable national defense, creating unprecedented mobility for both people and freight. Major cities invested in subways and elevated rail and commuter rail to underpin development, economic growth, and quality of life for their citizens. Long-distance air travel became common for both business and personal travelers, and also enabled overnight delivery of high-value, low-weight packages. And the containerization of cargo and dramatic increases in the size of ships revolutionized how trade moves around the globe, helping accelerate the integration of the United States into the global economy.

As the U.S. economy has shifted from rural to urban, from agrarian to industrial, and from “Frostbelt” to “Sunbelt,” the nation’s transportation system has responded. Transportation investments have shifted from ports and waterways to rail lines, to highways, and to airports. The U.S. transportation system today is one of the most extensive in the world, providing a level of mobility that would have been unthinkable two generations ago. Looking to the future, can this transportation system adapt yet again to meet the needs of an evolving and increasingly complex 21st century global economy?

2.1 Changing U.S. Economy

The U.S. economy is experiencing a fundamental transformation, resulting from a confluence of several trends:

- Markets are shifting from local and regional to national and global, with U.S. companies achieving a larger share of sales from export markets and developing a growing reliance on other countries for raw materials, lower-value manufactured goods, and some services.
- The drivers of U.S. economic growth are shifting from manufacturing to services, information, and innovation. The economy is less dependent on natural resources and production and more dependent on technology, knowledge, and creativity.
The location of U.S. economic growth is continuing to shift from the Northeast and Midwest to the South and West, and from rural areas to urban areas, which are linked together economically into massive “megaregions.”

The U.S. population and workforce are becoming older and more diverse.

U.S. and Global Economic Growth

Transportation demand is strongly correlated with economic growth. The U.S. economy has seen tremendous growth as measured by GDP over the last three decades, growing from a $2.7 trillion economy in 1980 to a $13.2 trillion economy in 2006. Throughout this period, the United States has maintained its role as an economic catalyst for the world, consistently accounting for more than one-fifth of the global economy and outpacing other industrialized nations.

Even as the mature U.S. economy continues to grow robustly (nearly doubling in size over the next 25 years), other countries, particularly developing parts of Asia, are now seeing their economies expand more quickly and offering formidable competition to the United States. Figure 2.1 ranks the top 10 world economies by the projected size of their real GDP for each decade between 2000 and 2050. China, which had the seventh-largest economy in 2000, is projected to be the second-largest economy by 2020, eventually overtaking the United States to become the largest economy in the world by 2050.

A More Global Economy

Historically, the U.S. economy has not been heavily dependent upon international trade. Between the 1860s and the 1960s, the value of international trade (most of it through Atlantic Coast seaports) grew slowly, accounting for a relatively small portion of U.S. economic activity. Exports and imports each represented less than 10% of the U.S. economy. By 1997, the combined value of imports and exports (including trade in both merchandise and services) was equivalent to 23% of the U.S. real GDP (i.e., GDP adjusted for inflation). This value increased to 28% in 2006.

The rapid increase in trade value and volume is expected to continue, with trade growing faster than the economy as a whole. Figure 2.2 compares the value of imports and exports to the real GDP from 1997 through 2030. The value of imports and exports is forecast to be equivalent to 37% of GDP in 2015, and to be equivalent to 60% of GDP by 2030.17 This will intensify the flow of imports and exports moving through the U.S. international trade gateways. And as global economic growth increasingly shifts to Asia (especially China and India) and Latin America (especially Brazil), the United States’ key trading partners will shift in importance as well. This will alter the volume of freight moving through individual gateways and along domestic highway, rail, and inland waterway trade corridors.

17 The value of U.S. imports and exports is compared to GDP to provide a sense of the scale of import and export activity, but they are different measures. Trade is measured by the total value of import and export sales; GDP is measured by the value added to the output of the economy.
Figure 2.1 GDP Growth Rates for Top 10 Global Economies

Country GDP Rank Based on Billions of Real (2003) U.S. Dollars

Source: Global Insight, Inc.

Figure 2.2 Value of U.S. Global Trade Compared to U.S. GDP

In trillions of 2000 dollars

Source: Global Insight, Inc.
A More Diverse Economy

The United States is at the forefront of a structural economic shift in the role and importance of service industries. While manufacturing, agriculture, and mining remain crucial elements of the nation’s economy and have played pivotal roles in its development, the United States’ rapid economic growth over the past decades has been fueled by the services industries (including finance, communications, healthcare, hospitality, and professional and business services). The impact of the transformation has been massive. Figure 2.3 shows the shift in the major U.S. industry sectors’ contribution to GDP between 1950 and 2006. By 2006, services accounted for more than one-half of the U.S. economy, up from 25% in 1950. Over the same period, agriculture and manufacturing’s share of U.S. production fell dramatically. However, when analyzing manufacturing’s employment decline, it is important to remember that many services formerly contained in-house, such as human resources, payroll, engineering, design, marketing, and finance, have been outsourced by many manufacturers—a trend that has reduced employment in manufacturing industries and added employment to service industries.

Figure 2.3 Changing Structure of the U.S. Economy

1950 to 2006

Source: Cambridge Systematics Collation, data from Bureau of Economic Analysis (BEA), Gross Domestic Product by Industry, November 2005, and BEA interactive tables (data for 2006)

The news media have tracked the shift to services and the loss of manufacturing employment, but amid this transformation, the United States still remains the world’s largest manufacturing country, accounting for about one-quarter of global production.18

The United States has maintained its position as a major manufacturing center by investing in automation to keep manufacturers competitive, and in transportation to reach national and global suppliers and markets cost-effectively. New technology, better transportation, and more ubiquitous information are supporting a revolution in production and distribution processes that is enabling the U.S. economy to be one of the most productive in the world. In 2006, the United States maintained its historic position as the most productive among major industrialized nations.¹⁹

The United States also maintains its traditional position as a crucial supplier of food, and is the globe’s top producer of grain, oilseeds, meat, and poultry, among many other key commodities—again, by making best use of national and global transportation systems. Additionally, the United States continues to be one of the world’s largest producers of oil, natural gas, and coal, although the country’s energy production largely stays within the United States today to meet domestic needs. Energy will be an area of emerging policy concern to the United States, and transportation will be a key factor in providing access to alternate sources. The expansion of ethanol production in the Corn Belt is one example.

A More Urban Economy

The location of U.S. economic growth is continuing its decades-long shift from rural to urban areas, and from the Northern and Midwest states to the South and West, paralleling the growth and location of the nation’s population. In 2007, the United States reached a population of 300 million residents. Federal projections are that the country will add another 80 million residents by 2035, with almost 90% of this growth expected to take place in the South and West.²⁰

The United States also is becoming an increasingly urban nation. By 2030, it is expected that 90% of the U.S. population will be living in metropolitan areas. The 100 largest metropolitan regions in the United States account for just 12% of the land area but contain 65% of the population, 69% of all jobs, and 70% of the nation’s GDP.²¹

The largest 100 metropolitan areas also serve the majority of our transportation activity, handling 72% of all foreign seaport tonnage, 79% of all U.S. air cargo tonnage, 92% of all air passenger boardings, and 95% of all public transit passenger miles traveled.²²

The primary trend over the past few decades has been for urban areas to grow out rather than up—that is, to add people and jobs at the fringes of existing development in suburban locations. The Brookings Institution reports that between 1982 and 1997, [Note: Refer to footnotes for sources and details]

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most metropolitan areas added urbanized land at a much faster rate than they added
population. Older, bedroom-suburb communities are becoming centers for jobs, pushing
housing, retail, and distribution even further out from the central city. Over the next few
decades, the tension between high costs of housing in urban centers and pressure to
reduce sprawl and its negative environmental and energy impacts will tend to focus
urban growth in two locations—far-flung “exurbs” on the outer fringes of urban areas,
and infill and revitalization of urban cores.

At the same time, urban areas increasingly are becoming integrated into a series of
megaregions that span traditional jurisdictional boundaries. These megaregions are
characterized by clusters of interrelated businesses that share common labor pools
and customer markets; they are knit together by high volumes of commuting trips,
business travel, and freight shipments. Recent national studies have suggested that
between eight and 12 megaregions will be the focus of U.S. economic growth in the
21st century. As shown in Figure 2.4, these include more mature regions such as the
nearly unending stretch of urban development from Boston to Washington, D.C., as well
as emerging regions such as the Piedmont area from Raleigh-Durham, North Carolina,
through Atlanta and into northern Alabama.\(^\text{23}\)

Figure 2.4 National Emerging Megaregions

Source: Regional Plan Association.

Metropolitan areas also tend to specialize in certain goods and service sectors. For example, the Seattle, Los Angeles, Dallas, and Hartford metro areas specialize in aerospace, and together account for 41% of national output in that industry. Another example, finance, tilts enormously toward the New York metro region, which includes nearly 43% of national output in that industry.24

U.S. cities and regions increasingly compete with cities and regions around the world. A recent study classified cities worldwide into five groups based on their relative role in the global economy.25 The authors ranked New York City and London as the world’s most global cities, followed by a first bands of 21 world cities that includes Chicago, Los Angeles, and San Francisco. The next two bands include regionally significant cities such as Atlanta, Boston, Washington, and Miami. The final two bands include less integrated cities such as Baltimore. The authors concluded that there appears to be a gap in the globalization of U.S. cities, and that many U.S. cities compete in a very large continental market but have not “gone global” to the extent of other world regions. Obviously, New York, as a truly world city, and Miami, with its link to Latin America, share significant linkages outside the continental United States, but overall, U.S. cities appear to have fewer global linkages than comparably sized metropolitan competitors. Global transportation connectivity will play a key role in helping transition more U.S. cities into this type of global competitive environment.

Spending is not targeted to achieve certain outcomes. Instead of focusing on how much money it should spend, Washington should focus instead on how that money will be spent and how that spending affects our nation and its metropolitan areas. Unlike many other nations in Western Europe and parts of Asia, the U.S. is continuing to grow. Most of this growth will be accommodated in the nation’s 50 largest metropolitan areas. Yet funds are not targeted to these growing and complex places. Rather, the federal government takes an almost agnostic approach to where funds are spent and as a result analysis shows a disproportionate amount of investment is happening away from the places that matter most to the prosperity of the nation. The emphasis is on consensus building through logrolling where funds are distributed broadly and thinly rather than on fixing national problems.

Source: Brookings Institution; Testimony to House Committee on the Budget, October 25, 2007.


A More Diverse and Aging Workforce

Demographic changes will reshape the U.S. workforce and consumer market, with important implications for transportation:

- It will be a sellers’ market for workers because of the decline in the number of people of working age. Between 2000 and 2030, the number of Americans over the age of 65 will double, while the working-age population will increase by only 18%. Employers will go where skilled employees are or want to be, creating opportunities for regions with attractive climates as well as rich educational and cultural resources. This trend will keep some Northern cities competitive in the face of the overall shift in population to the South and West.
- Employers will be more flexible regarding scheduling for hours and days of work in order to attract and retain workers.
- The U.S. labor force will become more racially and ethnically diverse, and the attachment of minorities to the center city will likely be broken.
- Both center cities and suburbs will move toward greater balance in jobs and workers (i.e., fewer jobs per worker in cities; more jobs per worker in suburbs), but this will not change the need to commute because of persisting differences in the mix of skills. Greater specialization in the labor force means that workers will need to be drawn from larger worker pools over greater distances.
- Multiworker households, frequent job changes, housing preferences, and the general friction of changes in residence are likely to generate longer work trips.

In the future, it is anticipated that workers will be able to live where they want and work where they want, but they will have to accept the penalties associated with longer commutes. One major indicator of this pattern is the increase in the number of commuters leaving their residence counties to work. In 1990, fewer than 24% of workers left their home counties to work elsewhere. This share increased to 27% in 2000 and 28% in 2005. This share will continue to expand, with substantial shares of the population crossing both metropolitan and rural areas to reach their job sites. This trend will affect not only commuting but also other travel purposes. As medical services and recreation activities become more specialized, their market sheds also expand, and the average trip lengths to these attractions increase. Commuting and other interactions between rural and metropolitan fringe areas will expand in importance.
2.2 Changing U.S. Freight and Logistics Systems

The structural changes in the U.S. and global economies and in trade patterns have forced changes in transportation and logistics systems, but they have been accelerated by changes in transportation technology and practices.

The time required to transport freight over long distances has decreased from months to hours since the mid-1800s. Transportation costs have dropped dramatically, particularly over the last 30 years, and travel-time reliability has improved. The local truck that delivers goods to a neighborhood store is often the last link in a supply chain that spans half the world, with the final retail price of those goods reflecting 10,000 miles of hard-gained freight transportation efficiencies within that chain. This has enabled shippers to buy more transportation and develop longer and more cost-effective supply chains. The following are among the major factors reducing the cost and improving the reliability of the transportation system:

- Economic deregulation and the subsequent restructuring of the freight transportation industry in the 1980s, which triggered strong competition and lower shipping prices;
- Increased public sector investment in the Interstate Highway System through the 1970s, 1980s, and early 1990s, which reduced travel time and improved trip reliability for motor carriers; and
- Adoption of new technologies (e.g., intermodal freight containers, computers and related information technologies, bar coding, radio frequency identification tags, and satellite communications) by shippers and carriers, which significantly improved the productivity and reliability of freight operations.26

Shippers have taken advantage of the lower transportation costs to buy more frequent and reliable long-distance and intermodal freight transportation. These changes have hastened a broad shift in business logistics practices, from manufacture-to-supply or inventory-based “push” supply chains to manufacture-to-order or replenishment-based “pull” supply chains.

Thirty years ago, most businesses operated push supply chains. Suppliers delivered materials to a manufacturer, who pushed products to a distributor or retailer and then to the customer. Each business maintained a large and expensive inventory of critical materials and products to protect against stockouts.

Today, most businesses are moving toward pull or on-demand supply chains, replenishing whatever the customer consumes as soon as it is sold. To ensure that inventory is available, businesses are tracking customer purchases as they occur, reducing inventory, centralizing it at fewer locations, and managing in-transit inventory closely. Industries that once held large inventories of products and could tolerate delays in shipment and receipt of goods are now demanding greater reliability and visibility from their freight carriers.

26 Other contributing factors have been the growth of services, which generate less demand for freight service, and lower interest rates, which reduce inventory carrying costs.
Eliminating inventory and replenishing everything right away results in smaller shipment sizes (since units are consumed one by one) and more individual products per shipment (to make lot sizes economical to ship). This has increased the importance of transportation over warehousing and favored the use of faster and more reliable trucking and air shipments over rail and bulk shipments.

On-demand supply chains are very effective. Inventory turns, a common measure of the speed with which material moves through a company’s supply chain, increased from an average of eight turns per year in 1995 to an average of 21 in 2005. Lean, on-demand supply chains are important to consumers as well as businesses. They result in lower-cost items, which means that households can get more product for the same amount of money.

But on-demand supply chains also pressure shippers and receivers to make more “just-in-time” (JIT) shipments with fewer products in each box. This puts shippers closer to the edge when the freight transportation system fails. Small failures—a missed connection, a garbled order, a truck breakdown, or more intensive security inspections—can affect dozens of shippers, carriers, and customers. A large failure—a labor action that shuts down the West Coast ports, a hurricane that closes the Gulf, or a terrorist attack—can quickly disrupt thousands of supply chains, undermining the operations and profitability of many shippers, carriers, and customers. In a world of tightly strung supply chains, freight transportation capacity, reliable performance, and some redundancy are critically important.

The tightening of system capacity across all modes of freight transportation has contributed to the first notable increase in total logistics cost in more than 25 years. Total logistics cost is the cost of managing, moving, and storing goods. Figure 2.5 shows the total logistics cost as a percentage of the U.S. GDP.
Logistics costs rose through the 1970s to a high of about 16% of GDP in 1980, reflecting rising fuel prices, increasing interest rates, and deteriorating productivity across the freight transportation system. Renewed investment in highways, economic deregulation of the freight transportation industry in the early 1980s, adoption of new technologies, and lower interest rates drove down the costs of truck, rail, air, and water freight transportation. The total logistics cost declined through the 1980s and 1990s to a low of about 8.6% of GDP in 2003. Businesses and consumers benefited because lower transportation costs resulted in lower-cost goods and better access to global markets.

But the total logistics cost is rising again. In 2006, the total logistics cost was 9.9% of GDP. The change reflects recent increases in fuel prices and increases in congestion on the nation’s highways and rail lines and at its international trade gateways and ports.

Deteriorating transportation reliability may have accounted for one-third of the increase in inventory carrying costs between 2005 and 2006. Freight shippers and carriers are worried that the productivity of the nation’s freight systems may continue to drop and that logistics costs may rise further, undermining future domestic economic productivity, international competitiveness, and economic growth.

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28 Boston Logistics Group estimates.
China competes as a nation. Under current economic growth projections in the U.S. and China, trade flows to the United States from China will continue to grow. China is building the infrastructure to handle them, but there are important questions as to whether the U.S. transportation system is ready. With a limited number of ports of entry, the U.S. transportation system necessarily concentrates these imports at a few strategic locations. If the United States wants to stay competitive globally, investment in transportation infrastructure is needed, new system management technologies should be applied, and institutional change in how we identify, fund, operate and make key infrastructure improvements to key elements of the transportation system should be considered. These improvements help not only to expedite the movement of imported goods, but to reduce the logistics cost of U.S. companies to compete in the global market.


The rise in total logistics cost also is of concern because analysis of trends in total logistics cost in other developed countries suggests that the United States is spending more on transportation logistics, while other developed countries such as Germany, Spain, and France are spending proportionately less. If this trend plays out, it will mean that U.S. industries will be at an increasing competitive disadvantage.

Another area of global competitive concern for the United States is illustrated by the Access Index developed by SRI International for FedEx. The Access Index measures a nation’s ability to compete in world markets. The methodology considers 22 factors of physical and information access including transportation, trade, and telecommunications. The top 10 countries in the Access Index achieved an average GDP per capita growth rate of 22.6% in the last decade, compared to a growth rate of only 14.1% for the bottom 10 countries on the list. The United States does not make the top 10, ranking 12th among the 75 nations studied. More information on the Access Index is provided in Appendix C.29

2.3 Changing Passenger Transportation Demand

Passenger transportation by automobile and by public transit has changed as much as freight transportation. We have become a much more mobile society. From 1970 to 1997, passenger vehicle miles of travel (VMT) in cars, pick-up trucks, vans, and buses grew at 3% per year, more than twice the rate of population growth. From 1997 to 2005, passenger VMT growth slowed to 2% per year because of near saturation in driver licensing and car ownership. The aging of the population and recent increases in energy prices have slowed demand for driving even more. However, a growing population, economy, and personal incomes will drive demand for greater personal mobility options in the future. All passenger modes will be challenged to meet the demand.

As we look to the future, we will see the following development trends and resulting demands on the nation’s passenger transportation systems:

- A highly dispersed, high-value, globally engaged, highly mobile society will emerge, with sharp growth differences among regions and within metropolitan areas.

- Approximately one-half of the U.S. population will live in metropolitan areas of more than five million population. These agglomerations of people and businesses will be critical to national productivity, and serving their transportation needs will be a major factor in ensuring that productivity.

- Continued “suburbanization” of people and jobs is expected, although we are likely to see more infill and densification, including transit-oriented development.

- The total number of trips will continue to increase, with increasing trip lengths to and from more dispersed origins and destinations, putting greater demands on an already congested highway system. Higher rates of metropolitan transit usage will help meet demand and alleviate highway congestion. Transit- and walking-oriented development nodes within these expanding megaregions can help reduce growth in automobile trip-making.

- Rural populations will be critical to the nation’s economy, with rural development spurred by trends such as retirees and workers seeking rural amenities, growing recreational and tourism activity, and specialized rural economic development areas.

- Long-distance travel for both business and personal purposes will grow dramatically. Greater competition will arise between air and auto travel for intermediate-length trips of 250 to 500 miles. In a few high-density corridors or megaregions like the Northeast, high-speed rail is likely to become a reality.

- Recreation and tourism will be growing markets. The Travel Industry Association estimated there were two billion tourism-related trips of more than 50 miles in length in 2006. Such travel-generated travel and tourism results in expenditures of $700 billion, with about $614 billion of that spending by U.S. residents and $86 billion by foreign visitors. This is an important growth industry for the United States. There is considerable concern that increasing congestion across all modes will significantly impede tourism growth, detract from the travel experience, and hurt our competitiveness in the global tourism market.30

This section summarized key trends reshaping the U.S. economy and their implications for moving people and freight. The next section focuses on five major sectors of the U.S. economy and their dependence on the nation’s transportation system.
3.0 Industries and Transportation

3.1 Introduction

The U.S. economy is one of the most competitive in the world because of its capacity for innovation, higher education system, market size, corporate ingenuity, fluid capital markets, and transportation network. These advantages have allowed U.S. industries to take a leadership role in the global economy, providing products and services demanded worldwide. Transportation is the foundation of this success, but each major industry has its own set of transportation needs and issues.

Five major economic sectors account for 84% of the U.S. economy. Four—agriculture and natural resources, manufacturing, retail, and services—are among the largest users of transportation. The fifth—the transportation sector itself—is a provider of transportation equipment and services.

The intensity of transportation use varies by sector. Transportation represents 7% of the value of output in the agriculture and natural resources sector, 4.7% of the retail sector, and 3.2% of the manufacturing sector. In the rapidly growing services sector—which does not produce material goods but depends on expedited delivery services, long-distance business travel, and employee commuting—transportation is 1.8% of the value of output. While the amount of transportation consumed by the sectors varies, each is critically dependent on the condition and performance of the nation’s transportation infrastructure.31

This section explores the multifaceted roles transportation plays within these industry sectors. The subsections describe each sector, the trends shaping the industry, the sector’s transportation issues, and its transportation needs.

31 The construction industry also is very dependent on the health of the U.S. transportation system to perform optimally, but was not included as a focus industry for this report because its role as the builder of the nation’s infrastructure and its linkages to transportation are evident and well documented.
3.2 Agriculture and Natural Resources Sector

Industry Profile and Outlook

The transformation of the economy and the rapid growth of service industries have not reduced the nation’s need for agricultural products and natural resources. The agriculture and natural resources sector has three major segments (Table 3.1):

1. Agriculture and forestry (crop and animal production and forest harvesting);
2. Energy (coal, oil, and natural gas extraction and electricity generation); and
3. Mining (copper, iron, gold, and other metals and aggregate industrial nonmetallic minerals and materials).

<table>
<thead>
<tr>
<th>Gross Domestic Product</th>
<th>Share/Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture and Forestry</td>
<td>$122.4 billion</td>
</tr>
<tr>
<td>Energy</td>
<td>$407.6 billion</td>
</tr>
<tr>
<td>Mining</td>
<td>$31.5 billion</td>
</tr>
<tr>
<td>Resources Sector</td>
<td>$561.5 billion</td>
</tr>
<tr>
<td>Total United States</td>
<td>$13,246.6 billion</td>
</tr>
</tbody>
</table>


These industries are the foundation of a value chain that supports almost all of our economic production and activity. In 1900, the U.S. economy consumed 161 million tons of new materials annually. By 2000, the U.S. economy consumed more than 3.4 billion tons of resources and materials annually, 20 times more than a century before. These industries contributed $561.5 billion to the economy in 2005, accounting for 4.3% of the U.S. GDP. They provide food, building materials, and the feedstocks used in the production of plastics, chemicals, medicines, fertilizers, fibers, processed foods, animal feeds, steel, electricity, and a wide variety of other products. The overall output of the sector is expected to increase as a result of population, trade, and economic growth, with the energy industry expected to grow faster than agriculture and mining.
The sector employs 2.6 million people in the United States, accounting for 1.9% of the nation’s jobs (Table 3.2). Domestic employment in the sector is expected to decline over the next 20 years as more processes are automated, but output will continue to grow, resulting in more demand for moving bulk materials.

Table 3.2 Employment in Agriculture and Natural Resources Industry

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment</th>
<th>Share of U.S. Jobs/Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture and Forestry</td>
<td>1,382,650</td>
<td>1.0% Stable after years of decline</td>
</tr>
<tr>
<td>Energy</td>
<td>788,200</td>
<td>0.6% Slowly declining</td>
</tr>
<tr>
<td>Mining</td>
<td>432,400</td>
<td>0.3% Slowly declining</td>
</tr>
<tr>
<td><strong>Agriculture and Natural Resources</strong></td>
<td><strong>2,603,250</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Total United States</strong></td>
<td><strong>140,206,762</strong></td>
<td>1.9% of U.S. jobs</td>
</tr>
</tbody>
</table>


The United States for decades has been the breadbasket of the world, exporting huge volumes of grain and meat to countries with inadequate tillable land or inefficient agricultural sectors. The value of U.S. agricultural exports reached a record $69 billion in 2006; however, the U.S. trade surplus in agriculture has been shrinking. In 1996, the country had a $27 billion surplus in agricultural trade; in 2006, this trade surplus had narrowed to $5 billion. Traditional importers such as China and India have adopted modernized agricultural practices, and other countries such as Brazil have emerged as major competitors in world markets.

For example, today U.S. producers are in head-to-head competition with Brazil in soybean exports. Further, the United States is vying with the European Union for overall leadership in total agriculture and food-related exports. So export competition and transportation’s role are very much at the forefront of concern through much of the agricultural industry. Figure 3.1 shows the trends in U.S. agricultural import and export trade from 1975 to 2007. Industry experts anticipate that the United States will become a net importer of agricultural products in coming years.

The total number of farm jobs reflects the number of people working at farms that are established as businesses (the job numbers are calculated by a BLS survey of businesses) and does not include sole proprietorship farmers and their families, which comprise a significant number of the jobs in the industry.
Transportation and the Agriculture and Natural Resource Industries

The agriculture and natural resource industries ship to domestic and international markets commodities that are heavy, bulky, and relatively low value per ton. Most agriculture and natural resource commodities must be shipped long distances, meaning that transportation costs are a significant portion of the price of delivered shipments and products. Today, every dollar of agricultural output requires about eight cents in transportation services—the highest among all industries. For this reason, agricultural and natural resource shippers stress the importance of lower-cost and reliable rail, barge, and ship transportation over higher-cost truck transportation to keep their industry cost competitive.

Agriculture and natural resources production is fixed in areas that have fertile land and commercially viable stone, mineral, or energy deposits. Because production areas are relatively fixed, transportation networks can be planned and their costs amortized over long periods of time. Figure 3.2 shows the relative concentration of agricultural crop cultivation in the central United States.
However, transportation needs are changing as new resources and new markets are developed. A recent example is the emergence of the Powder River Basin region as a major supplier of relatively clean-burning coal. The development of this resource, accelerated by the increasing cost of natural gas, has triggered a major realignment and expansion of rail infrastructure and services between the Powder River Basin in Wyoming and the Midwest and Southeast electric utilities markets. Nationally, U.S. coal production reached 3.4 million tons in 2006, produced from 2,000 mines. The industry employed more than 100,000 workers. Sixty-six percent of U.S. coal shipments move by rail, with water transportation and trucks making up the balance. Figure 3.3 shows the volume of coal movements by rail and other modes in 2004.

### Figure 3.3 Coal Flows by Water, Rail, and Truck 2004

<table>
<thead>
<tr>
<th>Water Millions of Tons</th>
<th>1-33</th>
<th>33-66</th>
<th>100-133</th>
<th>133-166</th>
<th>166-200</th>
<th>200-233</th>
<th>233-266</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ran Millions of Tons</td>
<td>1-33</td>
<td>33-66</td>
<td>100-133</td>
<td>133-166</td>
<td>166-200</td>
<td>200-233</td>
<td>233-266</td>
</tr>
<tr>
<td>Truck Millions of Tons</td>
<td>1-33</td>
<td>33-66</td>
<td>100-133</td>
<td>133-166</td>
<td>166-200</td>
<td>200-233</td>
<td>233-266</td>
</tr>
</tbody>
</table>

Source: Global Insight, Inc., based on 2004 TRANSEARCH data.
Another realignment and expansion of transportation networks and services serving agriculture and natural resources is happening to meet the nation’s demand for reducing automobile and truck engine emissions and to dampen the growth of greenhouse gases. Today in the United States, ethanol is largely refined from corn, while sugarcane is favored by Brazil. Other feedstocks are expected to grow in use in the future. The expansion of U.S. biofuels production and distribution capacity has shifted cultivation and local truck and rail transportation patterns in the Midwest and expanded the demand for longer-haul truck and rail transportation to East and Southeast markets.

The efficient, reliable, and low-cost movement of U.S. agricultural commodities to key gateways for export will be a determinant in how well the United States can compete in overseas markets in the future. U.S. soybean producers are concerned about transportation infrastructure condition and availability, particularly rail, for transporting soybeans and other commodities reliably and cost-effectively. Lower-cost producers such as Brazil have been making significant investments in transportation infrastructure to better serve their agricultural industries by linking their heartlands with ports.

**Rail Capacity and Service**

Over the last 20 years, shippers have benefited from rail and trucking deregulation. The price of rail transportation has dropped or been relatively stable as railroads have cut prices to compete with trucking following the economic deregulation of the trucking and rail industries in the 1980s. In recent years, after decades of decline, rail prices have begun to rise as excess capacity has been absorbed, long-haul rail services have become more competitive with long-haul trucking, and long-term contracts for transportation service expire (see Figure 3.4).

**Figure 3.4** Average Freight Railroad Rates 1981 to 2006

Class I Revenue Per Ton-Mile, All Commodities

The natural resource and electric utility industries are sensitive to transportation prices and service reliability, including rail line capacity, regional bottlenecks, prolonged infrastructure maintenance delays, accidents, and natural events. The railroads have expanded unit car service, hauling massive volumes of coal from the Powder River Basin to Midwest utilities to meet their customers’ needs. Production from the Powder River Basin is expected to increase dramatically through 2030 owing to strong reserves, the hazards of Eastern mining, and a low sulfur content that more easily conforms to environmental regulations. Powder River coal often must travel more than 1,000 miles to reach power plants in the East. As more clean-burning coal power plants come online, the capacity and efficiency of the nation’s rail network will be instrumental to ensure the availability of this energy source at a cost that is not onerous to consumers and the nation’s industries.

The agricultural sector perceives that it is in competition with the coal/electric power industries and the retail industry for space on the rail network, even as railroads make large capital investments to expand rail capacity. Agricultural shipments—especially by smaller shippers—are less profitable and more difficult to serve than retail and energy customers. Smaller shippers report difficulty obtaining specialized rail cars, such as bulk hopper cars, and getting reliable and timely service for small-lot shipments. While the containerization of agricultural shipments is increasing (e.g., cottonseed exports to China), agricultural shippers often are outbid by retailers for use of containers. And containerization is not feasible or cost-effective for many commodities, such as bagged soybeans, rolls of newsprint, and lumber. Industry experts anticipate that the price and availability of rail service may even influence where crops are grown in the future. For example, soybean production could shift from northern Minnesota, where rail consolidation has resulted in reductions in service, to locations such as Indiana, which have better and more accessible rail service.

Port Congestion and Delays

Port access and modernization are important to agriculture and natural resources industries to improve their export capabilities. Industry representatives noted particular problems at the Ports of Los Angeles and Long Beach and at the Port of Houston, where, at times, there can be a three- to five-hour wait to access port terminals. The ports are not adequately configured to handle today’s high volumes and highway and rail access is badly congested. Additionally, the operating hours of many major port terminals—typically 12 to 18 hours per day for five days per week—do not match the 24-hours-per-day and seven-days-per-week work cycles of the major shippers and receivers. This creates backups and adds to congestion.
“We are not investing in our ports and have fallen behind in port landside access.”
“China’s development of the Shanghai Deepwater Port is an example of massive infrastructure investment overseas that will make it harder to compete with China in the future.”
“Dubai, Tsingtao, and Brazil all have better port facilities than the U.S. We’re not as advanced as we think we are.”

- U.S. Agricultural Industry Representatives

### Shortage of Bulk Shipping Capacity

The global demand for breakbulk shipping capacity (e.g., ships designed to carry grains, scrap steel, coal, and other noncontainerized commodities) has been rising sharply as the economies of India, China, and other developing nations have expanded. Businesses around the world have bid up the cost of breakbulk shipping. For U.S. agriculture and natural resource producers, this has added to the cost of exporting already-expensive U.S. cotton, grains, and other commodities. While the containerization of agricultural shipments is increasing (e.g., cottonseed exports to China), breakbulk is still very important for soybeans and other agricultural products.

### Aging Inland Waterway System

The inland waterway system also is very important to this industry. For example, grain harvested in Minnesota is often moved by truck to Duluth for international shipment via the Great Lakes or moved by truck and regional railroads to barge ports on the Missouri and Mississippi Rivers system for domestic and international distribution. The aging inland waterway lock and dam system is affecting system capacity and reliability. The recent collapse of the I-35 bridge in Minneapolis also caused significant disruption to Mississippi River barge movements.

### Metropolitan Congestion

Stone, one of the top commodities transported in the country based on weight and a critical material for the construction industry, is being quarried farther away from urban centers as quarries located within metropolitan areas run out of capacity or are unable to expand because of encroaching development. Suppliers must make longer trips, increasing the likelihood of delays from congestion, lowering the productivity of customers, and raising overtime costs. In the past, concrete trucks working in the Atlanta region could deliver up to six loads per day of ready-mix concrete to a construction site. Today, industry representatives report that they can deliver only four loads per day owing to congestion. Concrete and stone are critical to the construction of roads, and as the movement of freight becomes less efficient, the expense of rebuilding infrastructure goes up, compounding the nation’s transportation issues.
Addressing Industry Needs

Business leaders in the agriculture and natural resources sector believe that current national transportation policies give only limited attention to the concerns of their industry. They believe that the import market gets more attention from government and carriers, and that this is short-sighted because it is hurting U.S. export capacity. Among the transportation proposals advanced by industry to help solve their transportation problems are increasing capacity on highways (including truck lanes), improving rail capacity and service, and shifting more of the movement of agricultural and natural resources to rail and barge. Specific recommendations made by industry representatives include the following:

- Increase investment to provide additional capacity and improve reliability across all the modes;
- Ensure access to rail services to support the nation’s critical agricultural export markets;
- Improve landside truck and rail access to ports and port throughput to reduce delays and the cost of handling exports;
- Upgrade inland waterway locks and dams to ensure reliable barge service;
- Explore public-private partnerships to create consolidation hubs where agricultural commodities from multiple shippers can be consolidated and offered to the railroads in 50- or 100-car unit, train-sized lots, creating economies of scale and cost savings needed by both agricultural shippers and the railroads; and
- Improve truck corridors by adding truck lanes; enhance truck efficiency by increasing size and weight limits, especially for trucking serving rail consolidation hubs; and ensure trucking hours-of-service flexibility for agricultural producers.

3.3 Manufacturing Sector

Industry Profile and Outlook

Manufacturing has been a mainstay of the U.S. economy, beginning with textiles and tobacco in the 19th century and continuing with the mass production of steel, automobiles, and an array of other consumer products in the 20th century. Today, manufacturing continues to be a key contributor to the economy, producing high-value advanced electronics, medical equipment, and biopharmaceuticals that keep the United States at the forefront of cutting-edge technologies and modern production processes.

35 These recommendations represent the views of individuals interviewed for this report and are not necessarily those of the U.S. Chamber of Commerce or the Americans for Transportation Mobility coalition.
The United States is the largest manufacturing country in the world, accounting for about one-quarter of total global production. In 2003, manufacturing equaled $1.5 trillion in value-added to the economy, significantly greater than the $600 billion worth of manufactured goods produced by China the same year (see Figure 3.5). While the recent expansion of manufacturing in China is historic and is changing how and where many products in the world are produced, the United States is a leader in the manufacture of technically advanced products such as computers, aircraft, pharmaceuticals, prototyping equipment, engines, and high-value machinery.

Figure 3.5  Share of World Manufacturing Output

The manufacturing sector employs 14 million people in the United States, accounting for 10% of the nation’s jobs (see Table 3.3). It contributed $1.6 billion to the economy in 2006, accounting for 12.1% of the U.S. GDP (see Table 3.4).

Table 3.3  Employment in Manufacturing Industry

<table>
<thead>
<tr>
<th>Employment</th>
<th>Share/Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Durable</td>
<td>8,863,000</td>
</tr>
<tr>
<td>Nondurable</td>
<td>5,120,000</td>
</tr>
<tr>
<td>Manufacturing Sector</td>
<td>13,983,000</td>
</tr>
<tr>
<td><strong>Total U.S.</strong></td>
<td><strong>140,206,762</strong></td>
</tr>
</tbody>
</table>


Table 3.4  U.S. Gross Domestic Product in Manufacturing Industry

<table>
<thead>
<tr>
<th>Gross Domestic Product</th>
<th>Share/Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing Sector</td>
<td>$1,601.2 billion</td>
</tr>
<tr>
<td><strong>Total U.S.</strong></td>
<td><strong>$13,246.6 billion</strong></td>
</tr>
</tbody>
</table>


Manufacturing also is the largest component of U.S. exports. The value of U.S. exports of manufactured goods reached $923 billion in 2006, accounting for 61% of the nation’s overseas shipments.

Employment in the manufacturing sector has been declining steadily, but manufacturing output has been increasing. U.S. manufacturers have invested heavily in automation and sophisticated process technologies, reducing their need for labor while maintaining and increasing output. The drop in manufacturing employment also reflects the internal restructuring of manufacturing firms. To lower costs, maintain competitiveness, and focus on core competencies, manufacturers have been outsourcing functions such as human resources, payroll, maintenance, engineering, and logistics services. This has shifted employment from manufacturing to other sectors, notably the services sector, which has seen continuing increases in employment. The number of manufacturing jobs declined by 19% between 1997 and 2006, but manufacturing output, measured in the value of goods produced, increased by 31%.37 (See Figure 3.6.)

**Figure 3.6  Manufacturing Employment in the United States**

Source: U.S. Census Bureau, County Business Patterns, 2005.

37 Bureau of Economic Analysis, manufacturing GDP growth adjusted for inflation.
Industry observers expect the manufacturing sector to grow steadily, but the industry will continue to face competition from lower-cost countries, which will put downward pressure on the prices of manufactured goods. U.S. manufacturers must differentiate themselves through technology and quality because they will be unable to compete on price alone. Producers of easily transferable, low-to-moderate-technology commodity products will be under the most pressure to innovate.

Counterbalancing this is the change in the value of the dollar. As the value of the dollar drops, U.S.-made goods become relatively more attractive and cost-competitive in global markets. Analysts expect that this will encourage the expansion of manufacturing operations within the United States, slowing the outsourcing of jobs. This also could result in the “insourcing,” or relocation, of jobs back to the United States. However, the insourcing of manufacturing jobs can be accomplished only if the domestic labor market can produce a sufficient supply of qualified workers. The shift toward automation and production of high-technology products means that manufacturers must be able to attract highly skilled workers or to relocate near pools of highly skilled workers.

**Transportation and the Manufacturing Industry**

These trends have several implications for transportation. First is the need to maintain flexible and reliable transportation services across the country. A generation ago, manufacturing employment was concentrated in the Northeast and the Great Lakes, much of it centered around the automotive industry. The Northeast has shifted into high-technology products, medical equipment, and pharmaceutical manufacturing. Automobile production has expanded into the Southeast and South Central states, following and replacing the textile industry. And on the West Coast, the aerospace industry in the Pacific Northwest and Southern California has been the foundation for the expansion of high-technology manufacturing.

What ties this widespread manufacturing capability together today is trucking and the U.S. highway system. Trucks and highways are backbone of manufacturing logistics. The manufacturing sector makes extensive use of intermodal rail, water, and air cargo services, but it is trucking and the highway system that provide manufacturers with the capability to access an extraordinarily wide range of materials, labor, technology, knowledge, and markets, and to integrate these elements into cost-effective, JIT manufacturing operations. The industry consumes 20% of all for-hire truck transportation, the largest amount of any U.S. industry sector. Trucking and the highway system have allowed manufacturing to spread out across the country, building efficient one-story plants on low-cost suburban and exurban land, and yet still have door-to-door freight service as well as quick access to international trade gateways at ports and air cargo hubs. If U.S. manufacturing is to remain cost-competitive in global markets and insource products and jobs within the United States, the truck and highway system must have the capacity to deliver freight reliably and at stable or lower costs.
The second implication of the trends is that more manufacturing jobs will be located in urban areas or in megaregions—clusters of economically integrated cities. Competitive U.S. manufacturing depends on access to highly educated and skilled workers, and more and more of these workers are choosing to locate in urbanized areas. As the U.S. population ages and competition for skilled workers increases among industries, economists expect that more manufacturers will relocate near cities to be near their most critical asset—highly skilled workers. This means that the competitiveness of manufacturing firms will depend not only on access to reliable and cost-effective freight transportation, but also on reliable and cost-effective passenger transportation for commuters traveling by car or by public transit.

Highway Congestion

Over the last two decades, the logistics strategies deployed by manufacturers have changed dramatically as part of a broad effort to control costs and increase productivity. This has included a transition from large, consolidated shipments that supply warehouse inventories capable of feeding a plant for weeks at a time to much more frequent and smaller deliveries for JIT manufacturing. As a result, manufacturers have increased their demand for more frequent, smaller, and varied shipments, almost always involving trucks for at least part of the trip. With orchestrated deliveries to manufacturing facilities (e.g., auto assembly plants mandate deliveries of parts within very narrow time thresholds), JIT is dependent on the reliability of the transportation system.

However, congestion in major metropolitan areas and along intercity corridors is forcing costly changes in manufacturing logistics. Shippers are introducing more trucks and drivers, sending trucks on longer alternative routes, paying overtime to make night and weekend deliveries, and forward-stockpiling parts to ensure the delivery of the same volume of goods. The costs accruing to manufacturers as they adjust their schedules can be subtle. For example, U.S. auto manufacturers using night deliveries to avoid congestion are finding a higher incidence of damage to cars delivered to dealers at night than during the day.

Congestion, deteriorating travel-time reliability, and escalating costs are offsetting the savings of a global supply network. At risk is the ability to hold onto and control the greatest value-added manufacturing operations.
The Boeing Corporation’s new 787 mid-size jetliner program demonstrates how the manufacturing supply chain has evolved in a generation and what is at risk if the performance of the U.S. transportation system deteriorates. Earlier airliners such as the 707 and 727 were assembled and built of parts largely sourced from a region-centric system of suppliers located in the Puget Sound area. The 787 also is assembled close to Seattle, but major components are sourced today from an extensive global manufacturing network. Wings, tail cones, rudders, landing gear, and entry doors are flown in from East Asia and Europe; engine pylons, fairings, and the leading edges for wings move by rail from the Midwest, Southeast, and Canada; and vertical fins are transported by truck from locations in metropolitan Seattle. Boeing relies on the robustness of its supply chain and the dependability of a multimodal transport system to assemble its planes, a system affected by Seattle road congestion, rail capacity, air traffic, and border crossing protocols and infrastructure. Similar to other manufacturers, Boeing adapts to transportation challenges (e.g., late deliveries due to delays on Puget Sound freeways) by building time into its logistics systems. This time cushioning is seen as a part of operating a business by most manufacturers and the costs associated with such adjustments (e.g., adding time to delivery windows, creating internal dispatch departments, and fewer turns for delivery vehicles) are not usually estimated. However, the missed delivery of a key component has a tangible effect on Boeing, forcing the removal of planes from the assembly line—a costly and day-long process.


Rail Service and Capacity

Manufacturers prefer rail to receive heavy inputs, such as the soda ash, limestone, sand, and recycled glass used to make glass. Rail congestion at major hubs, especially rail moves going through Chicago, was cited by multiple shippers as a continuing constraint. Some manufacturers report shifting from rail to truck and carrying more inventory to meet tight delivery windows. This adds to cost, erasing the efficiencies and cost advantages of using rail. Beyond the large, nationally visible problems are smaller ones. One shipper reported a localized problem of rail bridges across the Mississippi River that cannot accommodate heavy trains (e.g., 286,000-pound railcars), thwarting manufacturers’ and railroads’ efforts to increase efficiency and reduce congestion by carrying more freight on fewer trains.

Conflicting Security and Regulatory Policies

Manufacturers need the freight transportation system to function seamlessly while maintaining high security standards, but continuing uncertainty about security requirements makes it difficult to design and quickly modify supply chains to meet market demands. A manufacturer importing shoes from Asia through West Coast ports mentioned concern that new security requirements requiring 100% scanning of containers at foreign ports could disrupt its supply chains. The limited availability of security equipment and likely concentration of traffic into a smaller set of already-congested Asian ports will almost surely squeeze industry supply chains. Similarly, border crossings between Michigan and Ontario are slowing the movements of motor vehicle parts within an integrated automotive regional cluster stretching from Southern Canada to Michigan, Ohio, and Indiana.
This is our plan for our future—and if we do not commit to transportation infrastructure soon, we won’t be able to catch up. - Manufacturer

The U.S. lacks an integrated and holistic policy for freight transportation and manufacturers are concerned. - Chemical Company

Border crossings in NAFTA countries need to be seamless and they are not today. It is easier to cross between Poland and Germany than to go to Windsor (Ontario) from Detroit. - Auto Company

The greatness of the U.S. in the 20th century was having unrestricted travel coast-to-coast. Today, Europe is becoming seamless while we’re becoming compartmentalized. - Auto Company

Unreliable Inland Waterways and Insufficient Coastal Shipping

Chemical as well as other manufacturers depend on barges operating along the nation’s inland waterway system to carry heavy, bulky, and low-value-per-ton commodities. The lack of maintenance on the inland waterway system results in delays and chronic outages as locks are fixed and rivers are dredged. The service outages can be sudden, giving manufacturers little preparation time to find alternatives. A 10-day shutdown of Ohio River barge traffic forced an unexpected switch from barge to tanker trucks for a chemical manufacturer at significant cost in August 2004. If better maintained, inland waterways could help eliminate some rail and truck congestion, although customers would need to adapt to slower barge movements. The development of “coastal highways” along the U.S. seaboard could provide needed freight capacity, but the Jones Act, which limits intra-U.S. marine movements to U.S.-flagged ships, restricts the development of deep-sea domestic marine shipments as an alternative.

Addressing Industry Needs

The manufacturing industry is looking for broad changes and improvements to the transportation system. First and foremost, industry representatives have called for a clearly enunciated national freight transportation policy. The United States lacks a coherent and clear policy for investing in freight transportation improvements. Europe and Asia have set out investment guidelines and policies, making it easier and less risky for manufacturers to plan and invest in new facilities and markets. Representatives also highlighted the need to do the following:38

38 These recommendations represent the views of individuals interviewed for this report and are not necessarily those of the U.S. Chamber of Commerce or the Americans for Transportation Mobility coalition.
- Create one economic environment among the North American Free Trade Agreement (NAFTA) countries.
- Expand highway capacity by providing truck-only lanes, use private tolling initiatives to supplement public investments, and improve the reliability of traffic flows in and around metropolitan areas.
- Improve port capacity and throughput.
- Add rail capacity and improve service reliability.
- Balance security and freight transportation policies and practices.
- Standardize state freight transportation regulations. The significant variation in size and weight allowances, safety regulations, and taxes and fees among states is onerous and adds considerable administrative costs to shippers and carriers.
- Harmonize commodity classification codes used in international trade. The United States should use the industry classification codes being used in Canada, Mexico, and the rest of the world rather than going its own way. Translating between separate systems increases paperwork and slows the passage of freight across borders.

### 3.4 Retail Sector

#### Industry Profile and Outlook

The retail industry comprises establishments that sell merchandise. The retailing process is the final step in the distribution process, a process that includes manufacturing, wholesale trade, and transportation—all leading to the sale of merchandise, either through a store (i.e., a “brick and mortar” retailer) or a nonstore retailer (i.e., catalog or Internet sales), to the general public.

Retail is the second-largest industry in the United States after services when measured in terms of employment or number of establishments. Retail sales in the United States (excluding food) reached some $3.9 trillion in 2006. The retail industry accounts for about 11% of U.S. jobs (see Table 3.5). Measured in terms of GDP, retail makes up slightly less than 7% of the total U.S. economy (see Table 3.6). Retail employment is concentrated in and around the nation’s most populous areas, employment centers (see Figure 3.7), and business districts, as well as in locations favored by tourists.

#### Table 3.5 Employment in Retail Industry

<table>
<thead>
<tr>
<th>Employment</th>
<th>Share/Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail Trade</td>
<td>15,393,300</td>
</tr>
<tr>
<td>Total U.S.</td>
<td>140,206,762</td>
</tr>
</tbody>
</table>

Retail sales growth has remained relatively steady over recent decades. However, the industry has undergone significant transformations resulting from the establishment of large national retail chains, outsourcing of manufacturing, and use of the Internet as a sales channel.

The movement toward online, nonstore retailing has been a significant trend in the industry. In 2006, sales via the Internet increased to $104 billion, up 18% from the previous year. Internet sales reached 3% of total retail sales. While still a small portion of total sales, these nontraditional channels increase the need for freight services. Whereas most retail shopping is done by consumers driving their own cars to retail outlets, the growth of nonstore shopping increases the need for direct home delivery of parcels provided by FedEx, United Parcel Service, or the United States Postal Service.
The medium-term outlook for the retail industry will be influenced by several factors:

- **Consumer debt.** American consumers are carrying larger personal debt loads, which may reduce the discretionary income needed to buy merchandise. Personal debt combined with declining housing prices, tightened lending standards, and reduced liquidity may impact consumer buying patterns in the short to medium term.

- **Quality concerns for products manufactured overseas.** There have been several product recalls in recent months due to unsafe components found in toys, foods, and other products. Regulations may be strengthened to monitor imports, and quality concerns may affect retail supply chains. U.S. toy retailers and distributors already are showing a renewed emphasis on U.S. sourcing.

- **Depreciation of the dollar.** The decline of the dollar is putting upward price pressure on imported retail merchandise. Higher costs may impact the balance of imported and domestically sourced goods being sold to U.S. consumers by making American products more price competitive.

### Transportation and the Retail Industry

The retail industry in the United States is characterized by the tremendous variety of products it delivers to millions of consumers in domestic and international markets. These products are brought to market through sophisticated logistics channels that put significant demands on the nation’s intermodal transportation system. Retail goods comprise a large and rising share of total imports, much of which pass through high-volume container port facilities at Los Angeles and Long Beach, then make truck connections in inland intermodal terminals before finding their places on store shelves. The intermodal supply chains essential to the retail industry stretch around the globe are vulnerable to both recurring and unanticipated transportation bottlenecks that restrict the efficient movement of consumer goods.

Worldwide sourcing has been a common trend in the retail industry, and many of the consumer products sold by retailers in the U.S. market are now manufactured in China, Mexico, Jordan, India, and Vietnam. One-third of all U.S. imports (most of this retail merchandise) now come from the Pacific Rim. Trans-Pacific trade is forecasted to grow significantly, fueled by the manufacturing capacity of China and by factors including the elimination of import quotas on textiles and apparel. Despite a clear trend on the part of retail importers to diversify ports of entry, nearly 40% of all U.S. containerized imports enter the country through the ports of Los Angeles and Long Beach. To mitigate the risk of service disruptions at West Coast ports and to better reach the populous eastern U.S. market, some retailers are splitting imports of their consumer merchandise shipments between the Pacific and Atlantic Coasts.

In 2004, the increase in Asian trade, coupled with inaccurate business forecasting by stakeholders, resulted in six to eight days or more of additional transit time for U.S. retailers for most of the June through October peak shipping season, as an
unanticipated spike in container traffic strained the West Coast ports, notably Los Angeles and Long Beach. The overload was felt in virtually all aspects of marine terminal operations and spilled over onto the region’s highways and railroads. Although railroads have expanded service and capacity across their networks to meet the demand for high-volume and relatively more profitable intermodal double-stack train service for hauling retail goods imported through West Coast ports to Midwest and East Coast markets, intermodal rail network congestion resulted in two to three days of additional transit time for cargo moving off the West Coast to the Midwest and points east of the Mississippi.

Toys exemplify the impact of congestion and infrastructure weaknesses on retailers. The efficiencies that have been reaped in the toy supply chain are being reversed by inadequate port capacity and unreliable intermodal schedules. In 2001, space and throughput constraints, as well as the threat of work stoppages at the Port of Los Angeles, forced one retailer to ship by airfreight instead of ocean, and to subcontract an offsite third-party distributor to find space for two to three times its historical levels of inventory. Other retailers are routinely diverting imports from Los Angeles to Seattle and Vancouver to mitigate the risk of bottlenecks. The industry-wide effect is higher cost and less reliable product availability. These types of adjustments create significant cost burdens on retailers in terms of higher transportation and inventory expenses.

With trade continuing to rise, delays and congestion are expected to grow in the future, especially through Southern California, but not limited to that region. Retailers with distribution warehouse capacity on the East Coast are using all-water routes to alternate ports such as Jacksonville, Savannah, Charleston, Hampton Roads, New York/New Jersey, and the Gulf Coast. Kohl’s department store, for example, is almost balanced between its East and West Coast imports. But there are limits to this option. The Panama Canal cannot serve the largest of the modern container ships. Trade through the Suez Canal from Southeast Asia and the Indian subcontinent can be increased, but only if ships are available and the shippers can accept longer transit times.39

Retailers have flexed their muscle in recent years by establishing tight delivery-time windows and pushing transportation and logistics problems back onto their suppliers. In most cases they charge stiff penalties for noncompliance. Depending on the specific schedule of contract penalty charges, rail and truck delays can quickly cost a consumer products manufacturer more than the margin that would have been earned on the shipment. This complex system of performance penalties shows how deep the problem of transportation reliability has become for both manufacturers and retailers.

The trend toward reducing inventory levels to only slim balances, accomplished by pushing the responsibility back into the supply chain, is one of the most significant new business models of this century. Kohl’s operates almost entirely as a moving supply

chain—for example, quickly moving consumer goods from the Port of Los Angeles to Chicago by rail, and then making final distribution to retailers by truck—with almost no fixed inventory in the system. The expected transit time for this entire “speed sourcing” process is only five days from port to retailer. This operational strategy to minimize stock levels and optimize labor places tremendous pressure on the transportation system to carry inventory responsively and predictably; with this strategy, in-transit inventories essentially replace warehouses. The reliability of deliveries depends on roadways, ports, rail, and other hard infrastructure to function as planned.

Metropolitan congestion also increases delivery times, making it more difficult for retailers to ensure that they have the right products on the shelves at the right time. Travel delays in major American cities have risen dramatically over the last 20 years, making retail delivery a real challenge for consumer goods companies.

In response to Chicago area congestion, a U.S. auto maker, during a major promotion of a new product, transfers cars from national truck drivers to local truck drivers at a suburban lot so the automobiles can be delivered to retail dealers quickly. The switch from national to local drivers is necessitated by Chicago’s congestion and the advantages of having truck drivers familiar with how to avoid local bottlenecks to make deliveries.

These types of practices demonstrate resilience, and are internalized as a cost of doing business, but they do have tangible impacts (e.g., need for more truck drivers and trucks and lost time). As one of the country’s largest employers, retailers also are dependent on local transportation infrastructure—roadways and public transit—to bring workers to their jobs, often to locations within the most congested downtown and suburban areas.

**Addressing Industry Needs**

Among the transportation proposals advanced by industry to help solve these transportation problems are the following:

- Improve the productivity, efficiency, and throughput of U.S. ports. Suggested improvements include extending port hours and appointment systems, shuttling trains to inland distribution centers, spreading vessel sailings, and using chassis pools.
- Encourage the development of Oakland, California, and Pacific Northwest ports, as well as East Coast and Gulf Coast ports, as alternative gateways for Pacific Rim trade.
- Increase investment in intermodal rail to increase the capacity and velocity of trains moving containers across the country and to address choke points at east-west interchanges such as Chicago, as well as to provide an alternative to trucks on shorter haul north-south routes in the eastern United States.
- Increase public resources on nationally significant freight projects, investing wisely where they will have the biggest return, and in consultation with shippers to help understand business trends affecting the value of future capacity enhancements.
Deal with metropolitan congestion through highway and transit operations and capacity improvements.

The last federal surface transportation legislation created a program to fund projects of national and regional significance. This program might have partially addressed the problems highlighted by the retail industry, but the SAFETEA-LU program was entirely earmarked, with much of it expended on projects of less than national and regional significance. Early freight-oriented proposals for the reauthorization of SAFETEA-LU, such as the proposals for a Critical Commerce Corridors program, offer hope that more attention will be paid to critical international gateways and corridors in the future.

Meanwhile, state and local governments and the private sector have responded within their capabilities to ease infrastructure pressures in their regions, although community and environmental impacts are an increasing challenge. For example, the Los Angeles/Long Beach Clean Air Action Plan is seeking to reduce diesel pollution by 80% and could cost upwards of $1 billion. The cost of moving freight through the ports will rise, with one estimate predicting that freight rates could increase 80%. The retail industry believes that a balanced plan that includes improved infrastructure, congestion relief, and pollution reduction will be needed. A combination of public and private funding sources will be required to address these large interrelated challenges.

3.5 Services Sector

Industry Profile and Outlook

The service industry is the dominant U.S. industry in terms of employment (48% of total) and contribution to economic output (51% of total).\textsuperscript{40,41} As the national proportion of employment in services continues to increase, the effects are seen at every level of the economy. Regionally, even in states considered to be breadbasket economies such as Iowa, or automotive-alley economies such as Michigan, the services sector provides more than two-thirds of state gross product.\textsuperscript{42} As seen in Figure 3.8, the services sector’s share of national employment has grown steadily since 1940 and increased more rapidly since 1990.

\textsuperscript{40} Bureau of Labor Statistics, 2006 Census of Employment and Wages. Services-producing industries include only Transportation, Information, Finance and Real Estate, Professional and Business, Education and Health, Leisure and Hospitality, and other services. Percentage is a total of all nonfarm, private activity and excludes government services employment.

\textsuperscript{41} Bureau of Economic Analysis, National Economic Accounts, 2006. Services-producing industries include those listed above, and percentage is a total of all private, nongovernment activity.

\textsuperscript{42} Bureau of Economic Analysis, Survey of Current Business, Regional Data, November, 2006.
Figure 3.8  Goods-Producing and Services-Producing Employment Share
1940 to 2005

Source: Bureau of Labor Statistics, Census of Employment and Wages. This figure depicts a broader definition of services
(includes wholesale trade, retail trade, and transportation services) than analyzed in the services industry section
of this report.

The services sector includes several large and growing industries, among them
information (e.g., media, communications); finance; business and professional
services; education and health services; leisure and hospitality; and other services (see
Tables 3.7 and 3.8).

Table 3.7  Employment in Services Industry

<table>
<thead>
<tr>
<th></th>
<th>Employment</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>3,099,000</td>
<td>2.2%</td>
</tr>
<tr>
<td>Financial services</td>
<td>8,448,000</td>
<td>6.0%</td>
</tr>
<tr>
<td>Professional and business</td>
<td>17,950,000</td>
<td>12.8%</td>
</tr>
<tr>
<td>Education and health</td>
<td>18,531,000</td>
<td>13.2%</td>
</tr>
<tr>
<td>Leisure and hospitality</td>
<td>13,612,000</td>
<td>9.7%</td>
</tr>
<tr>
<td>Other services</td>
<td>5,477,000</td>
<td>3.9%</td>
</tr>
<tr>
<td>Services Sector</td>
<td>67,117,000</td>
<td>48% of U.S. jobs</td>
</tr>
<tr>
<td><strong>Total U.S.</strong></td>
<td><strong>140,206,762</strong></td>
<td></td>
</tr>
</tbody>
</table>
Table 3.8  U.S. Gross Domestic Product in Services Industry

<table>
<thead>
<tr>
<th>Industry</th>
<th>Gross Domestic Product</th>
<th>Share/Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>$579.2 billion</td>
<td>4.4%/increasing</td>
</tr>
<tr>
<td>Financial services</td>
<td>$2,758.6 billion</td>
<td>20.8%/increasing</td>
</tr>
<tr>
<td>Professional and business</td>
<td>$1,564.6 billion</td>
<td>11.8%/expanding</td>
</tr>
<tr>
<td>Education and health</td>
<td>$1,035.0 billion</td>
<td>7.8%/expanding</td>
</tr>
<tr>
<td>Leisure and hospitality</td>
<td>$471.8 billion</td>
<td>3.6%/increasing</td>
</tr>
<tr>
<td>Other services</td>
<td>$295.7 billion</td>
<td>2.2%/increasing</td>
</tr>
<tr>
<td>Services Sector</td>
<td>$6,704.9 billion</td>
<td>51% of U.S. economy</td>
</tr>
<tr>
<td><strong>Total U.S.</strong></td>
<td><strong>$13,246.6 billion</strong></td>
<td></td>
</tr>
</tbody>
</table>


Growth in the services industries is driven by increasing business and consumer demand. Businesses demand increasingly efficient communication, finance, transportation, and distribution services in order to develop competitive advantages and as essential inputs into the production of goods and other services. For consumers, as personal income grows so does demand for services such as banking, telecommunications, tourism, and entertainment. In general, demand for services caused by population and income growth rises more rapidly than does the demand for manufactured or agricultural products.

These interactions are reinforcing; as personal income grows, consumers demand more services, expanding economic activity and employment in services and driving further income growth. Growth in compensation offered by the services sector contributed more than one-half of the total percentage change in metropolitan area personal income from 2005 to 2006, the largest contribution of any industry sector. Similarly, business expansion fuels demand for increasingly complex, layered, and technology-driven services. This results in service innovations that provide additional bases for business growth and competition.

Small, medium, and large service companies all play key roles in terms of capital formation, business expansion, and new job generation. Small firms comprise the majority of service-providing enterprises and continue to provide the most employment generation and growth potential. Activities once performed in-house by major industrial or retail firms and government are being spun off or outsourced to services firms.

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43 Bureau of Economic Analysis, Personal Income for Metropolitan Areas, 2006. Measures the contribution of compensation growth to percent change in personal income by industry.

These activities include advertising, marketing, logistics, communications, information technology, engineering, and human resources management. This trend has been a major source of competition and innovation in emerging services industries, and one that has spurred productivity improvements across many other industries. Services businesses are often considered “force multipliers,” or industries that expand opportunities and increase productivity across other sectors of the economy. Services firms are the primary consumers of information technology services and products. Development of these services and products has spurred much of the growth in U.S. economic productivity.

Trade in services also is changing quickly. International markets for services offer new opportunities for U.S. firms, and trade in services accounts for nearly one-third of total U.S. exports. The United States exports and imports many high-value services, including financial, legal, engineering, architectural, and software development services. Services are increasingly important to international trade, and were highlighted in the most recent Doha round of negotiations on the General Agreement on Trade in Services.

One aspect of international trade in services is the facilitation of business-related travel and the need of U.S. companies to facilitate the temporary entry into the United States of key business personnel, including professionals, managers, consultants, and highly skilled experts and technicians. Many services firms are affected by tight quotas on domestic H-1B entry visas, which constrict the availability of skilled foreign employees. In 2005, $280 billion worth of services were imported and $360 billion were exported, primarily in financial services, with major trading markets in Europe and Asia. Additionally, sales in foreign markets through U.S. services companies operating abroad reached $489 billion in 2004, the latest year for which figures were available. With dramatic cost and speed reductions and reliability improvements in the transportation of people and the communication of information, the services market now includes some of the most intensive international competition.

Another important example of international trade in services is tourism. Foreign visitation has recovered from the post-9/11 decline and has become a significant source of positive balance of payments. U.S. tourism accounted for 26% of all services exports and 7% of overall exports in 2006. The favorable trade balance of $7.3 billion in 2006 is the 18th year of a positive balance in tourism; however, since the late 1990s, the balance has been slipping as foreign flag carriers have gained share of U.S. citizens’ travel expenditures and overall travel activity waned after 9/11. The year 2006 was the first in which the United States reached a higher level of tourism exports than in the year 2000—$107.4 billion in international travel receipts compared to the previous record of $103.1 billion set in 2000. Nevertheless, the number of total

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45 Office of the US Trade Representative, Benefits of Trade and Services, January 2007.
visitors has not rebounded yet to 2000 levels for many of the countries that are major sources of visitors to the United States. Even so, the number of visitors is prodigious. Almost 51 million visitors to the United States arrived in 2006—roughly 16 million from Canada, 13 million from Mexico, and 22 million from overseas origins. This had a substantial impact on the U.S. economy. The Office of Travel and Tourism Industries (OTTI) in the U.S. Department of Commerce is projecting 61 million visitors by 2011, a growth rate of about 20% for the five-year period.

**Industry Transportation Issues**

The services sector is very dependent on transportation systems to get access to workers. The services sector has been automating many functions, but the majority of its services must still be delivered in person. This means that effective service delivery depends on the mobility of both the producer (the worker) and the consumer (the client) of services.

The following key transportation issues face the industry today:

- Congestion imposes heavy costs on the services industry and its customers, since service delivery is concentrated in metropolitan regions. Industries like education and health service providers traditionally have located in clusters; for example, large urban college campuses and hospital and specialty-care provider centers. However, the benefits of centralizing are eroded by the costs imposed by congestion in our major metropolitan areas.

  Valencia Community College in Orlando reported that it was building multiple satellite branches within the Central Florida region because congestion has dramatically reduced the ability of part-time students to get to the central campus. Healthcare and services providers are also shifting to small facilities in neighborhood locations, further away from population centers, sacrificing the benefits of centralization such as quality and breadth of offerings because their customers cannot afford the time and cost of traveling to central locations.

- Some major employers are able to offer commuting and transportation options to their employees (such as carpooling, transit subsidies, in-house transit programs, and private investments in infrastructure) that enable firms to overcome the costs of congestion. However, the majority of businesses in the United States are small firms that are unable to provide these services.

- Employee business travel is increasingly at risk of delay when driving within a congested metropolitan sales region or flying and being subjected to increased aviation delays.

- The favorable trade balance in international tourism has been slipping; post-9/11 security requirements and aviation congestion and reliability exacerbate this trend.
Services sector employers are having to reach farther out into a bigger market shed to draw on the needed specialized worker pool. Housing costs have tended to push workers farther out from central areas. The transportation system needs to provide for longer-distance commutes to meet these needs. On average, the nation is rapidly approaching 30% of workers leaving their home counties to work.

A June 2007 article in the Washington Post laments the difficulty that parents who work in downtown Washington, DC, but live in the outlying suburbs, have in attending their kids’ evening soccer, t-ball, baseball, and softball games. Parents who are coaches and must arrive early to set up equipment, have an especially hard time, often arriving in their office clothes directly from work. Games are routinely pushed back 30 to 60 minutes, and leagues are overtaxed because only one game can be played each evening on a field.

Addressing Industry Needs

Consistent with the scope of its operations, the services industry is looking for broad changes and improvements to the transportation system focused largely on improved state and metropolitan planning and program delivery to do the following:

- Better engage and consider service industry growth needs in the transportation planning process. Many small businesses have difficulty effectively communicating to state and regional transportation officials.
- Better link land-use development and infrastructure planning, including smart growth, mixed-use development, and transit-oriented development approaches, to improve access to services and quality of life.
- Reduce metropolitan congestion through highway operations and capacity additions.
- Increase transit and commuter rail options to provide more choices and access for service workers and clients.
- Better consider tourism visitor needs in planning. This is a large industry for many states, but local planners often are not sensitive to the difficulty of visitors navigating unfamiliar geography and making transfers among modes.
- Address aviation congestion, which is affecting business and tourism travel, among other aspects of the economy and society.
- Increase transportation funding and provide more financing options for states and local governments, including the full range of local option fees and tax choices.
3.6 Transportation and Logistics Services Sector

Industry Profile and Outlook

We would be remiss if we did not highlight the importance of the transportation sector itself—a large part of the U.S. economy in its own right, and the provider of the transportation services that allow the rest of the U.S. economy to operate. The transportation service providers—the motor carriers, railroads, air carriers, steamship operators, public transit providers, and distributors—play an enormous role in the economy, whether moving bulk commodities long distances, delivering express packages to residences and offices, flying people and goods around the globe for next-day delivery, or restocking the shelves of the nation’s stores nightly.

Transportation service providers are absolutely dependent on the connectivity, speed, throughput capacity, and reliability of the infrastructure that comprises the U.S. transportation network. These providers, whether private or public, confront and adapt to the conditions of the country’s transportation infrastructure constantly to meet the demands of America’s businesses and traveling public. Their ability to offer efficient transportation services at economical rates is instrumental to the success of all other sectors of the U.S. economy. Transportation service providers experience the country’s transportation deficiencies firsthand—whether traffic jams on overcapacity roadways, delays at major airports with runway configurations that can function only during optimal weather conditions, or a daylong wait to enter a congested port. As these and other transportation deficiencies worsen and infrastructure failures become more common, the ability of transportation providers to offer efficient and cost-effective service deteriorates, damaging not only their own companies’ bottom lines but those of the companies and the people they serve.

The transportation industry’s history of innovation and application of new technologies can be linked to significant advances in the U.S. economy. The transportation industry has evolved substantially since Wells Fargo and the Pony Express first promised fast and reliable delivery services across the continent. Since then, FedEx and UPS have created an express delivery market with a worldwide reach, and companies of all kinds now have the ability to deliver products quickly, more flexibly, and globally. Quicker delivery has extended sales ranges, allowing businesses to serve customers in relatively remote locations. Quick adjustment to changing modes of transport (rail to truck), full integration of new technologies (e.g., UPC codes and GPS to track shipments and inventory precisely, automated sorting facilities), as well as basic service improvements (same-day delivery) have made the transportation and logistics industry a contributor to business productivity increases around the globe.

Other productivity enhancements within the transportation service industry, including the deregulation of the industry and containerization, also have resulted in cost savings
that can be passed on to consumers and businesses. Both passenger and freight transportation industry productivity was spurred by deregulation starting in the late 1970s, increasing competition among providers and pushing companies to identify and adopt practices to differentiate themselves within the marketplace on the basis of service or cost. Growth in transportation productivity also has benefited from the adoption of universal standards for containerization. The growth in containerization has led to more efficient intermodal and international freight transport, as containers can be lifted, loaded, and hauled by companies worldwide using the same equipment.

Constant improvements in productivity have been a hallmark of the transportation industry in recent decades. These improvements have allowed the industry to provide a greater range of services, often at lower cost, to its customers and have reverberated throughout the U.S. economy. The labor productivity improvements experienced by for-hire transportation firms between 1993 and 2003 are illustrated in Figure 3.9.

Productivity Advances Improves Transportation Firm's Wall Street Performance. At Norfolk Southern, moving to a scheduled railroad and making hundreds of small improvements throughout the system has allowed the railroad to make major advances: Since 2000, carload volume has risen 14 percent while the number of cars needed to move that volume has dropped 11 percent. Average train speed has risen 7 percent while downtime in yards has dropped 7 percent. Those metrics resulted in annual savings of $100 million, against an expenditure of less than $6 million to overhaul the operating system. And investors have rewarded the company, as the stock has far outpaced the broad market and the peer index over the past few years.


Figure 3.9 Labor Productivity of the For-Hire Transportation Industries 1993 to 2003
The transportation and logistics services industry represents 8% of jobs and 9% of the U.S. economy, as shown in Tables 3.9 and 3.10. The value of the industry’s output is steadily growing, but its share of the U.S. economy has actually declined very slowly since 1950—a testament to efficiency and productivity gains that have allowed the transportation industry to meet the nation’s mobility needs without having to grow faster than the nation’s economy as a whole.

**Table 3.9  Employment in the Transportation Industry**

<table>
<thead>
<tr>
<th>Employment</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation</td>
<td>3,882,800</td>
</tr>
<tr>
<td>Warehousing</td>
<td>659,500</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>6,028,500</td>
</tr>
<tr>
<td>Transportation Sector</td>
<td>10,570,800</td>
</tr>
<tr>
<td><strong>Total U.S.</strong></td>
<td><strong>140,206,762</strong></td>
</tr>
</tbody>
</table>


**Table 3.10  U.S. Gross Domestic Product in Transportation and Logistics Industry**

<table>
<thead>
<tr>
<th>Gross Domestic Product</th>
<th>Share/Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation</td>
<td>$363.7 billion</td>
</tr>
<tr>
<td>Warehousing</td>
<td>$34.0 billion&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>$788.7 billion</td>
</tr>
<tr>
<td>Transportation Sector</td>
<td>$1,152.40 billion</td>
</tr>
<tr>
<td><strong>TOTAL U.S.</strong></td>
<td><strong>$13,246.6 billion</strong></td>
</tr>
</tbody>
</table>


Transportation and logistics services, like other services, are provided directly to businesses and consumers by specialized firms. However, in many cases transportation services are not sourced to outside firms, but are provided internally by larger retail, wholesale, manufacturing, and even natural resource businesses. The most visible example is the retailer Wal-Mart, whose company trucks are seen regularly on highways. As a result of this internal economic activity, the contribution of transportation services to total economic activity and industry growth is underrepresented in national economic data. Most national tabulations of transportation services account only for the more easily measured value of the for-hire transportation portion of the industry and exclude
the contribution of in-house transportation within nontransportation firms (such as the economic contribution of Wal-Mart’s vast trucking fleet). According to the BTS Transportation Services Index for Freight, and as shown in Figure 3.10, the transport, warehousing, wholesale, and logistics industry has grown in tandem with the robust expansion of the overall U.S. economy during the last 15 years, slowing only recently. Passenger services are now tracking overall U.S. economic growth and have resumed an upward trajectory following a sharp downturn following 9/11. In general, transportation industries are procyclical with the U.S. economy—meaning they expand and contract in parallel with U.S. economic cycles.

Figure 3.10  Bureau of Transportation Statistics, Annual Index of Transportation Services 1990 to 2006

Source: Bureau of Transportation Statistics.

From a household perspective, for-hire transportation is a relatively small portion of household transportation expenditures, according to the Consumer Expenditure...
Survey.48 It reports that approximately 95% of household transportation spending goes to self-provided transport—the acquisition, use, and maintenance of family vehicles. Only about 5% goes to “purchased transportation,” which includes anything one pays a fare or fee to use: air carriers, transit, taxis, intercity vehicles, cruise ships, etc., but does not include spending to purchase and operate a motor vehicle. Total purchased household passenger transportation spending is about $450 per year. Of that amount, more than 80% is attributable to travel and tourism, including air fares, intercity and local bus and rail fares, and cruise ships. None of these amounts include business travel for which traveler expenditures are reimbursed by an employer. Of significant interest are the purchases of transportation by foreign visitors—a key component of the economies of many states and cities. While in the United States, foreign visitors spend approximately 14% of their total expenditures for transportation—an average of $232 per visitor. They tend to be more dependent on purchased transportation and are more likely to use intercity rail and bus and local transit services than the average American.

Industry Transportation Issues

As main users of the nation’s transportation infrastructure, transportation and logistics services industries are intimately aware of the system’s benefits and deficiencies, both in terms of how well it serves their own needs and how well it meets the demands of their customers. The needs of the transportation and logistics services industries are represented throughout this report and in the previous discussion of each of the large economic sectors they serve. However, the main issues encountered by the transportation and logistics services industry include the following:

- Near-gridlock conditions on major metropolitan roads during peak travel hours are adding costs to the operations of the country’s trucking firms. Hard-fought gains in productivity are now being eroded by forgone time and the operational expenses (e.g., fuel consumption, vehicle wear and tear, driver costs) of sitting in traffic.
- Transit, commuter rail, and intercity passenger funding is falling well short of needs at all levels of government.
- Rail freight capacity expansion is developing into a key issue. After years of substantial surplus capacity, rail volumes are rising, leading to congestion on major corridors and gridlock in and near major rail hubs and key ports. The Association of American Railroads reports that railroads plan to increase private capital investment to add capacity where needed and meet the growing demand for rail services, but may not be able to meet future needs without public investment.49

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On the water side, access is constrained by channel depth, which limits the size of ships that call at a port. The largest of the modern megacarrierships and tankers can be accommodated at only a limited number of U.S. ports, and most of those ports must routinely dredge and deepen their harbor channels and pier areas to maintain access.

The U.S. aviation system was once the envy of the world, but today we no longer lead. Severe congestion in major airports such as Atlanta, Chicago, Philadelphia, and all three major New York City–area airports ripple through the U.S. air traffic system, causing delays nationwide. These capacity problems are caused by both airside and landside traffic bottlenecks. Air space is limited because planes must maintain set distances as they approach busy airports, leading to delays at peak times—a condition exacerbated by an antiquated air traffic control system. On the landside, the United States is falling behind European and Asian rivals in investing in new airports.

Industry Transportation Proposals

- The freight railroads are proposing investment tax credits to encourage additional private sector investment in rail and related intermodal facilities.
- The American Trucking Associations (ATA) is proposing investments in truck freight corridors, including exclusive truck lanes, as part of SAFETEA-LU reauthorization; both shippers’ groups and the trucking industry are proposing increases in truck size and weight to improve productivity.
- Industry representatives support freight bottleneck relief efforts at gateways (e.g., ports, airports, international border crossings) and along key corridors and intermodal connectors.
- The American Association of Port Authorities (AAPA) advocates spending down the funds accumulating in the Harbor Maintenance Trust Fund for port dredging. AAPA also supports removal of the Harbor Maintenance Tax from domestic cargoes to encourage domestic short sea shipping.
- The transit industry is urging Congress to fully fund the federal transit program at the SAFETEA-LU-authorized levels to preserve the existing transit infrastructure and is advocating increased investment at all levels of government to expand and improve transit systems to meet emerging needs.
- A recent report for the National Transportation Policy Commission advocates increased intercity passenger rail investment to enhance passenger service in and between emerging megaregions.
- The industry is looking for expansion of airport capacity and upgrades to the nation’s air traffic control system to relieve aviation congestion.
4.0 Transportation Systems and Services

Freight and passenger transportation are multimodal systems, consisting of a network of highway, transit, rail, marine, and air links connected through intermodal terminals, hubs, and transfer facilities. In examining the potential of the nation’s transportation system to support continued economic growth and prosperity, it is important to consider how these transportation systems are performing both under today’s conditions and under projected levels of future travel demand.

This section begins with a brief summary of the projected growth in demand for transportation services, and then examines various performance indicators, concluding with a look at increased investment in other countries. The conclusion is that the performance of the U.S. transportation system is deteriorating and projected to worsen in the absence of investments that are significantly larger than those that have been made in recent years. Meanwhile, international competitors are embarking on major new infrastructure improvement programs.

4.1 Overall Demand for Transportation

Sections 2 and 3 provide a picture of the freight and passenger transportation needs of our nation’s business sectors and individual households. America’s leading role in commerce is placing enormous demands on its transportation infrastructure. At the same time, our citizens depend heavily on much of that same transportation system for access to their jobs, shopping, and recreation.

Substantial economic growth and population increases are projected for the coming decades. In the next 30 years, the U.S. population is projected to grow from 300 million to 380 million. Absent major disruptions such as global sustained recessions, increased trade barriers, and major global conflicts, the U.S. economy will more than double in real terms, and household wealth will increase in real terms from $37,000 per capita to about $66,000 per capita. This larger, richer, and more mobile nation cannot ride into the future on today’s transportation system. 50

Vehicle-miles of travel are likely to increase by 80% in the next 30 years. To reduce congestion and meet the growing demand for public transportation, AASHTO and