Freight in America

A New National Picture

U.S. Department of Transportation
Research and Innovative Technology Administration
Bureau of Transportation Statistics

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JANUARY 2006

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Table of Contents

List of Tables

List of Figures

List of Boxes

FREIGHT IN AMERICA

EXECUTIVE SUMMARY— THE BOTTOM LINE

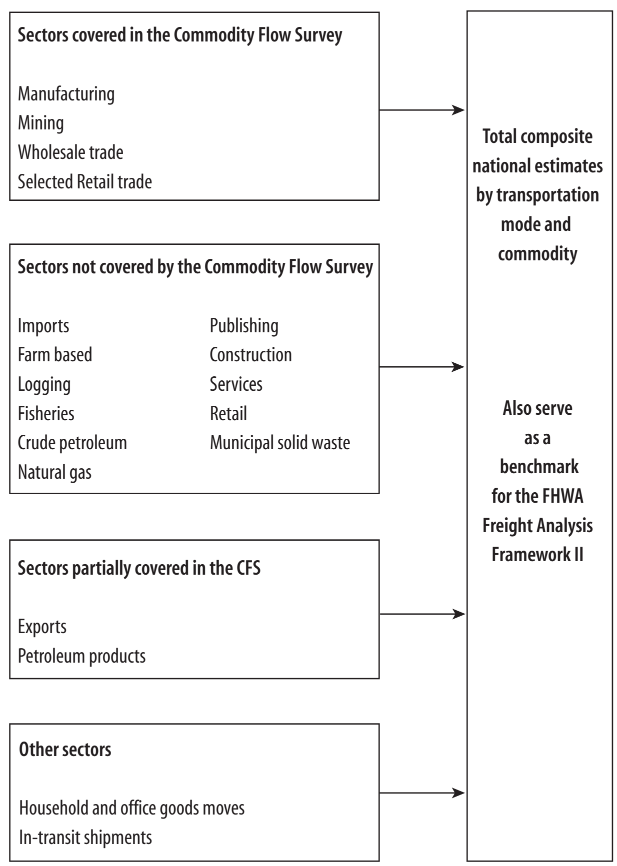
According to new estimates by the Bureau of Transportation Statistics (BTS) of the U.S. Department of Transportation's Research and Innovative Technology Administration (RITA) and the Federal Highway Administration (FHWA), over 19 billion tons of freight, valued at $13 trillion, was carried over 4.4 trillion ton-miles in the United States in 2002. This means that on a typical day in the United States in 2002, about 53 million tons of goods valued at about $36 billion moved nearly 12 billion ton-miles on the nation's multimodal transportation network.[1] The new estimates combine data from the Commodity Flow Survey (CFS)—the most comprehensive nationwide source of freight data—and data from other sources to provide the most complete picture of freight movement in America yet available (exhibit A).

This report discusses the resulting composite estimates, using 2002, the year of the latest CFS, as the baseline. It also discusses more recent data for specific modes, the geography of freight movements in the United States, and the growing importance of international trade to the U.S. freight transportation system.

As the U.S. freight transportation system advances further into the 21st Century, the need for managing the demand on the system and monitoring the volume of freight handled by each transportation mode will remain critical. It is important to know how much freight and what type of goods move on our nation's transportation network. These and other data about the kind of transportation mode, vehicle or vessel characteristics, and facility type are needed to track, monitor conditions and performance, evaluate investment needs, and fully measure the many ways freight interacts with and enables economic activity.

Today, businesses depend on the interconnected transportation network to move myriads of goods, from raw materials such as lumber, coal, and petroleum products to manufactured goods including medical supplies, furniture, household appliances, and computers. More than ever before, Americans take for granted buying imported fresh fruits, vegetables, and flowers at their local supermarkets; next-day delivery of goods purchased over the Internet; and tracking express packages online to know their whereabouts at any given time. These everyday occurrences result from the availability of a vast transportation network, changes in

EXHIBIT A



[1] These new national estimates were jointly developed by the RITA Bureau of Transportation Statistics and the FHWA Office of Freight Management and Operations as part of the Freight Analysis Framework II and the Commodity Flow Survey data program.

freight delivery services and freight carrier operations, and improvements in freight logistics due in part to advancements in information technology and the Internet.

While goods movement in the United States is changing, some long-standing freight trends persist and new ones are emerging. Among the modes of transportation, trucking remains the shipping choice for many businesses and is increasing its market share. Air freight and express delivery are growing the most rapidly, although air cargo remains a small and specialized part of freight activity in terms of tonnage. Intermodal freight is increasing and use of containers for multimodal shipments is rising. Growing demand for more efficient and faster delivery of high value, low weight products is changing the structure of the freight industry, creating new alliances among shippers, carriers, and logistics providers. At the same time, enormous volumes of bulk commodities—whether grains, lumber, ores, coal, or oil—continue to move into, out of, and within the United States. These trends continue to shape freight transportation and transportation's importance to the U.S. economy.

Major Highlights

Composite Estimates

- The composite estimates show that much more freight moves on the nation's freight transportation system than previously reported in the CFS.
- They show that in 2002, by value 36 percent of the freight moved nationally was non-CFS shipments; about 40 percent by tonnage and about 29 percent by ton-miles were non-CFS.
- On a per-capita basis, the composite estimates indicate that an average of about 68 tons of freight (135,338 pounds) valued at $45,324 were transported about 15,310 ton-miles for every American resident in 2002.

Transportation Mode

- Whether measured by value, weight, or ton-miles of the composite estimates, trucking as a single mode (including for-hire and private use) was the most frequently used mode, hauling an estimated 70 percent of the total value, 60 percent of the weight, and 34 percent of the overall ton-miles.
- Measured by ton-miles of the composite estimates, trucking was followed by rail at 31 percent, pipeline at 16 percent, and water with 11 percent. In general, trucking dominated shipment distances of less than 500 miles while rail dominated the longer distance shipments.

International

- According to the new composite estimates, nearly 1.7 billion tons of merchandise moved in and out of the United States in 2002, accounting for over 9 percent of the 19 billion tons of the total commercial freight transported on the nation's transportation system.

In 2004, the top five freight gateways represented the three transportation modes—water, air, and land. The John F. Kennedy (JFK) International Airport was the leading gateway for international trade by value, the Port of Los Angeles ranked second in value, and the Port of Long Beach ranked third. These were followed by the land border crossing of Detroit and the Port of New York and New Jersey.

Commodity Flow Survey (CFS) Estimates

Commodities

The composite estimates do not provide the detailed information about shipments provided by the CFS. Hence, the report relies on the CFS data to discuss commodity-specific shipments, shipments distance, weight, and geography of freight shipments.

- According to the CFS, in 2002, more than $1 out of every $10 (11 percent) of freight goods shipped was for electronic, electrical, and office equipment, down slightly from 13 percent of the value in 1997.
- One out of every six tons transported by freight carriers covered in the CFS was gravel and crushed stone.
- The top commodity by ton-miles in 2002 was coal, carrying 686 billion tons and accounting for about 22 percent of all CFS ton-miles.

Distance

- In 2002, more than three-quarters (77 percent) of the weight (9 billion tons) of all CFS shipments and over half the value ($4.6 trillion), moved in local and short haul shipments, within 250 miles from origin. However, long-haul shipments—more than 250 miles—carried 82 percent of the ton-miles.

Size

- Smaller sized shipments (less than 500 pounds) accounted for about 25 percent of the value of CFS shipments. Of these shipments, those weighing less than 100 pounds grew even faster by value between 1993 and 2002—65 percent by value.

Geography

- By value, the leading state of origin for CFS shipments was California with 11 percent ($924 billion) of the value of total CFS shipments, followed by Texas with 7 percent of the value. Other leading states of origin by value include Ohio and Illinois.
- By weight, the leading states of origin for outbound CFS shipments include Texas, California, and Illinois.
- By value, the Los Angeles-Long Beach-Riverside metro area was the lead for outbound CFS shipments originating in metropolitan areas.
- By weight, the leading metropolitan areas were: Houston-Baytown-Huntsville, Texas; Chicago-Naperville-Michigan City (Illinois part); and Los Angeles-Long Beach-Riverside.
- Nationally, nearly 60 percent of the value of CFS freight shipments by all modes, worth $4.9 trillion, crossed state lines in *interstate commerce*. By weight 34 percent of the shipments, over 4 billion tons was interstate.

Each transportation mode continues to play an important role in the movement of freight, whether hauling large quantities of bulk commodities or perishables over great distances, carrying smaller packages to the main streets and back roads of America, or flying high-value merchandise to and from our trading partners abroad. Growth in the U.S. economy, increases in wholesale and retail trade, and changes in our overseas trading partners will continue to affect the level of U.S. freight shipments and the demand for freight transportation services. By 2020 the nation's freight tonnage is projected to increase nearly 70 percent (USDOT FHWA 2003).[2] With this expected growth, the need to better track changes in how freight moves and monitor the possible impacts on system capacity, congestion, safety, and the environment will be of major importance.

THE NATION'S FREIGHT

Introduction

As the data in this report show, the U.S. freight transportation system carries enormous quantities of goods and raw materials to support economic and industrial activities all across the nation and to meet consumer demands. The system also handles large volumes of goods traded internationally and transported to and from the United States and places throughout the world. Freight transportation touches every aspect of American economic life. Goods movement is increasingly part of a complex logistical system that serves an increasingly globalized economy. Transportation's vital importance to the U.S. economy is underscored by the fact that more than $1 out of every $10 produced in the U.S. gross domestic product (GDP) is related to transportation activity (USDOT BTS 2005).[3]

Freight in America presents new estimates of freight movements in the United States that are more comprehensive than the Commodity Flow Survey (CFS) and covers domestic shipments from all the major economic sectors as well as exports and imports. It uses final data from the 2002 CFS and composite estimates compiled from many sources to fill gaps in CFS coverage by industry, commodity, and transportation mode (boxes A and B).[4] The new estimates include a large quan-

[2] This projection is based on the 1998 benchmark reported by the Federal Highway Administration's Freight Analysis Framework.

[3] This includes all aspects of transportation, including the movement of goods and the purchase of all transportation-related products and services as well as the movement of people.

[4] This report is more complete than the April 2004 *Freight Shipments in America* preliminary highlights report that was based on the preliminary 2002 CFS data. In this report estimates of the nation's freight shipments differ from the initial estimates. For instance, CFS' share of total shipments in this report are lower than the preliminary estimates due to the addition of estimates for previously uncovered sectors, such as construction, retail, services, and municipal solid waste.

BOX A

The New National Freight Composite Estimates

The largest single data source for estimating U.S. freight activity is the Commodity Flow Survey (CFS). This survey covers a large proportion of the nation's domestic and export freight movements associated with manufacturing, mining, and wholesale trade. However, it does not capture all of the freight that moves on the U.S. freight system because many economic activities are not covered. In order to report on the current state of freight shipments in America and to describe the major changes that are taking place in U.S. freight transportation, this report makes use of several other data sources to provide a more complete snapshot of the nation's freight activities in 2002 (the year of the most recent CFS). Where 2003 and 2004 data are available, such as goods imports and exports and overall ton-miles, this report also uses these data to describe recent freight activity.

The composite estimates presented in this report are the result of a joint effort by the Research and Innovative Technology Administration (RITA), Bureau of Transportation Statistics (BTS) and the Federal Highway Administration (FHWA), Office of Freight Management and Operations, to develop a more complete picture of the nation's commercial freight shipments, including all economic sectors that handle freight in one way or another (see exhibit A). This fuller composite picture draws on the CFS data and non-CFS freight data from several sources for economic sectors not covered in the CFS, such as retail, services, construction, and households goods movements – that traditionally are not perceived as freight "producers" but that do handle freight in their daily operations. It also includes shipments of agricultural products from farms to processing plants, logs and rough wood, fishery products, crude petroleum, and municipal solid waste. The new composite estimate is different and larger than the BTS estimates published in the *Freight Shipments in America* report, which used preliminary 2002 CFS data, not the final data used here, and does not include the non-CFS shipments discussed above.

Some data gaps still exist in the national freight picture. The new estimates do not include transshipments, such as shipments from Canada that are transported on U.S. highways to Mexico but do not officially enter into the U.S. economy. With the exception of municipal solid waste, the estimates do not include government shipments. The composite estimates, using the current methods, were developed for 2002 only. Because the additional complementary data have not been assembled for 1993 and 1997, the other CFS years, the report uses only the CFS data when discussing changes in freight movements by type of transportation modes used in moving the nation's freight, the kinds of commodities moved, and the distances traveled.

In order to make comparisons by mode, commodity, and other freight characteristics and determine, for example, which commodities are shipped the most, BTS performed statistical significance testing on CFS data for freight value, weight, and ton-miles.[1] It was not practical to do this testing for the non-CFS estimates because they were drawn from different sources and some of the estimates are modeled data with many assumptions that cannot be tested statistically.

Throughout this report, a statistically significant difference between two different entities in the CFS (numbers, groups, classifications, categories, etc. developed from a sample) is measured at the 10 percent level. This provides a 90 percent level of certainty about CFS estimates. That is, if we were to repeatedly make new estimates using exactly the same procedure (by drawing a new sample, conducting new interviews, calculating new estimates and new confidence intervals), the confidence intervals would contain the average of all the estimates 90 percent of the time.

[1] The BTS Office of Survey Programs performed the statistical significance testing for this report, using statistical reliability methods based on Raj and Chandhok 1998.

tity of material often not counted in domestic freight surveys, such as municipal solid waste, goods handled by the service sector, and household and office relocations.[5] Each mode carries more freight and uses more of the freight infrastructure than previously documented.

The 2002 CFS final national data were released in December 2004 by the Research and Innovative Technology Administration's (RITA) Bureau of Transportation Statistics (BTS) and the U.S. Census Bureau. Composite estimates in this report were subsequently developed by BTS and the Federal Highway Administration from multiple data sources to complement the CFS data and provide a better picture of commercial freight movements—both domestic and U.S.-international.

This report presents snapshots of changes in freight movements that occurred between 1993 and 2002, highlighting major trends during this period where the data allow such comparisons. *Freight in America* discusses recent trends in freight charac-

[5] As explained in box A, the CFS covers most but not all commercial freight activity in the United States. BTS and Federal Highway Administration supplemented the CFS data with other data sources to create a detailed picture of the nation's commercial freight flows.

BOX B

How the 2002 National Freight Composite Estimates Were Derived

The composite estimates include data from the Commodity Flow Survey (CFS) and data from sectors not covered in the CFS. The estimates were derived for each mode of transportation and at the 2-digit Standard Classification of Transported Goods (SCTG) level. Below is a brief description of the coverage, methods, and sources for these data:

Component	Coverage, methods, and sources
COMMODITY FLOW SURVEY DATA	
In-scope sectors	Covers domestic and export shipments by manufacturing, mining, wholesale trade, and selected retail sectors. Based on published results of the 2002 CFS as reported by the Bureau of Transportation Statistics and the U.S. Census Bureau.
NONCOMMODITY FLOW SURVEY DATA INCLUDED IN THE COMPOSITE ESTIMATES	
(a) Out-of-scope: sectors in the North American Industry Classification System (NAICS) not covered in the 2002 CFS	
Imports	Covers official U.S. merchandise imports trade by mode and commodity. Value and weight information derived from trade data. Ton-miles derived as a sum of tonnage multiplied by estimated shipment travel distance for each mode.
Farm-based	Covers farm-based agricultural shipments that occur prior to storage in off farm facilities (e.g., grain elevators) or processing plants (e.g., fruit and live stock distribution centers). Estimates based on the 2002 Census of Agriculture and the U.S. Department of Agriculture's 2004 Agricultural Statistics.
Fisheries	Covers fishery shipments that go from fishing vessels to processing/distribution centers, excluding farm-raised fish which is covered by the CFS. Based on tonnage data from the 2002 Fisheries of the United States by the National Marine Fisheries Service and vehicle mileage data from the Vehicle Inventory and Use Survey (VIUS).
Crude petroleum	Covers crude petroleum shipments by oil and gas extraction industries. Based on data from the Energy Information Administration (EIA) Petroleum Supply Annual 2002, the Federal Energy Regulatory Commission, and Shifts in Petroleum Transportation published by the Association of Oil Pipelines.
Natural gas	Covers natural gas shipments by oil and gas extraction industries. Based on data from EIA's Natural Gas Annual and the information from the Federal Energy Regulatory Commission.
Municipal solid waste	Covers waste collected by municipalities, such as household trash, cardboard boxes, consumer appliances, newspapers, and yard trimmings. Excludes wastes such as sludge, agricultural wastes, and industrial wastes. Based on data from various state and municipal agencies and information from the *BioCycle Journal of Composting and Organics Recycling.*
Logging	Logging is out of scope for the 2002 CFS because of the change from the Standard Industrial Classification (SIC) to the North American Industry Classification System (NAICS). Estimates based on data from the U.S. Department of Agriculture's Agricultural Statistics, the Rail Waybill Sample, and the Waterborne Commerce of United States.
Publishing	In 2002, publishing became out of scope because of the change from the Standard Industryial Classification (SIC) to the North American Industry Classification System (NAICS). Estimates based on data from the Economic Census and average miles per shipment information from the 1997 CFS.
Construction	Covers shipments of companies engaged in construction of residential and commercial buildings, utility systems, road and bridge construction, and specialty trade contractors. Estimates based on the Vehicle Inventory and Use Survey (VIUS), the Economic Census, and average miles per shipment information by commodity from the 1997 CFS.
Services	Covers shipments from service sector companies engaged in, for example, accommodation and food, rental and leasing, repair and maintenance, and scientific and technical services. Estimates based on the VIUS, the Economic Census, and average miles per shipment information by commodity from the 1997 CFS.

(continued on next page)

BOX B
How the 2002 National Freight Composite Estimates Were Derived—Continued

Component	Coverage, methods, and sources
(b) In-scope: sectors are in the CFS but coverage is incomplete	
Retail	Covers retail companies, including motor vehicle and parts dealers; furniture, home goods, electronic and appliance, building materials, clothing, etc. stores; and general merchandise stores.
Exports	Represents the net difference between official U.S. merchandise exports and the exports measured in the CFS by mode and commodity. Based on U.S.-international merchandise trade.
Petroleum products	Represents the net difference between petroleum products measured in the CFS and reported by the Association of Oil Pipe Lines and the Energy Information Administration.
(c) Other	
Household and office moves	Covers movement of household goods and used institutional or commercial furniture and equipment. Data from the Economic Census and the American Moving and Storage Association.
In-transit	Covers shipments from a foreign country passing through the United States to another foreign country, for example, shipments from Canada to Mexico via the United States. Based on U.S.-international merchandise trade data.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics. Adapted from the technical reports developed during estimation of the out-of-scope sectors and the composite estimates, October 2005.

teristics, such as length of haul, shipment size, and commodities shipped. The report also highlights the geography of freight movements, including freight movements at the state, regional, and metropolitan area levels; interstate freight shipments; and U.S.-international freight movements.

Composite Estimates of U.S. Freight Shipments, 2002

What the Estimates Show

The composite estimates show that American businesses transported over 19 billion tons of raw materials and finished goods in 2002 from the covered freight generating economic sectors (table 1).[6] The value of these freight shipments in 2002, including domestic commodity movements and domestic transportation of exports and imports, was $13 trillion. These large quantities of freight shipments are diverse and include manufactured goods, electronic equipment, grain moved along the Mississippi River to Gulf Coast ports, furniture and fixtures from household and office relocations, and farm products as well as crude petroleum and natural gas shipments (see boxes B and C).

Whether transported from farms, factories, or seaports and moved by trucks, trains, vessels, pipelines, or airplanes, the freight moved in 2002 generated more than 4.4 trillion ton-miles over the nation's freight transportation system. The shipments moved over an extensive freight transportation system supported by sophisticated information technology and operated, managed, and maintained by a large number of establishments employing a large labor force (table 2).

Comparison of the 2002 CFS and the Composite Estimates

As a proportion of the composite estimates, the 2002 CFS accounted for:

- 65 percent of the $13 trillion in total shipment value,

[6] 2002 is the most recent year for which comprehensive nationwide freight estimates are available for all modes of transportation and for local, intercity, interstate, and U.S.-international freight shipments. See boxes A and B for additional information.

TABLE 1
Commercial Freight Activity in the United States by Transportation Mode: 2002
(Based on composite estimates)[1]

Transportation mode	Modal estimates: Value (billion $)	Tons (million)	Ton–miles (billion)	Relative shares (percent): Value	Tons	Ton-miles
All modes[1]	13,052	19,487	4,409	100.0	100.0	100.0
Single modes	11,599	18,894	4,073	88.9	97.0	92.4
Truck[2]	9,075	11,712	1,515	69.5	60.1	34.4
Rail	392	1,979	1,372	3.0	10.2	31.1
Water	673	1,668	485	5.2	8.6	11.0
Air (incl. truck and air)	563	6	13	4.3	—	0.3
Pipeline[3]	896	3,529	688	6.9	18.1	15.6
Multiple modes	1,121	229	233	8.6	1.2	5.3
Parcel, postal, or courier	1,022	27	21	7.8	0.1	0.5
Truck and rail	77	52	50	0.6	0.3	1.1
Other multiple modes[4]	22	150	162	0.20	0.8	3.7
Unknown modes	331	365	103	2.5	1.9	2.3

KEY: — Represents measurement less than one-tenth of one percent.

[1] These composite estimates include Commodity Flow Survey (CFS) data and out-of-scope shipments for sectors that are not included in the CFS, such as imports, logging, construction, retail, services, publishing, municipal solid waste, and household and business moves. They also include estimates of in-scope shipments for sectors that are covered in CFS, including some sectors that may have been underestimated due to small sample size, such as exports, intermodal, and petroleum products. These composite estimates serve as the 2002 benchmark data for the FHWA Freight Analysis Framework II.

[2] "Truck" as a single mode includes shipments that were made by private truck only, for-hire truck only, or a combination of private and for-hire truck.

[3] Estimates for pipeline include shipments of crude petroleum.

[4] Other multiple modes include combinations of truck and water, rail and water, and other combinations.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2002 Commodity Flow Survey, United States Data, December 2004, plus sources for composite estimates listed in box B. The composite estimates were developed through a cooperative effort by the Bureau of Transportation Statistics and the Federal Highway Administration.

- 60 percent of the 19 billion tons of total shipments, and
- 71 percent of the 4.4 trillion ton-miles of estimated total commercial freight movement.

Table 3 provides the estimates of value, tons, and ton-miles of total U.S. freight shipments by transportation mode and the relative shares of the CFS component compared with the component not covered by the CFS. The composite estimates could be further revised as the estimation methods are improved.

Other differences between the CFS subtotals and the data sources used to develop the composite picture, relate to value, modal combinations, average shipment distance, and commodity mix (table 3). For example, shipments covered by the CFS were valued at $720 per ton compared with about $590 per ton of shipments measured in the non-CFS data. The non-CFS data have lower average value per ton because these data include heavier products such as crude oil, some petroleum products, and municipal solid waste. The CFS reported the average distance traveled per shipment-ton to be about 270 miles while the non-CFS calculations estimated an average of about 160 miles per ton. The proportional shares of CFS and non-CFS shipments also vary in terms of freight modes. Most imports are not covered in the CFS component, but are included in the non-CFS estimates. Hence, the portion of total estimates for water, air, and pipeline reported by the non-CFS estimate

BOX C

Interpreting Shipment Value and Tonnage Data in the Composite Estimates

The new freight totals are larger than the value-added and final weight of materials used in products purchased by consumers and other end-users. Also, the total value of shipments is not directly comparable to the national Gross Domestic Product (GDP) because GDP measures the value added or net output of production. The value of goods measured in the CFS includes the market value of goods used in production as well as final demand; hence the goods may be counted more than once in the production life cycle.

While the composite estimates of *total freight shipments* provide the most complete commercial freight picture for *all modes of transportation*, they exclude most government shipments, except municipal solid waste.

The new national composite estimates define a shipment in a similar manner as defined in the CFS. A shipment is a single movement of goods, commodities, or products from an establishment to a single customer or to another establishment owned or operated by the same company as the originating establishment (e.g., a warehouse, distribution center, or retail or wholesale outlet). Shipments are recounted every time the goods change hands from one establishment to another. Full or partial truckloads are counted as a single shipment only if all commodities on the truck are destined for the same location. If a truck makes multiple deliveries on a route, each stop is counted as one shipment.

For the sectors covered in the CFS, a shipment is counted to represent a transportation movement and measures the true origins and destinations as contrasted with terminal-to-terminal movements. Even where shipments are carried by more than one transportation mode, the shipment information covers the ultimate origins and destinations. However, because the CFS data are from shippers and not carriers, the data do not accurately measure intermodal combinations used for transporting the goods. This lack of accurate modal information affects the level of intermodal shipments, because some of these shipments are grouped into other and unknown modes.

For the non-CFS sectors, shipments represent the total goods generated, handled, or transported by that sector. Because actual information on true origins and destination is not available for nearly all these non-CFS sectors, the new estimates cover an approximate distance representing the average distance traveled by particular commodities and transportation modes. This is particularly the case for merchandise imports, where detail information on ultimate domestic destination of goods by commodity and mode or whether and where the goods changed hands are nonexistent. And so, for example, the value and tonnage of imported freight are not counted multiple times as the goods arrive at U.S. ports and are transported to their true final destinations elsewhere in the country or to local warehouses and distribution centers. However, if the imports happen to be transported to a domestic U.S. establishment that is covered by the CFS, then those goods will be measured by the CFS and as such will be double counted in these new composite estimates. Currently, BTS and FHWA do not have the information necessary to remove such potential double counting.

data sources exceed the estimates captured in the CFS. For instance, the non-CFS data accounted for over 53 percent of the total value of air shipments and over 80 percent of the total value of water shipments.

Table 4 shows the relative shares of the composite estimates by CFS and non-CFS components and a breakdown of the non-CFS portion. By value, the major non-CFS commodities include goods transported by the construction sector, imports, natural gas, retail sector goods, and service sector. By weight, the largest non-CFS sectors are natural gas, imports, farm-based products, and crude petroleum.

The key highlight to be gleaned from the new composite estimates is illustrated by figure 1, which shows a breakdown of the overall estimate into the proportion covered by the CFS and the non-CFS data in terms of value, weight, and ton-miles. The charts clearly illustrate the largest data gaps filled by the joint BTS and FHWA cooperative effort.

- Measured by value, the non-CFS supplemental data accounted for over 80 percent each of water and pipeline shipments, mostly because of the CFS exclusion of imports and crude petroleum; over half of air shipments; nearly

TABLE 2
Major Elements of the U.S. Freight Transportation System: 2002

Mode	System extent
Highway	Public roads
	46,769 miles of Interstate highway
	115,032 miles of other National Highway System roads
	3,828,046 miles of other roads
Air	Public-use airports
	5,286 airports
Rail	Miles of railroad operated
	98,944 miles by Class I freight railroads in the United States[1]
	15,648 miles by regional freight railroads
	26,347 miles by local freight railroads
Water	26,000 miles of navigable waterways
	Commercial waterway facilities
	Great Lakes: 600 miles deep-draft
	Great Lakes: 154 miles shallow-draft
	Inland: 2,361 miles shallow-draft
	Ocean: 4,284 miles deep-draft
	Ocean: 1,765 miles shallow-draft
	Locks: 275 miles
Pipeline	Oil
	Crude lines: 64,336 miles of pipe
	Product lines: 75,565 miles of pipe
	Gas
	Transmission: 309,503 miles of pipe
	Distribution: 1,079,565 miles of pipe

[1] Includes 570 miles of railroad owned by Canada.

SOURCE: Various sources, as cited in USDOT, Bureau of Transportation Statistics (BTS), *National Transportation Statistics*, available at http:// www.bts.gov; Association of American Railroads, *Railroad Facts, 2003* (Washington, DC: 2004); USDOT, Federal Highway Administration, *Highway Statistics 2003* (Washington, DC: 2004), table HM-18; Oil & Gas Journal, Aug. 23, 2004; USDOT, Federal Transit Administration, *2002 National Transit Summaries and Trends*, table 18 and appendix, available at www.ntdprogram.com; USDOT, BTS, "Airport Activity Statistics of Certificated Air Carriers, Summary Tables, 12 Months Ending Dec. 31, 2002," 2004; U.S. Army Corps of Engineers, Institute for Water Resources, Navigation Data Center, *The U.S. Waterway System Facts, December 2003* (Alexandria, VA: 2003).

one-third of truck shipments; and about one-fifth of rail shipments.

- The picture changes when measured by weight, with the non-CFS data accounting for 80 percent of the pipeline tonnage, 59 percent of the water shipments, 40 percent of the air shipments, one-third of truck shipments and, about 5 percent of rail mode shipments.
- By ton-miles, the non-CFS data accounted for nearly all of the pipeline shipments because the 2002 CFS did not cover crude petroleum and natural gas movements. These supplemental data accounted for about 42 percent of water ton-miles, 17 percent of the truck ton-miles and about 8 percent of the rail ton-miles.

TABLE 3
Modal Breakdown of Composite Estimates of U.S. Commercial Freight: 2002
(Based on composite estimates)[1]

Transportation mode	Value (billion $) CFS 2002	Value (billion $) Non CFS	Value (billion $) Total[1]	Tons (million) CFS 2002	Tons (million) Non CFS	Tons (million) Total[1]	Ton–miles (billion) CFS 2002	Ton–miles (billion) Non CFS	Ton–miles (billion) Total[1]
All Modes	8,397	4,655	13,052	11,668	7,819	19,487	3,138	1,271	4,409
Single modes	7,049	4,549	11,599	11,087	7,807	18,894	2,868	1,205	4,073
Truck[2]	6,235	2,840	9,075	7,843	3,870	11,712	1,256	259	1,515
Rail	311	81	392	1,874	105	1,979	1,262	110	1,372
Water	89	584	673	681	987	1,668	283	202	485
Air (incl. truck and air)	265	298	563	4	3	6	6	8	13
Pipeline[3]	149	747	896	685	2,844	3,529	S	688	688
Multiple modes	1,079	42	1,121	217	12	229	226	7	233
Parcel, postal, or courier	988	34	1,022	26	2	27	19	2	21
Truck and rail	70	7	77	43	9	52	46	5	50
Other multiple modes[4]	22	1	22	148	2	150	161	0.5	162
Unknown modes	269	62	331	365	—	365	44	59	103
Percent of relative share of total	64.3	35.7	100.0	59.9	40.1	100.0	71.2	28.8	100.0

KEY: — Represents data cell equal to zero or less than 1 unit of measure.

S = Estimate does not meet publication standards because of high sampling variability or poor response quality.

[1] These composite estimates include Commodity Flow Survey (CFS) data and out-of-scope shipments for sectors that are not included in the CFS such as imports, logging, construction, retail, services, publishing, municipal solid waste, and household and business moves. They also include estimates of in-scope shipments for sectors that are covered in CFS but may have been underestimated due to small sample size, such as exports, intermodal, and petroleum products. These composite estimates serve as the 2002 benchmark data for the FHWA Freight Analysis Framework II.

[2] "Truck" as a single mode includes shipments that were made by only private truck, only for-hire truck, or a combination of private and for-hire truck.

[3] Estimates for pipeline include shipments of crude petroleum.

[4] Other multiple modes include combination of truck and water, rail and water, and other combinations.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2002 Commodity Flow Survey, U.S. Data, December 2004, plus sources for composite estimates listed in box B. The composite estimates were developed through a cooperative effort by the Bureau of Transportation Statistics and the Federal Highway Administration.

Commodity Flow Survey Estimates

Major Commodity Groups[7]

Table 5 presents the value, weight, and ton-miles as well as the relative shares for the major CFS commodities shipped by U.S. businesses.[8] See box D for the meaning of these estimates in the CFS. Because the CFS does not cover several important commodities, such as crude petroleum pipeline movements and imports and because commodity details for sectors such as retail, services, and construction are unavailable, the CFS commodity data presented in this section underestimates the true amount of these commodities transported over our nation's freight network.[9]

[7] Most of the findings presented in this section are based on the CFS only data. Detailed information on type of commodity is not available for *all* of the supplementary data. Where the commodity information is available (i.e., crude petroleum, municipal solid waste, imports and exports) the report uses the data in the discussions.

[8] The commodities are based on the two-digit Standard Classification of Transported Goods (SCTG) coding system.

[9] While BTS has aggregate estimates of the major missing pieces, such as imports, crude petroleum, logging, and some of the in-scope sectors that are underrepresented in the CFS, further analysis of the commodity level out-of-scope retail, service, and construction sectors is needed to determine how much of each commodity in these sectors were transported. BTS and FHWA are continuing to research the supplemental data.

TABLE 4
Percent Shares of the Sectors Covered in the Composite Estimates of U.S. Commercial Freight: 2002

Sectors	Value (Percent)	Tons (Percent)	Ton-miles (Percent)
Total composite estimate	100.0	100.0	100.0
CFS total	64.6	59.9	71.2
Non-CFS total	35.7	40.1	28.8
Construction	9.8	4.5	1.3
Imports	8.9	5.9	6.0
Natural gas	4.5	9.7	7.8
Retail	4.4	2.6	0.5
Services	2.9	1.9	0.7
Farm-based	1.5	5.4	0.9
Publishing	1.1	0.2	0.4
Net exports[1]	0.8	0.1	0.1
Crude petroleum	0.7	4.6	6.5
Municipal solid waste	0.3	2.5	0.5
Petroleum products	0.2	0.5	3.5
Households and business moves	0.1	0.1	0.1
Logging	0.1	1.9	0.5
Fisheries	—	—	—

KEY: — Represents measurement less than one-tenth of one percent.

[1] Net exports represent the difference between U.S. official merchandise trade exports and the Commodity Flow Survey estimates. These composite estimates serve as the 2002 benchmark data for the FHWA Freight Analysis Framework II.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2002 Commodity Flow Survey, U.S. Data, December 2004, plus additional composite estimates. The composite estimates were developed through a cooperative effort by the Bureau of Transportation Statistics and the Federal Highway Administration.

Value

In 2002, electronic, electrical, and office equipment; mixed freight; and motorized and other vehicles, including parts, led the list of commodities covered by the CFS in terms of shipment value (table 5). Businesses shipped $891 billion of electronic goods (SCTG 35) in 2002, compared to $864 billion in 1997. Mixed freight shipments, another leading commodity by value, accounted for $840 billion or about 10 percent of the CFS shipments in 2002, up from 3.4 percent in 1997.

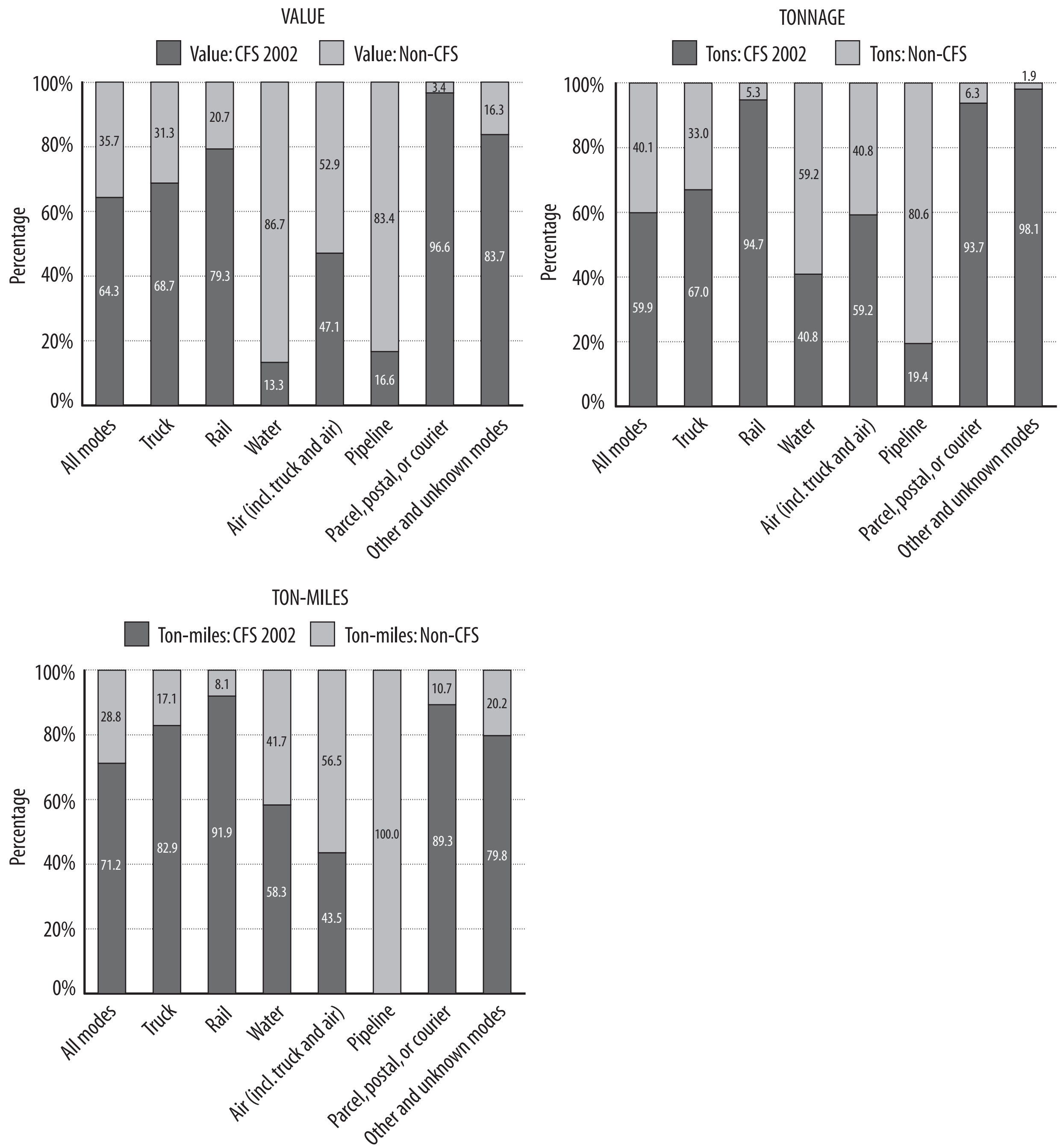
Tonnage

By weight, the leading commodity group was gravel and crushed stone, a low-value-per-ton commodity group that is typically transported only short distances (table 5). One out of every six tons identified in the CFS was gravel and crushed stone. The shipments of 1.9 billion tons were 16 percent of the weight measured in the 2002 CFS. In 2002, other leading commodity groups by weight included coal, gasoline and aviation fuel, and nonmetallic mineral products. Although gravel and crushed stone was 16 percent of total CFS tons, shipments in this category accounted for less than 1 percent of the value and about 3 percent of the ton-miles of all CFS shipments, impacting mostly local transportation. Gravel and stone shipments traveled an average of about 57 miles per ton (figure 2).

Ton-Miles

Coal led the list of CFS commodities in terms of ton-miles in 2002 (table 5). With 686 billion

FIGURE 1
Breakdown of the National Freight Composite Estimates by Data Source and Mode: 2002



NOTE: These composite estimates include Commodity Flow Survey (CFS) data and out-of-scope shipments for sectors that are not included in the CFS such as imports, logging, construction, retail, services, publishing, municipal solid waste, and household and business moves. They also include estimates of in-scope shipments for sectors that are covered in the CFS but which may have been underestimated due to small sample size, such as for the exports, intermodal, and petroleum products sectors.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2002 Commodity Flow Survey, U.S. Data, December 2004, plus sources for composite estimates listed in box B. The composite estimates were developed through a cooperative effort by the Bureau of Transportation Statistics and the Federal Highway Administration.

TABLE 5
Freight Shipments by Two-Digit Commodity: 1997 and 2002
(Commodity Flow Survey data only)

SCTG	Commodity description	Value, tons, and ton-miles 1997	Value, tons, and ton-miles 2002	Percentage of total 1997	Percentage of total 2002
	Leading 2002 value (billions)				
	CFS total	6,860	8,397	100.0	100.0
35	Electronic, electrical, and office equipment	864	891	12.6	10.6
43	Mixed freight[1]	233	840	3.4	10.0
36	Motorized and other vehicles (including parts)	569	749	8.3	8.9
34	Machinery	418	484	6.1	5.8
21	Pharmaceutical products	226	479	3.3	5.7
30	Textiles, leather, and articles of textiles or leather	377	466	5.5	5.6
40	Miscellaneous manufactured products	418	387	6.1	4.6
7	Other prepared foodstuffs, fats, and oils	343	356	5.0	4.2
24	Plastics and rubber	281	326	4.1	3.9
17	Gasoline and aviation turbine fuel	220	279	3.2	3.3
	Leading 2002 tonnage (millions)				
	CFS total	10,566	11,668	100.0	100.0
12	Gravel and crushed stone	1,817	1,866	17.2	16.0
15	Coal	1,215	1,240	11.5	10.6
17	Gasoline and aviation turbine fuel	877	1,064	8.3	9.1
31	Nonmetallic mineral products	909	968	8.6	8.3
2	Cereal grains	486	561	4.6	4.8
18	Fuel oils	475	549	4.5	4.7
11	Natural sands	444	473	4.2	4.1
7	Other prepared foodstuffs and fats and oils	402	449	3.8	3.8
19	Coal and petroleum products, n.e.c.	475	448	4.5	3.8
20	Basic chemicals	296	348	2.8	3.0
	Leading 2002 ton-miles (billions)				
	CFS total	2,593	3,138	100.0	100.0
15	Coal	542	686	20.9	21.9
2	Cereal grains	200	264	7.7	8.4
7	Other prepared foodstuffs and fats and oils	124	162	4.8	5.1
31	Nonmetallic mineral products	91	136	3.5	4.3
32	Base metal in primary or semifinished forms and in finished basic shapes	117	121	4.5	3.9
26	Wood products	93	120	3.6	3.8
17	Gasoline and aviation turbine fuel	101	117	3.9	3.7
20	Basic chemicals	137	116	5.3	3.7
3	Other agricultural products	80	109	3.1	3.5
12	Gravel and crushed stone	93	106	3.6	3.4

KEY: SCTG = Standard Classification of Transported Goods.

n.e.c. = Not elsewhere classified.

[1]Mixed freight shipments include: supplies and food for restaurants and fast food chains, items (including food) for grocery and convenience stores, hardware or plumbing supplies (not elsewhere classified), office supplies, and miscellaneous.

NOTE: The CFS totals in this table differ from the larger composite estimate totals specified in the text and in the tables because they do not include additions to account for the out-of-scope missing pieces and some in-scope segments that were underrepresented in the CFS, such as waterborne and pipeline shipments.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, based on data from the 1997 and 2002 Commodity Flow Survey, December 2004.

BOX D

Interpreting Value, Tons, and Ton-Miles in the Commodity Flow Survey

Example of Shipment Flow

Value of shipments. The CFS defines the value of shipments as the market value in dollars of goods shipped by businesses. It represents the net selling value, excluding freight charges and taxes. CFS measures the value of shipments of materials used to produce or manufacture a product and the value of shipments of the finished product. This means that the value of the intermediate materials used to produce a particular product could contribute multiple times to the value if it is shipped multiple times during the survey year. For example, if a $1,000 product is shipped from a manufacturer in Boston, MA to a distributor in Washington, DC, who ships it to a wholesaler in Chicago, IL, who then ships it to a retail outlet in Los Angeles, CA, the value of the shipment (product) is counted three times if the manufacturer, distributor, and wholesaler are sampled by the CFS. Each shipment is counted to represent each transportation movement (solid lines in the map). The same product is counted only once, however, if it is directly shipped from the manufacturer in Boston to the retailer in Los Angeles (dotted line in the map).

Tonnage of shipments. This represents the total weight of a shipment. Businesses report the entire weight of a shipment in pounds. As with value of shipments above, the tonnage of a product could be counted multiple times depending on the number of times the product is transported in the production and consumption cycle.

Ton-miles. Ton-miles measure the shipment weight multiplied by the mileage traveled by the shipment. Businesses report shipment weight in pounds. Aggregated pound-miles were converted to ton-miles. Mileage is calculated as the distance between the shipment origin and destination ZIP Codes. For all shipments, the CFS mileage excludes the international portion of the distance, starting from the final U.S. port of exit. For example, mileages from Alaska to the continental United States exclude any mileages through Canada. And air shipments from Denver, Colorado to Japan exclude the mileage over U.S. airspace from the airport in Denver. Unlike value and tonnage, the CFS total for ton-miles is not subject to multiple counting because the number of times goods are shipped does not affect the calculations.

For additional information, visit http://www.bts.gov/cfs.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics based on Bureau of Transportation Statistics and U.S. Department of Commerce, Census Bureau, *2002 Economic Census: Transportation 2002 Commodity Flow Survey, United States 2002.* December 2004; and examples from the Bureau of Transportation Statistics.

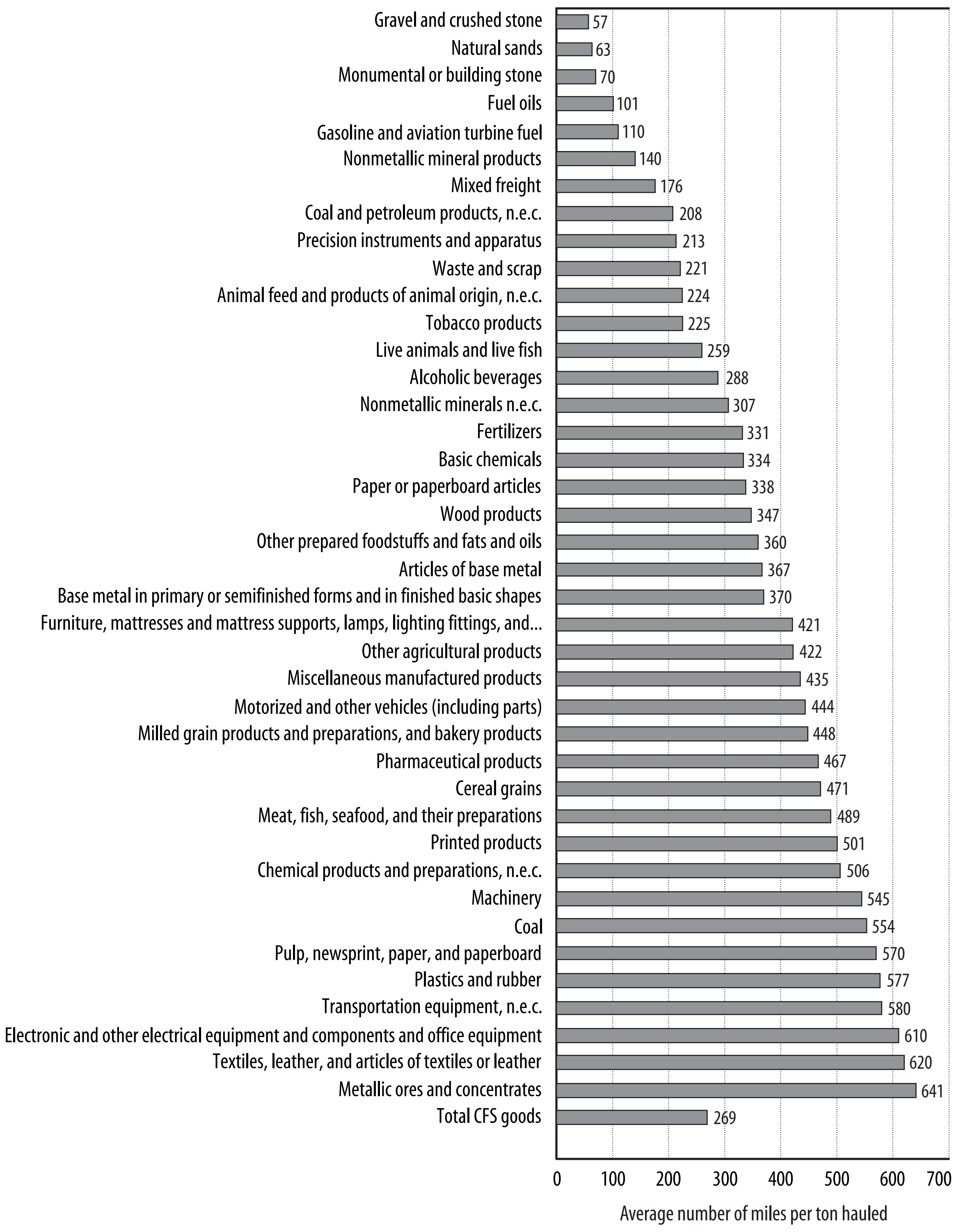
ton-miles in 2002, coal accounted for about 22 percent of all CFS ton-miles and more than twice the ton-miles of cereal grains, the second leading commodity group (table 5). Coal and cereal grains were followed by prepared foodstuffs, nonmetallic mineral and products, and base metals. Coal generated the most ton-miles because, unlike gravel and stone which tends to be produced and used in the same locale, coal production is concentrated in relatively few areas and is often shipped long distances. For example, coal mined in Wyoming is transported nationwide, to coal-fired power plants in particular states, and to export locations.[10] In 2002, a ton of coal was shipped 554 miles on average, far above the 269 average miles per ton for all commodities (figure 2).

[10] Coal from Kentucky, Pennsylvania, and West Virginia is consumed almost entirely east of the Mississippi River.

Hazardous Materials Shipments

Hazardous materials shipments move by truck, train, vessel, and airplane in quantities ranging from several ounces to thousands of tons. In the United States, the U.S. Department of Transportation's (USDOT's) Pipeline and Hazardous Materials Safety Administration (PHMSA) has responsibility for the safe transportation of hazardous materials to industry and consumers by all transportation modes, including the nation's pipelines. Hazardous materials are essential to the U.S. and global economy. They include fossil fuels used in cars, trucks, power plants, and heating and cooling homes and offices, as well as petrochemi-

FIGURE 2
Average Length of Haul by Major Commodity Group: 2002
(Commodity Flow Survey data only)



SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, based on data from the 2002 Commodity Flow Survey, December 2004.

TABLE 6
Hazardous Material Shipment Characteristics by Mode of Transportation: 2002
(Commodity Flow Survey data only)

Mode of transportation	Value 2002 (million $)	Value Percent	Tons 2002 (thousands)	Tons Percent	Ton-miles 2002 (millions)	Ton-miles Percent
All modes	660,181	100.0	2,191,519	100.0	326,727	100.0
Single modes	644,489	97.6	2,158,533	98.5	311,897	95.5
Truck[1]	419,630	63.6	1,159,514	52.9	110,163	33.7
For-hire truck	189,803	28.8	449,503	20.5	65,112	19.9
Private truck	226,660	34.3	702,186	32.0	44,087	13.5
Rail	31,339	4.7	109,369	5.0	72,087	22.1
Water	46,856	7.1	228,197	10.4	70,649	21.6
Air (includes truck and air)	1,643	0.2	64	—	85	—
Pipeline[2]	145,021	22.0	661,390	30.2	S	S
Multiple modes	9,631	1.5	18,745	0.9	12,488	3.8
Parcel, postal, or courier	4,268	0.6	245	—	119	—
Other multiple modes	5,363	0.8	18,500	0.8	12,369	3.8
Other and unknown modes	6,061	0.9	14,241	0.6	2,342	0.7

KEY: — Represents an estimate equal to zero or less than 1 unit of measure.

S = Estimate does not meet publication standards because of high sampling variability or poor response quality.

[1] "Truck" as a single mode includes shipments that were made by only private truck, only for-hire truck, or a combination of private and for-hire truck.

[2] Estimates for pipeline exclude shipments of crude petroleum.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, and U.S. Census Bureau, 2002 Commodity Flow Survey, Hazmat Data, December 2004.

cal feedstock. And they are also used for farming and medical applications and in manufacturing, mining, and other industrial processes.

According to Commodity Flow Survey (CFS) data, there were 2.2 billion tons of hazardous materials shipments in the United States in 2002 (table 6). Trucks carried about 53 percent of this CFS tonnage. Pipelines carried 660 million tons of shipments or roughly 30 percent of total tonnage of hazardous shipments measured in the 2002 CFS. However, the CFS does not include crude petroleum shipments. The U.S. Department of Transportation categorizes hazardous materials into nine hazard classes.[11] By weight, trucks carried 93 percent of Class 1 explosives, 53 percent of Class 3 flammable liquids, and 45 percent of Class 2 gases in 2002 (table 7).

Safety and security are key matters in providing hazardous materials transportation services, with shipments traveling through major metropolitan areas posing special challenges. While the overwhelming majority of shipments arrive without incident, hazardous material shipments sent by pipelines, truck, and trains are vulnerable to accident or attack.

The USDOT reviews government and industry hazardous materials transportation safety and security programs. Since September 2001, the hazardous materials shipment industry and the federal government have been implementing a "layered" system of measures affecting shippers, carriers, and drivers to reduce associated security risks. This system involves incident prevention,

[11] The hazardous materials classes are: Class 1 Explosives, Class 2 Gases, Class 3 Flammable liquids, Class 4 Flammable solids, Class 5 Oxidizers and organic peroxides, Class 6 Toxic materials and infectious substances, Class 7 Radioactive materials, Class 8 Corrosive materials, and Class 9 Miscellaneous dangerous goods.

TABLE 7

Hazardous Material Shipment by Hazard Class and Mode of Transportation: 2002

(Commodity Flow Survey data only)

Hazard class	Transportation mode	Tons (thousands)	Tons (Percent)
Class 1, Explosives	Pipeline[2]	—	—
	Rail	352	7.0
	Truck[1]	4,631	92.6
	Water	—	—
Class 2, Gases	Pipeline[2]	78,857	37.0
	Rail	29,230	13.7
	Truck[1]	96,865	45.4
	Water	7,133	3.3
Class 3, Flammable liquids	Pipeline[2]	576,739	32.2
	Rail	36,083	2.0
	Truck[1]	948,619	53.0
	Water	199,304	11.1
Class 4, Flammable solids	Pipeline[2]	—	—
	Rail	3,157	27.9
	Truck[1]	6,711	59.4
	Water	1,263	11.2
Class 5, Oxidizers and organic peroxides	Pipeline[2]	—	—
	Rail	2,430	19.2
	Truck[1]	9,870	77.9
	Water	—	—
Class 6, Toxic materials and infectious substances	Pipeline[2]	1,753	20.7
	Rail	1,908	22.6
	Truck[1]	2,255	26.7
	Water	2,325	27.5
Class 7, Radioactive materials	Pipeline[2]	—	—
	Rail	—	—
	Truck[1]	52	91.0
	Water	—	—
Class 8, Corrosive materials	Pipeline[2]	3,959	4.4
	Rail	23,949	26.4
	Truck[1]	51,385	56.7
	Water	9,552	10.5
Class 9, Miscellaneous dangerous goods	Pipeline[2]	—	—
	Rail	12,260	20.1
	Truck[1]	39,126	64.1
	Water	8,619	14.1

KEY: — Represents an estimate equal to zero or less than 1 unit of measure.

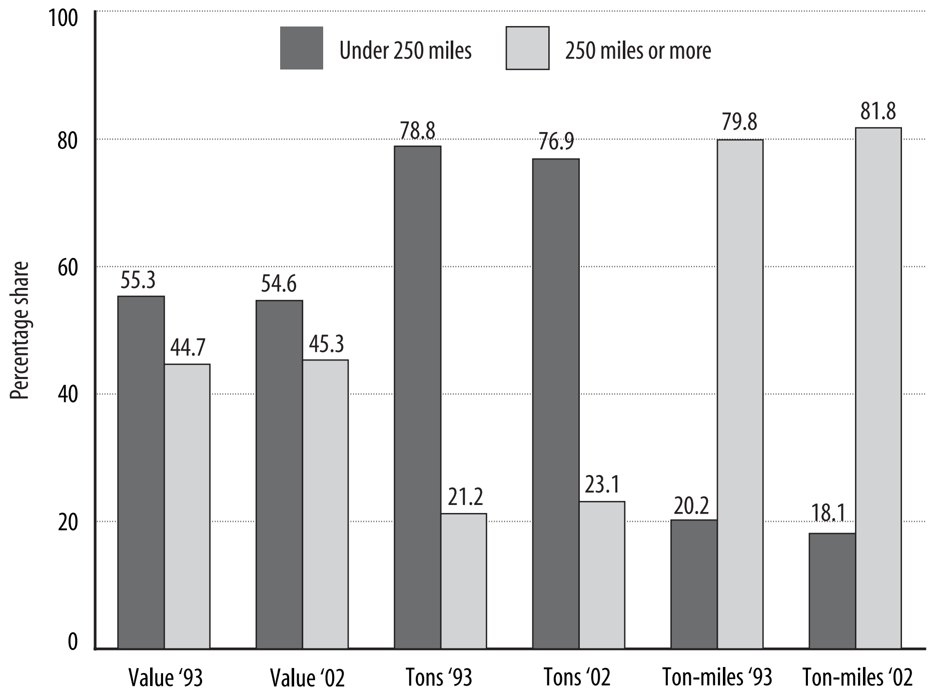
S = Estimate does not meet publication standards because of high sampling variability or poor response quality.

[1] "Truck" as a single mode includes shipments that were made by only private truck, only for-hire truck, or a combination of private and for-hire truck.

[2] Estimates for pipeline exclude shipments of crude petroleum.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Census Bureau, 2002 Commodity Flow Survey, Hazmat Data, table 6a. December 2004.

FIGURE 3
U.S. Freight Shipments by Distance Shipped: 1993 and 2002
(Commodity Flow Survey data only)



NOTE: Shipments are grouped into distance categories based on Great Circle Distance (GCD), which is the shortest distance between 2 points on the surface of a sphere. Ton-miles estimates are based on estimated distances traveled along a modeled transportation network.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, based on data from the 1993 and 2002 Commodity Flow Survey, December 2004.

preparedness, and response. The USDOT and Department of Homeland Security have taken steps to enhance the security of hazardous materials transportation.[12] For example, the USDOT requires shippers and carriers to implement security plans regarding specified hazardous materials transportation. The USDOT grants encourage state and some local governmental personnel to conduct hazmat inspections and to plan and train for spills of these materials.

Distance Traveled[13]

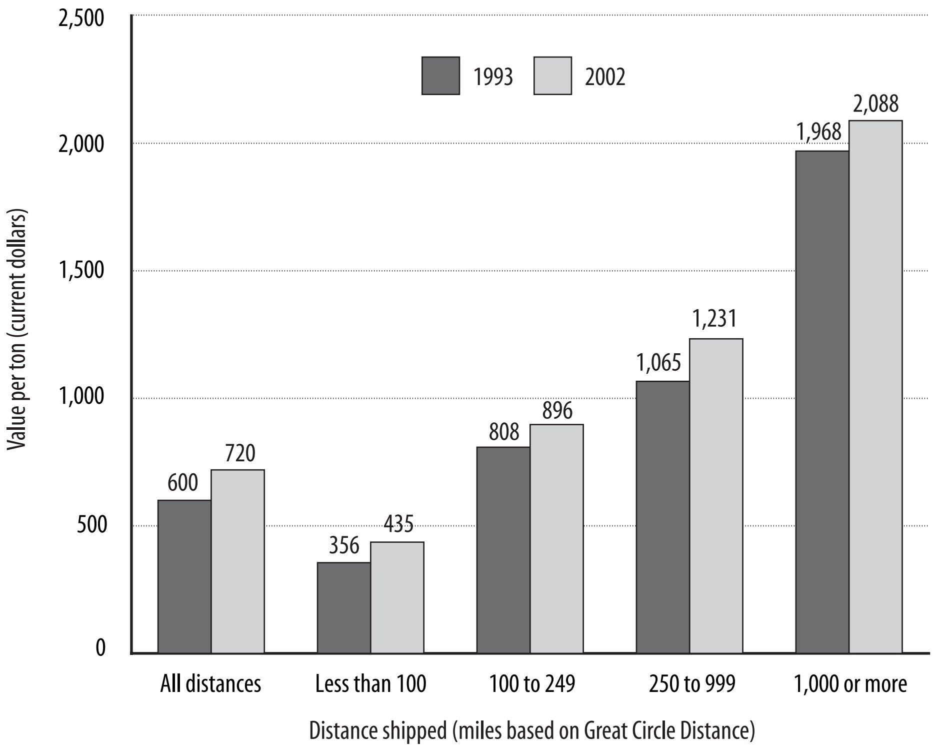
Most U.S. freight shipments by value and tonnage move less than 250 miles. In 2002, more than three-quarters (77 percent) of the weight (9 billion tons) of all CFS shipments and over half the value ($4.6 trillion), moved in local and short-haul shipments that are critical to metropolitan area economies, using local roads, tracks, and facilities (figure 3). But goods that move longer distances—more than 250 miles—carried 82 percent of CFS ton-miles, a slight increase from 80 percent in 1993. By weight, only 5 percent of shipments travel more than 1,000 miles. Nevertheless these shipments carried nearly one-third (32 percent) of the ton-miles in 2002, an increase from 29 percent in 1993. These longer haul shipments were transported an average of 1,780 miles per ton in 2002.

The distance shipped per ton varies greatly by commodity type. Longer haul shipments, on average, had a much higher value per ton than local and short-haul shipments (figure 4). The average value

[12] Congressional Research Service, the Library of Congress. Transportation Security: Issues 109th Congress. http://www.mipt.org/pdf/CRS_IB10135.pdf

[13] These findings are based on the CFS only data. Distance of shipment information is not available for the non-CFS data.

FIGURE 4
Value Per Ton of Shipments by Distance Shipped: 1993 and 2002
(Commodity Flow Survey data only)



NOTE: Shipments are grouped into distance categories based on Great Circle Distance (GCD), which is the shortest distance between 2 points on the surface of a sphere.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, based on data from the 1993 and 2002 Commodity Flow Survey, December 2004.

of long-haul shipments (more than 250 miles) was much higher ($1,400 per ton in 2002) than goods shipped less than 250 miles ($500 per ton). For example, goods that moved 1,000 or more miles in 2002 had an average value of over $2,000 per ton, compared with an average of $430 per ton for goods shipped less than 100 miles.

Shipment Weight[14]

Growth in parcel and express courier services and an increase in consumer purchases over the Internet are influencing shipment size and contributing to a rise in smaller sized shipments. Lower weight shipments (less than 500 pounds) accounted for a 25 percent share of the value of all CFS shipments and grew 53 percent by value between 1993 and 2002 (table 8). Of the lower weight shipments, those weighing less than 100 pounds grew even faster—65 percent by value. These lower weight shipments are often high-value, time-sensitive commodities and are mostly transported by express or parcel, postal, and courier services.

Between 1993 and 2002, lower weight shipments grew only 8 percent by weight but 29 percent by ton-miles, reflecting both increased length of haul and increased frequency of shipments. In 2002, shipments of less than 500 pounds were transported 312 miles per ton on average, up 19 percent from 1993. By contrast, the average for shipments of 10,000 pounds or more was 270 miles per ton in 2002, just 7 percent higher than in 1993.

[14] These findings are based on the CFS only data. Shipment size information is not available for the non-CFS data.

TABLE 8
Freight Shipments by Shipment Weight: 1993 and 2002
(Commodity Flow Survey data only)

Shipment weight	Value (billions $) 1993	Value (billions $) 2002	Value (percent share) 1993	Value (percent share) 2002	Percent change, 1993-2002
Less than 500 pounds	1,368	2,099	23.4	25.0	53.4
500 to 999 pounds	319	430	5.5	5.1	34.9
1,000 to 49,999 pounds	3,411	4,857	58.3	57.8	42.4
50,000 pounds or more	749	1,012	12.8	12.0	35.1
All shipment sizes	5,846	8,397	100.0	100.0	43.6
	Tons (millions)		**Tons (percent share)**		
Less than 500 pounds	109	118	1.1	1.0	8.0
500 to 999 pounds	65	77	0.7	0.7	18.8
1,000 to 49,999 pounds	3,830	5,068	39.5	43.4	32.3
50,000 pounds or more	5,685	6,405	58.7	54.9	12.7
All shipment sizes	9,688	11,668	100.0	100.0	20.4
	Ton-miles (billions)		**Ton-miles (percent share)**		
Less than 500 pounds	29	37	1.2	1.2	28.9
500 to 999 pounds	13	17	0.6	0.6	28.0
1,000 to 49,999 pounds	728	1,038	30.1	33.1	42.6
50,000 pounds or more	1,651	2,046	68.2	65.2	23.9
All shipment sizes	2,421	3,138	100.0	100.0	29.6

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, based on data from the 1993 and 2002 Commodity Flow Survey, December 2004.

Heavier shipments (over 50,000 pounds) comprised 65 percent of the CFS ton-miles and 55 percent of tons shipped, but only 12 percent of the value of shipments in 2002, relatively similar to the 1993 and 1997 proportions. During the decade, such shipments grew 24 percent by ton-miles, 13 percent by weight, and 35 percent by value. As the number of larger sized shipments increase, their impact on our roads, rail tracks, and ports can be expected to rise.

Beyond Composite Estimates and the Commodity Flow Survey

Growth in Nation's Freight Shipments

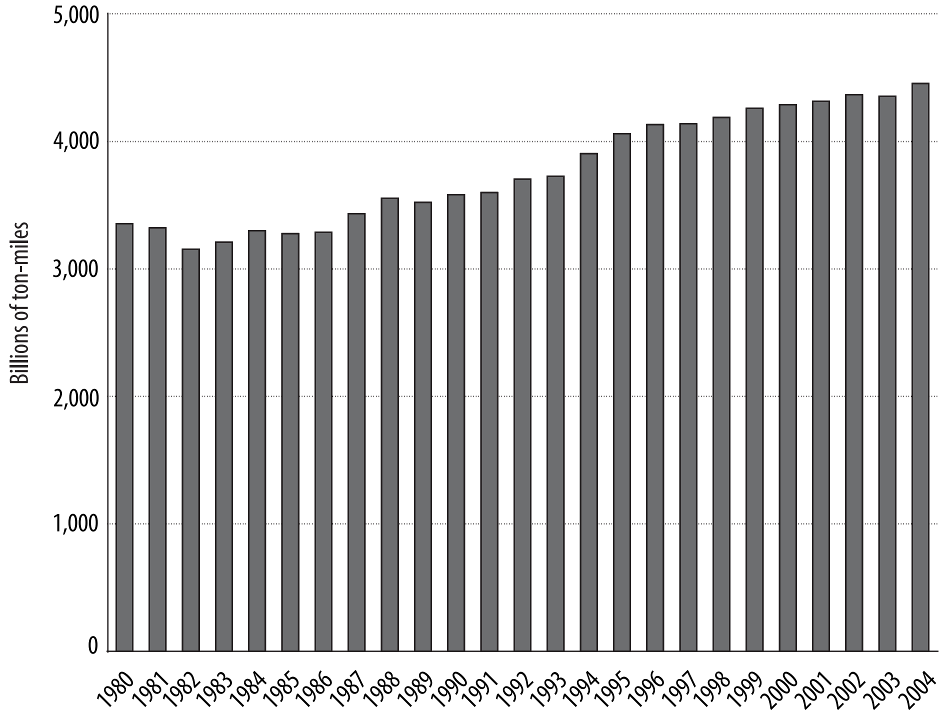
In this section, data were compiled from several sources to provide a current view of the trends in freight flows. Sources used, other than the CFS and the new composite estimates, include data from the U.S. Army Corps of Engineers and from the U.S. Department of Commerce's Census Bureau.

Figure 5 shows that between 1980 and 2004, the nation's freight ton-miles by all freight modes steadily increased, rising at an average annual growth rate of about 1.2 percent per year. This overall ton-mile information is not part of the composite estimates developed to complement the 2002 CFS. They are based on a separate BTS effort to improve available trend data on the nation's overall ton-miles by mode going back to 1960. See the source on figure 2 for additional information.

The growth in freight movements reflects U.S. economic growth, an increase in U.S.-international merchandise trade, improvements in freight sector productivity, and the availability of an extensive multimodal transportation network in the United States.

Between 1980 and 2004, domestic air cargo (freight, express, and mail) had the most rapid growth rate among modes in ton-miles (figure 6). Air ton-miles increased more than threefold from 5 billion to nearly 17 billion revenue ton-miles.

FIGURE 5
Growth in U.S. Domestic Freight Ton-Miles: 1980-2004



SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics: 1990-2003 data from the *Journal of Transportation and Statistics*, vol. 8, no. 1, 2005, Scott M. Dennis, "Improved Estimates of Ton-Miles," pp 23-44; other data are special tabulations from BTS using the same methodology.

Intercity trucking and railroads grew at a lesser rate and oil pipelines remained steady. Maritime ton-miles continued to decline, largely reflecting the reduction in crude petroleum shipments by water transportation from Alaska. While domestic waterborne ton-miles declined, U.S.-international waterborne transportation grew by about 15 percent during this period.

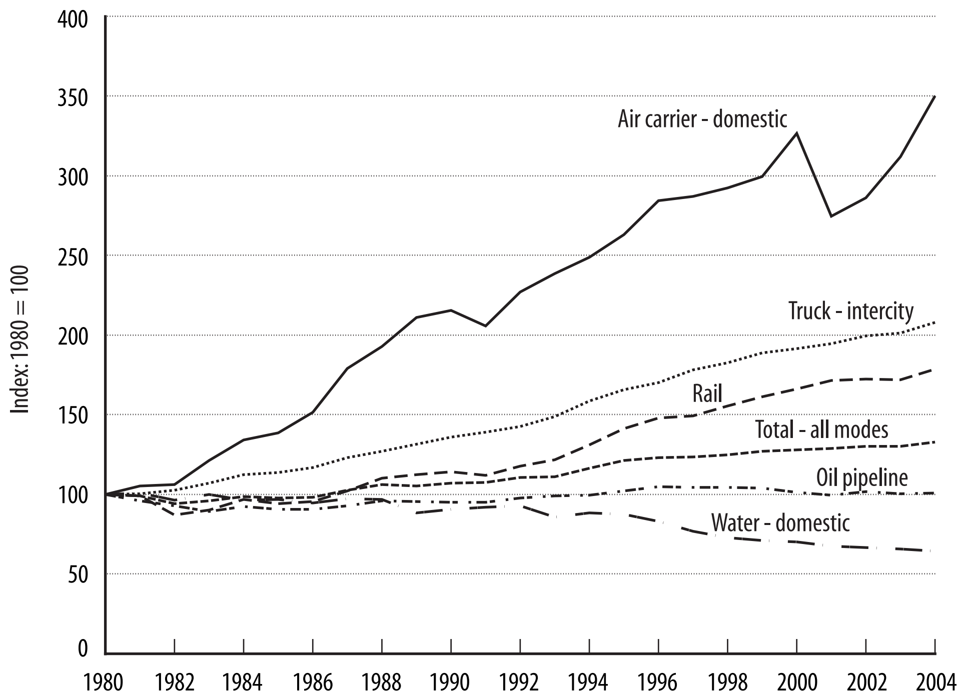
Domestic demand for air cargo service grew the most rapidly largely reflecting growth in all-cargo carriers[15], which accounted for more than two-thirds of the domestic air revenue ton-miles in 2004, expanded services. Federal Express, United Parcel Service, and DHL are the leading all-cargo carriers and provide intermodal freight services. See the section on multimodal shipments[16] for further discussion of recent trends in express freight.

While air cargo grew at a faster pace than the other modes, truck and rail moved far greater tonnage and generated more ton-miles. The number of trucks used in commercial transportation (both single unit and tractor trailer combination) rose 37 percent between 1980 and 2002, increasing from 5.8 million to 7.9 million (table 9). Commercial trucks also traveled more vehicle miles, averaging about 27,000 miles per truck in 2002 compared to

[15] These are carriers that transport only cargo, unlike passenger air carriers that mostly carry people but also carry goods, such as expedited packages, mail, etc., in their aircraft cargo holds.

[16] In this report, the term "multimodal" refers to shipments transported by a combination of modes, including parcel, courier, and postal services, truck and rail, truck and water, rail and water, and other modal combinations. Multimodal also could be used to describe air-truck combinations, but, because nearly all air shipments also involve truck before and after the air leg of the shipment, it is common to refer to air as a single mode. As used in this report, multimodal is different from *intermodal* which is used in this report to describe the traditional truck and rail combination only.

FIGURE 6
Growth in U.S. Domestic Freight Ton-Miles by Mode: 1980-2004



SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics: 1990-2003 data from the *Journal of Transportation and Statistics*, vol. 8, no.1, 2005, Scott M. Dennis, "Improved Estimates of Ton-Miles," pp 23-36; other data are special tabulations from BTS using the same methodology.

19,000 miles per truck in 1980. Nationwide, the total vehicle miles of travel by single-unit trucks grew from 40 billion miles to 76 billion miles in 2002. The vehicle miles traveled by combination trucks doubled from 69 million to 139 million, during this period (USDOT FHWA 2003).

During the same period, Class I freight rail car-miles reached over 35 billion in 2003, up from 29 billion in 1980. Also, the average miles traveled annually per rail car more than tripled from 25,000 to 76,000. Rail hauls bulk commodities, such as grain and coal, over long distances as well as time-sensitive commodities, such as automobiles and parts, to domestic markets and to industrial plants in the United States and in Canada and Mexico, our top trading partners. Refrigerated rail cars can be used to transport perishable produce on tight schedules. The intermodal segment of the rail industry moves a wide assortment of goods from imported seasonal toys to lawn mowers, bicycles, and computers. Maritime vessels generated over 714 billion ton-miles in 2003, carrying bulky commodities such as wheat and other grains, ores and heavy metals, and finished products like automobiles and imported merchandise. About 85 percent, or 606 billion, of the waterborne ton-miles in 2003 was from domestic movements, a proportion that has dropped considerably since 1980. Back then, domestic shipments accounted for 91 percent (921 billion) of the over 1 trillion total maritime ton-miles (USACE 2004 and 1994).

This growth in the U.S. freight system use places pressure on transportation facilities arising from congestion, delays, capacity management, and operational bottlenecks, and it impacts the individual modes as well as multimodal freight movements. For example, according to the Federal Highway Administration, between 1980 and 2002, truck travel grew by more than 90 percent while lane-miles of public roads increased by only 5 percent (USDOT FHWA 2004). Also, over the

TABLE 9
Number of Vehicles, Aircraft, Railcars, and Vessels

	1980	1990	2000	2002
Highway				
Truck, single-unit 2-axle 6-tire or more	4,373,784	4,486,981	5,926,030	5,650,619
Truck, combination	1,416,869	1,708,895	2,096,619	2,276,661
Truck, total	5,790,653	6,195,876	8,022,649	7,927,280
Air				
Air carriers	3,808	6,083	8,055	8,194
Rail				
Class I, locomotive	28,094	18,835	20,028	20,506
Class I, freight cars[1]	1,168,114	658,902	560,154	477,751
Nonclass I freight cars[1]	102,161	103,527	132,448	130,590
Railcar companies and shippers freight cars[1]	440,552	449,832	688,194	691,329
Water	38,788	39,445	41,354	41,002
Nonself-propelled vessels[2]	31,662	31,209	33,152	32,381
Self-propelled vessels[3]	7,126	8,236	8,202	8,621
Oceangoing steam and motor ships[4]	864	636	454	426

[1] Beginning with 2001 data, Canadian-owned U.S. railroads are excluded. This accounted for about 47,000 cars in 2000.

[2] Nonself-propelled vessels include dry-cargo barges, tank barges, and railroad-car floats.

[3] Self-propelled vessels include dry cargo, passenger, off-shore support, tankers, and towboats.

[4] 1,000 gross tons and over. This figure is included in self-propelled vessels.

SOURCE: Various sources, as cited in U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, *National Transportation Statistics 2005*, table 1-11, available at http://www.bts.gov.

past two decades as the rail industry consolidated, the mileage of rail roads operated by the remaining Class I railroads sharply declined from 165,000 miles in 1980 to about 99,000 miles in 2004 (AAR 2005a and 2005b).[17] Despite the reduction in rail line stemming from the consolidation and mergers, rail freight tons originated rose 24 percent between 1980 and 2004, leading to industry-wide productivity growth. The continued overall growth in the use of the national freight network, relative to the infrastructure extent, could pose operational and performance challenges for goods movement. FHWA forecasts that freight volumes are expected to increase greatly by the year 2020, further straining system capacity, reliability, and productivity (USDOT FHWA 2004).[18]

Behind the Modal Trends

As the value of shipments has increased over time, changes have occurred in the national pattern of mode selection. The rising need for quicker deliveries of high-value products on time-definite schedules has led to the rapid growth in the value of air shipments, which as measured in the 2002 CFS grew by 90 percent from $141 billion in 1993 to $264 billion in 2002 in inflation-adjusted 2000 dollars (table 10). During this same period, the value of parcel, postal, and courier shipments,

[17] Miles of rail roads is the aggregate length of roadway, excluding yard tracks and sidings, and does not reflect the fact that a mile of road may include two, three, or more parallel tracks. The number of rail tracks owned declined from 271,000 miles in 1980 to under 169,000 in 2004.

[18] FHWA's Freight Analysis Framework, a database and policy analysis tool, projects that between 1998 and 2020, U.S. freight tonnage is expected to grow by 70 percent and the value of freight shipments is expected to more than triple to nearly $30 trillion (USDOT FHWA 2004, *Freight Facts and Figures 2004*).

TABLE 10
Commodity Flow Survey Shipments by Transportation Mode: 1993 and 2002
(CFS Data Only)

Transportation mode	Value (billion inflation-adjusted 2000 $) 1993	2002	Percent change	Tons (millions) 1993	2002	Percent change	Ton–miles (billions) 1993	2002	Percent change
All modes	5,862	8,382	43.0	9,688	11,668	20.4	2,421	3,138	29.6
Single modes	4,953	7,037	42.1	8,923	11,087	24.2	2,138	2,868	34.2
Truck[1]	4,414	6,224	41.0	6,385	7,843	22.8	869	1,256	44.5
Rail	246	310	26.1	1,540	1,874	21.6	942	1,262	34.0
Water	64	89	38.3	504	681	35.2	271	283	4.2
Air (incl. truck and air)	141	264	88.0	—	4	NA	5	6	20.5
Pipeline[2]	88	149	69.4	484	685	41.4	S	S	NA
Multiple modes	662	1,077	62.6	223	217	–2.8	191	226	18.0
Parcel, postal, or courier	563	986	75.2	19	26	31.7	12	19	57.0
Truck and rail	82	S	S	39	43	10.9	39	46	17.5
Other multiple modes	12	21	S	165	148	S	S	161	S
Other and unknown modes	240	268	11.6	543	365	–32.8	92	44	–51.9

NOTE: The 2002 value data in this table are adjusted for inflation to allow comparison with the 1993 data and, hence, they are different from data in table 3, which are in current dollars.

KEY: — Represents data cell equal to zero or less than 1 unit of measure.

S = Estimate does not meet publication standards because of high sampling variability or poor response quality.

NA = Not applicable.

[1] "Truck" as a single mode includes shipments that were made by only private truck, only for-hire truck, or a combination of the two.

[2] CFS estimates for pipeline exclude shipments of crude petroleum.

[3] Other multiple modes include combination of truck and water, rail and water, and other combinations.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2002 Commodity Flow Survey, U.S. Data, December 2004.

which are transported predominately by air and truck, grew 75 percent from $563 billion to $986 billion.

Heavy, low-value commodities are mostly transported at lower unit costs by rail and water modes. In 2002, according to the composite estimates, rail shipments were valued at $198 per ton on average compared to $401 per ton for water and $775 per ton for truck. Shipments by multimodal combinations were valued on average at approximately $4,892 per ton, and air-truck shipments averaged more than $88,618 per ton (table 11). The variation in the modal averages reflects the wide variation in the range of commodities moved by each of the modes. For example, trucks haul goods ranging from gravel and crushed stones, coal, and grain to electronic equipment, refrigerated perishables, pharmaceuticals, and gasoline.

Trucking

According to the composite estimates, trucking as a single mode was the most frequently used mode, accounting for an estimated 70 percent of the total value, 60 percent of the weight, and 34 percent of the ton-miles.[19] In 2002, the trucking industry, both for-hire and private own-use, transported over $9 trillion worth of shipments, weighing over 11 billion tons and generating about 1.5 trillion ton-miles (table 3). Measured by ton-miles, trucking was followed by rail at 31 percent, pipeline at 15, and water with 11 percent. Trucking's modal share by ton-miles has grown as manufacturing and services, rather than bulk commodity producing sectors such as agriculture and min-

[19] The relative modal shares of ton-miles depend on how "multimodal" shipments are measured. Rail moves a slightly larger share when intermodal truck-rail shipments are counted in its totals.

TABLE 11
Value Per Ton of U.S. Freight Shipments by Transportation Mode: 2002

Transportation mode	Value per ton (dollars)
All Modes[1]	667
Multiple modes	4,892
Single modes	611
Air (incl. truck and air)	88,618
Parcel, USPS, or courier	37,538
Truck and rail	1,480
Truck[2]	775
Water	401
Pipeline[3]	241
Rail	198
Other multiple modes[4]	148
Unknown modes	908

[1] These composite estimates include the Commodity Flow Survey and non-CFS sectors such as imports, logging, construction, retail, services, publishing, municipal solid waste, and household and business moves. They also include estimates of in-scope shipments for sectors that are covered in CFS but may have been under-estimated due to small sample size, such as exports, intermodal, and petroleum products. These composite estimates serve as the 2002 benchmark data for the FHWA Freight Analysis Framework II.

[2] "Truck" as a single mode includes shipments that were made by private truck only, for-hire truck only, or a combination of private and for-hire truck.

[3] Estimates for pipeline include shipments of crude petroleum.

[4] Other multiple modes includes truck and water, rail and water, and other combinations.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, 2002 Commodity Flow Survey, U.S. Data, December 2004, plus additional composite estimates. The composite estimates were developed through a cooperative effort by the Bureau of Transportation Statistics and the Federal Highway Administration.

ing, have increased their combined share of the nation's economic activities. Manufactured goods tend to be higher in value per ton than farming and mining products (e.g., grain and coal).

In recent years, as trucking maintained its dominance, the number of trucks traveling on the nation's highways steadily increased and the truck fleet mix changed. While two-axle single-unit trucks are the most common commercial trucks on the nation's roads, the number of larger combination trucks grew at a much faster rate, increasing about 59 percent over this period, compared to 30 percent for single-unit trucks (figure 7). In 2003, combination trucks accounted for 28 percent of the commercial truck fleet, up from 24 percent in 1980. These larger trucks also travel more miles per vehicle than the single-unit trucks. Combination trucks generated a total of 138 billion vehicle-miles of travel (VMT) in 2003, compared to 78 billion miles by single-unit trucks (figure 8). Since 1980, overall truck vehicle-miles have doubled from 108 billion to 216 billion in 2003. Despite this growth in truck VMT, commercial truck's share of *total highway* vehicle-miles remained steady, hovering between 7.1 and 7.5 percent over this period. This was primarily because travel by *all* highway vehicles, including passenger cars, buses, and light trucks (e.g., pickup trucks, sport utility vehicles, and minivans) also grew at a similar pace.

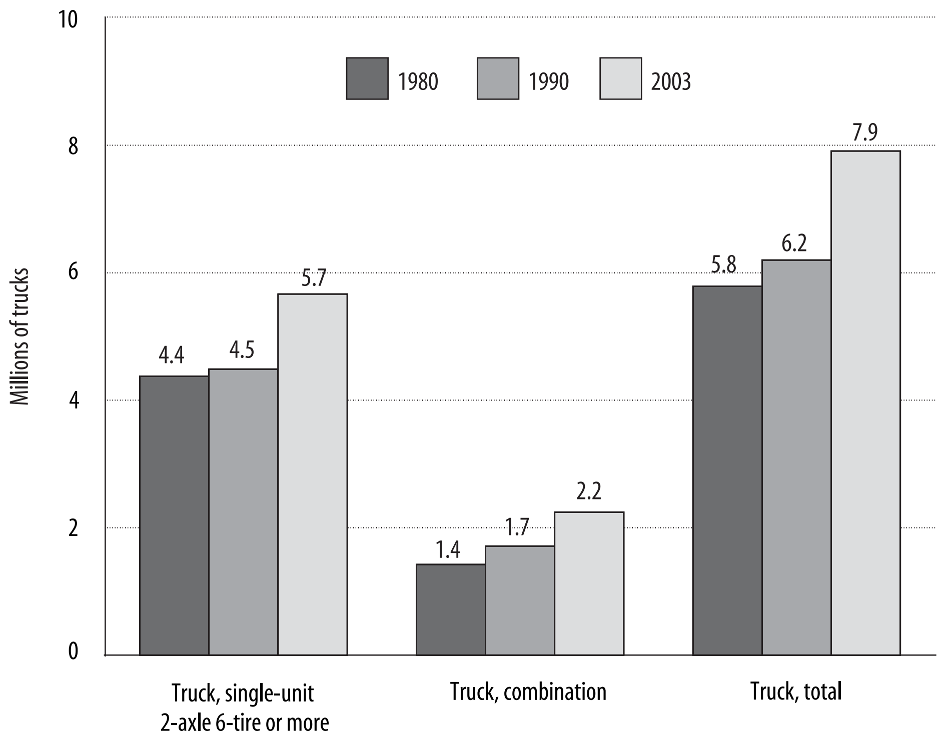
Railroad

In 2004, Class I railroads in the United States transported the highest originating tonnage ever, 1.8 billion tons (AAR 2005a).[20] This record level tonnage reflects steady growth in rail traffic for six straight years, since 1998. Coal accounted for 43 percent of the rail tonnage in 2004, followed by chemicals and related products with 9 percent, and farm products and non-metallic products with 8 percent each. By revenue, coal accounted for 20 percent ($8.4 billion) of the Class I rail industry-wide gross revenues ($41.6 billion), followed by miscellaneous mixed shipments (mostly intermodal) with 15 percent, and chemicals and related products with 12 percent (AAR 2005a).

U.S. freight trains are carrying more loads and traveling farther than in 1980. The average freight train carried over 3,100 tons of freight in 2004,

[20] This figure differs from the composite and CFS figures in tables 1, 3, and 6 because they represent only Class I railroads. U.S. Class I railroads are line haul freight railroads with operating revenue in excess of $278 million. In 2004, the seven U.S. Class I railroads were: BNSF Railway, CSX Transportation, Grand Trunk Corporation, Kansas City Southern Railway, Norfolk Southern Railroad, Soo Line Railroad, and Union Pacific Railroad (AAR 2005). The Class I railroads accounted for about 71 percent of industry road miles operated and 93 percent of the total rail freight revenues.

FIGURE 7
Number of Commercial Trucks on U.S. Highways: 1980, 1990, 2003



NOTE: Total trucks exclude light trucks such as pickup trucks, sport utility vehicles, and minivans.

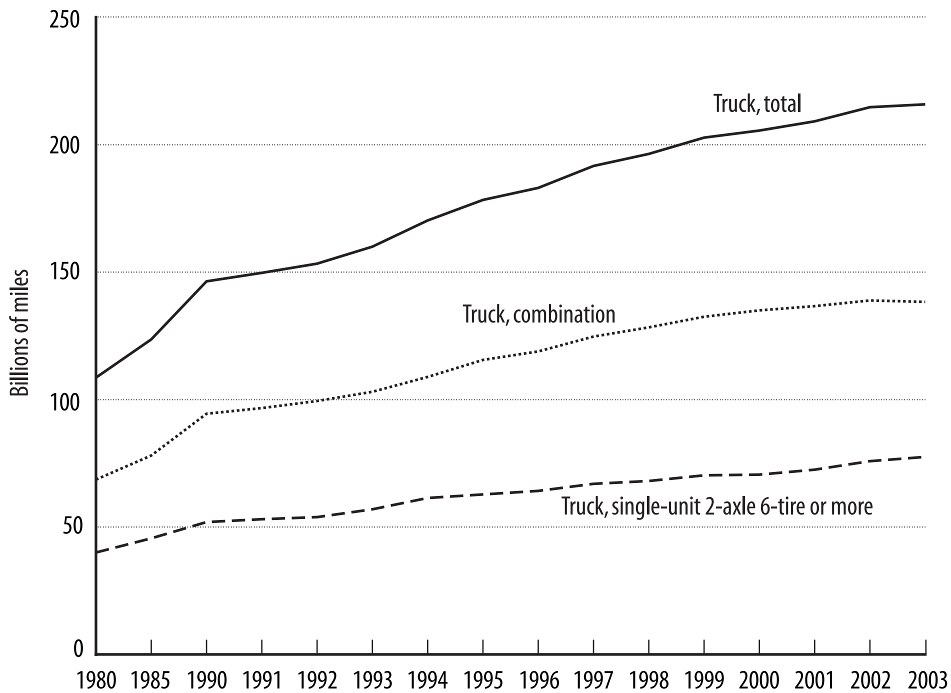
SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, *National Transportation Statistics 2005*, available at http://www.bts.gov/publications/national_transportation_statistics/ as of August 2005.

also a record high for the rail industry. By comparison, the average train load in 1980 was about 2,200 tons. While the average load per train rose, the average cargo weight per rail car dropped from 67 tons in 1980 to 61 tons in 2004, reflecting the higher growth rate of lighter freight that is typical of intermodal shipments. During this same period, the freight trains traveled more miles on average. The average length of haul was 902 miles per ton in 2004, up from 616 miles per ton in 1980. Since 1980, the length of haul has grown at an average annual rate of about 1.6 percent per year. Railroads improved on their operational efficiency as they carried more loads farther. Net ton-miles per train-hour,[21] one measure of industry efficiency, increased 49 percent from 40,400 in 1980 to 60,300 in 2003 (AAR 2005b).

U.S. freight railroads serve almost every economic sector in the nation that handles goods, including manufacturing, mining, wholesale, and retail trade. They move not only bulk commodities but also time-sensitive goods. According to the composite estimates, rail as a single mode carried about 3 percent of nation's freight shipments, measured by value, and 10 percent of the weight, hauling over long distances everything from coal to vegetables, lumber to orange juice, and finished automobiles and parts to grain (table 1). Rail accounted for 31 percent of the estimated total ton-miles, despite having a more spatially concentrated network than the highway system and in spite of declines in miles of rail roadway operated due to rail abandonment and industry

[21] This is a measure of the number of tons hauled and the miles traveled during an average hour of freight train's operation. The peak for net ton-miles per train-hour was in 1991 when the industry averaged about 66,300 ton-miles every train hour (AAR 2004).

FIGURE 8
Truck Vehicle-Miles Traveled on U.S. Highways: 1980-2003



NOTE: Total trucks exclude light trucks such as pickup trucks, sport utility vehicles, and minivans.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, *National Transportation Statistics 2005*, available at http://www.bts.gov/publications/national_transportation_statistics/ as of August 2005.

consolidation.[22] Rail's shares of overall shipment value and weight primarily reflect the fact that low value-per-ton primary raw materials like metallic ores (e.g., bauxite), logs and wood products, and grains account for the bulk of rail shipments. Coal and chemicals alone accounted for over half (52 percent) of the rail tonnage in 2004 (AAR 2005a). Rail's share of ton-miles reflects the high weight and the longer length of haul of the products moved by rail. For example, in 2002, coal was shipped an average of 671 miles per ton, cereal grain averaged 841 miles per ton, and fertilizers about 747 miles per ton (table 12).

Some of the largest rail freight flows by tonnage are coal shipments originating in the Powder River Basin in Wyoming and from West Virginia, Illinois, Kentucky, and Pennsylvania. These are vital economic flows because the vast majority of coal shipments are to coal-fired power plants for generating electricity. In 2003, these five states accounted for more than three-quarters (79 percent) of the total tonnage of coal originations (table 13). In 2003, the leading states for total rail tons *originated* included Wyoming, Illinois, West Virginia, Pennsylvania, and Kentucky. The leading states by tons *terminated* included Texas, Illinois, Florida, Ohio, and California (figure 9).

[22] Miles of rail roadway have been declining for decades. In 2004, Class I railroads operated about 99,000 miles of rail roadways, down from about 160,000 miles in 1980.

Waterborne

In 2003, 9 out of the top 20 freight gateways in America (land, sea, and air), in terms of value of U.S.-international merchandise freight, were maritime seaports. The leading overall freight gateway by value was the Port of Los Angeles, with $122 billion of trade. Port of Houston was the leading port by weight, handling about 126 million tons of import and export cargo in 2003 (USDOT BTS 2004). Maritime ports serve the international trade needs of every state, both coastal states with seaports as well as landlocked states that depend on the ports for their imports and exports.

TABLE 12
U.S. Rail Carload and Intermodal Commodity Shipments: 2002

SCTG code	Description	Tons (thousands)	Ton-miles (millions)	Miles per ton
15	Coal	849,060	569,552	671
42	Mixed freight	136,962	193,270	1,411
2	Cereal grains	127,365	107,159	841
12	Gravel and crushed stone	105,124	22,858	217
20	Basic chemicals	84,332	69,556	825
26	Wood products	66,446	71,331	1,074
14	Metallic ores and concentrates	65,570	12,979	198
32	Base metal in primary or semi finished forms and in finished basic shapes	57,131	37,075	649
13	Nonmetallic minerals n.e.c.	55,928	29,165	521
41	Waste and scrap	55,719	27,165	488
27	Pulp, newsprint, paper, and paperboard	53,782	52,283	972
7	Other prepared foodstuffs and fats and oils	53,415	52,071	975
36	Motorized and other vehicles (including parts)	50,672	42,232	833
19	Coal and petroleum products, n.e.c.	47,675	32,859	689
22	Fertilizers	45,130	33,701	747
31	Nonmetallic mineral products	37,549	18,464	492
24	Plastics and rubber	37,360	34,804	932
4	Animal feed and products of animal origin, n.e.c.	35,012	26,620	760
3	Other agricultural products	28,952	28,804	995
6	Milled grain products and preparations, and bakery products	22,058	16,876	765
11	Natural sands	17,848	7,443	417
23	Chemical products and preparations, n.e.c.	17,763	14,483	815
8	Alcoholic beverages	6,914	7,903	1,143
25	Logs and other wood in the rough	6,766	2,393	354
33	Articles of base metal	6,740	7,626	1,132
37	Transportation equipment, n.e.c.	4,589	2,167	472
18	Fuel oils	2,267	1,891	834
17	Gasoline and aviation turbine fuel	2,222	776	349
34	Machinery	2,130	2,584	1,213
28	Paper or paperboard articles	1,805	2,103	1,165
35	Electronic and other electrical equipment and components and office equipment	1,589	2,214	1,393
5	Meat, fish, seafood, and their preparations	1,246	2,340	1,878
16	Crude petroleum	1,121	391	349
39	Furniture, mattresses and mattress supports, lamps, lighting fittings, and...	869	1,389	1,599
40	Miscellaneous manufactured products	830	1,051	1,266
10	Monumental or building stone	634	323	509
29	Printed products	560	700	1,250
30	Textiles, leather, and articles of textiles or leather	455	718	1,579
21	Pharmaceutical products	155	227	1,464
38	Precision instruments and apparatus	71	130	1,834
9	Tobacco products	11	22	2,059
99	Commodity unknown	18	22	1,223

KEY: SCTG = Standard Classification of Transported Goods.

SOURCE: U.S. Department of Transportation, Surface Transportation Board, 2002 Carload Waybill Sample data.

TABLE 13
Tons of Coal for Top Railroads Originated by State: 2003

	Tons (millions)	Percent of U.S. total
Wyoming	358	46.1
West Virginia	108	14.0
Kentucky	72	9.3
Illinois	38	4.8
Pennsylvania	36	4.6
Top 5 states total	612	78.8
U.S. total	777	100.0

SOURCE: Association of American Railroads (AAR), 2003, Origination and Termination States of Leading Rail Commodities, available at www.aar.org, as of September 2005.

Nearly 9 percent of total tonnage transported within the United States involved some form of waterborne transportation, according to the composite estimates (table 1). The total tonnage of U.S. waterborne freight, including domestic commerce and international trade, was nearly 2.4 billion tons in 2003, up from 2 billion tons in 1980 (table 14).

The maritime transportation system carries more U.S.-international freight, both in terms of tonnage and value, than other freight modes. In 2003, water transportation carried over three-quarters (78 percent) of the weight and 41 percent of the value of U.S.-international merchandise trade (USDOT BTS 2004).[23]

A major global trend in maritime trade in recent decades has been the growth in use of containers for international shipments. In 2004, nearly 24 million 20-foot equivalent units (TEUs)[24] of merchandise moved in and out of U.S. container ports, up 79 percent from 13 million in 1995 (table 15). U.S. container ports handled an average of 65,344 TEUs of loaded containers a day in 2004. These container units arrive and leave the seaports either by rail or truck as single modes or by intermodal truck-rail combination.[25] Five of the top 10 container ports in the United States are on the West Coast (table 15). Between 1995 and 2004, the Port of Los Angeles had the largest growth in terms of number of TEUs, reflecting increased trade with Asia and Pacific Rim countries. Savannah, GA, showed the fastest growth in terms of annual percent change. High growth rates for Savannah and Houston reflect the strong activity in U.S. container trade with Latin American countries.

Oil and Gas Pipelines

Pipelines carry a wide variety of energy commodities, from different grades of crude petroleum and refined petroleum products such as aviation fuels, diesel, and heating oils, as well as natural gas. These pipelines transport commodities from domestic production—either in coastal waters or onshore—and from imports. Energy derived from piped crude or petroleum products is consumed at nearly every stage of the production of goods and services in the United States. The movement of products by pipelines is an elaborate and complex process, in part because of the number and types of commodities transported. Several types of oil and gas pipelines are in operation in the United States today. Gathering pipelines carry products from production fields, transmission pipelines transport products to terminals and refineries, and distribution pipelines carry products to final market and consumption points. Together, these pipelines move large quantities of hazardous liquid and gas products.[26]

In 2003, according to recently improved BTS estimates of ton-miles, U.S. pipeline movement of crude oil, petroleum products, and natural gas produced 868 billion total ton-miles (table 16). These new pipeline estimates include shipments by natural gas liquids which accounted for about one-third of the pipeline total. When natural gas shipments are included in the pipeline total, oil and gas pipelines accounted for approximately 20 percent of total freight ton-miles by all modes in

[23] Freight handled by land modes accounted for 22 percent of the overall weight and 28 percent of the value of U.S. international merchandise trade. Air cargo accounted for less than one percent of the weight but 26 percent of the value (USDOT BTS 2004).

[24] A TEU is the standard unit for counting containers of various lengths and describing the capacity of container vessels.

[25] A large number of containers also cross the land border crossing ports by truck and rail.

[26] Besides liquid pipelines, there are pipelines that carry natural gas. Liquid pipelines sometimes carry gaseous products such as natural gas liquids, including propane, that are often referred to as highly volatile liquids (HVLs). These products are gases at atmospheric temperatures and pressure but liquids under the pressures of pipelines. Non-liquid pipelines handle almost all natural gas transmission and distribution (AOPL 2004a).

FIGURE 9
Tonnage of Inbound and Outbound Rail Shipments: 2003

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, based on Surface Transportation Board carload, rail waybill sample data.

2003 (14 percent from oil pipelines and 6 percent from gas pipelines).

Pipelines move large volumes of both domestic and imported petroleum and gas products. For example in 2004, the United States imported over 4.7 billion barrels of crude oil and petroleum products, and pipelines helped to transport a large proportion of these on part of the journey from the points of entry to refineries, terminals, and markets for final consumption.[27] Additionally there was over 3.6 million cubic feet of natural gas imports from Canada into the United States in 2004, up from 1.4 million cubic feet in 1990 (USDOE EIA 2005).

[27] The Association of Oil Pipe Lines estimates that pipelines accounted for about 68 percent of the ton-miles produced from transporting crude petroleum and petroleum products in the United States in 2002 (AOPL 2004:b).

TABLE 14
Tons, Ton-Miles, and Length of Haul of U.S. Domestic and International Maritime Freight: 1980-2003

	Tons (millions)			Ton-miles (millions)			Average length of haul (miles per ton)		
Year	Total	U.S.-international cargo	Domestic cargo	Total	U.S.-international cargo	Domestic cargo	Total	U.S.-international cargo	Domestic cargo
1980	1,995	921	1,074	1,016,085	94,249	921,836	509.2	102.3	858.4
1990	2,159	1,042	1,118	932,151	98,608	833,544	431.7	94.7	745.7
2000	2,419	1,355	1,064	763,421	117,622	645,799	315.6	86.8	606.8
2001	2,387	1,351	1,037	736,930	115,244	621,686	308.7	85.3	599.7
2002	2,335	1,319	1,016	721,422	109,341	612,081	308.9	82.9	602.5
2003	2,388	1,378	1,010	714,440	108,294	606,146	299.2	78.6	600.3
Percent change 1980-2003	19.7	49.6	–6.0	–29.7	14.9	–34.2	–41.2	–23.2	–30.1

SOURCE: U.S. Army Corps of Engineers, Navigation Data Center, *Waterborne Commerce of United States,* Annual issues, also at http://www.iwr.usace.army.mil/ndc/wcsc as of October 2005.

TABLE 15
Top 10 U.S. Maritime Container Ports: 1995-2004

	Thousands of TEUs						Average number of TEUs per day		Percent change
Port	1995	2000	2001	2002	2003	2004	1995	2004	1995-2004
Los Angeles, CA	1,849	3,228	3,428	4,060	4,664	4,875	5,066	13,355	163.6
Long Beach, CA	2,137	3,204	3,195	3,184	3,091	3,764	5,855	10,313	76.1
New York, NY	1,537	2,200	2,355	2,627	2,803	3,163	4,211	8,666	105.8
Charleston, SC	758	1,246	1,159	1,197	1,250	1,421	2,077	3,894	87.5
Savannah, GA	445	720	813	1,014	1,124	1,290	1,219	3,535	189.9
Norfolk, VA	647	850	885	982	1,093	1,206	1,773	3,304	86.4
Oakland, CA	919	989	963	979	1,064	1,197	2,518	3,280	30.3
Houston, TX	489	733	783	851	933	1,098	1,340	3,008	124.5
Seattle, WA	993	960	824	850	815	1,049	2,721	2,874	5.7
Tacoma, WA	425	647	612	769	931	941	1,164	2,577	121.3
Top 10 U.S. Ports	10,199	14,777	15,017	16,513	17,768	20,004	27,942	54,807	96.1
Top 10 ports as % of total	76.5	74.1	82.9	83.7	83.5	83.9			
Total, all ports[1]	13,328	19,938	18,117	19,729	21,289	23,851	36,515	65,344	79.0

[1] Includes all container ports in the 50 states and Puerto Rico.

NOTE: TEUs = 20-foot equivalent units. One 20-foot container equals 1 TEU while one 40-foot container equals 2 TEUs. The data in this table include only loaded containers engaged in U.S.-international maritime activity. Data include U.S. imports, exports, and transshipments. Transshipments neither originate nor are destined for the United States but pass through it from one foreign country to another. For example, an automobile component shipped from Japan and destined for Mexico may pass through the Ports of Los Angeles or Long Beach before being trucked to Mexico. Therefore, the trade levels will be greater than those reported in U.S.-international trade statistics, which exclude transshipments. The data also exclude military shipments.

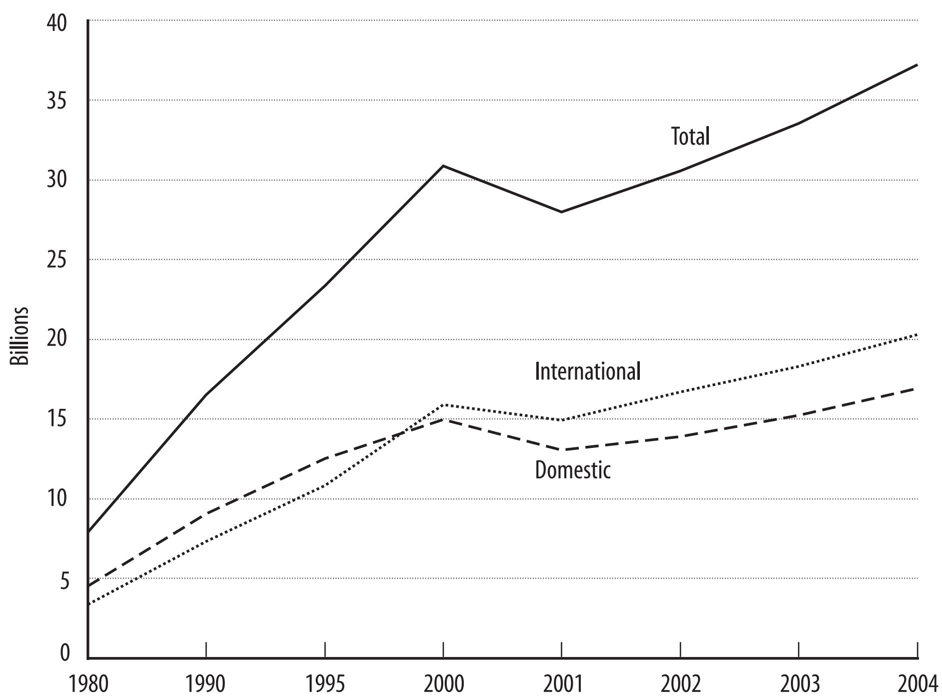
SOURCE: U.S. Department of Transportation, Maritime Administration, September 2005; based on *Journal of Commerce,* Port Import/Export Reporting Services (PIERS) data from multiple years.

TABLE 16
U.S. Pipeline Ton-Miles: 1980-2003
(Billions)

Year	Pipeline total	Liquid pipelines (oil & oil products)	Natural gas pipelines	Total	Pipeline's share of total ton-miles (percent)
1980	866	588	278	3,353	25.8
1990	822	584	238	3,584	22.9
2000	874	577	297	4,285	20.4
2001	859	576	283	4,317	19.9
2002	879	586	293	4,366	20.1
2003	868	590	278	4,357	19.9

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, *Journal of Transportation and Statistics*, vol. 8, no. 1, 2005, Scott M. Dennis, "Improved Estimates of Ton-Miles," pp 23-44.

FIGURE 10
U.S. Air Freight Domestic and International Revenue Ton-Miles: 1980-2004



NOTE: The air ton-miles for U.S. imports and exports are from air cargo handled at U.S. airports by U.S. and foreign air carriers.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, based on Office of Airline Information data in National Transportation Statistics, 2005, online version, available at http://www.bts.gov/publications/national_transportation_statistics/ as of September 2005.

Air Cargo

In 2004, all-cargo carriers and other commercial airlines generated over 37 billion freight revenue ton-miles (figure 10). Since 1980, air freight revenue ton-miles grew faster in the international market (averaging 8 percent per year) than in the domestic market (6 percent per year). Ton-miles from the international market now exceed those from the domestic market, having overtaken the domestic segment in 2000. During this period, total freight revenue ton-miles grew even faster (7 percent annually) than total revenue passenger miles (4 percent annually) (table 17).

TABLE 17
Air Carrier Revenue Freight Ton-Miles and Passenger-Miles: 1980-2004
(Billions)

	1980	1990	2000	2001	2002	2003	2004	Percent change, 1980-2004	Annual average percent growth rate, 1980-2004
Total freight ton-miles	8	17	31	28	31	34	37	372.4	6.7
Domestic freight ton-miles	5	9	15	13	14	15	17	274.1	5.7
International freight ton-miles	3	7	16	15	17	18	20	505.7	7.8
Total revenue passenger miles	268	473	709	665	654	674	751	180.1	4.4
Domestic revenue passenger miles	204	346	516	487	482	505	557	172.4	4.3
International revenue passenger miles	63	126	193	178	172	169	194	206.2	4.8

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, *National Transportation Statistics 2005*, online version, available at www.bts.gov.

Because commodities that move by air tend to be high in value, U.S.-international air cargo averaged $82,000 per ton in 2004. And because it is so high in value, air cargo accounted for a much larger proportion of the value (27 percent) than the weight (less than 1 percent) of overall U.S.-international merchandise trade (USDOT BTS 2004).

Air cargo also accounts for a much smaller share of the weight and ton-miles of U.S. domestic and international freight combined. According to the composite estimates, air freight accounted for about 4 percent of the value and less than one percent of the tonnage and ton-miles in 2002 (table 1). Although air's share of the tonnage and ton-miles is relatively small, growth in air freight creates demand for more truck and intermodal services because almost all air cargo shipments begin and end their journey by truck.

Major U.S. airports serve as gateways of exit and entry for air cargo originating in or destined for markets located in large metropolitan areas. In 2004, John F. Kennedy (JFK) International Airport, in New York, was the leading *overall gateway* for U.S. international freight by value. It handled $125 billion of air cargo, accounting for 6 percent of the $2.2 trillion in total U.S. international goods trade (USDOT BTS 2005). JFK was followed in 2004 by the 2003 leader, the Port of Los Angeles ($121 billion) and Port of Long Beach ($121 billion) in terms of value of U.S.-international freight. In terms of weight, Anchorage, AK, was the leading U.S. air gateway in 2004, handling 28 percent of the 9.5 million tons of international air cargo transported through U.S. airports in 2004.[28] Memphis International Airport was the lead hub airport for express and overnight air shipments.

Multimodal[29]

In 2002, according to the CFS over $1 trillion worth of goods were transported multimodally, including:[30]

- parcel, U.S. Postal Service, and courier,
- truck and rail
- truck and water, and
- rail and water.

Between 1993 and 2002, the value of these multimodal shipments measured in the CFS grew

[28] Anchorage International Airport (ANC) is a major hub for international air trade to Asian countries, with most flights from the United States destined for Asia or flights from Asia destined for the United States making an operational stop at ANC. A 1996 U.S. Department of Transportation (USDOT) rule permits air carriers from foreign countries (except those from the United Kingdom and Japan) to conduct expanded cargo activities at Anchorage. These activities include cargo transfer from foreign carrier's aircraft to any of its other aircraft, transfer from a foreign carrier to any U.S. air carrier, and transfer from one foreign carrier to another foreign carrier. (ANC website http://www.dot.state.ak.us/anc/Management/Marketing/usdot.htm.)

[29] Due to lack of detailed modal information for the non-CFS shipments it was not possible to assign any of these shipments, that were out of scope of the CFS and that may have moved multimodally, to the multimodal category. Hence the CFS-only estimates presented here almost certainly underestimate the true level of multimodal freight activity in the United States.

[30] In this report, the term "multimodal" refers to shipments transported by a combination of modes, including parcel, courier, and postal services, truck and rail, truck and water, rail and water, and other modal combinations. As used in this report, multimodal is different from *intermodal* which is used in this report to describe the traditional truck and rail combination only.

63 percent in inflation-adjusted terms, from about $662 billion to about $1.1 trillion (table 10). These shipments accounted for 13 percent of the value of the CFS shipments in 2002, about 2 percent by the weight, and about 7 percent by ton-miles of shipments. Two large market segments of the multimodal shipments by value are parcel and courier services and intermodal truck and rail. Both have experienced growth and industry changes in recent years. As defined in the CFS, multimodal shipments exclude commodities transported by air (which almost always require movements by truck from the shipment origin to the airport and from the airport to the shipment destination).[31]

Parcel and courier service—In 2002, according to the CFS, over $986 billion worth of goods shipped by U.S. businesses were transported by the parcel, postal, and courier service, which is treated as a separate "mode" of transportation in the CFS (table 10). Between 1993 and 2002, these shipments grew about 75 percent by value in inflation-adjusted terms. Goods moved by this industry, such as electronics, pharmaceuticals, textiles, and auto parts, are typically higher value relative to their weight and averaged over $38,000 per ton in 2002.

In 2002, parcel and express shipments measured by the CFS traveled an average of 745 miles per ton, reflecting the multimodal nature of the services offered by the major parcel and express carriers, including Federal Express (FedEx), United Parcel Service (UPS), and DHL.

Intermodal truck and rail—According to the Rail Waybill data, the classic intermodal rail and truck combination (called rail intermodal) moved shipments weighing 173 million tons in 2002, an increase of 47 percent from 118 million tons in 1993.[32] If it is assumed that these goods would have otherwise been carried by only trucks in 50,000 lb payloads, then the intermodal traffic handled by rail in 2002 essentially removed 6.9 million large truck trips from our highways for a major part of the distance traveled by these shipments.

In 2004, intermodal rail-truck service handled about 11 million trailers and containers, according to the Association of American Railroads (AAR) (figure 11). In 2003, for the first time ever, intermodal freight surpassed coal in terms of revenue for U.S. Class I railroads, accounting for about 23 percent of Class I carriers gross revenue. In 2004, nearly three-quarters (74 percent) of the rail-truck intermodal traffic was in containers.[33] Trailers accounted for the remainder (AAR 2005b). Rapid growth in use of containers for transportation of U.S.-international merchandise trade is the primary factor behind the rising trend in U.S. rail-truck intermodal shipments. Imports account for the majority of this intermodal activity.

Parcel and Express Shipments

During the past two decades, growth in the number of parcels shipped has transformed America's parcel industry and its impact on the freight transportation system. Increasing global integration of the U.S. economy has become a significant force in shaping the nation's freight transportation system. A truly multimodal industry, parcel and express plays an important role in the American economy as it enables the transportation of time-sensitive shipments that are critical to the competitiveness of U.S. businesses domestically and abroad.

The parcel industry shipped an estimated 12 percent of CFS shipments by value, weighing 26 million tons in 2002. The top commodities shipped by parcel couriers include electronic and office equipment, miscellaneous manufactured products, textiles, mixed freight, and printed products.

Shipments by three of the major U.S. parcel couriers, the United States Postal Service (USPS), Federal Express (FedEx), and United Parcel Service (UPS),[34] have dramatically increased in past years. USPS shipments increased from 102 billion pieces of mail (i.e., packages, letters, magazines, etc.) in 1980 to 206 billion in 2004 (USPS 2005).

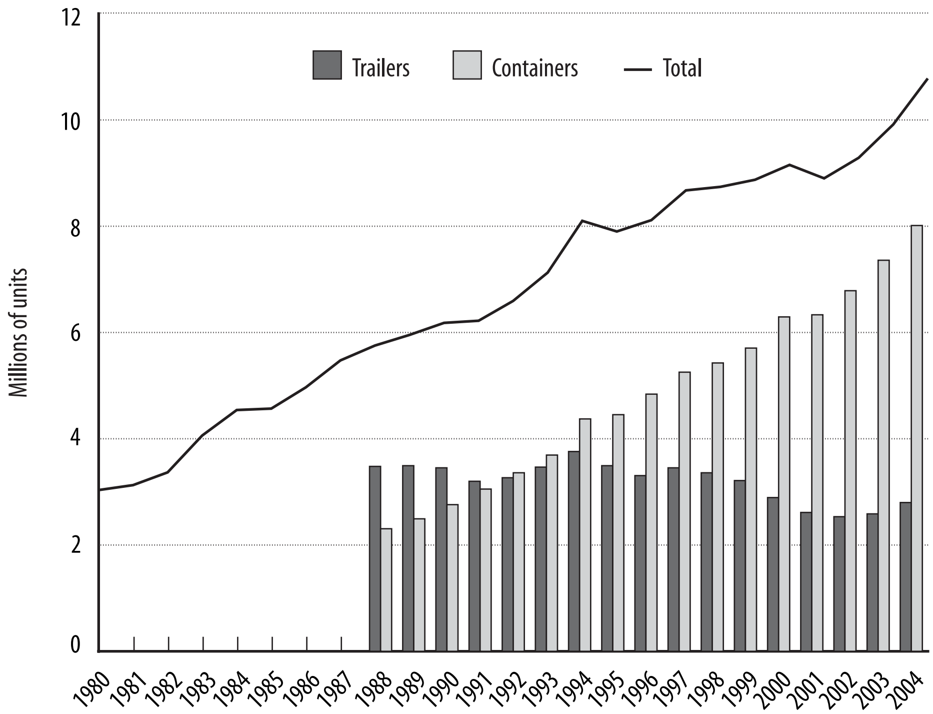
[31] An example of an air-only shipment is when a manufactured aircraft flies from the production plant to the purchaser.

[32] This section uses the Surface Transportation Board's Rail Waybill Sample data on truck-rail intermodal because the 2002 CFS truck-rail data did not meet publication standards. Multimodal shipments may be underreported in the CFS because shippers, who report on the characteristics of shipments, may not always know whether the shipment is transported by more than one mode.

[33] This figure represents the number containers of any size not the number of standardized twenty-foot equivalent units (TEUs) used elsewhere in this report.

[34] Another major firm in the parcel industry, DHL, does not release its shipment figures to the public.

FIGURE 11
Rail-Truck Intermodal Traffic in the United States: 1980-2004



NOTE: Container-trailer breakdown not available prior to 1988.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, based on data from Association of American Railroads, 2004: *Class I Rail Road Statistics,* p. 2; 1990-2003 *Rail Road Facts, 2003*, p. 26; 1980-1985 *Rail Road Facts, 1991*, p. 26; 1986-1989 *Rail Road Facts, 2001*, p. 26.

FedEx and UPS also experienced large growth in their shipments. From 1980 to the 2004, FedEx shipments grew from 68,000 to 3.2 million parcels shipped in average daily package volume (FEDEX 1 2005), while UPS shipments grew from 3.5 billion packages shipped in 2000 to 3.6 billion packages in 2004 (UPS 2004).[35]

FedEx processes millions of shipments daily on route to addresses within the United States and more than 220 countries. In 2004, the average weight of a FedEx package was 7.4 lb (FEDEX 2 2005). With an average daily delivery volume of 14.1 million packages and documents, delivering parcels internationally to more than 200 countries, UPS provides services to more than 7.9 million customers daily (UPS 2005).

The parcel sector pioneered a "hub and spoke" streamlined model of parcel delivery, with their major hubs located near large demographic centers of the United States (see figure 12). When a package is shipped by a private parcel carrier it is sent to an origin processing facility, then to an origin regional center, and from there to its destination regional center, destination processing facility, and finally to its recipient.

FedEx, headquartered in Memphis, TN, accounts for nearly all of the freight movement processed by the Memphis International Airport. UPS is headquartered in Louisville, KY, and accounts for virtually all freight traffic handled by Louisville's Standiford Field. The top airport for air cargo by DHL, another major parcel courier, was the Greater Cincinnati Airport of Ohio, where the firm has two ground-air multimodal freight centers. USPS has several regional ground distribution hubs.

35 UPS data prior to 2000 were unavailable.

FIGURE 12
Air Freight Handled by the Top Three All-Cargo Carriers at their Hubs: 2004

NOTE: This map represents freight handled by United Parcel Service, Fedex, and DHL at their airport hubs.

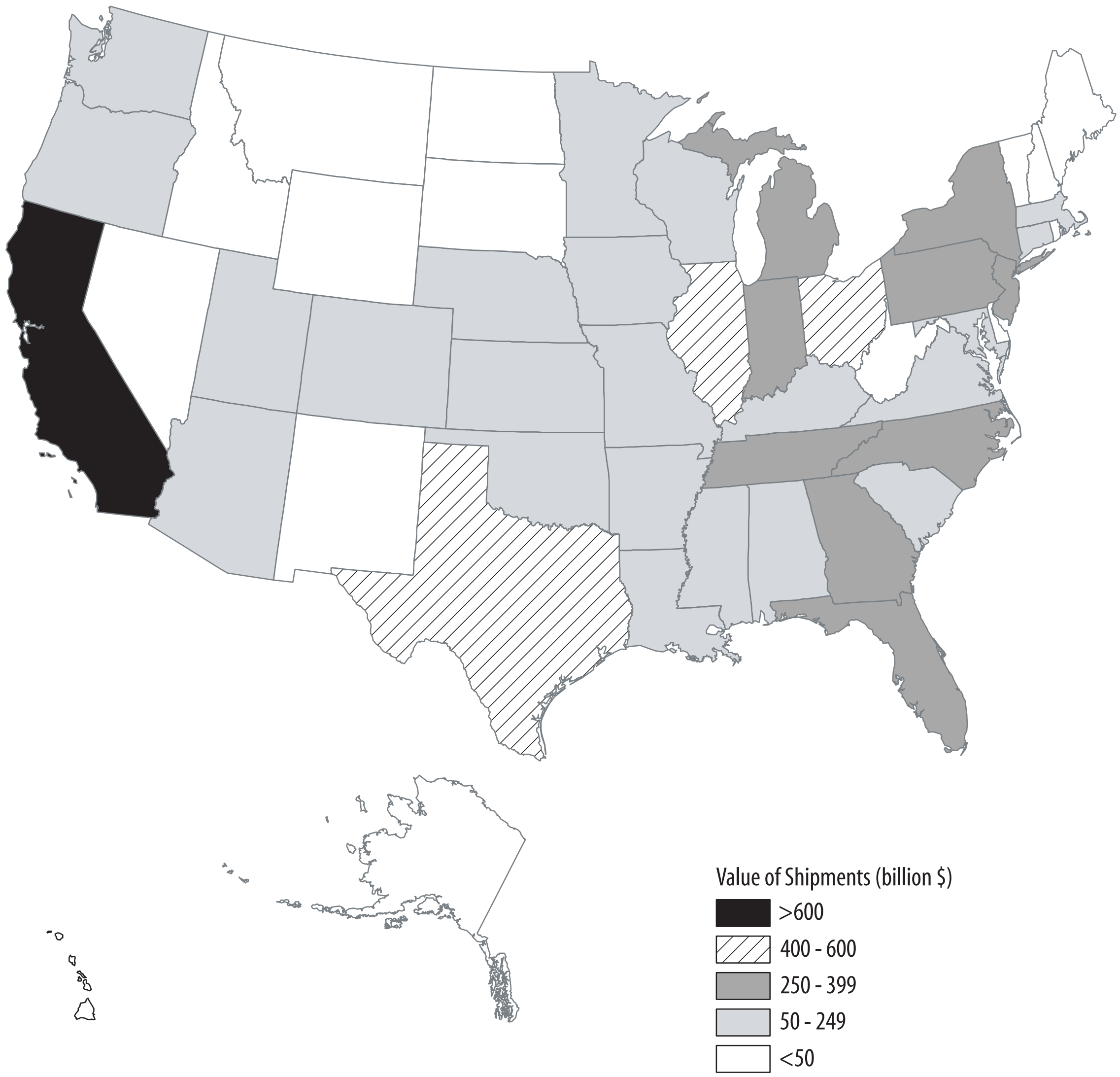
SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Office of Airline Information, Special Tabulation, 2004 Air Traffic Data.

THE GEOGRAPHY OF U.S. FREIGHT SHIPMENTS[36]

Several factors influence the distribution of shipments originating in or sent to specific states, including the size of a state's population and economy, its resources, and geographic spread. The 2002 CFS provides data that allow analysis of the geography of freight flows at the state, interstate, and metropolitan area levels. The CFS origin and destination picture presented here will differ from the picture that will arise if we had origin and destination data from the non-CFS portion of the composite data.

[36] These findings are based on the CFS only data. Origin and destination information is not available for the non-CFS component of the composite estimates.

FIGURE 13
Value of Freight Shipments by State of Origin: 2002
(Commodity Flow Survey data only; covers all modes)



SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, 2002 Commodity Flow Survey data.

Origins and Destinations by State and Metro Areas

In 2002, more than one-quarter (29 percent) of CFS shipments by value originated in states with large manufacturing sectors and populations—California, Texas, Ohio, and Illinois (figure 13 map). These four large states were also the destination for nearly one-third of shipments by value. The amount of freight shipped to and from these states stems in part from their large domestic markets and their importance to manufacturing and assembling parts produced in other states. Also these states have major freight gateways and border crossing ports or have large intermodal terminals (e.g., Chicago in Illinois). Therefore a good proportion of the freight destined for these states involves international trade. Table 18 shows the value and weight of both outbound and inbound freight shipments by state in 2002. Key highlights on state origins and destinations include:

TABLE 18
Value and Weight of Outbound and Inbound Commodity Flows by State: 2002
(Commodity Flow Survey data only)

Value of shipments (billion $)			Weight of shipments (million tons)		
Ordered by value of outbound shipments	Outbound	Inbound	Ordered by weight of outbound shipments	Outbound	Inbound
California	924	894	Texas	1,083	1,180
Texas	589	719	California	904	974
Ohio	494	413	Illinois	718	673
Illinois	442	416	Ohio	546	585
Michigan	389	407	Louisiana	496	561
Pennsylvania	354	328	Florida	455	542
New York	319	372	Wyoming	401	69
Florida	297	405	Pennsylvania	400	400
North Carolina	294	257	Indiana	398	429
Indiana	291	244	Georgia	340	388
New Jersey	287	267	Kentucky	336	266
Tennessee	287	200	Minnesota	336	275
Georgia	271	295	Michigan	331	366
Wisconsin	217	183	North Carolina	276	328
Massachusetts	201	160	West Virginia	276	132
Kentucky	189	160	Tennessee	270	273
Missouri	185	178	Virginia	269	274
Washington	177	223	Washington	260	249
Minnesota	166	161	Missouri	255	237
Virginia	165	199	New York	250	286
South Carolina	143	129	New Jersey	238	280
Louisiana	140	159	Iowa	233	191
Alabama	128	124	Wisconsin	230	249
Maryland	121	152	Alabama	216	225
Iowa	115	89	Kansas	193	186
Arizona	111	119	Maryland	165	189
Oregon	103	94	Oregon	158	187
Kansas	95	87	Colorado	150	134
Mississippi	95	78	South Carolina	143	164
Colorado	93	105	Oklahoma	136	144
Arkansas	92	78	Arkansas	120	128
Connecticut	82	75	Utah	110	82
Oklahoma	78	83	Nebraska	102	115
Nebraska	62	52	Arizona	101	132
Utah	62	62	Mississippi	99	106
Nevada	41	69	Montana	90	45
West Virginia	38	37	North Dakota	88	82
Maine	32	29	Massachusetts	75	93
New Hampshire	31	32	South Dakota	52	39
Idaho	28	28	Connecticut	49	59
South Dakota	26	20	New Mexico	49	51
Rhode Island	21	18	Nevada	44	61
Delaware	20	31	Alaska	36	36
North Dakota	19	24	Idaho	35	34
Vermont	16	18	New Hampshire	34	34
New Mexico	15	34	Maine	32	26
Hawaii	13	21	Delaware	31	47
Montana	12	23	Hawaii	24	25
Wyoming	12	16	Rhode Island	19	17
Alaska	8	14	Vermont	16	16
District of Columbia	4	14	District of Columbia	1	6
CFS total	8,397	8,397	**CFS total**	11,668	11,668

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Census Bureau, 2002 Commodity Flow Survey, individual state data, May 2005.

Originations

- By value, the leading state of origin for CFS shipments was California with 11 percent ($924 billion) of the value of total CFS shipments, followed by Texas with 7 percent of the value. Other leading states of origin by value include Ohio and Illinois.
- Four states had over $440 billion each of outbound freight shipments (California, Texas, Ohio, and Illinois). Together these four states accounted for 29 percent of the value of CFS shipments.
- By weight, the leading states of origin for outbound shipments include Texas, California, and Illinois with over 700 million tons each.

Destinations

- By value, the leading state of destination for inbound CFS shipments was California, with over $890 billion destined for the state. California was followed by Texas with $719 billion. Other leading states for inbound shipments include Illinois, Ohio, Michigan, Florida, and New York.
- Seven states had over $370 billion each of inbound freight shipments (California, Texas, Illinois, Ohio, Michigan, Florida, and New York). Together these states accounted for 43 percent of the value of CFS shipments.
- By weight, the leading state of destination for inbound freight was Texas with 10 percent of the national total. California was next with 8 percent of shipments destined to locations in the state.

By Mode

- Nationally, trucks carried 74 percent or $6.2 trillion of the total value of CFS shipments. In 25 states, truck transportation handled at least 74 percent of the value of the total shipments originating in each of these states. California was both the origin as well as the destination for the largest amount of truck freight shipments by value, with $626 billion (outbound) and $618 billion (inbound).
- Nationally, trucks hauled 67 percent or 7.8 billion tons of the total weight of CFS shipments. In 37 states, trucks transported at least 67 percent of the tonnage of the total shipments originating in each of these states. Once again, California was both the origin as well as the destination for the largest amount of truck freight shipments by weight, with 768 million tons (outbound) and 782 million tons (inbound).
- For rail, Wyoming, which ships large volumes of coal, was the leading state for outbound shipments with 330 million tons. Texas was the top state for inbound rail shipments by weight with over 231 million tons of freight destined there in 2002.

Metropolitan Areas[37]

- In 2002, the largest 64 metropolitan areas (MAs) where statistically reliable estimates could be made accounted for 61 percent of the CFS shipments by value and 45 percent by weight. Over 5 billion tons of freight valued at $5 trillion originated in the largest MAs.[38]
- By value, the Los Angeles-Long Beach-Riverside metro area was the lead for outbound shipments originating in MAs. Over $504 billion of freight went out of this metro region in 2002. Shipments from MAs are widely dispersed through the nation to other metro regions as illustrated by figure 14 [map], which shows shipments from the Los Angeles-Long Beach-Riverside MA. Chicago-Naperville-Michigan City metro area (Illinois part) was second with about $305 billion of outbound freight.
- By weight, three metropolitan areas led in outbound freight shipments. These top MAs, in no rank order, were Houston-Baytown-Huntsville, Texas (462 million tons); Chicago-Naperville-Michigan City metro area (Illinois part) (399 million tons); and Los Angeles-Long Beach-Riverside metro area (384 million tons).

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[37] In this report, multi-state metropolitan areas are kept separate. For example, the Illinois and Michigan parts of the Chicago-Naperville-Michigan City metro area and the Kansas and Missouri parts of the Kansas City, MO-KS metropolitan statistical area (MeSA) are not combined.

[38] In 2002, there were 361 metropolitan statistical areas (MAs) in the United States as officially designated by the U.S. Office of Management and Budget in December 2003. The largest 64 MAs, covered in the CFS, accounted for roughly 61 percent (163 million) of the 269 million U.S. population in 2002 (USDOC Census 2005). Table 1: Annual Estimates of the Population of Metropolitan and Micropolitan Statistical Areas: April 1, 2000 to July 1, 2003 (CBSA-EST2003-01). Internet Release Date: June 7, 2005.

FIGURE 14
Distribution of CFS Shipments from Los Angeles Metropolitan Area: 2002

CFS = Commodity Flow Survey

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, 2002 Commodity Flow Survey data.

Interstate Freight Movements

The U.S. freight transportation network is a national system, involving heavy interstate activity, as shown in the 2002 CFS data.

- Nationally, nearly 60 percent of the value of CFS freight shipments by all modes, worth $4.9 trillion, crossed state lines in interstate commerce. By weight 34 percent of the shipments, over 4 billion tons, was interstate (table 19).
- Interstate's share of shipments varies by state, commodity, and mode. In 42 states, out-of-state shipments accounted for more than 50 percent of the value of the state's outbound shipments. Only in eight states did interstate shipments account for less than 50 percent of the value of their outbound shipments. These include large states with major cities that are widely separated, such as California and Texas; states in the corners of the country, such as Florida and Washington State; and Alaska and Hawaii which are not contiguous with the other 48 states (figure 15 map).
- By weight, interstate shipments accounted for over half the shipments in 8 states, including Wyoming where nearly 87 percent of the tonnage originating in the state was interstate.

The 2002 CFS provides a measure of the relative share of states' products moved by mode and the proportion shipped to out-of-state markets by that

TABLE 19

Interstate Commerce as Share of Shipments by State of Origin: 2002

(Commodity Flow Survey data only; covers all modes)

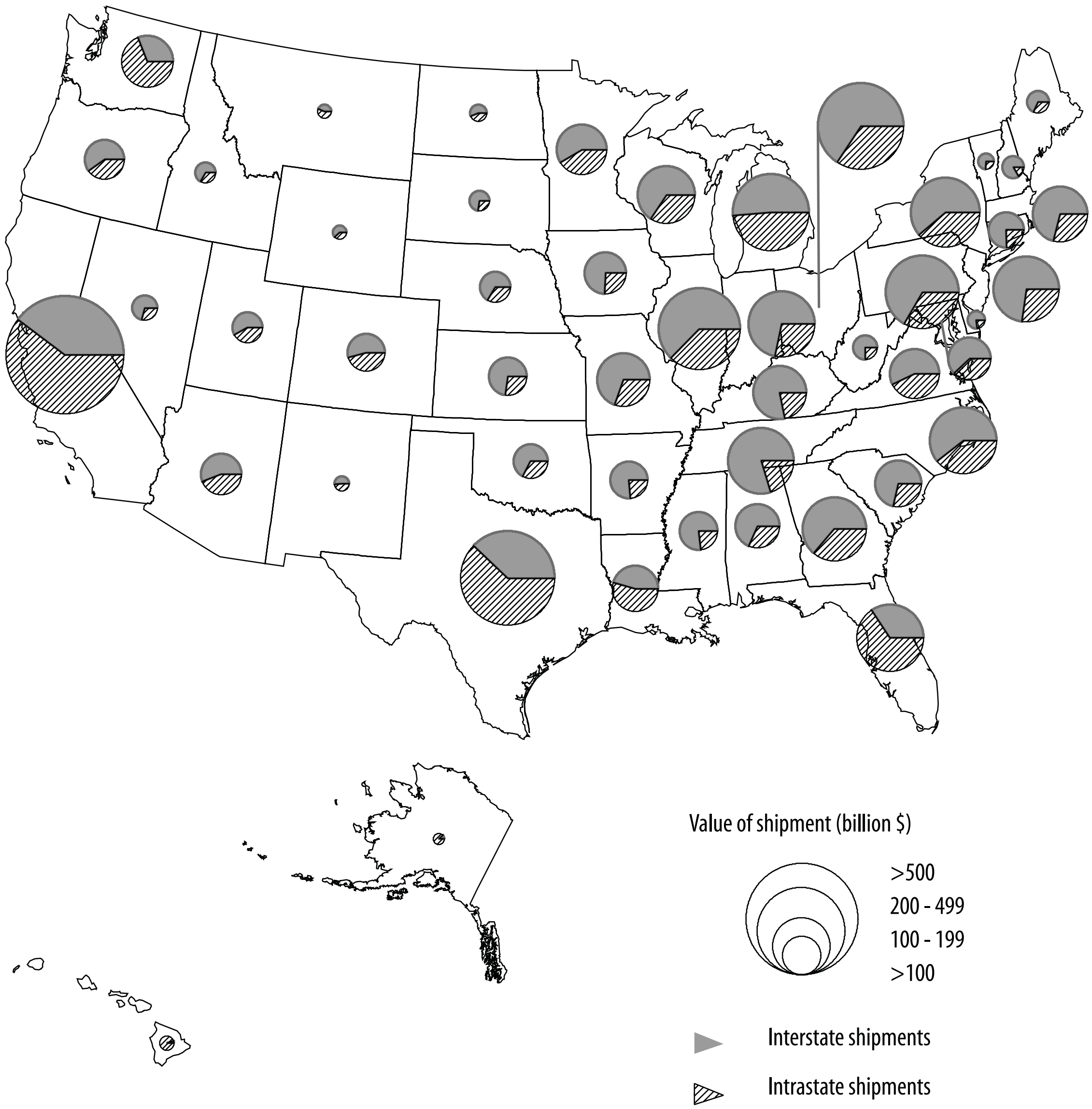
Value (billion $)				Weight (million tons)			
Ranked by percent interstate	**State total**	**Interstate**	**Percent interstate**	**Ranked by percent interstate**	**State total**	**Interstate**	**Percent interstate**
Rhode Island	21	18	83.8	Wyoming	401	350	87.4
New Hampshire	31	26	83.1	West Virginia	276	183	66.5
Tennessee	287	228	79.6	Montana	90	52	58.6
Kentucky	189	148	78.0	Kentucky	336	194	57.6
Mississippi	95	73	76.8	Idaho	35	19	53.4
Delaware	20	16	76.6	Mississippi	99	53	53.4
Arkansas	92	70	76.0	Rhode Island	19	10	51.0
West Virginia	38	29	75.5	Arkansas	120	61	50.9
Connecticut	82	62	75.3	Missouri	255	126	49.6
Iowa	115	86	74.5	Iowa	233	113	48.5
Vermont	16	12	74.2	South Dakota	52	24	45.3
New Jersey	287	209	72.8	Maine	32	14	44.8
South Dakota	26	19	72.8	Wisconsin	230	101	44.0
Kansas	95	69	72.8	Utah	110	48	43.8
Indiana	291	209	71.6	Delaware	31	13	43.5
South Carolina	143	102	71.4	Alabama	216	94	43.3
Massachusetts	201	143	71.0	Minnesota	336	145	43.2
Nevada	41	29	70.7	Pennsylvania	400	166	41.5
Missouri	185	129	69.4	Tennessee	270	111	41.2
Alabama	128	87	68.4	Colorado	150	61	40.3
Maine	32	22	67.8	Ohio	546	212	38.8
Oklahoma	78	52	67.2	South Carolina	143	54	37.9
Idaho	28	19	67.0	Illinois	718	271	37.7
Pennsylvania	354	237	66.8	New Jersey	238	89	37.6
Nebraska	62	41	66.4	New Mexico	49	18	37.0
Wisconsin	217	143	65.8	Indiana	398	146	36.6
Ohio	494	325	65.8	Vermont	16	6	36.5
Georgia	271	172	63.6	Oklahoma	136	46	34.0
Illinois	442	277	62.7	Kansas	193	65	33.8
Wyoming	12	8	62.3	New York	250	84	33.8
Maryland	121	75	61.9	New Hampshire	34	11	33.5
New York	319	195	61.2	Nebraska	102	34	33.5
North Carolina	294	178	60.6	Maryland	165	55	33.2
Oregon	103	61	59.8	Virginia	269	84	31.3
Minnesota	166	97	58.5	Massachusetts	75	23	30.8
Utah	62	36	58.1	Louisiana	496	150	30.4
Virginia	165	94	57.1	Michigan	331	98	29.6
Arizona	111	62	55.9	Georgia	340	99	29.3
North Dakota	19	11	55.7	Nevada	44	13	28.7
Colorado	93	50	54.1	North Dakota	88	24	26.8
Michigan	389	199	51.2	Connecticut	49	13	26.5
New Mexico	15	8	51.2	Oregon	158	42	26.4
Louisiana	140	64	45.5	North Carolina	276	71	25.6
Montana	12	5	43.5	Washington	260	61	23.4
California	924	366	39.6	Arizona	101	21	20.4
Texas	589	223	37.9	Texas	1083	167	15.4
Florida	297	102	34.4	Florida	455	44	9.7
Washington	177	55	31.1	California	904	81	9.0
Alaska	8	1	10.9	Hawaii	24	1	5.2
Hawaii	13	1	5.1	Alaska	36	1	3.9
District of Columbia	4	3	84.1	District of Columbia	1	S	S
CFS total	8,397	4,945	58.9	CFS total	11,668	4,024	34.5

KEY: — Represents data cell equal to zero or less than 1 unit of measure;

S = Estimate does not meet publication standards because of high sampling variability or poor response quality.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Census Bureau, 2002 Commodity Flow Survey, individual state data, May 2005.

FIGURE 15
Interstate and Intrastate Flows as Share of Outbound Shipment Value by State: 2002
(Commodity Flow Survey data only; covers all modes)



SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, 2002 Commodity Flow Survey data.

mode. For example, nationally, truck shipments accounted for at least half of the value of goods movement in all but two states—Louisiana and Wyoming (table 20). Twenty-one states depend on highways to transport more than three-quarters of the value of their states' products. Among states with large manufacturing activity that depend heavily on truck shipments, Texas, California, Illinois, Ohio, Michigan, and Pennsylvania relied on trucking to transport between 60 percent and 80 percent of the value of their freight.

Nationwide, interstate freight shipments accounted for over half (56 percent) of the value and 25 percent of the weight of goods transported by truck in the CFS. This suggests that individ-

TABLE 20
Truck Shipments as Share of Total Value of All Shipments Originating in State: 2002
(Commodity Flow Survey data only)

State of origin	Value by all modes (million $)	Value by truck (million $)	Truck shipments as share of all mode total (percent)
District of Columbia	3,707	3,576	96.5
North Carolina	293,604	264,443	90.1
South Carolina	143,194	126,452	88.3
Mississippi	94,897	82,103	86.5
Maryland	121,356	104,030	85.7
Arkansas	91,967	78,165	85.0
Virginia	164,557	137,943	83.8
Kentucky	189,390	157,473	83.1
Georgia	270,703	224,029	82.8
Pennsylvania	354,399	287,156	81.0
Iowa	115,396	92,849	80.5
Nebraska	61,797	49,569	80.2
Tennessee	286,576	229,373	80.0
Alabama	127,727	101,595	79.5
Wisconsin	217,451	172,120	79.2
Maine	32,355	25,307	78.2
Michigan	388,571	303,640	78.1
Oklahoma	77,576	60,450	77.9
Vermont	16,238	12,571	77.4
Indiana	291,458	225,612	77.4
Florida	296,989	226,639	76.3
Ohio	494,278	377,110	76.3
Connecticut	82,477	61,768	74.9
New Mexico	14,907	11,118	74.6
Illinois	442,130	328,191	74.2
West Virginia	38,479	28,536	74.2
Utah	61,515	45,233	73.5
New Jersey	286,580	210,095	73.3
Kansas	95,285	69,645	73.1
Missouri	185,392	134,904	72.8
New York	318,775	231,714	72.7
Massachusetts	200,813	145,408	72.4
Oregon	102,600	73,655	71.8
Delaware	20,348	14,481	71.2
North Dakota	18,921	13,126	69.4
Minnesota	166,430	114,842	69.0
Colorado	93,184	64,155	68.8
Rhode Island	21,035	14,475	68.8
Nevada	40,756	27,748	68.1
California	923,669	625,530	67.7
Idaho	28,471	19,094	67.1
Montana	12,447	8,281	66.5
Arizona	111,273	73,237	65.8
Texas	589,064	379,531	64.4
New Hampshire	31,191	19,541	62.6
South Dakota	26,430	15,634	59.2
Alaska	8,032	4,620	57.5
Hawaii	13,480	7,484	55.5
Washington	177,395	89,594	50.5
Wyoming	12,106	5,675	46.9
Louisiana	139,843	55,481	39.7
CFS total	8,397,210	6,235,001	74.3

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Census Bureau, 2002 Commodity Flow Survey, individual state data, May 2005.

ual state economies rely on other states' highway networks and the *national* highway systems to transport nearly 2 billion tons of goods to their ultimate destinations. In the CFS data, interstate shipments accounted for over 50 percent of the value of truck shipments in 36 states (table 21).

U.S.-INTERNATIONAL FREIGHT SHIPMENTS[39]

According to the composite estimates, nearly 1.7 billion tons of merchandise moved in and out of the United States in 2002. This means that approximately 9 percent of the 19 billion tons of total commercial freight transported on the nation's transportation system were imported goods or goods destined for exports. Maritime vessels carried 76 percent of the total weight and 39 percent of the total value of the imports and exports in 2002. Trucks carried 11 percent of the weight and 21 percent of the value, while air carried less than 1 percent of the weight but 27 percent of the value. Rail and pipeline carried the remainder.

According to U.S.-foreign trade statistics, in 2004, the U.S. freight transportation network carried merchandise exports and imports worth over $2.2 trillion, an increase of 168 percent from $822 billion in 1990 (both in inflation-adjusted 2000 dollars).[40] Between 1990 and 2004, the ratio of the value of U.S. goods produced for exports and goods imported into the United States to GDP increased from 12 percent to 21 percent, also in inflation-adjusted terms.

Most U.S.-international merchandise trade is with relatively few countries, although the United States trades with most countries worldwide. In 2004, three-quarters (75 percent) of the value of U.S. merchandise trade was with 15 countries, and just five countries—Canada, Mexico, China, Japan, and Germany—accounted for over half (54 percent) of the value of U.S. goods imports and exports (table 22).

U.S.-NAFTA Trade

Nearly one-third of U.S. merchandise trade was with Canada and Mexico, the U.S.-North American Free Trade Agreement (NAFTA) trade partners. In 2004, land modes of transportation (truck, rail, pipeline) carried the majority (89 percent) of U.S. goods trade with Canada and Mexico, a proportion that has remained stable since 1990.

The modal shares of overall U.S.-NAFTA freight vary depending on the value or weight of the traded goods. In terms of value, trucks transported nearly two-thirds (64 percent) of the goods in U.S.-NAFTA trade in 2004 (figure 16). Trucks moved $453 billion ($215 billion of exports and $238 billion of imports) of this trade. Trucking was followed by rail, water, pipeline, and air. Trucks are more dominant in U.S. trade with Mexico, accounting for 69 percent of the value, than in U.S. trade with Canada, accounting for 60 percent of the value.

The relative modal roles in U.S.-NAFTA trade vary by weight (figure 16). In 2004, water transportation carried more of this trade in terms of tonnage than any other mode. About 246 million tons of U.S.-NAFTA trade traveled over water, accounting for about 39 percent of the weight. Water transportation was followed in descending order by truck, rail, pipeline, and air. Water is more dominant in terms of weight because of its role in transporting heavy bulk products (e.g., grains and crude petroleum), while higher value-per-ton commodities (e.g., fresh flowers, electronics, and office equipment) are more often moved by air, truck, and rail. Trucks moved an estimated 176 million tons of traded goods with Canada and Mexico, accounting for about 28 percent of the weight of U.S.-NAFTA trade. Modal shares by weight vary by imports and exports. In 2004, trucks moved 21 percent of import tonnage and an estimated 45 percent of export tonnage.

North American Land Border Crossings

Along the U.S. land borders with Canada and Mexico are over 100 land ports where freight crosses between the countries; 80 of these are along the Canadian border and 24 are along the

[39] The U.S. international data presented in this section are based on official U.S. merchandise trade data and are not from the CFS. Summarized imports and export trade data are incorporated into the composite estimates and described in box B.

[40] Inflation-adjusted chained 2000 dollars data on U.S.-international goods trade are not available from the Bureau of Economic Analysis for 1980 on the National Income and Products Accounts (NIPA) basis. The NIPA basis data for goods reflects adjustments for statistical differences and balance of payments. See Table 4.2.6 at http://www.bea.gov/bea/dn/nipaweb/SelectTable.asp?Selected=N#S4, available as of September 2005.

TABLE 21
Interstate Truck Shipments as Share of All Truck Shipments Originating in State: 2002
(Commodity Flow Survey data only)

State of origin	Value of all truck shipment (million $)	Value of interstate truck shipments (million $)	Interstate shipment as share of state's truck total (percent)
District of Columbia	3,576	3,042	85.1
Rhode Island	14,475	11,592	80.1
Delaware	14,481	11,504	79.4
Tennessee	229,373	179,598	78.3
Mississippi	82,103	64,142	78.1
New Hampshire	19,541	15,257	78.1
Kentucky	157,473	119,757	76.0
Arkansas	78,165	58,353	74.7
West Virginia	28,536	21,127	74.0
Iowa	92,849	66,232	71.3
Indiana	225,612	160,577	71.2
South Carolina	126,452	89,407	70.7
Connecticut	61,768	43,348	70.2
New Jersey	210,095	146,433	69.7
Kansas	69,645	47,900	68.8
Vermont	12,571	8,641	68.7
Massachusetts	145,408	96,233	66.2
Nebraska	49,569	32,688	65.9
Oklahoma	60,450	39,826	65.9
Alabama	101,595	65,923	64.9
Ohio	377,110	243,503	64.6
Pennsylvania	287,156	185,187	64.5
Maine	25,307	16,153	63.8
Missouri	134,904	83,680	62.0
Maryland	104,030	64,450	62.0
Nevada	27,748	16,938	61.0
Wisconsin	172,120	104,823	60.9
Georgia	224,029	134,925	60.2
South Dakota	15,634	9,388	60.0
North Carolina	264,443	158,015	59.8
Illinois	328,191	190,703	58.1
New York	231,714	128,444	55.4
Idaho	19,094	10,459	54.8
Utah	45,233	24,486	54.1
Virginia	137,943	73,412	53.2
Minnesota	114,842	60,006	52.3
Oregon	73,655	38,422	52.2
North Dakota	13,126	6,224	47.4
Louisiana	55,481	25,902	46.7
New Mexico	11,118	5,143	46.3
Colorado	64,155	28,377	44.2
Michigan	303,640	133,119	43.8
Arizona	73,237	28,575	39.0
Wyoming	5,675	1,977	34.8
Washington	89,594	30,859	34.4
Texas	379,531	124,096	32.7
California	625,530	199,094	31.8
Montana	8,281	2,565	31.0
Florida	226,639	58,423	25.8
Alaska	4,620	75	1.6
Hawaii	7,484	—	0.0
U.S. total	6,235,001	3,469,003	55.6

KEY: — Represents data cell equal to zero or less than 1 unit of measure.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Census Bureau, 2002 Commodity Flow Survey, individual state data, May 2005.

TABLE 22
Top 15 U.S. Trading Partners by Value of Merchandise Trade: 2004
(Billions of current U.S. dollars)

Rank	Country	Imports	Exports	Total U.S. trade	Percent of total U.S. trade	Cumulative percent
1	Canada	255.9	187.7	443.6	19.4	19.4
2	Mexico	155.8	110.8	266.6	11.7	31.1
3	China	196.7	34.7	231.4	10.1	41.2
4	Japan	129.6	54.4	184.0	8.0	49.2
5	Germany	77.2	31.4	108.6	4.8	54.0
6	United Kingdom	46.4	36.0	82.4	3.6	57.6
7	Korea	46.2	26.3	72.5	3.2	60.8
8	Taiwan	34.6	21.7	56.3	2.5	63.2
9	France	31.8	21.2	53.1	2.3	65.6
10	Malaysia	28.2	10.9	39.1	1.7	67.3
11	Italy	28.1	10.7	38.8	1.7	69.0
12	Netherlands	12.6	24.3	36.9	1.6	70.6
13	Ireland	27.4	8.2	35.6	1.6	72.1
14	Brazil	21.2	13.9	35.0	1.5	73.7
15	Singapore	15.3	19.6	34.9	1.5	75.2
	All other trading partners	362.6	204.5	567.1	24.8	
	Top 15 countries	1,107.1	611.8	1,718.9	75.2	
	Total, all countries	1,469.7	816.3	2,286.0	100.0	

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, based on data from U.S. Department of Commerce, U.S. International Trade Commission, available at http://dataweb.usitc.gov/ as of August 2005.

Mexican border. In 2004, more than 11 million trucks and 41 thousand trains carried freight into the United States through these ports of entry. On those trucks and trains were nearly 14 million containers with goods destined for every state in the country.[41]

Despite numerous available ports, a large percentage of this activity takes place at only a few. Nearly 40 percent of all truck crossings from Canada and Mexico passed through Detroit (MI), Laredo (TX), and Buffalo-Niagara Falls (NY), three ports that are also ranked in the top five for train crossings (table 23). Each day truck crossings at these ports number in the thousands.

The number of containers entering the country by truck and rail has increased. Since 1998, truck container entries grew by 31 percent, and rail container entries grew by 65 percent (BTS Border Crossing data, 2005).

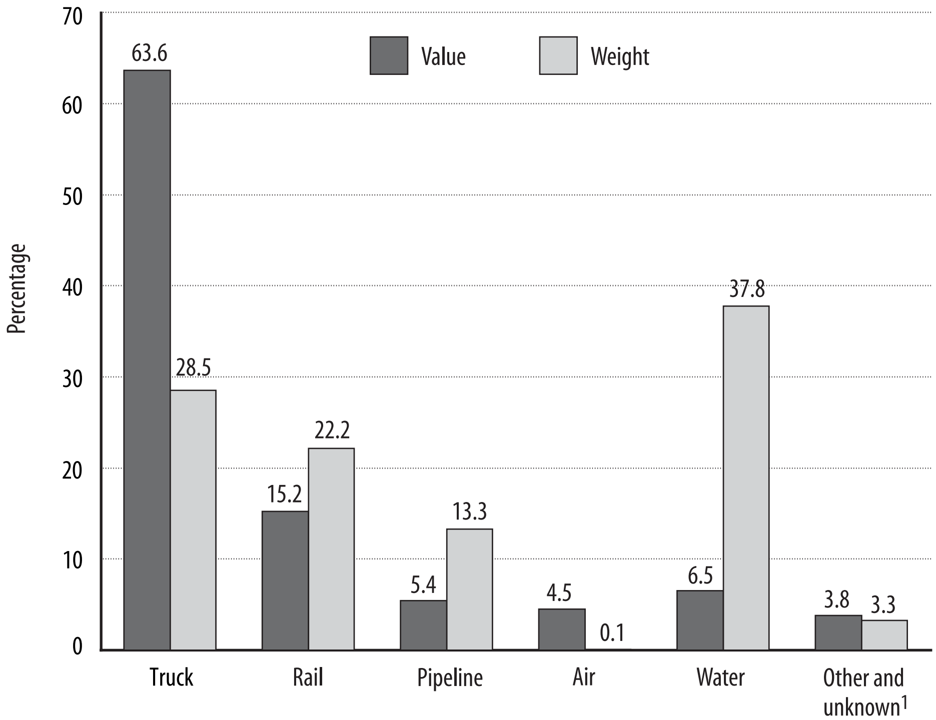
[41] The truck and rail container information presented here represent actual count of container equipment, not twenty-foot equivalent units (TEUs), as often used to describe maritime containers.

U.S.-International Freight Gateways

Over 400 U.S. freight gateways—seaports, airports, and land border crossings—handle U.S. exports and imports. At least 125 gateways handle one billion dollars of trade or more, and these gateways are located in 40 states. The bulk of U.S. goods imports and exports passes through a relatively few number of gateways (USDOT BTS 2004). In 2004:

- the nation's top five freight transportation gateways by value of goods handled more than one-fourth ($595 billion) of the total value of U.S.-international merchandise trade
- the nation's top 15 gateways handled more than 52 percent of U.S.-international merchandise trade by value, and

FIGURE 16
Modal Shares of U.S. Trade with Canada and Mexico by Value and Weight: 2004



[1] Other and unknown includes "flyaway aircraft" (i.e., aircraft moving from the manufacturer to a customer and not carrying any freight), vessels moving under their own power, pedestrians carrying freight, and miscellaneous.

NOTE: These data reflect U.S. import and export trade with Canada and Mexico. Weights of export shipments by land modes are estimates from the Bureau of Transportation Statistics.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, Transborder Freight Data, as of May 2005.

- the top 50 gateways handled 80 percent ($1.8 trillion) of U.S.-international trade.[42]

In 2004, the top five gateways represented the three transportation modes—water, air, and land (table 24):

1. The John F. Kennedy (JFK) International Airport was the leading gateway for international trade by value with over $125.3 billion in air cargo.
2. The Port of Los Angeles ranked second in value with $121.4 billion in total oceanborne trade.
3. The Port of Long Beach ranked third with a total of $121.3 billion in export-import trade.

[42] Ranking of the leading freight gateways is based on the value of traded goods instead of the weight because weight data for land exports are not collected by U.S. authorities.

Table 24 shows the top 25 freight gateways ranked by value of total trade. Throughout the 1990s, JFK Airport was the leading gateway for overall merchandise trade by total value of shipments. In 2004, JFK regained the top gateway position handling $52.7 billion in export trade and $72.6 billion in imports and displacing the Port of Los Angeles, which was the leading gateway in 2003. Between 1999 and 2003, trade handled at the Port of Los Angeles jumped 47 percent in value, far above the 14 percent average growth for the top 25 gateways. This growth reflects a major increase in trade with Asia and Pacific-Rim countries, especially growth in goods from China.

The Port of Los Angeles' position as the leading gateway by value of goods reflects the specialization among U.S. seaports. The Pacific and Atlan-

TABLE 23
Top 5 U.S. Land Ports by U.S.-NAFTA Border Crossings: 2004

Truck			Rail		
Rank in 2004	Border	Number of crossings	Rank in 2004	Border	Number of crossings
	Top 5 U.S.-NAFTA ports	5,940,682			19,351
1	Detroit, MI	1,701,452	1	Port Huron, MI	5,276
2	Laredo, TX	1,391,850	2	Detroit, MI	3,936
3	Buffalo-Niagara Falls, NY	1,175,254	3	International Falls, MN	3,720
4	Port Huron, MI	945,962	4	Laredo, TX	3,443
5	Otay Mesa/San Ysidro, CA	726,164	5	Buffalo-Niagara Falls, NY	2,976
	Top 5 as % of total	52.1		Top 5 as % of total	47.1
	U.S.–NAFTA total crossings	11,405,508		Total U.S.-NAFTA	41,111
	Top 5 U.S.-Canada ports	4,591,686			18,564
1	Detroit, MI	1,701,452	1	Port Huron, MI	5,276
2	Buffalo-Niagara Falls, NY	1,175,254	2	Detroit, MI	3,936
3	Port Huron, MI	945,962	3	International Falls, MN	3,720
4	Champlain-Rouses Pt., NY	397,317	4	Buffalo-Niagara Falls, NY	2,976
5	Blaine, WA	371,701	5	Warroad, MN	2,656
	Top 5 as % of total	66.5		Top 5 as % of total	55.8
	U.S.–Canada total crossings	6,901,820		U.S.-Canada	33,267
	Top 5 U.S.-Mexico ports	3,604,137			7,282
1	Laredo, TX	1,391,850	1	Laredo, TX	3,443
2	Otay Mesa/San Ysidro, CA	726,164	2	Eagle Pass, TX	1,653
3	El Paso, TX	719,545	3	Brownsville, TX	998
4	Hidalgo, TX	454,351	4	El Paso, TX	744
5	Calexico East, CA	312,227	5	Nogales, AZ	444
	Top 5 as % of total	80.0		Top 5 as % of total	92.8
	U.S.–Mexico total crossings	4,503,688		U.S.-Mexico	7,844

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, based on data from the Department of Homeland Security, U.S. Customs and Border Protection, Office of Management Reporting, *Data Warehouse* CD-ROM, August 2005.

tic coast ports are heavily involved in container trade, while the U.S. Gulf Coast ports are primarily involved in dry bulk and tanker trade. Gulf ports such as Houston, TX, lead other U.S. ports in terms of tonnage of international cargo, including shipment of agricultural, petroleum, coal, and other bulk commodities.

In 2004, over 1.3 billion short tons of international maritime cargo were transported through U.S. seaports, with exports accounting for 27 percent and imports accounting for 73 percent of that tonnage. Table 25 shows that the ranking of the seaports changes when sorted by tonnage rather than by cargo value. In 2003, the top three seaport gateways by weight were the Port of Houston (over 126 million tons of freight), followed by the Port of South Louisiana (80 million tons) and the Port of New York and New Jersey (78 million tons). The top 20 seaports accounted for 64 percent of the maritime export tonnage and 72 percent of the import tonnage.

TABLE 24
Top 25 U.S. Freight Gateways, Ranked by Value of Shipments: 2004
(Current $, billions)

Rank	Port name	Mode	Total U.S. trade	Exports	Imports	Exports as % of total
1	JFK International Airport, NY	Air	125.3	52.7	72.6	42.0
2	Los Angeles, CA	Water	121.4	16.4	105.1	13.5
3	Long Beach, CA	Water	121.3	18.6	102.8	15.3
4	Detroit, MI	Land	113.8	58.2	55.6	51.1
5	Port of New York and New Jersey	Water	113.5	23.1	90.4	20.4
6	Laredo, TX	Land	89.5	38.4	51.1	42.9
7	Los Angeles International Airport, CA	Air	68.7	33.9	34.8	49.3
8	Buffalo-Niagara Falls, NY	Land	68.3	31.7	36.6	46.5
9	Houston, TX	Water	66.4	29.2	37.2	44.0
10	Port Huron, MI	Land	65.9	23.6	42.3	35.8
11	Chicago, IL	Air	65.4	25.2	40.1	38.6
12	San Franscisco International Airport, CA	Air	54.6	24.3	30.3	44.5
13	Charleston, SC	Water	46.7	15.4	31.3	32.9
14	El Paso, TX	Land	42.8	18.3	24.4	42.9
15	Norfolk, VA	Water	33.5	12.0	21.5	35.8
16	Baltimore, MD	Water	31.3	6.9	24.4	22.0
17	Dallas/Ft. Worth, TX	Air	31.2	14.6	16.6	46.7
18	New Orleans, LA	Air	30.0	15.2	14.8	50.6
19	Seattle, WA	Water	29.6	6.7	22.9	22.6
20	Tacoma, WA	Water	28.9	5.3	23.6	18.3
21	Oakland, CA	Water	27.3	8.5	18.8	31.1
22	Savannah, GA	Water	26.3	9.7	16.6	36.9
23	Anchorage, AK	Air	26.3	5.7	20.5	21.8
24	Miami International Airport, FL	Air	25.3	16.2	9.1	64.0
25	Atlanta, GA	Air	24.9	10.4	14.6	41.6
Total U.S. merchandise trade by all modes			2,286.2	816.5	1,469.7	35.7
Top 25 gateways			1,478.3	520.1	958.2	35.2
Top 25 gateways as share of U.S. total (%)			64.7	63.7	65.2	

NOTE: *All data*—Trade levels reflect the mode of transportation as a shipment enters or exits a U.S. Customs port. Flows through individual ports are based on reported data collected from U.S. trade documents. Low-value shipments (imports less than $1,250 and exports less than $2,500) and intransit shipments are not included in trade data. *Air*—Data for all airports are based on U.S. port classifications and include a low level (generally less than 2% to 3% of the total value) of small user-fee airports located in the same region. Air gateways not identified by airport name include major airports in that geographic area in addition to small regional airports. Also due to U.S. Census Bureau confidentiality regulations, data for some of the air gateways include courier operations. For example, data for New Orleans International Airport include FedEx air cargo activity in Memphis, TN.

SOURCES: *Air*—U.S. Department of Commerce, U.S. Census Bureau, Foreign Trade Division, special tabulation, October 2005. *Water*—U.S. Army Corps of Engineers, Navigation Data Center, special tabulation, November 2005. *Land*—U.S. Department of Transportation, Research and Innovative Technology Adminstration, Bureau of Transportation Statistics, Transborder Surface Freight Data, October 2005.

TABLE 25
U.S. Maritime Freight Gateways, Ranked by Value and Weight: 2003

Value (current $, billions)					Weight (short tons, millions)				
Rank by value	Seaport name	U.S. maritime trade	Exports	Imports	Rank by weight	Seaport name	U.S. maritime trade	Exports	Imports
1	Los Angeles, CA	122.1	16.9	105.2	1	Houston, TX	126.1	36.2	89.9
2	New York and New Jersey	101.2	24.3	76.9	2	South Louisiana, LA	80.3	49.5	30.8
3	Long Beach, CA	95.9	17.2	78.7	3	New York and New Jersey	77.9	8.7	69.2
4	Houston, TX	49.9	21.4	28.5	4	Beaumont, TX	68.7	5.4	63.3
5	Charleston, SC	39.4	13.4	26.0	5	Corpus Christi, TX	53.4	8.6	44.8
6	Norfolk Harbor, VA	29.5	11.0	18.5	6	Long Beach, CA	51.3	14.2	37.2
7	Tacoma, WA	26.3	5.2	21.1	7	New Orleans, LA	48.7	27.9	20.8
8	Baltimore, MD	26.0	5.7	20.3	8	Texas City, TX	43.4	3.2	40.2
9	Oakland, CA	25.1	7.8	17.4	9	Los Angeles, CA	41.8	12.7	29.2
10	Seattle, WA	23.1	5.7	17.4	10	Lake Charles, LA	31.8	3.9	27.8
11	Savannah, GA	21.3	7.4	13.9	11	Freeport, TX	25.1	2.4	22.7
12	New Orleans, LA	19.4	11.2	8.2	12	Mobile, AL	25.0	7.5	17.5
13	Miami, FL	16.6	6.8	9.8	13	Norfolk Harbor, VA	24.2	15.0	9.1
14	Portland, OR	11.8	3.0	8.8	14	Baltimore, MD	24.0	5.1	18.9
15	Jacksonville, FL	11.2	2.3	8.9	15	Baton Rouge, LA	23.1	4.4	18.6
16	Everglades, FL	10.5	4.3	6.2	16	Savannah, GA	21.3	8.2	13.1
17	Philadelphia, PA	10.3	0.6	9.7	17	Pascagoula, MS	20.8	3.3	17.5
18	Morgan City, LA	10.1	0.2	9.9	18	Plaquemines, LA	18.9	10.4	8.5
19	Corpus Christie, TX	9.9	2.0	7.9	19	Philadelphia, PA	18.5	0.2	18.3
20	Beaumont, TX	9.6	1.0	8.7	20	Arthur, TX	18.4	4.2	14.3
Total, U.S. waterborne trade (all seaports)		811.1	206.2	604.9	Total U.S. waterborne trade (all seaports)		1,211.5	363.5	848.0
Total, top 20 seaports		669.2	167.4	501.8	Total, top 20 seaports		842.7	231.2	611.6
Top 20 seaports as share of U.S. maritime total (percent)		82.5	81.2	83.0	Top 20 seaports as share of U.S. maritime total (percent)		69.6	63.6	72.1

NOTE: Data do not include intransit (i.e., shipments transiting U.S. ports from one foreign country to another but not counted as part of U.S. official merchandise trade).

SOURCES: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistic, based on: *Value*—U.S. Department of Commerce, Bureau of the Census, Foreign Trade Division, August 2004; *Weight*—special tabulations from U.S. Army Corps of Engineers, Waterborne Commerce of United States data, November 2004.

APPENDIX A

Measuring the Nation's Freight Movements

Accurately measuring the magnitude of freight movement is a challenge. No single data source provides complete and timely information on all freight transportation modes for all goods and sectors of the economy.

The Commodity Flow Survey (CFS) is the primary source of national- and state-level data on domestic freight shipments by American businesses. As a shipper-based survey, the CFS collects information on how U.S. establishments transport raw materials and finished goods; the types of commodities shipped by mode of transportation; the value, weight, origin, and destinations of shipments; and the distance shipped. It covers establishments classified in the North American Industry Classification System (NAICS) as manufacturing, mining, and wholesale trade.

Produced as part of the Economic Census, the CFS allows analysis of the nation's freight activities within the context of changes in the nation's economy. The CFS data are helpful in market analysis of how businesses use competing transportation modes to move freight and facilitate production and trade activities. Although the CFS is the most comprehensive data source on nationwide freight movements, there are important data gaps in the coverage of certain industries and commodities and in the domestic movements of imports. Additional data must be used to fill gaps in CFS coverage.

To present a more complete national estimate of the overall freight moved on the nation's transportation system in 2002, Bureau of Transportation Statistics (BTS) and the Federal Highway Administration (FHWA), Office of Freight Management and Operations have supplemented the CFS data with estimates from other sources on freight shipments that are not fully measured in the CFS. These additional estimates cover farm shipments to processing plants, crude petroleum pipeline shipments, waterborne imports and exports, and logs and wood in the rough. They also cover shipments by the service, retail, and construction sectors as well as municipal solid waste. The new composite national estimates provide the benchmark data for the FHWA Freight Analysis Framework II. Information on the methods and data sources used in developing these composite estimates will be available by summer 2006 at the agencies' websites www.bts.gov and www.fhwa.dot.gov.

This report compares the final data from the 2002 CFS with data from the 1997 and 1993 CFS to show changes in modal shares, distance shipped, shipment sizes, and ton-miles generated on the national transportation network. It is important to note that most of the 1993 and 1997 freight data presented in this report are revised from those published in earlier BTS publications. They were adjusted to account for changes in industry coverage as a result of the transition to the NAICS code.

Coverage and Limitations of the CFS Freight Data

The 2002 CFS is the most recent nationwide shipper survey of commodities shipped in the United States. It follows the 1993 and 1997 CFS and its predecessor, the 1977 Commodity Transportation Survey. The Bureau of Transportation Statistics and the Census Bureau cosponsor the CFS as part of the quinquennial (every 5 years) Economic Census (BTS and Census 2003). The Census Bureau collects CFS data from a sample of manufacturing, mining, and wholesale trade industries in the United States. The survey excludes shipments by establishments classified in the North American Industry Classification System (NAICS) as farms, forestry, fishing, government agencies, construction, transportation, and most retail and service industries. The 2002 survey did not capture most shipments from logging establishments because under NAICS, the classification of this industry moved from manufacturing (in-scope for the CFS) to agriculture (out-of-scope for the CFS). Further, because the CFS is a survey of domestic establishments and measures shipments leaving an establishment's facility, it includes exports but not imports (unless the imported goods are received by an in-scope domestic business at the port of entry and reshipped by that business). Although the initial 1993 CFS design included establishments from the oil and gas extraction industry, all three surveys exclude shipments of crude petroleum by this industry because of the way these companies record and report "shipment" information.

Reliability of the CFS Data Used in this Report

The CFS data presented in this report are derived from a sample survey and may differ from the actual, unknown values for the entire population of businesses they represent. Statisticians define this difference as the total error of the estimate. When describing the accuracy of survey results, it is convenient to discuss total error as the sum of sampling error and nonsampling error. Sampling error is the average difference between the estimate and the result that would be obtained from a complete enumeration of the sampling frame conducted under the same survey conditions. Nonsampling error encompasses all other factors that contribute to the total error of a sample survey estimate.

The sampling error of the estimates reported in the CFS can be estimated from the selected sample because the sample was selected using probability sampling. Common measures related to sampling error are the sampling variance, the standard error, and the coefficient of variation (CV). The sampling variance is the squared difference, averaged over all possible samples of the same size and design, between the estimator and its average value. The standard error is the square root of the sampling variance. The CV expresses the standard error as a percentage of the estimate to which it refers.

Nonsampling errors are difficult to measure and can be introduced through inadequacies in the questionnaire, nonresponse, inaccurate reporting by respondents, errors in the application of survey procedures, incorrect recording of answers, and errors in data entry and processing. Data users should take into account both the measures of sampling error and the potential effects of nonsampling error when using the CFS estimates. See the CFS source cited below for detailed discussion of reliability of the CFS data and estimates of standard errors. Additional information on (1) comparability of 2002 CFS with the 1993 and 1997 CFS, (2) reliability of the CFS estimates, and (3) sample design, data collection, and estimation is available at http://www.bts.gov/cfs/prod.html.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, "2002 Economic Census: Transportation Commodity Flow Survey, Final Report," December 2003, EC02TCF-US.

APPENDIX B

Why the 2002 Composite Estimates in this Report Differ from Preliminary Estimates

The 2002 composite estimates in this report were jointly developed by the Research and Innovative Technology Administration's Bureau of Transportation Statistics (BTS) and the Federal Highway Administration's (FHWA's) Office of Freight Management and Operations.[43] An earlier BTS report, *Freight Shipments in America,* issued in 2004, also presents composite estimates for 2002, but the numbers were preliminary and are not the same.

The table below compares the estimates in this report for value, tons, and ton-miles with those in *Freight Shipments in America.* BTS considers the jointly developed composite estimates to be more reliable and complete than earlier estimates because of improvements in estimation methods and expanded industry-commodity coverage. As the table shows, the new estimates for total value and total tonnage are larger than the preliminary estimates in the earlier report. This is largely because the new estimates include previously uncovered sectors, such as construction, retail, services, and municipal solid waste. However, the new estimate for total ton-miles is about 2.1 percent (or 97 billion ton-miles) less than the BTS preliminary estimate. This difference is primarily due to revisions between the preliminary and final 2002 Commodity Flow Survey data. The final CFS ton-miles were 67 billion tons less than the preliminary CFS data. The remaining difference of 30 billion ton-miles was due to improvements in methodology, i.e., the use of a more disaggregated method of estimating the distance traveled per shipment. While the new composite estimates were derived at the commodity, industry, and mode of transportation levels, the former estimates were derived mostly at the modal level. The new estimates for water transportation are lower than the preliminary estimates because in the new method some shipments of crude oil and petroleum products were correctly reassigned to pipelines to avoid double counting.

In a separate effort to improve on the estimate of overall ton-miles (see figure 5 and its source), BTS reported 4,366 billion as the total national ton-miles for 2002, a number that is fairly comparable to the new composite estimates. The difference of 43 billion ton-miles between that estimate and the jointly developed composite estimate in the above table is less than one percentage point. This difference is due mainly to different methodologies and definitions.

[43] The performing organizations for this project were MacroSys Research and Technology and the Oak Ridge National Laboratory, who worked under the management supervision of BTS and FHWA.

REFERENCES

Association of American Railroads (AAR). 2005a. *Class I Railroad Statistics.* Page 2. Available online at: www.aar.org, as of July 2005. Washington, DC: July 2005.

Association of American Railroads (AAR). 2005b. *Railroad Facts 2004.* Page 38. Washington, DC: October 2004.

Association of American Railroads (AAR). 2005c. *Rail Intermodal Transportation.* Page 1. Available online at: www.aar.org, as of July 2005. Washington, DC: June 2005b.

Association of Oil Pipe Lines (AOPL). 2004a. *The Liquid Pipeline Industry in the United States: Where It's Been. Where It's Going.* Washington, DC: April 2004.

TABLE 26
Comparison of Estimates of U.S. Total Commercial Activity for 2002

Transportation mode	Published preliminary estimates[1]			New composite estimates[2]		
	Value (billion $)	Tons (million)	Ton–miles (billion)	Value (billion $)	Tons (million)	Ton–miles (billion)
All modes	10,460	15,815	4,506	13,052	19,487	4,409
Truck	6,660	9,197	1,449	9,075	11,712	1,515
Rail	388	1,895	1,254	392	1,979	1,372
Water	867	2,345	733	673	1,668	485
Air (incl. truck and air)	777	10	15	563	6	13
Pipeline	285	1,656	753	896	3,529	688
Multiple modes	1,111	213	226	1,121	229	233
Unknown modes	373	499	77	331	365	103

[1] From Table 1 Commercial Freight Activity in the United States by Mode of Transportation: 1993, 1997, 2002 of *Freight Shipments in America* report, released April 2004. The value data as published were adjusted for inflation and are in 2000 chained dollars. This was done to make the value data comparable to 1997 and 1993, the other CFS years.

[2] From Table 1 of this report *Freight in America*, released January 2006.

SOURCE: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, January 2006.

Association of Oil Pipe Lines (AOPL). 2004b. *Shifts in Petroleum Transportation*. Table 1. Washington, DC: June 2004.

Federal Express (FedEx 1), *Investor Relations: Financial History, Selected Financial and Operating Data, FedEx Express, Highlights- 30 year*, available online at: http://www.fedex.com/us/investorrelations/financialinfo/downloads/, as of September 6, 2005.

Federal Express (FedEx 2), *About FedEx, FedEx Corporation Facts*, available online at http://www.fedex.com/us/about/today/companies/corporation/facts.html, as of September 6, 2005.

Raj, D. and Chandhok, P. 1998. *Sample Survey Theory*, Narosa Publishing House, London, United Kingdom.

U.S. Army Corps of Engineers (USACE) *Waterborne Commerce of the United States, 2004. Part 5. National Summaries*. New Orleans, LA: 2004.

U.S. Army Corps of Engineers (USACE) *Waterborne Commerce of the United States, 1994. Part 5. National Summaries*. New Orleans, LA: 1994.

U.S. Department of Commerce (USDOC), Census Bureau, Population Division, Table 1: Annual Estimates of the Population of Metropolitan and Micropolitan Statistical Areas: April 1, 2000 to July 1, 2003 (CBSA-EST2003-01). Internet Release Date: June 7, 2005.

U.S. Department of Commerce (USDOC), Census Bureau, Foreign Trade Division, *U.S. Exports of Merchandise CD and U.S. Imports of Merchandise CD*, December 2004.

U.S. Department of Commerce (USDOC), Census Bureau, *Statistical Abstract of the United States 1997*. Washington, DC: 1997.

U.S. Department of Energy (USDOE), Energy Information Agency (EIA), 2005. *Annual Energy Review*, Table 5.3 and 6.3. Available at www.eia.doe.gov/emeu/aer/petro.html and www.eia.doe.gov/emeu/aer/natgas.html, as of September 2005.

U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, using Department of Homeland Security, U.S. Customs and Border Protection, Data Warehouse CD-ROM, May 2005.

U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, 2005. *Transportation Statistics Annual Report*, Washington, DC, November 2005.

U.S. Department of Transportation (USDOT), Research and Innovative Technology Administration, Bureau of Transportation Statistics (BTS), 2004. *America's Freight Transportation Gateways*. Washington, DC: 2004, available at http://www.bts.gov/publications/americas_freight_transportation_gateways/as of December 2005.

U.S. Department of Transportation (USDOT), Research and Innovative Technology Administration, Bureau of Transportation Statistics (BTS), 2005. *U.S.-North America Trade and Freight Transportation Highlights*. Washington, DC: June 2005.

U.S. Department of Transportation (USDOT), Federal Highway Administration (FHWA), 2004. *Freight Transportation: Improvements and the Economy.* Washington, DC: June 2004.

U.S. Department of Transportation (USDOT), Federal Highway Administration (FHWA), 2004. *Freight Facts and Figures 2004*. Washington, DC: November 2004.

U.S. Department of Transportation (USDOT), Federal Highway Administration (FHWA), *2003 Highway Statistics*, table VM-1, (Washington, DC: Annual issues), and Internet site http://www.fhwa.dot.gov/policy/ohpi/index.htm.

U.S. Postal Service (USPS 1), Annual Report Operating Statistics: 1970-2004, personal communication, June and July 2005.

United Parcel Service (UPS), UPS Pressroom, Media kits, UPS Fact Sheet, available online at, http://www.pressroom.ups.com/mediakits/factsheet/0,2305,866,00.html, as of September 6, 2005.

United Parcel Service (UPS), 2004 Annual Report, available online at, http://www.shareholder.com/ups/, as of September 6, 2005.