Freight Shipments in America

Preliminary Highlights from the 2002 Commodity Flow Survey

Plus Additional Data

U.S. Department of Transportation

Bureau of Transportation Statistics

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PREFACE

The nation's interconnected network of highways, railroads, airports, pipelines, and waterways and ports is essential to most economic activity in the nation, enabling access by businesses and households to markets throughout the United States and the world. This report presents major highlights on freight shipments in the United States in 2002, using the Commodity Flow Survey (CFS) and other data sources. It also presents snapshots of changes in freight movements in 1993, 1997, and 2002, highlighting major trends during this period. While the report primarily relies on 2002 CFS preliminary national data recently released by the Bureau of Transportation Statistics (BTS) and the Census Bureau, several additional freight data sources are drawn on to provide a more complete picture of commercial freight movements. This report indicates where combined data and where CFS-only data are used. It also discusses the relationship between transportation and economic activity and highlights recent trends in length of haul, shipment size, and commodities shipped.

GROWTH IN THE NATION'S FREIGHT SHIPMENTS – HIGHLIGHTS

The U.S. transportation system is the largest in the world, serving more than 7 million domestic business establishments and 288 million residents while employing 1 out of 7 U.S. workers. In 2002, the nation's freight transportation system transported nearly 16 billion tons of raw materials and finished goods, up from 13 billion tons in 1993. This 18-percent growth in tonnage represents an average annual increase of 1.9 percent over this period.[1] The Bureau of Transportation Statistics (BTS) estimates that this large quantity of commercial freight traveled nearly 5 trillion ton-miles in 2002, a 24-percent increase over 1993, rising at an average of 2.4 percent per year (figures 1 and 2).[2]

The value of freight shipments in 2002, including domestic commodity shipments and domestic transportation of exports and imports, was $11 trillion—a 45-percent increase over 1993 when measured by value of shipments in inflation-adjusted chained 2000 dollars[3] (boxes A and B). This steady growth in freight movements was possible because of growth in the U.S. economy, 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.

More than $1 out of every $10 produced in the U.S. GDP is related to transportation activity.

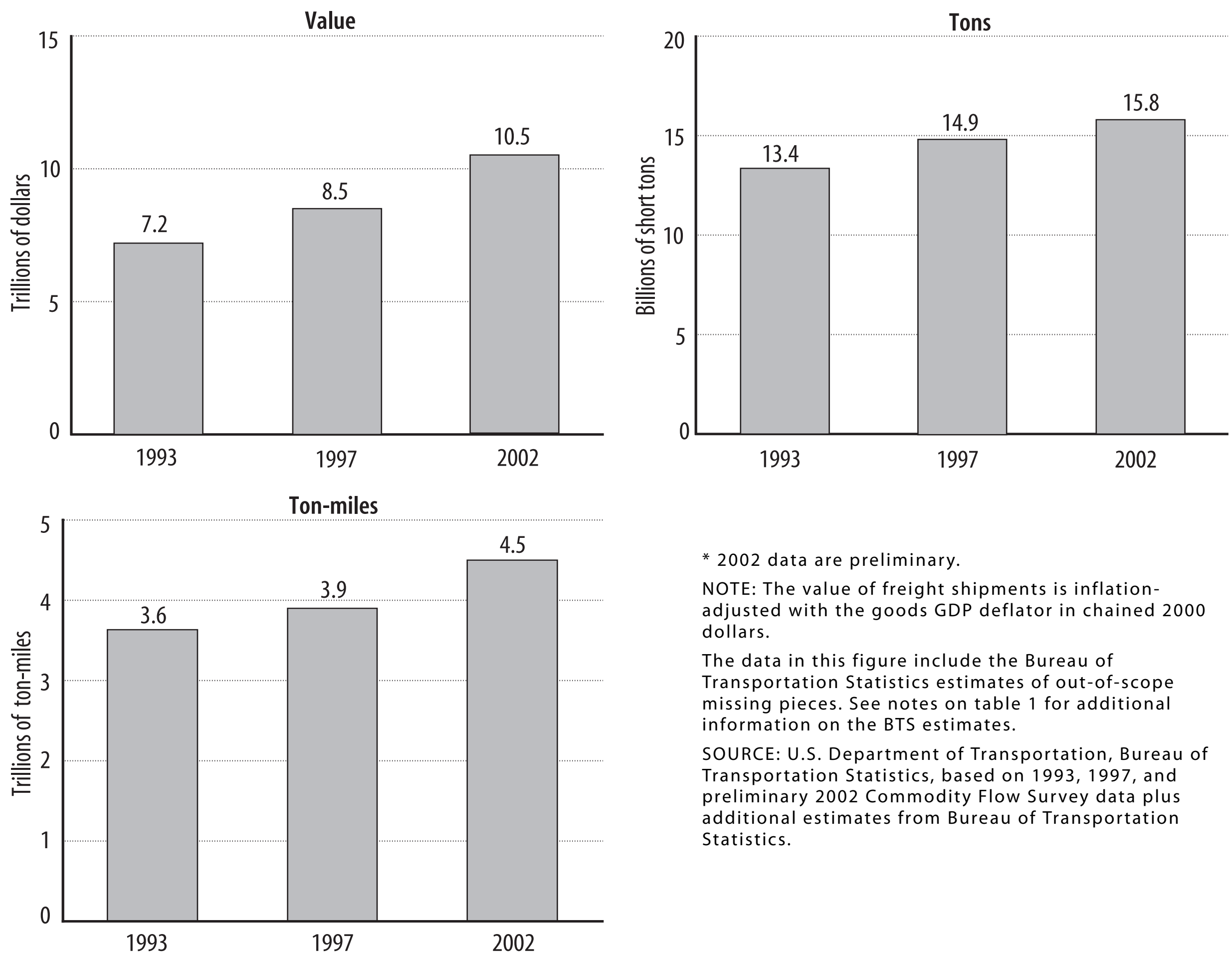
The U.S. transportation sector moves large volumes of freight to support economic activities in the nation. More than $1 out of every $10 produced in the U.S. Gross Domestic Product is related to transportation activity. Transportation employs nearly 20 million people in America—11 million in direct transportation

[1] 2002 is the most recent year for which comprehensive nationwide freight data are available for all modes of transportation and for local, intercity, interstate, and U.S. international freight shipments. The 1993 CFS was the first available directly comparable survey of national freight shipments. See box C for definition of shipments, value, tons, and ton-miles.

[2] This BTS estimate of total U.S. commercial freight is based on the preliminary 2002 Commodity Flow Survey (CFS) plus additional information on major industries not covered by the CFS. See box B and the section on measuring the nation's freight shipments for additional information on coverage of CFS and supplementary data.

[3] This report uses inflation-adjusted figures when discussing the overall totals for all modes of transportation. It uses the *goods GDP* deflator (not the *overall GDP* deflator) to adjust the value of freight shipments because overall GDP covers goods and services. See notes on table 1 for additional information on adjusting for inflation.

FIGURE 1
Value, Weight, and Ton-Miles of U.S. Commercial Freight Shipments: 1993, 1997, and 2002*



* 2002 data are preliminary.

NOTE: The value of freight shipments is inflation-adjusted with the goods GDP deflator in chained 2000 dollars.

The data in this figure include the Bureau of Transportation Statistics estimates of out-of-scope missing pieces. See notes on table 1 for additional information on the BTS estimates.

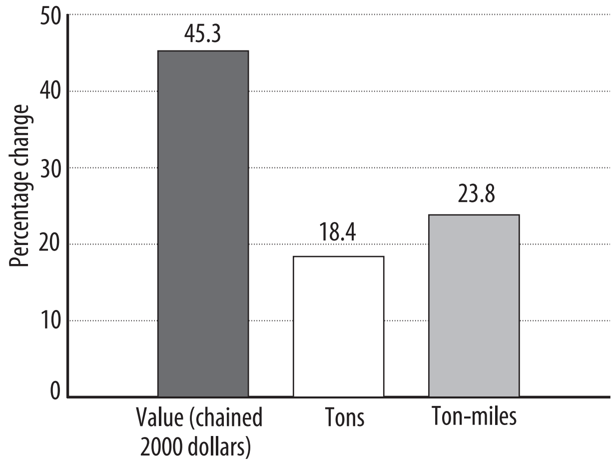
SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, based on 1993, 1997, and preliminary 2002 Commodity Flow Survey data plus additional estimates from Bureau of Transportation Statistics.

and transportation-related industries (e.g., pilots, train operators, autoworkers, and highway construction workers) and another 9 million in nontransportation industries (e.g., truck drivers for retail and grocery stores, wholesale shipping clerks, and distribution managers for manufacturing firms).

Today, Americans purchase billions of dollars worth of goods over the Internet for home delivery, routinely send next-day express packages, and buy fresh fruits, flowers, and vegetables produced globally.[4] And these shipments move over an extensive freight transportation system comprising millions of vehicles and

[4] U.S. consumers are increasingly making retail purchases over the Internet. In 2002, Internet online retail sales were $44 billion compared with $28 billion in 2000 (Census Bureau 2003). The number of online purchases made increased from 253 million in 2000 to 285 million in 2001 (Census Bureau 2002).

FIGURE 2
Growth in U.S. Commercial Freight Shipments: 1993–2002*



* 2002 data are preliminary.

NOTE: The value of freight shipments is inflation-adjusted with the goods GDP deflator in chained 2000 dollars.

The data in this figure include the Bureau of Transportation Statistics estimates of out-of-scope missing pieces. See notes on table 1 for additional information on the BTS estimates.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, based on 1993 and preliminary 2002 Commodity Flow Survey data plus additional estimates from Bureau of Transportation Statistics.

millions of miles of road, track, and pipeline[5]—all supported by sophisticated information technology and operated, managed, and maintained by a large labor force.

Highlights

Major highlights from the recently released preliminary 2002 CFS data plus additional estimates show that:

Overall

- On a typical day in 2002, about 43 million tons of goods valued at about $29 billion moved nearly 12 billion ton-miles on the nation's interconnected transportation network. This represents an increase from about 37 million tons, valued at $20 billion, and traveling about 10 billion ton-miles in 1993.

[5] Include more than 4 million miles of highways, railroad, and waterways; 400,000 plus miles of oil and gas-transmission pipelines; over 9,000 commercial waterway facilities; and more than 5,000 public-use airports.

BOX A

How to Interpret Shipment Value and Tonnage Data

The value and ton totals in the CFS represent the sum of separate shipments of a commodity as it moves through the production and consumption segments of the supply chain. Therefore the CFS totals are much 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) even though both are ostensibly of similar size 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.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, February 2004.

- These BTS estimates of overall freight shipments support the often cited trend that U.S. households are acquiring more products and appliances. These estimates translate into over 300 pounds of daily freight shipments in 2002, each worth nearly $100 and transported over 43 miles per person, per day. By comparison, in 1993 about 280 pounds of freight, valued at $76, were transported some 38 miles daily for each U.S. resident.
- Trucking moved 64 percent of the value, 58 percent of the tonnage, and 32 percent of the ton-miles of the nation's total commercial freight.

Distance Shipped

- A typical freight shipment traveled nearly 40 percent farther in 2002 than in 1993—on average 590 versus 420 miles, respectively—as businesses expanded the geographic scope of their production and distribution operations to gain efficiencies in scale and scope.[6]
- Most freight shipments in America, as measured by value and weight, move less than 250 miles. In 2002, more than half the value ($4.5 trillion) and 80 percent of the tonnage (9 billion) of CFS shipments moved in local and short-haul shipments critical to state and metropolitan area economies.
- Long-distance shipments—greater than 250 miles—carried 20 percent of tons shipped, although they represent almost half the value of CFS shipments.

Shipment Size

- Compared to other weight categories, smaller sized shipments (less than 500 pounds) increased the most (56 percent) by value since 1993. The smaller the shipments, the higher the value and the more the growth since 1993. This faster growth of smaller shipments supports efficient just-in-time inventory systems, which reduce inventory carrying costs and overall logistics costs.

[6] This trend reflects much more than the simple geographical dispersion of economic activity. More importantly, it also shows the integration of geographically dispersed activities.

- Large-size shipments (over 50,000 pounds) comprised nearly two-thirds (65 percent) of the ton-miles of CFS shipments in 2002, similar to the 1993 share, but grew 26 percent by ton-miles, 13 percent by weight, and 34 percent by value. Because of their weight, these shipments placed high demand on the transportation network, generating more than 2 trillion ton-miles.

BOX B
What Isn't Covered by the CFS and BTS Estimates

While the BTS estimates of *total freight shipments* provide the most complete commercial freight picture for *all modes of transportation*, they exclude most shipments by the retail sector and government shipments, such as goods for defense operations, and collection of municipal solid waste. The estimate also excludes possible shipments by *nongoods producing* sectors such as services, construction, household goods movements, and transportation service providers.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, February 2004.

Top Commodities

- Electronic, electrical, and office equipment was the top category of commodity measured by shipment value in 2002—the same as in 1993. Gravel and crushed stone was the top commodity by weight, and coal the top commodity by ton-miles in 2002. Coal was the top commodity in both categories in 1993.
- Mixed-freight shipments grew the fastest in terms of percentage change in value and also ton-miles, while miscellaneous manufactured product shipments and pharmaceuticals grew the fastest as measured by weight. [7]

Total U.S. Commercial Freight Shipments

As mentioned in the preface, the CFS does not cover all U.S. commercial freight shipments. Thus, BTS has used other data sources to create a more complete picture of the nation's commercial freight flows. This more complete picture shows that the 2002 CFS covered most of the commercial freight moved within the United States—about 81 percent of the $11 trillion in shipment value, 73 percent of the 16 billion tons of shipments, and 71 percent of the nearly 5 trillion ton-miles of estimated total commercial freight (see box C). Table 1 provides the BTS 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 supplemental out-of-scope shipments. These BTS estimates are preliminary and could change as the various source agencies responsible for the supplemental data release their final 2002 data.

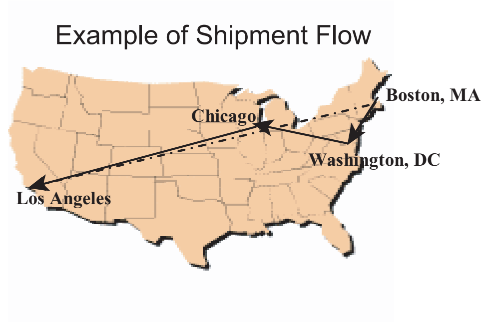
[7] Mixed freight shipments include supplies and food for restaurants and fast food chains, items (including food) for grocery and convenience stores, hardware or plumbing supplies (not elsewhere classified), office supplies, and miscellaneous.

BOX C

Meaning of Shipment, Value, Tons, and Ton-Miles in the CFS

Shipment. 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). 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. Shipments such as refuse, scrap paper, waste, or recyclable materials are not considered shipments unless the establishment is in the business of selling or providing these materials.

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, as well as the value of shipments of the finished product itself. 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 shipments by truck, rail, or shallow draft vessels, the mileage excludes international segments. For example, mileages from Alaska to the contiguous states exclude any mileages through Canada. Unlike value and tonnage, the national total for ton-miles is not subject to multiple counting because the number of shipments does not affect the calculations.

For additional information, see *Commodity Flow Survey, United States 2002 Preliminary report.* Also available at http://www.bts.gov/cfs/prod.html.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, "2002 Economic Census: Transportation Commodity Flow Survey, Preliminary Report," December 2003.

There are major differences when CFS totals are compared to the supplemental data, especially in relative modal combinations, average shipment distance, and commodity mix. For example, shipments covered by the CFS were valued at $733 per ton compared with $470 per ton of shipments measured in the supplemental data, which has a lower value because it better covers crude oil and petroleum products. A ton of CFS-only shipments on average traveled about 270 miles, slightly less than the approximate 300 miles for the shipments in the additional data, in part because the CFS includes large bulk shipments such as sand and gravel, which are mostly local shipments.

TABLE 1
Commercial Freight Activity in the United States by Mode of Transportation: 1993, 1997, and 2002*

Transportation mode	1993 Value (billions 2000 $) (1)	1993 Tons (millions)	1993 Ton-miles (billions)	1997 Value (billions 2000 $)	1997 Tons (millions)	1997 Ton-miles (billions)	2002 Value (billions 2000 $)	2002 Tons (millions)	2002 Ton-miles (billions)
Combined total (CFS plus out-of-scope estimates)	**7,197**	**13,357**	**3,639**	**8,518**	**14,854**	**3,904**	**10,460**	**15,815**	**4,506**
Truck	4,684	7,275	931	5,271	8,836	1,109	6,660	9,197	1,449
Rail	278	1,580	965	366	1,612	1,066	388	1,895	1,254
Water	620	2,128	883	753	2,281	813	867	2,345	733
Air (includes truck and air)	395	7	9	654	10	15	777	10	15
Pipeline	312	1,595	593	229	1,448	617	285	1,656	753
Multimodal combinations (2)	665	231	166	935	227	212	1,111	213	226
Other and unknown modes	243	541	93	310	440	73	373	499	77
CFS component, all modes	**5,862**	**9,688**	**2,421**	**6,860**	**11,090**	**2,661**	**8,468**	**11,573**	**3,204**
Out-of-scope component, all modes (3)	**1,335**	**3,669**	**1,218**	**1,658**	**3,764**	**1,243**	**1,992**	**4,242**	**1,301**
Relative shares of components:									
CFS % of combined total	81.4	72.5	66.5	80.5	74.7	68.2	81.0	73.2	71.1
Out-of-scope % of combined total	18.6	27.5	33.5	19.5	25.3	31.8	19.0	26.8	28.9

* 2002 data are preliminary.

(1) To compare economic changes over time, current or nominal values of currencies must be deflated or adjusted for inflation. In the United States, the Bureau of Economic Analysis (BEA) establishes indices to calculate changes between years. These are used to calculate real chained dollars. Annual changes in the indices are chained (multiplied) together to form a time series. Chained dollars, instead of merely reflecting inflation, capture the effect of relative changes in prices and in the composition of output. They also better reflect cyclical fluctuations in the economy. Chained 2000 dollars are the most currently available indices from BEA for adjusting for inflation.

(2) Multimodal includes the traditional intermodal combination of truck and rail plus truck and water; rail and water; parcel, postal, and courier service; and other multiple modes for the same shipment.

(3) Modal details for the BTS out-of-scope supplemental data will be available when the final 2002 CFS data are released in late 2004.

NOTE: The data in this table include the Bureau of Transportation Statistics estimates of out-of-scope missing pieces. These estimates cover logging, farm-based truck shipments, truck imports from Canada and Mexico, rail imports from Canada and Mexico, air cargo imports and exports, water imports and exports, and pipeline crude and petroleum products shipments. These estimates exclude other out-of-scope categories of goods movements for which no reasonable basis for an estimate currently exists including, government shipments, service sector, retail sector, construction sector, transportation service providers, household goods movement, and municipal solid waste.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, based on 1993, 1997, and preliminary 2002 Commodity Flow Survey data plus additional estimates from Bureau of Transportation Statistics.

Shipment Trends and Freight Realities

Changes in freight data reflect the basic economic realities that carriers and shippers face every day in the freight marketplace. As the value per ton of a shipment rises, the cost of having a valuable cargo tied up in transit increases, so shippers are likely to shift more of their shipments to faster, more expensive modes like truck and air. For example, in 2002 the average value per ton of air shipments was $75,000, up from $55,000 per ton in 1993; truck shipments averaged $725 per ton, up from $640; while rail shipments averaged $205 per ton, an increase from $176 in 1993.

The faster growth of smaller shipments supports rise in just-in-time deliveries.

Also, as the value per ton rises, shippers are more likely to transport goods in smaller, more frequent shipments. For example, shipments weighing less than 50,000 pounds (average payload of a typical truck) grew twice as fast (28 percent), measured by weight, than those weighing more than 50,000 pounds (13 percent) between 1993 and 2002, reflecting growth in smaller sized just-in-time deliveries.

As the length of haul (miles per ton traveled) increases, causing the line-haul transportation cost to become a larger portion of the total, shippers are more likely to shift to lower cost modes like rail and water (though in some cases, where delivery time is critical, they may shift from truck to air). For example, in 2002, a ton of truck shipments (both local and intercity) traveled on average 158 miles, up from 128 in 1993. By comparison, a ton of rail shipments traveled 662 miles in 2002, rising from 610 miles in 1993. During the same period, a ton of air shipments traveled 1,420 miles in 2002, an increase from 1,270 in 1993. Length of haul is an economic indicator of the cost of transportation relative to the cost of the goods being transported. As the cost of transportation falls, shippers tend to ship over a longer distance. Secondly, length of haul is an indicator of the contribution that transportation makes to the economy. Because the efficiency of our economy is influenced by the geographic spread of both domestic and international markets, a growing length of haul indicates a growing extent of the market. So a growing length of haul suggests that transportation is getting cheaper and reflects business reorganization of production and distribution activities over larger and more efficient markets.

TABLE 2
Modal Change in Shipment Value, Tonnage, and Ton-Miles: 1993 and 2002*

	Percentage change between 1993 and 2002		
Transportation mode	Value (real)	Tons	Ton-miles
Overall total (CFS plus out-of-scope estimates)	**45.3**	**18.4**	**23.8**
Truck	42.2	26.4	55.5
Rail	39.2	19.9	29.9
Water	39.9	10.2	–16.9
Air (includes truck and air)	96.7	45.9	63.2
Pipeline	–8.7	3.8	27.0
Multimodal combinations (1)	67.0	–7.5	36.7
Other and unknown modes	53.4	–7.6	–17.3

* 2002 data are preliminary.

(1) Multimodal includes the traditional intermodal combination of truck and rail plus truck and water; rail and water; parcel, postal, and courier service; and other multiple modes for the same shipment.

NOTE: The data in this table include estimates of out-of-scope missing pieces from the Bureau of Transportation Statistics. These estimates cover logging, farm-based truck shipments, truck imports from Canada and Mexico, rail imports from Canada and Mexico, air cargo imports and exports, water imports and exports, and pipeline crude and petroleum products shipments.

The estimates exclude non-commercial freight shipments such as government shipments and municipal solid waste.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, based on 1993, 1997, and 2002 Commodity Flow Survey data plus additional estimates from Bureau of Transportation Statistics.

Modal Trends

Each mode plays an important role in the nation's freight transportation system—railroads and barges haul bulk commodities and perishable goods over long distances, trucks carry smaller packages to the main streets and back roads of America, and airplanes fly expensive goods overnight across the country. Between 1993 and 2002, shipments by air (including intermodal truck-air shipments) grew the most whether measured by value, tons, or ton-miles (table 2). The value of air freight shipments almost doubled (97 percent) during this time, followed by increases in multimodal combinations of 67 percent and trucking of 42 percent. [8] By tonnage, air freight shipments increased 46 percent, followed by trucking with 26 percent and rail with 20 percent. And by ton-miles, air cargo grew by 63 percent, followed by truck with

[8] Multimodal includes the traditional intermodal combination of truck and rail plus truck and water; rail and water; and parcel, postal, and courier service.

56 percent and multimodal combinations by 37 percent.[9] Water transportation was the only freight mode to move fewer ton-miles during this period, dropping about 17 percent (table 2).[10]

Trucking continued its dominance of our nation's freight transportation system. In 2002, trucks hauled about 64 percent of the value, 58 percent of the tonnage, and 32 percent of the ton-miles of total shipments (figure 3), a slightly lower percentage of the value than in 1993, but more of the tons and ton-miles. Measured by ton-miles, trucking was followed by rail at 28 percent and water and pipeline with 16 percent each.[11] In general, trucking dominated shipment distances of less than 500 miles while rail dominated the longer distance shipments.

Multimodal transportation—shipments moved by more than one transportation mode—grew substantially in value (67 percent), increasing from $665 billion in 1993 to $1.1 trillion in 2002. Of these shipments, parcel, postal, or courier services (typically involving more higher value and smaller size shipments) grew the most rapidly and accounted for over 90 percent of the value of multimodal shipments in 2002, up from 85 percent in 1993.

Transportation and the Economy

Freight is an important part of the transportation sector, and the transportation sector is in itself a major component of our economy. The transportation sector moves goods and people, employs millions of workers, generates revenue, and consumes materials and services produced by other sectors of the economy. The wide range of transportation services used in the economy includes for-hire freight carriers, private transportation providers, freight forwarders, logistics providers, and firms that service and maintain vehicles.

In 2002, transportation-related goods and services accounted for more than 10 percent—over $1 trillion—of U.S.

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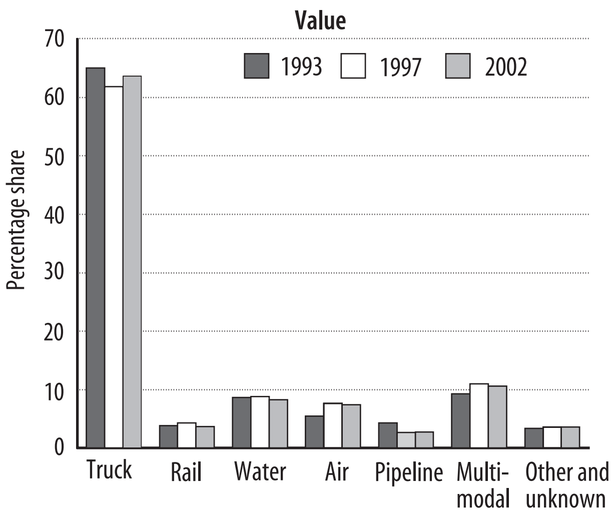
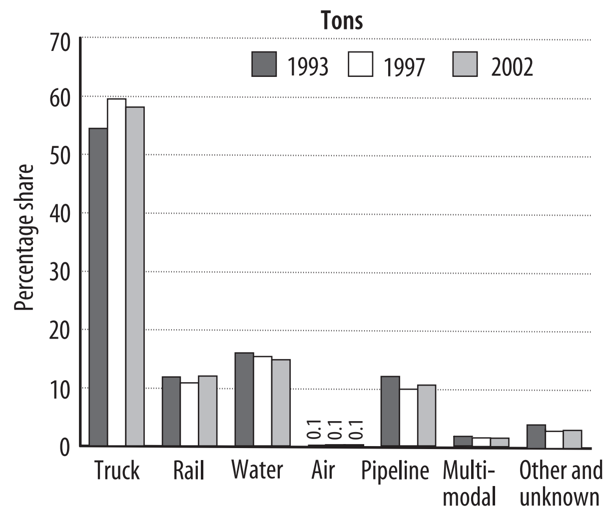
[9] The Surface Transportation Board's Rail Waybill Sample data show that total rail ton-miles grew about 45 percent between 1993 and 2002, from 1.1 trillion to 1.5 trillion. Nonintegrated rail grew by 44 percent while intermodal rail grew by about 50 percent.

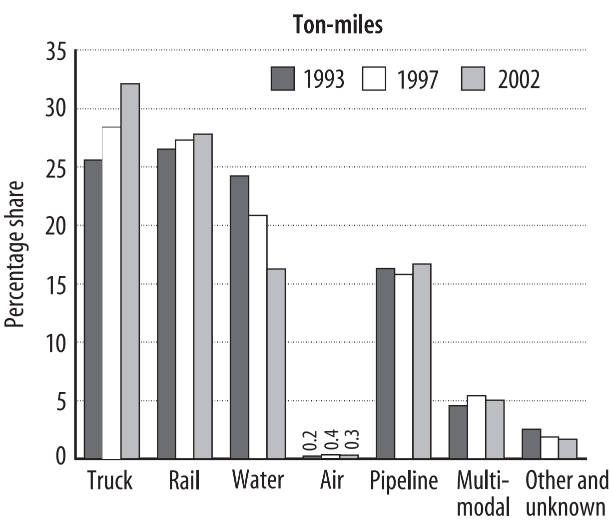
[10] Water transportation ton-miles declined in large part because the tonnage of domestic waterborne commerce has been declining over the past two decades, reflecting drops in crude petroleum shipments from Alaska. However, ton-miles from U.S. merchandise imports and exports have increased.

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

FIGURE 3
Modal Shares of U.S. Commercial Freight Shipments by Value, Weight, and Ton-Miles: 1993, 1997, and 2002*







* 2002 data are preliminary.

NOTE: Multimodal includes the traditional intermodal combination of truck and rail plus truck and water; rail and water; parcel, postal, and courier service; and other intermodal combinations.

The data in this figure include the Bureau of Transportation Statistics estimates of out-of-scope missing pieces. See notes on table 1 for additional information on the BTS estimates.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, based on 1993, 1997, and preliminary 2002 Commodity Flow Survey data plus additional estimates from Bureau of Transportation Statistics.

Gross Domestic Product (table 3).[12] Only three sectors—housing, health care, and food—contributed a larger share of GDP than transportation (USDOT BTS 2004). The *for-hire* transportation service industries alone, not including the value of transportation equipment, fuels, and other material inputs, and the value of the in-house transportation services provided by nontransportation industries for their own use, contributed $306 billion to the U.S.

[12] Transportation-related purchases include all consumer and government purchases of goods (e.g., vehicles and fuel) and services (e.g., auto insurance) and exports related to transportation.

Transportation and related industries and occupations employed almost 20 million people in 2002.

GDP in 2001. Sixty-eight percent of this *for-hire* contribution came from the freight transportation sector (BTS estimate based on data from U.S. National Income and Product Accounts).

Transportation also contributes to the economy by providing millions of jobs. It allows men and women to earn their living by manufacturing vehicles and by driving, maintaining, and regulating them to allow for the safe and efficient movement of goods and people. One out of every seven jobs in the United States is transportation related. Transportation jobs in transportation industries as well as in nontransportation industries employed nearly 20 million people in 2002, accounting for 16 percent of U.S. total occupational employment (table 3). For example, the for-hire transportation sector employed over 4.4 million workers in 2002. More than 60 percent of these for-hire workers are either in freight-related occupations or in jobs that directly support freight transportation.[13] An additional 1.7 million workers are employed in transportation equipment manufacturing and another 4.5 million in transportation-related industries such as automotive service and repair, highway construction, and motor vehicle and parts dealers (USDOT BTS 2004). Transportation-related occupations also make up a significant portion of the employment of nontransportation industries such as truck drivers, freight arrangement agents, and freight-moving workers in the wholesale and retail industries. In 2002, there were about 9.2 million people employed in transportation-related occupations in nontransportation industries.[14]

Growth in productivity is the fundamental driving force for economic growth. Productivity growth in freight transportation has long been a driving force for the growth of U.S. overall productivity and contributed directly to the growth of the U.S. GDP. For example, from 1991 to 2000 labor productivity rose 21 percent in the overall nonfarm business sector.[15] During the same time period, labor productivity rose 53 percent for rail, 23 percent for trucking, and 143 percent for pipeline. All three of these modes are primarily engaged in freight transportation.

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[13] This share is a BTS estimate based on description of labor categories in the North American Industry Classification System (NAICS) and the Standard Industrial Classification (SIC).

[14] Current data do not allow estimate of freight's share of transportation-related jobs in nontransportation industries, but freight is likely to account for a large proportion of these jobs.

[15] Labor productivity is measured by the Bureau of Labor Statistics (BLS) as output per employee-hour. Output is measured by quality-adjusted ton-miles and passenger-miles for rail and air transportation and by quality-adjusted ton-miles for trucking and pipelines. See the *BTS Issue Brief "Productivity Growth in Transportation"* (USDOT BTS 2003) for additional information.

TABLE 3
Transportation and the U.S. Economy

In relation to GDP	2001
Overall GDP (trillions of dollars)	10.05
Transportation related goods and services purchases (trillions of dollars) (1)	1.05
Transportation's share of GDP (percent)	10.4%

In relation to employment (millions)	2002
Total U.S. occupational employment	127.5
Total transportation	**19.9**
Transportation and related-industries	10.7
For-hire transportation industry, total	4.4
Equipment manufacturing (transportation only)	1.7
Other related industries (e.g., automotive repair, service stations, car dealers, auto supplies, and highway construction)	4.5
Transportation occupations in nontransportation industries (e.g., truck drivers employed by retail and grocery chain and wholesale shipping clerk)	9.2
Transportation and related jobs' share of total labor force (percent)	**15.6%**

(1) Includes all consumer and government purchases of goods (e.g., vehicles and fuel) and services (e.g., auto insurance) and exports related to transportation.

NOTE: "For-hire transportation industry," "Equipment manufacturing," and "Related industries" data are based on the Standard Industrial Classification.

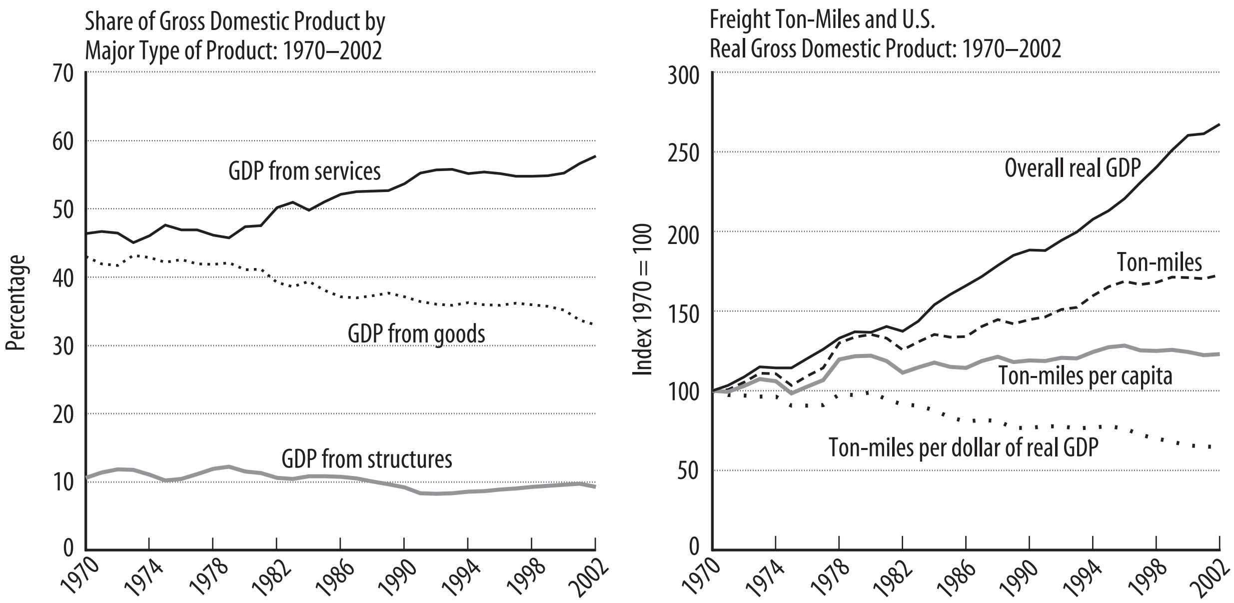
SOURCE: **GDP data** from U.S. Department of Transportation, Bureau of Transportation Statistics, based on data from U.S. Department of Commerce, Bureau of Economic Analysis, *Survey of Current Business*, October 2002.

Employment data from various sources, as cited in USDOT, Bureau of Transportation Statistics, *National Transportation Statistics (NTS) 2002*, table 3-19, available at www.bts.gov; and NTS 2003 online version.

Such productivity gains result in lower transportation costs and lower prices for consumers. This brings savings to consumers and reduces business costs.

During the past few decades, continued shifts in the U.S. economy towards more services, increased production of high-value and light-weight goods, expanded trade with Mexico and China, and the current pattern of global production and distribution systems influenced trends in U.S. freight transportation. As the nation's economy shifted towards more services, the goods share of GDP declined relative to total GDP (figure 4). Thirty-four years ago, in 1970, goods accounted for 43 percent of U.S. GDP, only slightly lower than the 46-percent share of services in GDP. But, by 2002 the share of goods in GDP decreased to 33 percent, while the share of services increased to 58 percent. Because freight transportation is, in general, more closely associated with goods production than with services production, the decline in goods share of GDP contributed to a

FIGURE 4
Freight Transportation and the U.S. Economy: 1970–2002



NOTE: GDP can be classified into services, goods, and structures. Services include government consumption expenditures, which are for services (such as education and national defense) produced by government.
Structures include fixed assets such as roads, railroad tracks, airports, power plants, and medical buildings.
Goods include all goods consumed as final demand.

SOURCE: **GDP data**—U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Products Account (NIPA), available at http://www.bea.gov/bea/dn/nipaweb/index.asp, as of February 2004.

Ton-miles data—U.S. Department of Transportation, Bureau of Transportation Statistics, National Transportation Statistics (online: February 2004).

Population data—U.S. Department of Commerce, Census Bureau, available at http://eire.census.gov/popest/archives/pre1980/popclockest.txt, as of February 2004.

slower growth in freight transportation (measured in ton-miles) than the overall growth of GDP in the past few decades. Between 1970 and 2002, U.S. real GDP, measured in 2000 chain-type dollars, grew 167 percent. During the same time period, U.S. freight transportation, measured in ton-miles, grew only 73 percent. Consequently, the freight transportation intensity of the U.S. economy decreased from 0.59 ton-miles per dollar of GDP (measured in 2000 dollars) to 0.38 ton-miles per dollar of GDP (box D).

Freight transportation intensity declined even within the goods producing sector. In 1970, it took 2.1 ton-miles of freight transportation to produce \$1 of goods GDP. In 2002, it took only half that amount, 1.1 ton-miles, to produce the same value of goods GDP (in real terms). This trend reflects two underlying changes in the U.S. economy:

- the downsizing of products towards lighter weight products (such as computers, cell phones, and hand-held digital devices), and
- improvement in the efficiency of the freight transportation system, not only in terms of faster and timelier delivery, but also higher direct accessibility.

Although freight ton-miles grew more slowly than real GDP, it grew faster than the U.S. population, which is another factor in the growth of freight transportation as well as total transportation. From 1970 to 2002, U.S. per capita ton-miles grew 23 percent, from nearly 11,000 to 14,000. And it is still on an increasing trend (figure 4). Looking ahead, the nation's freight tonnage is projected to increase nearly 70 percent by 2020 (USDOT FHWA 2003).[16] General cargo tonnage is projected to more than double, and some gateways may see a tripling in freight volumes between 1998 and 2020. As the demand for freight transportation grows, so will its overall contribution to the nation's economy. And the expected growth in freight movements could result in capacity, congestion, and environmental challenges. Balancing the need for efficient and secured movement of goods with concerns for improved safety, accessibility, and mobility will likely remain a major interest of the transportation community.

BOX D

Freight Transportation Intensity of the U.S. Economy

There is a close link between growth in freight transportation and economic growth. Changes in economic activities influence the demand for freight services. An indicator, known as *freight transportation intensity,* illustrates this relationship. Measured as the ratio of total ton-miles to total GDP, this indicator shows that the actual freight activity required to produce a unit of goods and services in the nation's GDP has declined. The ratio dropped from 0.59 ton-miles per dollar of GDP in 1970 to 0.38 ton-miles per dollar of GDP in 2002 (as measured in 2000 dollars). This suggests an increase in freight transportation productivity. Alternatively, this decline may be due to GDP growing at a faster rate than growth in freight transportation. Changes to the ratio reflect both macro level driving forces (e.g., the shift in the structure of the economy from goods to more services) and micro level factors (e.g., changes in freight rates, time in transit, accessibility to ports, and security of goods).

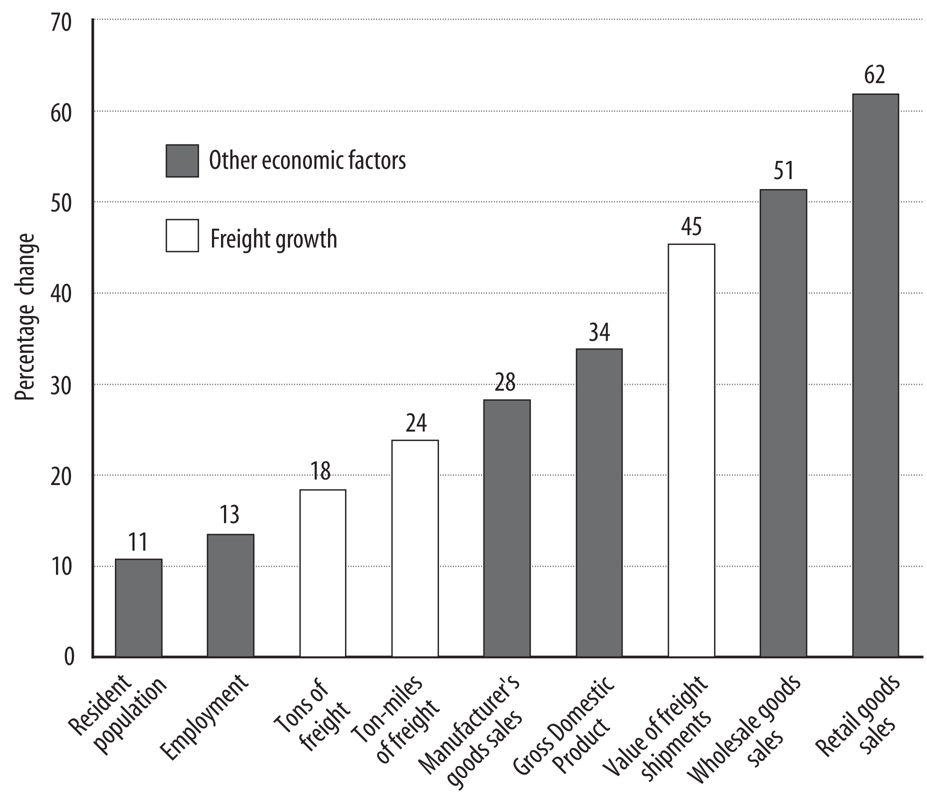
SOURCE: Bureau of Transportation Statistics, February 2004.

FREIGHT SHIPMENTS AND RELATED FACTORS OF CHANGE

Strong growth in the U.S. economy, wholesale trade, and retail trade sales were key factors that affected the level of U.S. freight shipments between 1993 and 2002 (figure 5). Increases in these

[16] This is a projection from the 1998 base year, as reported by the Federal Highway Administration's Freight Analysis Framework.

FIGURE 5
Increases in U.S. Commercial Freight Shipments and Related Growth Factors : 1993–2002*



* 2002 data used in these calculations are preliminary.

NOTE: The value of freight shipments, manufacturer's sales, wholesale trade sales, retail trade sales, and gross domestic product are based on inflation-adjusted chained 2000 dollars.
The value, tons, and ton-miles data in this figure include the Bureau of Transportation Statistics estimates of out-of-scope missing pieces. See notes on table 1 for additional information on the BTS estimates.

SOURCES: U.S. Department of Transportation, Bureau of Transportation Statistics:
Value, tons, and ton-miles are based on 1993 and preliminary 2002 Commodity Flow Survey data plus additional estimates from Bureau of Transportation Statistics.

GDP chained dollars—U.S. Department of Commerce, Bureau of Economic Analysis, National Economic Accounts, Gross Domestic Product, Current-Dollar and "Real" GDP. Available at: http://www.bea.doc.gov/bea/dn/home/gdp.htm, as of October 2003.

Employment, total—Bureau of Labor Statistics, "Current Population Survey," data query, available at: http://www.bls.gov/cps/home.htm, as of Jan. 5, 2004.

Wholesale and retail trade sales—U.S. Census Bureau, "Monthly Wholesale Trade Survey," available at: http://www.census.gov/svsd/www/mwts.html, as of Jan. 5, 2004.

factors meant greater volume of goods produced and consumed, resulting in increased demand for freight transportation, more freight movements, and increased length of haul.

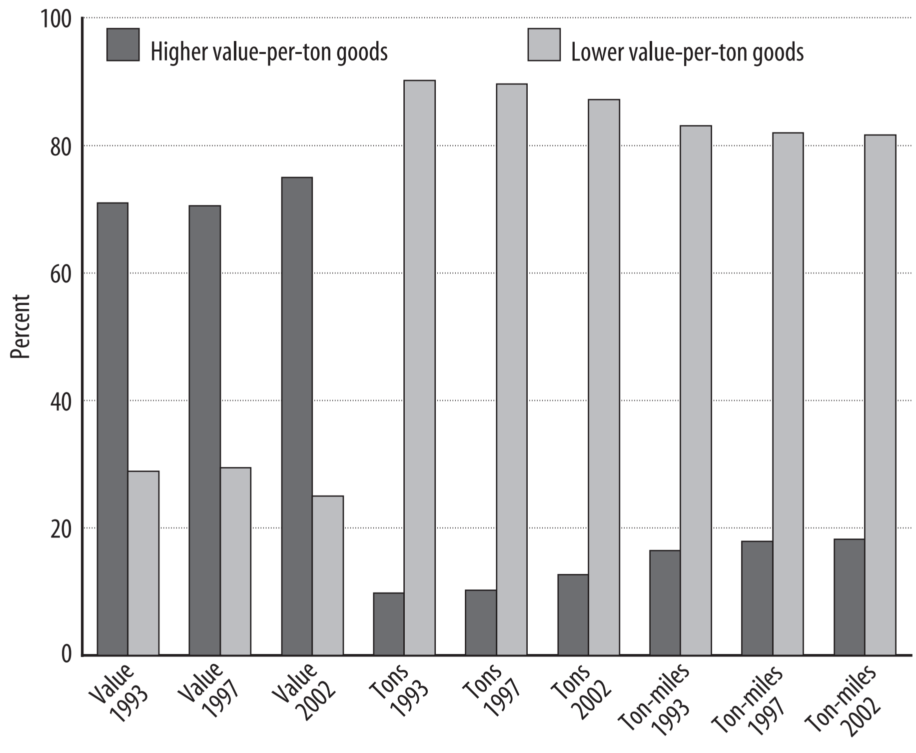
In 2002, the U.S. economy—measured by Gross Domestic Product—was one-third larger than in 1993 (figure 5). The economy's strong growth—3.3 percent annually—spurred the growth of freight shipments. During this period, the value of freight shipments grew 45 percent by value at an average rate of 4.2 percent annually (both adjusted for inflation), in part because of the faster growth rates of wholesale trade and retail trade sales. Tons and ton-miles of freight shipments grew more slowly—18 percent and 24 percent respectively—because of the relatively slower growth of the manufacturing sector and increased production of lighter weight goods.

Changes in patterns of goods production and trade (in which manufacturing and assembly operations are often located in different countries), increases in consumer demand for rapid delivery of goods, and a rise in international trade have contributed to the growth in freight tonnage and ton-miles. Also, continued shifts in the U.S. and world economy toward more services and high-value, low-weight products such as laptops, cell phones, and handheld personal computing devices are influencing the commodity mix and modal choice even as overall freight shipments rise. For example, electronic and electrical equipment have a much higher value per ton ($18,000) than wood products ($430), are more likely to move by truck or air courier service, and frequently travel farther (612 miles per ton) than the lower value per ton wood products (355 miles per ton) (CFS 2002).

In 2002, a ton of goods shipped was valued at $637, a 7-percent increase over $597 in 1993 (both in chained 2000 dollars). Higher value shipments (more than $1,000 per ton) accounted for 75 percent of the value of overall 2002 shipments, up from 71 percent in 1993. Because these high-value goods are lighter products (e.g., pharmaceuticals, precision instruments, and textiles) they accounted for just about 13 percent of the tonnage and 18 percent of the ton-miles in 2002, both within 3 percentage points of the corresponding figures in 1993 (figure 6).

While the U.S. economy will continue to use large quantities of low-value bulk commodities, and the movement of these goods may continue to grow, it is likely that higher value shipments' relative proportion of overall freight and their contribution to GDP will increase. Today, due to improved freight productivity and reliability, timed delivery of a wide range of goods—from flowers and perishables to parts from suppliers for factory assembly—has become much more common and, in contrast to three decades ago, such goods may come from or go

FIGURE 6
Higher Value Goods' Share of U.S. Freight Shipments: 1993, 1997 and 2002 *
(Commodity Flow Survey Data Only)



* 2002 data are preliminary.

NOTE: Higher value goods were valued at over $1,000 per ton and include pharmaceutical products, electronic and other electricals, transportation equipment, precision instruments, tobacco products, textile and leather products, and motorized vehicles. Lower value goods were valued under $1,000 per ton in 2002 and include milled grains, food and related products, chemical products, metal products, wood products, minerals and metallic products, fertilizers and coal.

The data in this figure exclude the Bureau of Transportation Statistics estimates of out-of-scope missing pieces.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, based on 1993, 1997, and preliminary 2002 Commodity Flow Survey data.

to places anywhere in the world. Even for commodities traditionally shipped in bulk, more specialized shipping requirements are becoming more common. Containers, for example, may be used to ship grain and other cereal products that are handled as neo-bulk.[17]

[17] Neo-bulk commodities are generally handled like bulk commodities, except they move in small quantities per shipment. For example, steel, lumber, oranges, and forest products could all be shipped in the same vessel with cargo separation maintained during loading, transportation, and unloading (Muller 1999).

FREIGHT SHIPMENTS BY MODE OF TRANSPORTATION

Businesses often are willing to pay for more expensive or specialized transportation to ensure quicker product deliveries, often on time-definite schedules. A shipper's choice of mode often reflects the value of the goods shipped. Thus as the value of shipments has increased over time, changes have occurred in the national pattern of mode selection. The need for quicker deliveries of high-value products on definite schedules has led to the rapid growth in the value of air freight—up 97 percent since 1993. At the same time, the value of truck shipments grew 42 percent, and rail, which is delivering more scheduled shipments, 39 percent. Only pipeline shipments value fell, by 9 percent, because of fluctuations in crude petroleum prices.

Heavy, low-value commodities are mostly transported at lower unit costs by rail and water transportation, while lighter, high-value, time-sensitive commodities often move by truck and air-truck or rail-truck intermodal combinations. In 2002, on average, shipments by rail were valued at $205 per ton compared to $371 for water and $725 for truck. Shipments by multimodal combinations were valued at about $5,200 per ton, and air-truck shipments averaged more than $75,000 per ton (figure 7). The average reflects the wide 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. Between 1993 and 2002, the value per ton of shipments increased for almost all freight transportation modes, with the exception of pipelines.

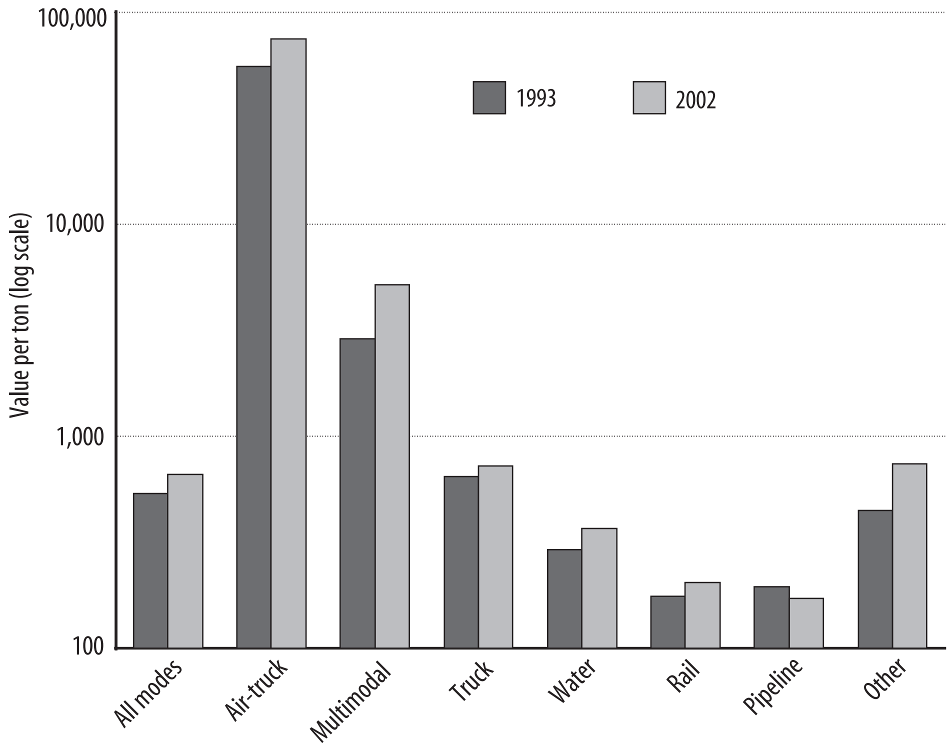
In 2002, trucks moved over 9.2 billion tons of goods and generated 1.4 trillion ton-miles.

Trucking

In 2002, trucking—both for-hire and private—continued its dominance of the freight industry, moving 64 percent of the nation's commercial freight, measured by value, and 58 percent of the tonnage. However, by ton-miles, trucks moved just slightly more than rail, 32 percent compared to 28 percent, followed by pipeline with 17 percent and waterborne shipments with 16 percent (table 4).[18] These numbers show the faster

[18] The pipeline totals presented in this report include movement of crude petroleum and petroleum products. It excludes estimates of ton-miles generated by moving natural gas. The addition of natural gas pipeline shipments increases pipeline's share and changes the shares of the other modes. BTS is working on redefining ton-miles to include natural gas flows.

FIGURE 7
Value Per Ton of U.S. Freight Shipments by Transportation Mode: 1993 and 2002*



* 2002 data are preliminary.

NOTE: The data are plotted on a log scale. Data that span a wide range are often plotted on a log scale to display variations at the low end as clearly as variations at the high end. For example, this figure would not show any detail below $1,000 per ton if it had used the familiar linear scale. Multimodal includes the traditional intermodal combination of truck and rail plus truck and water; rail and water; parcel, postal, and courier service; and other intermodal combinations. The data in this figure include the Bureau of Transportation Statistics estimates of out-of-scope missing pieces. See notes on table 1 for additional information on the BTS estimates.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, based on 1993 and preliminary 2002 Commodity Flow Survey data plus additional estimates from Bureau of Transportation Statistics.

growth in shipments by truck, compared with rail, and the decline in water transportation since 1993 (table 2). Truck ton-miles grew by 56 percent, rail by 30 percent, and water declined by about 17 percent. A decade ago, trucks moved almost 26 percent of ton-miles and rail moved about 27 percent, followed by water with 24 percent and pipeline with 16 percent.

Trucks moved more than $6.7 trillion worth of freight in 2002, an increase from $4.7 trillion in 1993 (in inflation-adjusted terms). However, truck's 64-percent share of the total value of shipments was similar to its share in 1993 because of increased share for air and multimodal shipments. Measured by

TABLE 4
Modal Shares of Commercial Freight Activity in the United States by Mode of Transportation: 1993, 1997, and 2002*

	1993			1997			2002		
Mode of Transportation	**Value**	**Tons**	**Ton-miles**	**Value**	**Tons**	**Ton-miles**	**Value**	**Tons**	**Ton-miles**
Combined total (CFS plus out-of-scope estimates)	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Truck	65.1	54.5	25.6	61.9	59.5	28.4	63.7	58.2	32.1
Rail	3.9	11.8	26.5	4.3	10.9	27.3	3.7	12.0	27.8
Water	8.6	15.9	24.3	8.8	15.4	20.8	8.3	14.8	16.3
Air (includes truck and air)	5.5	0.1	0.2	7.7	0.1	0.4	7.4	0.1	0.3
Pipeline	4.3	11.9	16.3	2.7	9.7	15.8	2.7	10.5	16.7
Multimodal	9.2	1.7	4.6	11.0	1.5	5.4	10.6	1.3	5.0
Other and	3.4	4.0	2.5	3.6	3.0	1.9	3.6	3.2	1.7

* 2002 data are preliminary.

(1) Multimodal includes the traditional intermodal combination of truck and rail plus truck and water; rail and water; parcel, postal, and courier service; and other multiple modes for the same shipment.

NOTE: The data in this table include estimates of out-of-scope missing pieces from the Bureau of Transportation Statistics. These estimates cover logging, farm-based truck shipments, truck imports from Canada and Mexico, rail imports from Canada and Mexico, air cargo imports and exports, water imports and exports, and pipeline crude and petroleum products shipments. The estimates exclude non-commercial freight shipments such as government shipments and municipal solid waste.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, based on 1993, 1997, and 2002 Commodity Flow Survey data plus additional estimates from Bureau of Transportation Statistics.

value of shipment, trucking was followed by multimodal combinations (11 percent), water (8 percent), and air-truck (7 percent) (table 4). Trucks moved about 58 percent of the total freight tonnage in 2002, followed by water (15 percent), rail (12 percent), and pipeline (11 percent).

Railroad

Rail, which carried about 4 percent of shipments, measured by value, and 12 percent of the weight, hauls not only bulk goods but also time-sensitive goods such as machinery, automobiles and parts, and perishables such as produce over long distances. Rail carried more than one-quarter of the total ton-miles, despite having a more spatially concentrated network than the highway system. Rail's shares of shipment value and weight primarily reflect the large quantities of low value-per-ton goods like coal, ores, and grains shipped by rail. Its share of ton-miles reflects the high weight and the longer length of haul of most products moved by rail (e.g., cereal grains and coal traveled an average of 450 miles per ton, and metallic ores over 500 miles per ton). The average value per ton of single mode rail shipments increased from $176 in 1993 to $205 in 2002. The rail increase partially reflects recent trends of businesses to use rail even to move more time-sensitive goods, such as vehicle parts and automobiles.

Waterborne

The total tonnage of U.S. waterborne freight, including domestic commerce and international trade, was over 2.3 billion tons in 2002, up more than 10 percent from 2 billion tons in 1993. Ton-miles of waterborne movements declined during this period, reflecting drops in the tonnage of domestic shipments (table 2). Tonnage of domestic waterborne commerce has declined during the past two decades, in part due to the decline of crude petroleum shipments from Alaska (USACE 2003). During this period, tons of waterborne imports and exports increased as U.S. international trade grew. Maritime transportation carries over three-quarters (78 percent) of the weight of U.S. international merchandise freight (USDOT BTS 2003b). The physical characteristics, value, and weight of commodities are some of the factors that determine the use of containers, tankers, or bulk vessels. In 2002, the value per ton of waterborne freight was $370 compared with $290 in 1993 (figure 7). This increase reflects the rising reliance on imports for manufactured goods (e.g., higher value automobiles and automotive parts from Europe and Asia).

Air

Air freight value, tonnage, and ton-miles grew the most rapidly of any mode during the past decade and are expected to rise as U.S. international trade grows and business requirements for more carefully timed shipments increase. In 2002, air freight shipments were valued at over $770 billion, nearly double the $395 billion in 1993. While still representing less than 1 percent of the overall tons and ton-miles, air cargo grew in tonnage by about 46 percent and in ton-miles by 63 percent (table 2) between 1993 and 2002. The air freight share of the weight is small because the commodities moved by air tend to be higher in value per ton (e.g., electronics, clothing, and perishables such as flowers) than other modes. Also, because almost all air cargo shipments begin and end their journey by truck, growth in air freight creates demand for more truck and intermodal services.

In 2002, the goods U.S. businesses shipped by air had higher value per ton ($75,000) than in 1993 ($56,000), partially reflecting the role of air cargo in transporting imports and exports (figure 7).[19]

Multimodal

In 2002, about 11 percent of shipments, by value, moved multimodally—a slight increase from 1993 (table 4). These are shipments that moved by more than one mode, as well as parcel, postal, or courier services, excluding air-truck intermodal.[20] Multimodal shipments were more than 1 percent by weight and about 5 percent by ton-miles of total shipments. Of the multimodal shipments, those moving by parcel, postal, or courier services (typically higher value and smaller size shipments) grew the most—over 80 percent by value and averaged about $39,000 per ton. Multimodal shipments are higher in average value per ton than typical single-mode shipments. The average value per ton of goods shipped by multimodal combinations was more than $5,000 per ton in 2002 (figure 6). The classic intermodal truck and rail combination moved 173 million tons in 2002, an increase of 47 percent from 118 million tons in 1993. Intermodal truck and rail ton-miles grew 50 percent from 160 billion to 240 billion (STB 2003).[21]

Pipelines

U.S. pipeline movements of crude and petroleum products produced over 750 billion ton-miles, representing a sizable increase from about 600 billion ton-miles in 1993.[22] Pipelines accounted for about 17 percent of total ton-miles in 2002, similar to its share in 1993. Pipelines move large volumes of freight that allow the other freight modes access to both domestic and imported oil. Pipeline transportation is important for the U.S. economy

[19] Air freight moves about 30 percent of the value of U.S. international freight. And the higher value of these goods (e.g., computer chips, cashmere sweaters, and flowers) influences the overall average value per ton of air cargo shipments.

[20] Multimodal transportation includes truck and rail, truck and water, rail and water, and parcel, postal, and courier services.

[21] This report uses the Surface Transportation Board's Waybill Sample data on truck-rail intermodal because the preliminary 2002 CFS data did not meet publication standards and BTS and the Census Bureau are analyzing the data to determine reasons for the statistical errors. 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.

[22] Pipeline totals exclude gas pipelines.

because the energy derived from piped crude or petroleum products is consumed at nearly every stage of the production of goods and services. The role of pipelines is likely to remain critical as freight transportation demand increases.

FREIGHT SHIPMENTS BY DISTANCE[23]

Most freight shipments by value and tonnage move less than 250 miles. In 2002, more than half the value of all CFS shipments ($4.5 trillion), and 80 percent of the weight (9 billion tons), moved in local and short-haul shipments that are critical to state and metropolitan area economies and that use local roads, tracks, and facilities (figure 8). But goods that move longer distances—more than 250 miles—carried 82 percent of the ton-miles, an increase from 80 percent in 1993. During the past decade, local and short-haul shipments grew 41 percent by value, 16 percent by weight, and 19 percent by ton-miles. Shipments traveling over 250 miles grew faster—51 percent by value, 34 percent by weight, and 36 by ton-miles.

The ability to move large amounts of freight nationwide allows domestic trade to flourish.

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 traveled an average of 18,000 miles and grew the most by value, tons, and ton-miles compared to other distance categories—53, 54, and 57 percent respectively. The ability to move large amounts of freight nationwide allows domestic trade to flourish and demonstrates the importance of transportation to the nation's commerce.

Higher value products, such as pharmaceuticals, precision instruments, and textile products that cannot be obtained locally, are shipped longer distances. Commodities that can be found in every region, such as gravel and crushed stone, travel only a few miles. Long-distance shipments—traveling more than 250 miles—carried 20 percent of tons shipped, although they were almost half the value of CFS shipments. These shipments facilitate interstate commerce within the United States, connecting rural America to large urban centers and allowing manufacturers to locate plants throughout the country.

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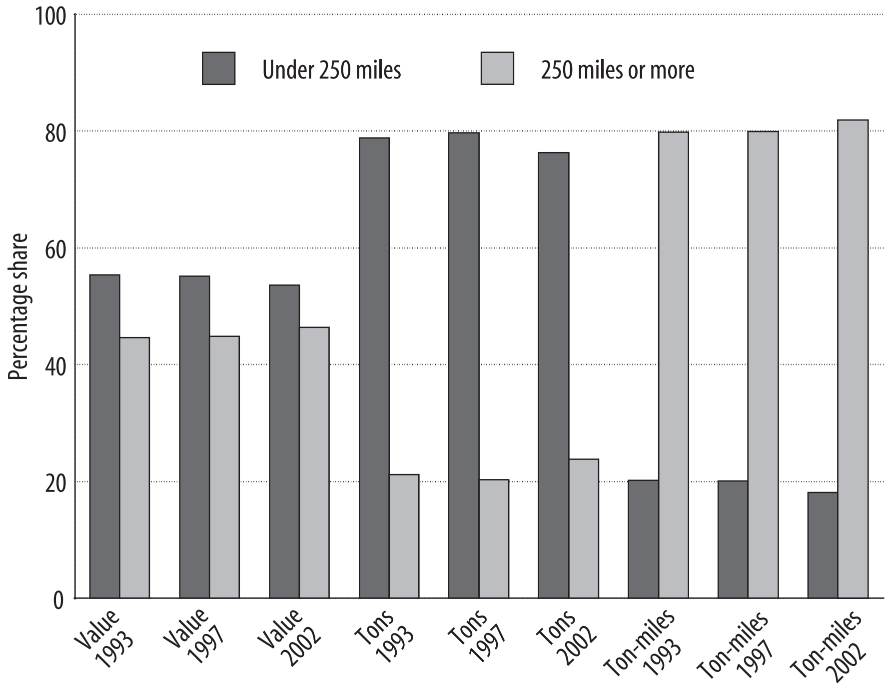
[23] These findings are based on the CFS data only. Distance of shipment information is not available for the supplementary data.

FIGURE 8
Freight Shipments by Distance Shipped: 1993, 1997, and 2002*
(Commodity Flow Survey Data Only)



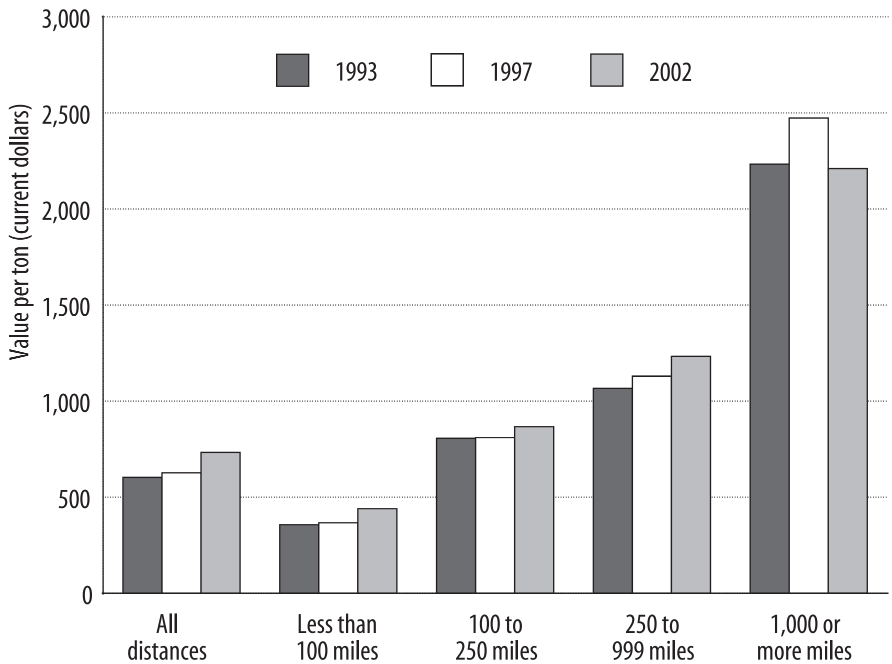
* 2002 data are preliminary.

NOTE: Shipments are grouped into distance categories based on Great Circle Distance (GCD). GCD 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, Bureau of Transportation Statistics, based on the 1993, 1997, and preliminary 2002 Commodity Flow Survey data.

Longer haul shipments, on average, had a much higher value per ton than local and short-haul shipments (figure 9). These long-haul shipments (more than 250 miles) were valued higher ($1,430 per ton in 2002) than goods shipped less than 250 miles ($510 per ton). For example, goods that moved 1,000 or more miles in 2002 had an average value of $2,200 per ton, compared with an average of $440 per ton for goods shipped less than 100 miles. Low-valued commodities are not usually shipped long distances because the value of the goods would not cover the cost of transportation. Moreover, businesses are often willing to pay a premium to have high-value goods shipped longer distances by air and truck combination in exchange for speedy delivery (figure 10). It's expected that as more and more businesses move beyond "just-in-time" deliveries to "this-specific-time" deliveries, where the entire logistics supply chain

FIGURE 9
Value Per Ton of Shipments by Distance Shipped: 1993, 1997, and 2002*
(Commodity Flow Survey Data Only)



* 2002 data are preliminary.

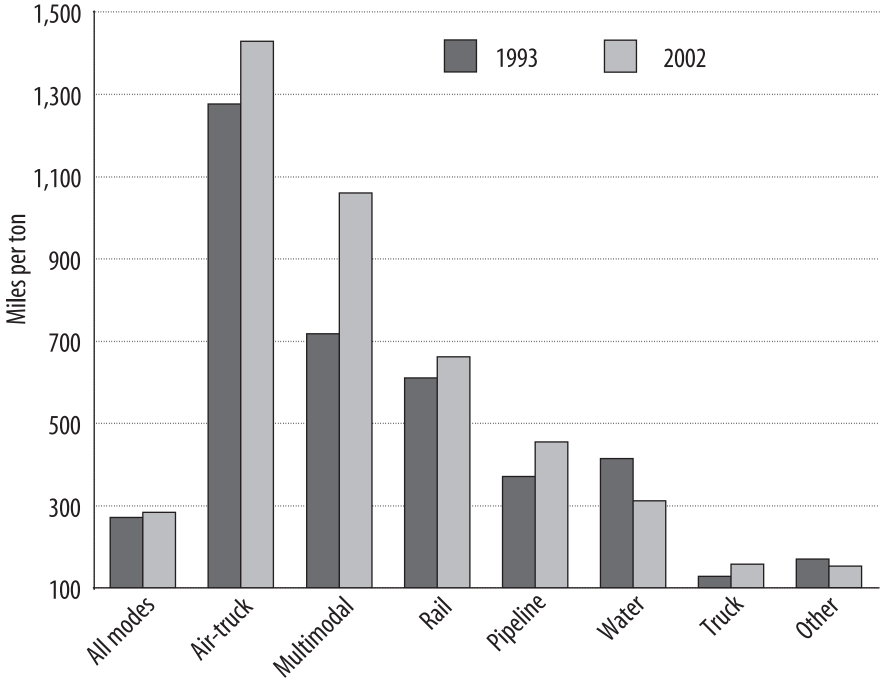
NOTE: Shipments are grouped into distance categories based on Great Circle Distance (GCD). GCD is the shortest distance between 2 points on the surface of a sphere.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, based on the 1993, 1997, and preliminary 2002 Commodity Flow Survey data.

is vertically integrated and coordinated to the very last minute, the tonnage and ton-miles generated from long-haul shipments will continue to increase.

Textiles, leather, and related products traveled the most miles per ton in 2002—650 miles, a 16-percent growth from 560 miles in 1993. During this period, these products averaged about $10,000 per ton. They were followed in length of haul by electronic, electrical, and office equipment, traveling about 610 miles per ton in 2002, down slightly from 680 in 1993 (figure 11). Gravel and crushed stones, which mostly travel in local areas, were shipped about 60 miles in 2002, nearly the same distance as in 1993.

FIGURE 10
Average Length of Haul of U.S. Freight Shipments by Transportation Mode: 1993 and 2002*



* 2002 data are preliminary. Average length of haul is defined as miles per ton traveled.

NOTE: The data in this figure include the Bureau of Transportation Statistics estimates of out-of-scope missing pieces. These estimates cover logging, farm-based truck shipments, truck imports from Canada and Mexico, rail imports from Canada and Mexico, air cargo imports and exports, water imports and exports, and pipeline crude and petroleum products shipments. These estimates exclude other out-of-scope categories of goods movements for which no reasonable basis for an estimate currently exists, including government shipments, service sector, retail sector, construction sector, transportation service providers, household goods movement, and municipal solid waste.

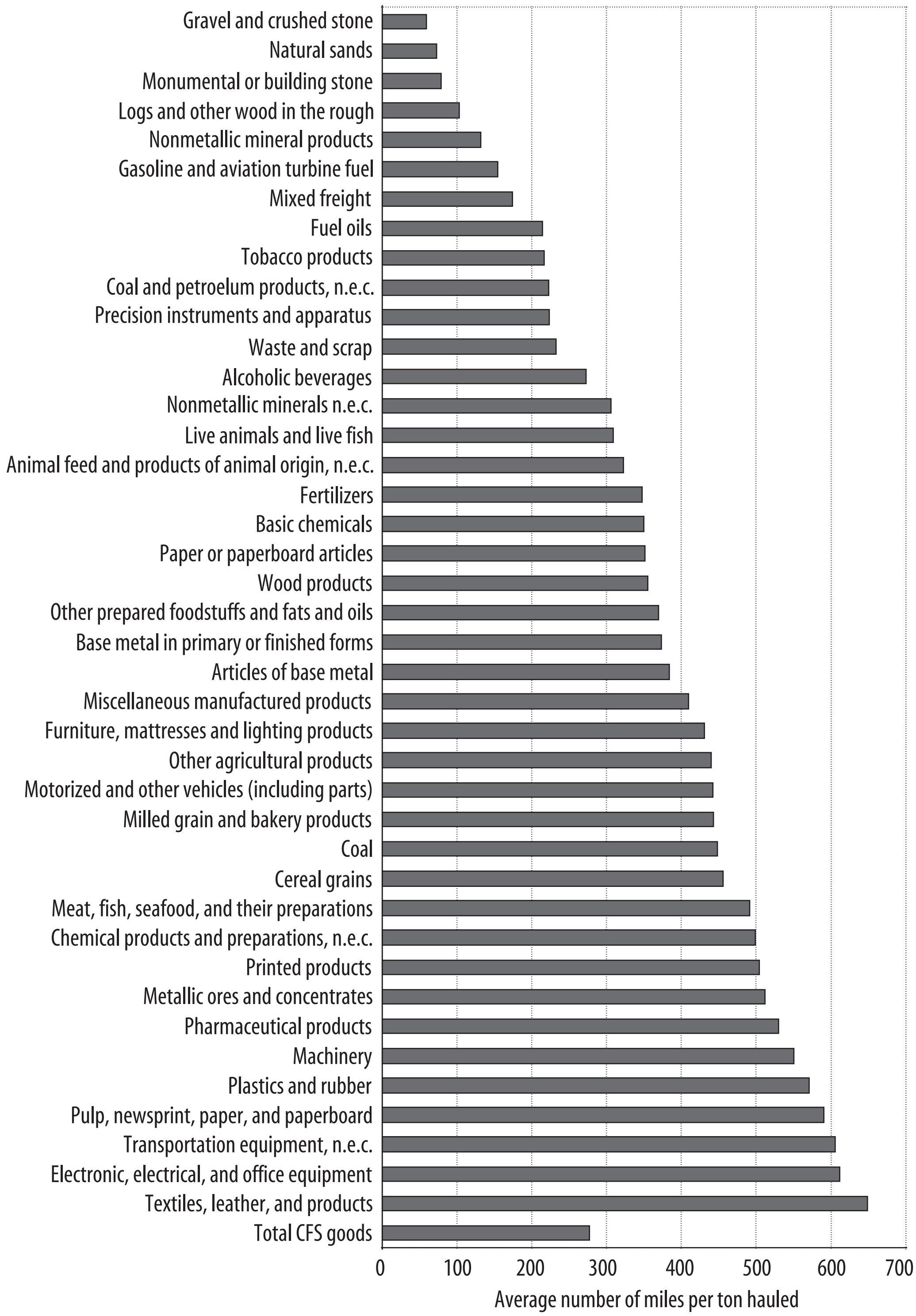
SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, based on 1993 and preliminary 2002 Commodity Flow Survey data plus additional estimates from the Bureau of Transportation Statistics.

FREIGHT MOVEMENTS BY SHIPMENT SIZE[24]

Smaller sized shipments (less than 500 pounds) grew the most (56 percent) by value since 1993, compared with shipments of other weight categories (table 5). These shipments also had a higher value per ton ($19,000) in 2002, and experienced a faster growth

[24] These findings are based on the CFS data only. Shipment size information is not available for the supplementary data.

FIGURE 11
Average Length of Haul by Major Commodity Group: 2002*
(Commodity Flow Survey Data Only)



* 2002 data are preliminary.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, based on data from the preliminary 2002 Commodity Flow Survey data, January 2004.

TABLE 5
Freight Shipments by Shipment Size: 1993, 1997, and 2002*
(Commodity Flow Survey Data Only)

Shipment weight	Value (current billions $)			Value (percent share)			% change 1993 and 2002
	1993	1997	2002	1993	1997	2002	
Less than 500 pounds	1,368	1,830	2,138	23.4	26.4	25.2	56.3
500 to 999 pounds	319	373	432	5.5	5.4	5.1	35.6
1,000 to 49,999 pounds	3,411	3,823	4,909	58.3	55.1	57.9	43.9
50,000 pounds or more	749	917	1,004	12.8	13.2	11.8	34.1
All shipment sizes	**5,846**	**6,944**	**8,483**	**100.0**	**100.0**	**100.0**	**45.1**
	Tons (millions)			Tons (percent share)			
Less than 500 pounds	109	118	115	1.1	1.1	1.0	5.0
500 to 999 pounds	65	71	73	0.7	0.6	0.6	13.6
1,000 to 49,999 pounds	3,830	4,653	4,943	39.5	42.0	42.7	29.1
50,000 pounds or more	5,685	6,247	6,442	58.7	56.3	55.7	13.3
All shipment sizes	**9,688**	**11,090**	**11,573**	**100.0**	**100.0**	**100.0**	**19.4**
	Ton-miles (billions)			Ton-miles (percent share)			
Less than 500 pounds	29	34	39	1.2	1.3	1.2	36.0
500 to 999 pounds	13	16	18	0.6	0.6	0.6	33.6
1,000 to 49,999 pounds	728	866	1,061	30.1	32.5	33.1	45.8
50,000 pounds or more	1,651	1,745	2,086	68.2	65.6	65.1	26.4
All shipment sizes	**2,421**	**2,661**	**3,204**	**100.0**	**100.0**	**100.0**	**32.4**

* 2002 data are preliminary.

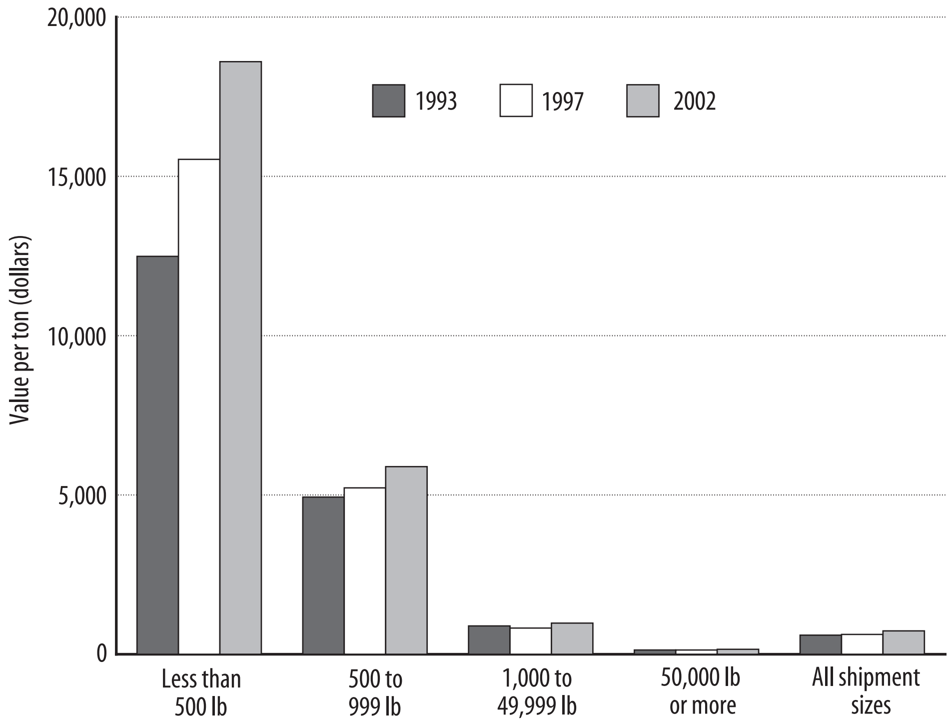
SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, based on data from the 1993, 1997, and preliminary 2002 Commodity Flow Survey, January 2004.

increase than the other categories—up 48 percent from $12,400 in 1993 (figure 12). These small-size shipments are often high-value, time-sensitive commodities and are mostly transported just-in-time by express or parcel, postal, and courier services.

Because smaller sized shipments are low weight, they grew only 5 percent by weight but 36 percent by ton-miles, reflecting their increased length of haul and the increased transportation of high-value smaller sized shipments. In 2002, the average miles traveled per ton of shipments (less than 500 pounds) was 339, growing 30 percent from 262 in 1993. By contrast, heavier shipments of 1,000 pounds or more traveled an average 277 miles per ton in 2002, just 10 percent higher than 252 in 1993.

In 2002, although the tonnage and ton-miles of CFS shipments less than 500 pounds were about 1 percent of the CFS total, they were 25 percent of the value ($2.1 trillion), similar to the 1993 and 1997 shares (table 5). Of these, shipments less than 100 pounds were 15 percent of value of the freight shipments. While since 1993 these shipments grew 68 percent by value and 33 percent by ton-miles, their total weight dropped 5

FIGURE 12
Value Per Ton of Shipments by Shipment Size: 1993, 1997, and 2002*
(Commodity Flow Survey Data Only)



* 2002 data are preliminary.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, based on data from the preliminary 2002 Commodity Flow Survey data, January 2004.

percent. Very low-weight shipments (less than 100 pounds) averaged $40,000 per ton in 2002, compared to $23,000 in 1993, and traveled 490 miles per ton, up from 353 in 1993.

Large-size shipments (over 50,000 pounds) were 65 percent of the ton-miles and 56 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, these very large shipments placed more demand on the transportation network, generating more than 2 trillion ton-miles—nearly two-thirds of the CFS ton-miles. They traveled an average of 324 miles per ton, an increase of 12 percent from 290 in 1993. As these larger sized shipments grow, their impact on our roads, rail tracks, and ports can be expected to rise.

The size of shipments moved over the nation's transportation system depends on type of commodity (whether raw material or finished manufactured products), kind of shipper and consignee (manufacturer, wholesaler, distributor, or retailer), and mode of transportation, among other factors. Shippers usually transport higher value goods in smaller, more frequent shipments in order to minimize inventory storage costs. Bulky raw materials such as grain, coal, and ore are shipped in large lots while most finished goods such as furniture, processed foods, and automobiles are often relatively small and transported in frequent shipments.

As the value per ton rises, shippers are less likely to wait to assemble a large shipment and are more likely to deliver materials and parts as they are needed in the distribution process and to deliver finished products to distributors as they are demanded by customers. Almost always, this involves more frequent and smaller just-in-time (JIT) shipments, which put a premium on transportation system reliability, speed, and flexibility of intermodal combinations. For example, U.S. freight shipments less than 50,000 pounds (average payload of a typical truck) grew much faster than those weighing more than 50,000 pounds between 1993 and 2002, confirming the growth in smaller sized shipments and JIT deliveries. Shipments less than 50,000 pounds grew 47 percent by value, 28 percent by tonnage, and 45 percent by ton-miles, while shipments more than 50,000 pounds grew 34 percent by value, 13 percent by tonnage, and 26 percent by ton-miles.

U.S. freight shipments less than 50,000 pounds grew faster than those weighing more than 50,000 pounds between 1993 and 2002.

Further, although transportation costs may increase due to JIT, there is reduction in the overall logistics costs share of production. For example, in 2002, total U.S. logistics cost was 8.7 percent of USGDP, down from to 9.9 percent in 1993. By comparison, logistics cost was about 16 percent of USGDP in 1981 (Cass Information Systems 2003).[25] To the extent that the U.S. transportation system makes it possible for shippers to move inputs and final products more cost-effectively, reliably, and safely, the economy's competitiveness and ability to sustain growth are enhanced.

[25] Total logistics cost is composed of inventory carrying costs (e.g., interest, taxes, depreciation, insurance, and warehousing), transportation costs (e.g., carrier charges and freight forwarder fees), and administrative costs (e.g., shipper-related and logistic providers fees). It was $506 billion in 1981, $660 billion in 1993, and $910 billion in 2002. For further discussion, see Cass Logistics Systems, 14th *Annual State of Logistics Report*, June 2003.

FREIGHT SHIPMENTS BY MAJOR COMMODITY GROUPS[26]

Electronic, electrical, and office equipment was the top commodity moved by value, gravel and crushed stone the top commodity by weight, and coal the top commodity by ton-miles in 2002 (table 6). In 1993, the top commodity groups transported by value were electronic, electrical, and office equipment; coal was the top commodity by weight and ton-miles. Table 6 presents the value, weight, and ton-miles as well as the relative shares of the major commodities shipped by U.S. businesses.[27] Because the CFS does not cover several important commodities and sectors of the economy, such as crude petroleum pipeline movements and imports, the volumes and shares of the commodities moved could vary with the addition of out-of-scope shipments.[28]

By Value

More than $1 out of every $10 of freight goods shipped in 2002 was for the commodity group of electronic, electrical, and office equipment. Businesses shipped $948 billion of these goods in 2002—over 80 percent more than $515 in 1993—representing 11 percent of total shipments in 2002, slightly more than in 1993. It was followed in value by mixed freight; motorized and other vehicles (including parts); machinery; textiles, leather, and articles of textiles and leather; pharmaceuticals; and miscellaneous manufactured products. Mixed freight shipments grew the fastest measured by percent change in value, increasing from $207 billion to $858 billion, at 17 percent annually. It was followed by pharmaceuticals, which grew from $163 billion to $427 billion, at an 11 percent annual rate.

By Weight

Gravel and crushed stone, a low-value commodity that moves short distances, was the leading item shipped by weight. One out of every seven tons transported by freight carriers was

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[26] These findings are based on the CFS data only. Detailed information on type of commodity is not available for the supplementary data.

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

[28] 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 extensive analysis is needed to disaggregate these data into appropriate two-digit commodity groups. BTS intends to research this as part of the ongoing CFS data analysis.

TABLE 6
Freight Shipments by Two-Digit Commodity: 1993, 1997, and 2002
(Commodity Flow Survey Data Only)

SCTG	Commodity description	Value, tons, and ton-miles			Percentage of total		
		1993	1997	2002 (P)	1993	1997	2002 (P)
	Ranked by 2002 value	**Value (billion current dollars)**					
	CFS total	**5,846**	**6,944**	**8,483**	**100.0**	**100.0**	**100.0**
35	Electronic, electrical, and office equipment	515	870	948	8.8	12.5	11.2
43	Mixed freight (1)	207	230	858	3.5	3.3	10.1
36	Motorized and other vehicles (including parts)	498	571	736	8.5	8.2	8.7
34	Machinery	385	417	509	6.6	6.0	6.0
30	Textiles, leather, and articles of textiles or leather	449	379	507	7.7	5.5	6.0
21	Pharmaceutical products	163	224	427	2.8	3.2	5.0
40	Miscellaneous manufactured products	233	421	405	4.0	6.1	4.8
7	Other prepared foodstuffs, fats, and oils	347	346	362	5.9	5.0	4.3
24	Plastics and rubber	236	279	343	4.0	4.0	4.0
32	Base metal in primary or semifinished forms and in finished basic shapes	145	286	254	2.5	4.1	3.0
	Ranked by 2002 tonnage	**Weight (millions tons)**					
	CFS total	**9,688**	**11,090**	**11,573**	**100.0**	**100.0**	**100.0**
12	Gravel and crushed stone	977	1,815	1,775	10.1	16.4	15.3
15	Coal	1,130	1,217	1,255	11.7	11.0	10.8
31	Nonmetallic mineral products	817	910	910	8.4	8.2	7.9
17	Gasoline and aviation turbine fuel	912	963	840	9.4	8.7	7.3
2	Cereal grains	440	490	579	4.5	4.4	5.0
18	Fuel oils	448	482	508	4.6	4.3	4.4
20	Basic chemicals	246	296	497	2.5	2.7	4.3
11	Natural sands	405	443	466	4.2	4.0	4.0
7	Other prepared foodstuffs and fats and oils	372	397	463	3.8	3.6	4.0
19	Coal and petroleum products, n.e.c.	524	475	431	5.4	4.3	3.7
	Ranked by 2002 ton-miles	**Ton-miles (billions)**					
	CFS total	**2,421**	**2,661**	**3,204**	**100.0**	**100.0**	**100.0**
15	Coal	488	542	562	20.1	20.4	17.6
2	Cereal grains	202	201	264	8.3	7.5	8.2
20	Basic chemicals	109	137	174	4.5	5.1	5.4
7	Other prepared foodstuffs and fats and oils	127	124	171	5.2	4.7	5.3
17	Gasoline and aviation turbine fuel	102	137	130	4.2	5.1	4.1
3	Other agricultural products	74	81	122	3.1	3.0	3.8
32	Base metal in primary or semifinished forms and in finished basic shapes	70	117	122	2.9	4.4	3.8
31	Nonmetallic mineral products	86	91	120	3.5	3.4	3.8
26	Wood products	98	97	114	4.0	3.6	3.6
18	Fuel oils	59	51	109	2.5	1.9	3.4

KEY: SCTG = Standard Classification of Transported Goods; P = preliminary.

(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 BTS totals specified in the text and in tables 1, 2, and 3 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, Bureau of Transportation Statistics, based on data from the 1993, 1997, and preliminary 2002 Commodity Flow Survey, January 2004.

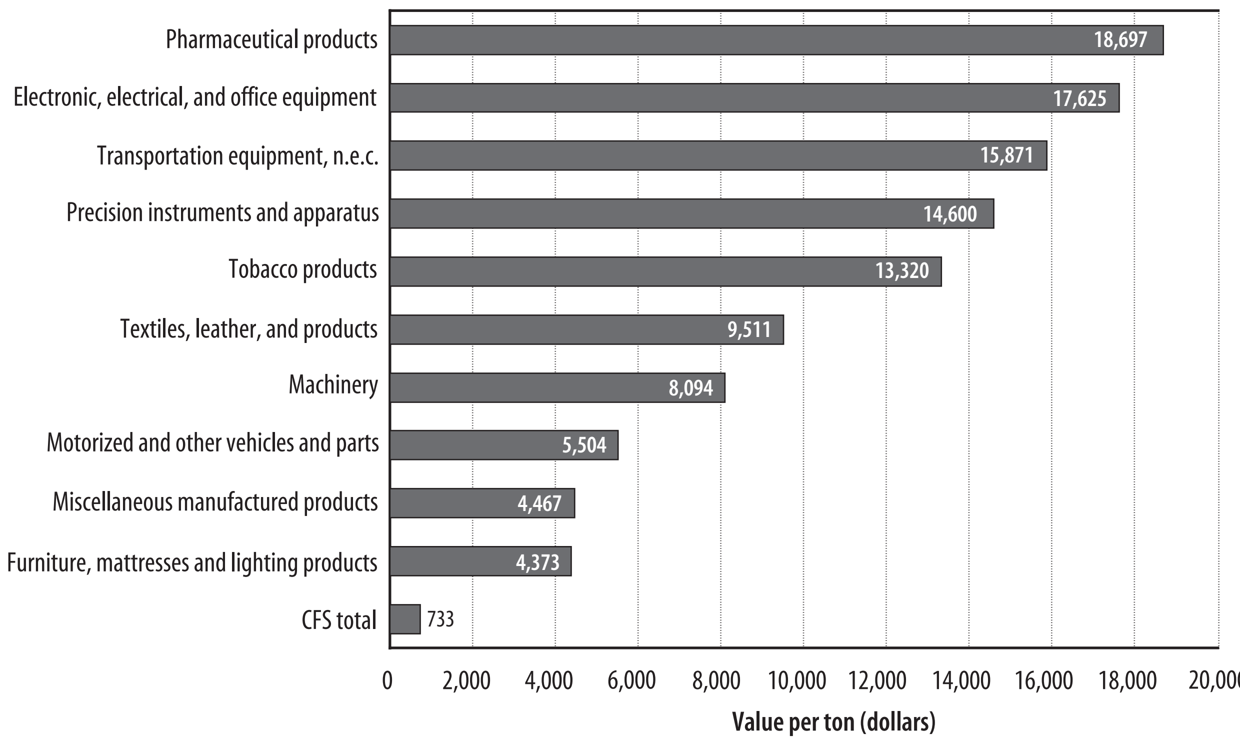
gravel and crushed stones. The shipments of 1.8 billion tons were 15 percent of the 2002 CFS weight, up from about 10 percent in 1993. In 2002, gravel and stone was followed by coal, nonmetallic mineral products, and gasoline and aviation fuel. Although gravel and crushed stone was 15 percent of total 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 shipments, impacting mostly local transportation. Gravel and stone shipments also traveled the least miles (about 60 miles) as measured by average length of haul (i.e., miles per ton). See figure 11. Miscellaneous manufactured product shipments and pharmaceuticals grew the fastest measured by percent change in weight, increasing from 26 million tons to 91 million tons and from 7 million tons to 23 million tons, respectively. Each grew about 15 percent annually from 1993 to 2002. They were followed by mixed freight, which also grew nearly 15 percent per year.

By Ton-Miles

Coal continues to carry the most ton-miles—562 billion in 2002, accounting for about 18 percent of all CFS ton-miles and more than twice the ton-miles of cereal grains, the second leading commodity group (table 6). Coal and cereal grains were followed by basic chemicals, prepared foodstuffs, and gasoline and aviation fuel. Coal generated the most ton-miles because, unlike gravel and stone which move mostly in local areas, coal is produced only in certain areas and is often shipped long distances. For example, coal mined in Wyoming, Montana, Kentucky, and Pennsylvania is transported nationwide. In 2002, a ton of coal was shipped 448 miles on average, more than seven times the average miles for a ton of gravel and crushed stone (figure 11). Mixed freight shipments grew the fastest measured by percent change in ton-miles, increasing from 14 billion tons to 58 billion tons—a 17 percent annual rate. It was followed by miscellaneous manufactured products and pharmaceuticals, which both grew about 13 percent annually.

The major commodities vary greatly when ranked by the value-per-ton of different shipments (figure 13). In 2002, pharmaceutical products ranked highest, averaging nearly $19,000 per ton. The second highest category by value was electronic, electrical, and office equipment, averaging about $18,000 per

FIGURE 13
Top 10 Commodity Groups Ranked by Value Per Ton: 2002*
(Commodity Flow Survey Data Only)



* 2002 data are preliminary.

NOTE: Ranking is based on value per ton in 2002. Commodities groups are based on the Standard Classification of Transported Goods, SCTG code.

SOURCE: U.S. Department of Transportation, Bureau of Transportation Statistics, based on data from the preliminary 2002 Commodity Flow Survey data, January 2004.

ton. Among all commodity groups, gravel and crushed stones ranked lowest, at $7 per ton, followed by natural sands at $10 and coal at $19 per ton.

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 most comprehensive national picture of freight movement comes from the BTS and the Census Bureau's Commodity Flow Survey (CFS). 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 that BTS is working to fill. However, as discussed earlier, the CFS does not in itself provide a complete picture of commercial freight movements in the United States. Additional data must be used to fill gaps in CFS coverage.

The CFS provides information on local and long-distance freight shipments for all modes, including multimodal.

The 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. By contrast, a carrier-based survey would provide information on shipment route, cost, and time of travel.

To present a more complete national estimate of the *overall* freight moved on the nation's transportation system in 2002, BTS has 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 out-of-scope imports by surface and air for the 1993, 1997, and 2002 estimates of commodity flows. For the 2002 CFS, BTS has filled gaps in shipments of logs and lumber.

The report compares the preliminary 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. BTS revised the additional supplementary figures for 1993 and 1997 because of improved methodology and to address coverage issues in the survey. The revised data are noted where appropriate in the report.

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, wholesale trade, and selected retail 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 also excluded 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 issues with how these companies record and report "shipment" information. See box E for additional information on sources and reliability of the CFS data.

Where appropriate, this *Freight Shipments in America* report supplements the CFS data with additional estimates of crude petroleum shipments by pipelines published by the Department of Energy's Energy Information Administration (EIA), the Federal Energy Regulatory Commission (FERC), and the Association of Oil Pipe Lines. This report also presents additional data on waterborne freight movements not fully captured in the CFS and imports carried by surface (with Canada and Mexico), air, and water transportation with all trading partners that are out of the scope of the CFS.[29]

[29] In general the data sources used in estimating the supplemental data provide better coverage of *all* activities in the respective sector of the economy or commodity group and are therefore more complete than the CFS data. For example, the official U.S. export merchandise trade data, which are based on 100 percent administrative records, better measures the overall transportation of exported goods.

BOX E

Source and Reliability of the CFS Data and Other Sources Used in this Report

The CFS data presented in this report are estimates derived from a sample survey. Because the CFS is a sample survey and uses estimation methods and procedures to estimate total freight activity for the entire United States, the data are subject to sampling and nonsampling errors. Sampling errors occur because one set of businesses sampled in a survey may have different characteristics from another sample set of companies selected from the entire universe of businesses. Nonsampling errors occur because of all other factors that may contribute to the total errors in a sample survey, such as nonresponse, response errors, and differences in interpretation of questions by respondents. See the CFS source cited below for detailed discussion of reliability of the CFS data and estimates of standard errors.

The supplementary data on crude petroleum, logging, imports, and farm shipments used in this report are not based on surveys and therefore are not subject to sampling errors. However, the data are subject to nonsampling errors that may also occur in censuses and other forms of data collection. The impact of these nonsampling errors on the supplementary data is not fully quantifiable. Clearly, because the supplementary data did not cover all out-of-scope industries and government shipments, the estimates of overall national freight activity are incomplete.

In this report, the BTS estimates of the value, tons, and ton-miles of crude petroleum and petroleum products shipments by pipelines are based on pipeline data from the Federal Energy Regulatory Commission (FERC). BTS converted FERC information on barrels of petroleum and petroleum products transported into tons and ton-miles. Estimates of waterborne shipments not captured in the CFS are based on information from the U.S. Army Corps of Engineers (USACE) and the Census Bureau's Foreign Trade Division (FTD). The USACE reports data on the tons and ton-miles of domestic and foreign waterborne commerce. The FTD reports information on the value and tons of waterborne U.S. international trade. BTS used data from both the USACE and Census Bureau to develop a set of values, tons, and ton-miles for all domestic and foreign waterborne freight.

This report also compares the CFS data with data from the Surface Transportation Board's Carload Rail Waybill Sample. The preliminary analysis of rail freight activities reported by the CFS and the Waybill shows some differences in the overall change in volume of freight moved between 1993, 1997, and 2002. While the CFS shows a slight increase in rail tonnage, the Waybill shows a larger increase in rail tonnage over the same period. These differences for rail single mode and intermodal truck and rail combination are being analyzed, and BTS will present any findings after additional processing of the CFS during 2004.

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, Bureau of Transportation Statistics and U.S. Department of Commerce, U.S. Census Bureau, "2002 Economic Census: Transportation Commodity Flow Survey, Preliminary Report," December 2003, EC02TCF-US(P).

Most of the 2002 additional supplementary data are preliminary and are subject to revision after the individual data sources release their final estimates during 2004. These additional data can be used to estimate the overall value, tons, and ton-miles of national freight shipments, but not to estimate specific commodities, shipment sizes, or average length of haul. Also, because of a number of improvements in the methodology used to estimate the supplementary data and the availability of previously unavailable imports data, the 1993 and 1997 additional data presented in this report are not comparable to those published earlier by BTS. Beyond the overall national estimate, this report uses only CFS data to show changes in freight movements by mode of transportation, commodities shipped, shipment sizes, and average length of haul per ton of shipments for the three survey years.

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