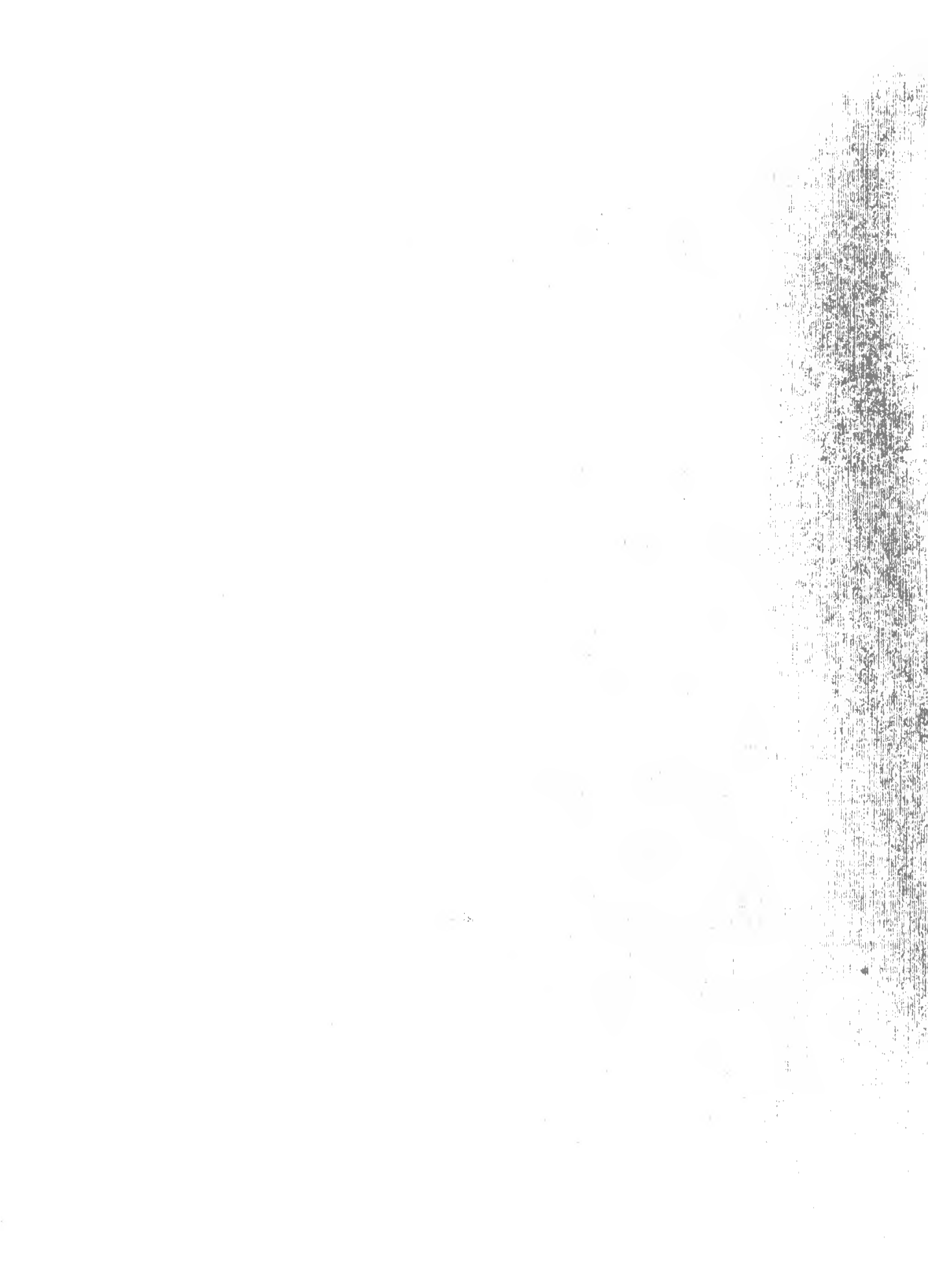


BEBR

FACULTY WORKING PAPER NO. 1361

A Comparative Study of the Trucking Industries of the United States of America and Poland

Part B. An Overview of the Trucking Industry in the United States of America

Benjamin Allen
Boguslaw Liberadzki

College of Commerce and Business Administration
Bureau of Economic and Business Research
University of Illinois, Urbana-Champaign

BEBR

FACULTY WORKING PAPER NO. 1361

College of Commerce and Business Administration

University of Illinois at Urbana-Champaign

May 1987

A Comparative Study of the Trucking Industries of the United States of America and Poland

Part B. An Overview of the Trucking Industry in the United States of America

Benjamin Allen, Visiting Professor*
Department of Economics

Boguslaw Liberadzki, Visiting Scholar**
Department of Economics

*Dr. Allen is Chairperson of the Department of Transportation and Logistics, College of Business Administration, Iowa State University and a Professor of Transportation and Logistics. During the 1986-87 academic year he is serving as the visiting McKinley Professor of Economics and Public Utilities at the University of Illinois.

**Dr. Liberadzki is the Director of the Research Institute for Transport Economics in Warsaw, Poland. The Institute reports to the Minister of Transport of Poland. He is also an Associate Professor at the Central School of Planning and Statistics in Warsaw. During the 1986-87 academic year he is serving as a Senior Fulbright Scholar in the Department of Economics at the University of Illinois.

Abstract

This paper along with a companion working resulted from collaborative work of an economist from Poland and an economist from the United States of America (USA) that compares the trucking industries of Poland and the USA. The companion working paper is Part A entitled, "An Overview of the Trucking Industry in Poland: 1975-1984." This paper almost exclusively focuses on the trucking industry in the USA.

The paper attempts to provide a picture of the role and nature of the trucking industry in the USA for transportation economists not familiar with the transportation industries in the USA. The interrelationships between firms in the private sector, which own and operate the trucking equipment, and the government sector, which provides the infrastructure and regulates the industry, are analyzed. The cost and operational characteristics of the various types of trucking firms are discussed. Selected important policy and managerial issues such as the high costs and lack of availability of insurance are also presented and briefly discussed.

An Overview of the Trucking Industry in the United States of America

I. Overview of the United States Economy and the Provision of Transportation

The U.S. economy has grown significantly in real terms and changed in composition since the trucking industry began providing intercity transportation services around the time of World War I. Since that time, Gross National Product (GNP) in real terms has increased 5.5 times.[1] Although the U.S. population has increased from 106 million in 1920 to more than 230 million at the present time, which is approximately 6.2 times the population of Poland, the population density is much less in the United States than it is in Poland.[2] If the states of Alaska and Hawaii, which are not contiguous to the other 48 states, are not considered in the area calculation, the area of the United States of America (United States) is approximately 2,900,000 square miles. Although this area is about 25 times larger than the area of Poland, it contains only about 6 times as many people. The population density of the United States, when considering only the 48 contiguous states, is 76 persons per square mile while the population density of Poland is more than 300 persons per square mile.[3]

The U.S. economy, as illustrated in Table 1, is both diversified and changing over time. Since 1929 agriculture and mining have become less important relative to the other sectors while services have become more important. Manufacturing has remained fairly constant although its relative importance dropped somewhat in the last decade. The constancy in the share of GNP that manufacturing makes up is somewhat misleading. Certain sectors within the manufacturing component of GNP

TABLE 1

GROSS NATIONAL PRODUCT BY SECTOR, SELECTED YEARS, 1929-1985
(percent)

SECTOR	1929	1950	1960	1970	1975	1985
Agriculture, Forestry	8.6	5.7	4.5	3.2	3.2	2.6
Mining	3.9	2.2	2.0	1.8	1.6	3.6
Construction	5.8	5.4	6.2	5.2	4.1	4.5
Manufacturing	25.4	24.6	23.3	24.2	22.7	21.7
Transportation, Communication	6.3	7.2	7.8	8.8	9.4	9.0
Wholesale and retail	19.4	16.4	16.0	16.6	17.7	16.9
Finance, Insurance	11.6	12.1	13.9	14.3	15.1	14.6
Services	11.1	11.1	11.2	11.6	12.1	15.0
Government	7.2	14.1	14.5	14.1	13.6	11.1
Rest of World	.7	1.1	.7	.1	.6	1.1

SOURCE: Study of Federal Aid, U.S. Department of Transportation, January 1977, p. II-15 and Survey of Current Business, July 1986, U.S. Department of Commerce, p. 63.

have grown much faster than others. For example, chemicals, electrical machinery, and instruments have grown rapidly while the textile, apparel, and lumber industries have grown much less rapidly. These fast growth sectors tend to have higher value per unit of weight and many have lower weight. Both of these factors favored the development of the trucking industry in the United States.

In addition, there have been shifts in the location of manufacturing activities during the last sixty years, as indicated by the information in Table 2. Along with this interregional shifting of manufacturing, which hurt the railroads in the East, there was a shift of manufacturing activities from the central areas of cities to the areas on the outskirts of cities.

At the present time, about 65 percent of the communities in the United States depend solely upon the trucking industry to meet their transportation needs.[4] As Table 3 indicates, the trucking industry was responsible for moving more than 600,000 million ton-miles of intercity freight in 1984, or about a quarter of all the intercity ton-miles in 1984. A recent estimate put the total trucking industry's employment, including mechanics, dock workers, helpers, and other employees, at about 9,000,000. Excluded were employees of truck manufacturing firms, dealerships, and truck stops. More than 1,200,000 were employed in establishments primarily engaged in local or long-distance trucking.[5]

The trucking industry did not become a significant component of U.S. intercity transportation until after World War I. In the 1920s and 1930s the trucking industry grew rapidly with the help of technological improvements in truck vehicles, development of the pneumatic

TABLE 2

VALUE ADDED BY MANUFACTURING, BY REGION, 1919-1982
(percent of U.S. total)

YEAR	EAST	MIDWEST	SOUTH	WEST
1919	48.7	35.6	13.5	6.6
1939	39.7	37.1	15.8	7.4
1960	31.6	35.5	20.3	12.6
1972	26.4	34.9	25.4	13.4
1977	23.7	34.4	27.5	14.5
1982	23.7	29.7	29.5	17.1

SOURCE: Study of Federal Aid, U.S. Department of Transportation, January 1977, Appendix Table 6 and Statistical Abstract of the United States, 1986, 106th edition, U.S. Department of Commerce, 1985, p. 750.

tire, and expansion of the highway network.[6] The shortages of gasoline and tires and the difficulty of obtaining vehicles had a significant adverse impact on the modal share of the trucking industry during World War II. As Tables 3 and 4 indicate, the trucking industry grew substantially absolutely and relatively to the other modes after World War II. The development of the National System of Interstate and Defense Highways (interstate highways), the increasing value of goods, which favored the more service oriented trucking industry, and the decentralization of manufacturing, which favored the short-haul characteristics of trucking, combined with other factors, both economic and regulatory, to make the trucking industry an increasingly important participant in the intercity transportation segment.[7]

The information in Tables 3 and 4 provides an overall summary of the absolute and relative importance of the intercity trucking industry in the United States. The tons carried by natural gas pipelines have traditionally not been included in the transportation statistics in the United States. This omission inflates the relative importance of trucking along with the other modes of transportation. On the other hand, the trucking industry would become a more important mode for carrying goods intercity if the data were in terms of tons instead of ton-miles. In 1984, for example, the trucking industry hauled about 38 percent of the tons moved intercity while the second most important mode, rail, carried 28 percent.[8]

The data in Tables 3 and 4 substantially understate the relative importance of trucking with respect to the amount of expenditures for freight services received by each mode. As Table 5 indicates, 274

TABLE 3

VOLUME OF INTERCITY FREIGHT

(Millions of Revenue Ton-miles)

YEAR	RAILROADS	TRUCKS	WATER CARRIERS	OIL PIPELINES	AIR
1944	746,912	58,264	150,155	132,864	71
1960	579,130	285,483	220,253	228,626	778
1975	759,000	454,000	342,000	507,000	4,000
1985	898,000	600,000	348,000	562,000	6,390

SOURCE: Railroad Facts, 1986, Association of American Railroads, September 1986, p. 32.

TABLE 4

PERCENTAGE OF TOTAL VOLUME OF INTERCITY FREIGHT

(Percent of Revenue Ton-miles)

YEAR	RAILROADS	TRUCKS	WATER CARRIERS	OIL PIPELINES	AIR
1944	68.6	5.4	13.8	12.2	0
1965	44.1	21.7	16.7	17.4	0
1975	36.7	22.0	16.6	24.5	.2
1985	37.2	24.8	14.4	23.2	.3

NOTE: Water carriers refer to carriers on inland rivers and canals and the Great Lakes.

SOURCE: Railroad Facts, 1986, Association of American Railroads, September 1986, p. 32.

TABLE 5

FREIGHT REVENUES
MOTOR CARRIER COMPARED TO UNITED STATES TOTAL

YEAR	TRUCK REVENUE ($ billions)	TOTAL U.S. FREIGHT REVENUE ($ billions)	TRUCK REVENUES AS PERCENT OF U.S. FREIGHT REVENUE	TRUCK REVENUES AS PERCENT OF GNP
1978	129	174	74.1	6.0
1979	142	193	73.6	5.9
1980	155	213	72.8	5.9
1981	173	235	73.6	5.8
1982	177	235	75.3	5.8
1983	189	249	75.9	5.7
1984	208	274	75.9	5.7

SOURCE: American Trucking Trends, 1985, American Trucking Associations, Inc., p. 9.

billion dollars were spent for the transportation of freight in 1984. Since 1978 the trucking industry has consistently received approximately 75 percent of these expenditures. In contrast, the second most important mode in terms of revenues, the rail industry, earned only 11.1 percent of the total freight revenues.[9] The difference between the relative importance of trucking in terms of ton-miles carried (about 24 percent) and expenditures (about 75 percent) reflects both the much higher revenue per ton-mile earned by trucking than other modes except air and the fact that local shipments, where trucking dominates, is included in the information in Table 5 but not in Tables 3 and 4. If local transportation were excluded for the revenue calculations, trucking's importance would drop from about 75 percent to about 65 percent.[10] Thus, most of the increase in relative importance is due to the much higher costs per ton-mile of shipping by truck in the United States.

When one looks at the manufacturing sector of the U.S. economy, the relative importance of trucking increases. The value per ton of manufacturing commodities shipped tends to be higher than the value per ton of nonmanufactured commodities, such as agricultural and mining products. Table 6 contains information on the relative importance of the different sectors of the manufacturing component in the U.S. economy in terms of tons shipped, and also shows the relationship between value per ton of the commodity and the degree of participation by the trucking industry. In general, the more valuable per ton the commodity is, the greater the share of traffic moving by truck.

Before discussing the industry structure and the operating characteristics of the U.S. trucking industry, several comments about the U.S.

TABLE 6

SELECTED INFORMATION ON TRANSPORTATION OF MANUFACTURED COMMODITIES

COMMODITY	VALUE PER TON	TRUCK SHARE (percent of tons)	TOTAL TONS ALL MODES
All Commodities	$405.55	57.1%	3311992
Instruments, Photo, etc.	$10,564.04	82.5%	2397
Electrical Mach. and other	$5,626.68	72.6%	16273
Leather and Leather Prod.	$5,411.84	91.0%	1503
Machinery, ex. electrical	$4,752.20	80.8%	25820
Miscellaneous Products of Man.	$4,498.00	85.3%	4502
Tobacco Products	$3,962.42	67.9%	2262
Transportation Equipment	$2,673.87	46.7%	59391
Textile Mill Products	$2,573.78	90.9%	13709
Furniture and Fixtures	$2,035.48	84.1%	8371
Rubber and Related Products	$2,002.74	82.7%	18978
Printed Matter	$2,000.48	86.0%	24891
Fabricated Metal Products	$1,355.47	80.2%	60922
Primary Metal Products	$560.40	63.1%	183741
Pulp, Paper and Allied Prod.	$483.24	51.5%	107525
Food and Kindred Products	$449.32	73.5%	426587
Chemicals and Allied Products	$357.48	47.2%	323299
Apparel, and other	$294.07	83.6%	5645
Lumber and Wood Prod.	$109.21	61.1%	356978
Petroleum and Coal Prod.	$100.57	25.0%	997731
Stone, Clay and others	$56.69	91.3%	653496

SOURCE: Calculations based on data in 1977 Census of Transportation, Commodity Transportation Survey-Summary, U.S. Department of Commerce, June 1981, Table 2.

transportation data sources should be made. First, statistical data on trucking and the other modes are gathered and published by a number of governmental agencies, carrier associations, for example, the American Trucking Association, Inc., and private firms, for example, Transportation Policy Associates. The associations and private firms generate data series based upon information published by the different government agencies, such as the Interstate Commerce Commission, and from data which they collect. The U.S. Department of Transportation, the Interstate Commerce Commission, the Army Corps of Engineers, and the U.S. Department of Commerce (Bureau of Census) are the governmental agencies that collect and publish most of the transportation data. The Bureau of Census publishes the most complete and reliable data on truck population and traffic allocation among the different modes (see Table 6). Unfortunately, the Bureau of Census publishes these data series only once every five years and with a considerable lag. For example, 1977 Bureau of Census data had to be used in this paper in several tables because the Bureau of Census has not yet published the 1982 data. One by-product of regulatory reform in the United States has been the reduction in the data collected by regulatory agencies which could adversely affect research in the transportation area in the future.

II. Structure of Motor Carrier Industry in the United States

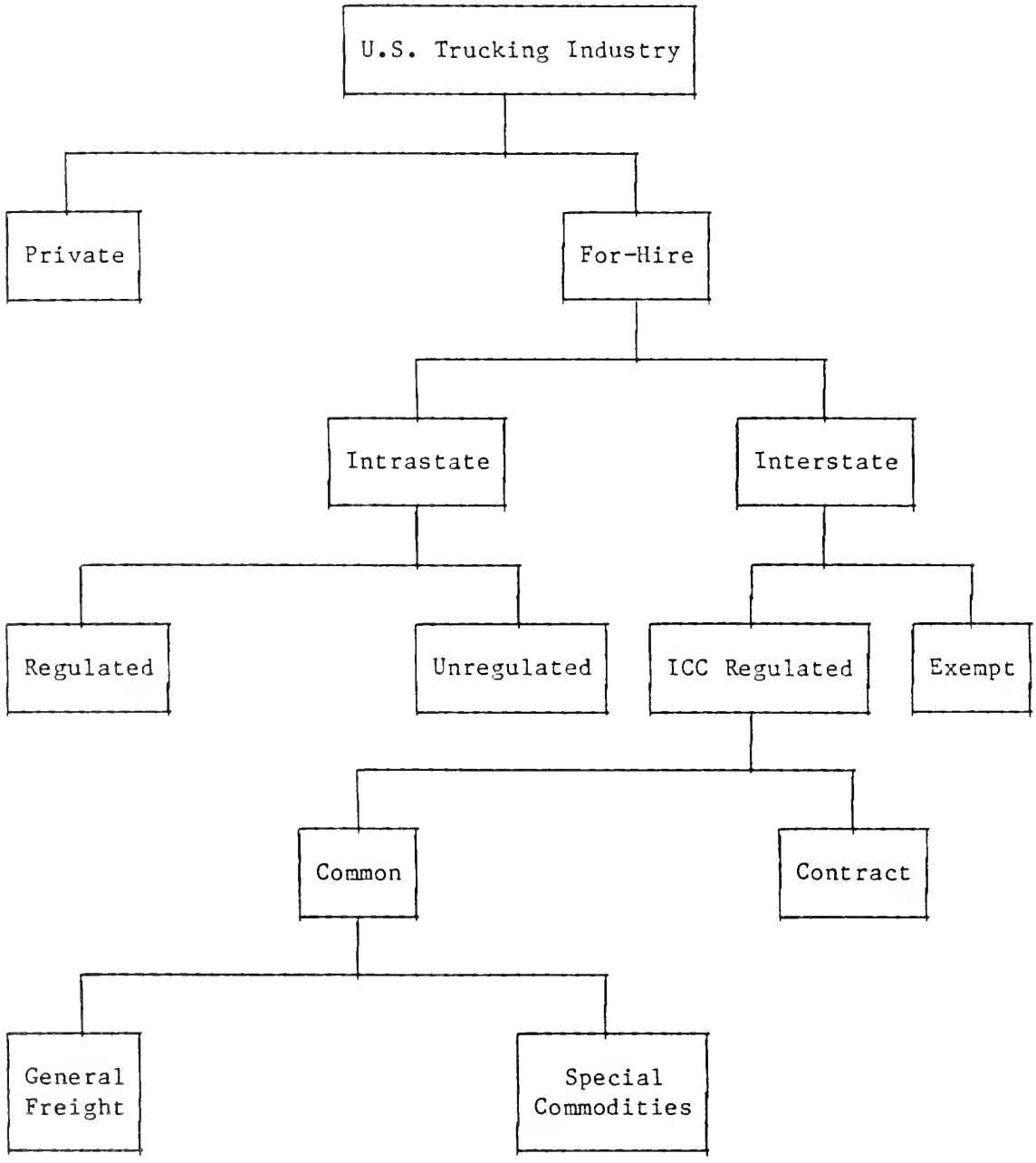
Trucking services in the United States are almost exclusively provided by persons or firms in the private sector. These firms operate their trucks, however, on highways and roads provided by government. Approximately 37.4 million private and commercial trucks were registered

in the United States in 1985.[11] More than half (57 percent) of the trucks in 1982 were used mainly for personal transportation, defined as being used in place of an automobile to go from home to work, for outdoor recreation, and camping.[12] The remaining 42 percent of trucks were owned and operated for business purposes.

The motor carrier industry is comprised of groups of heterogeneous carriers having different legal and service characteristics, and carrying different types of commodities. The various components of the trucking industry are outlined in Figure 1. Many of the firms owning trucks are not involved in providing transportation for other shippers. According to one estimate, there were more than 570,000 motor carriers of freight in the United States in 1983. These firms can initially be grouped into for-hire and private categories. The for-hire carriers provide service to the general shipping public and charge a fee for their services. Of the 570,000 motor carrier firms, only 70,000 were classified as for-hire motor carriers or firms whose primary function is to provide transportation service.[13] These for-hire firms owned and operated only about 725,000 of the trucks in 1982 although these trucks tended to be much larger and driven many more miles than other trucks.[14] The overwhelming majority of trucking firms in the United States are called private carriers. The primary business of the firm operating a private carrier is <u>not</u> providing transportation. The private carrier provides service to the firm that owns or leases the vehicles and in almost all cases does not charge a fee. Private carriers are truck operations owned and operated by retailers, manufacturers and firms in all types of industry except transportation.

FIGURE 1

OVERVIEW OF U.S. TRUCKING INDUSTRY



For-hire carriers can be either local or intercity carriers. Included in the for-hire group of carriers is the exempt carrier, which is specifically exempt from economic regulation by the Interstate Commerce Commission (ICC), the federal regulatory agency in charge of regulating motor carriers, railroads, and barge lines. The exempt carrier is excluded from ICC economic regulation if it restricts itself to hauling commodities identified by law as being exempt. Agricultural commodities are the most important exempt commodities. In 1983 about 40,000 exempt carriers were estimated to exist.[15]

The other type of for-hire carrier is the regulated carrier. Intercity regulated for-hire carriers are regulated by the ICC while intrastate motor carriers are under the regulation of the regulatory agencies of the various states. The ICC-regulated for-hire carrier may be a common or contract carrier. Common carriers are required to serve the general public upon demand at reasonable rates in a nondiscriminatory fashion. Historically, the common carriers have been more numerous and more important in providing trucking services than contract carriers. On the other hand, the contract carrier serves shippers under specific contracts and thus does not hold itself out to serve the general public. Regulatory reform in the United States has made it easier for one firm to be both a common carrier and a contract carrier at the same time.

Common carriers constitute the majority of ICC-regulated truck carriers and are classified by the ICC into seventeen commodity-specific groups according to the type of freight carried. The largest group is the general-freight carrier, which accounts for 60 percent of all revenue generated by ICC-regulated motor freight carriers. This type of

carrier includes the largest motor carrier firms in the United States such as Yellow Freight, Inc., Consolidated Freightways and Roadway Services. Each of these firms earned about a billion and a half dollars in revenues in 1985.[16] The other sixteen groups, called special-commodity carriers, consist of the following: household goods, heavy machinery, petroleum products, refrigerated liquids, dump trucking, agricultural commodities (products based on agricultural commodities), motor vehicles, armored truck services, building materials, films and associated commodities, forest products, mine ores not including coal, retail store delivery service, dangerous or hazardous materials, and other commodities not classified elsewhere.

In 1984 there were about 30,500 trucking firms in the ICC-regulated category.[17] The ICC-regulated carriers have been additionally classified into three classes according to size of trucking operations. Class I carriers are those carriers that earn at least $5 million in revenue, Class II carriers earn at least $1 million but less than $5 million, and Class III carriers earn less than $1 million. In 1983 there were about 1100 Class III ICC-regulated carriers, about 1600 Class II carriers and about 24,500 Class III carriers.[18] Although less numerous than Class II and III carriers, Class I carriers dominate the ICC-regulated component of the trucking industry in terms of revenues earned in the United States, earning about 80 of the total revenues earned by ICC-regulated carriers.[19] In addition, there are intrastate carriers, both regulated and unregulated, that provide trucking services within the borders of a particular state. Because it is not possible to briefly review the intrastate trucking operations in each of the 50 states, the focus of this paper is on interstate trucking.

Two other components of the trucking industry, owner-operators and truck rental and leasing firms, play important roles in the truck transportation in the United States. Owner-operators or "independent truckers" are persons who normally own one truck (power unit only or a power unit and a trailer) but have not been authorized to carry regulated commodities for-hire by the regulatory system. Owner-operators can either carry for-hire traffic that is exempt from regulation or hire themselves and their vehicles out to a carrier that is authorized to carry regulated traffic. Owner-operators have been estimated to carry as much as 40 percent of the intercity trucking ton-mileage.[20] Truck rental and leasing firms play an important role in trucking by providing equipment and related services mainly to private carriers on a very short-term basis (one day) or a much longer term (up to six years). Full-service leasing firms not only provide equipments (power units and trailers) but other related services such as the provision of maintenance, acquisition of required permits, and provision of fuel. Only within the last several years have these rental and leasing firms been allowed to provide drivers with the vehicles.[21]

As noted above, there are no government owned for-hire trucking firms in the United States. Government agencies did own and operate a million and a half trucks of all sizes in 1985.[22] Government agencies in the United States use the commercial, for-hire trucking firms to meet much of their transportation needs.

III. Operating Characteristics of Motor Carriers

There are major differences between the private and for-hire carriers in terms of operating characteristics. As the data in Tables 7 and 8 suggest, private carriers usually have a shorter average haul and

TABLE 7

TRUCK SHARES AND SHIPMENT SIZE, 1977

SHIPMENT SIZE (Pounds)	FOR-HIRE (Percent)	PRIVATE (Percent)	TOTAL TRUCK (Percent)
<500	48.5	38.5	87.0
500-999	56.5	40.3	96.8
1000-4999	47.6	42.3	89.9
5000-9999	37.7	57.2	94.9
10,000-19,999	30.5	64.0	94.5
20,000-29,999	30.9	62.6	93.5
30,000-59,999	51.9	41.2	93.1
60,000-89,999	22.0	21.7	43.7
90,000+	7.9	16.9	24.8

SOURCE: Calculations based on data in 1977 Census of Transportation, Commodity Transportation Survey, U.S. Department of Commerce, June 1981, Table 7.

TABLE 8

DISTANCE AND TRUCK SHARES, 1977

SHIPMENT DISTANCE (Miles)	FOR-HIRE (Percent)	PRIVATE (Percent)	TOTAL TRUCK (Percent)
<100	16.4	52.8	69.2
100-199	32.7	27.9	60.6
200-299	28.4	17.9	46.3
300-499	30.0	18.0	48.0
500-999	24.8	7.7	32.5
1000-1499	17.7	6.2	23.9
1500+	21.5	3.8	25.3

SOURCE: Calculations based on data in 1977 Census of Transportation, Commodity Transportation Survey, U.S. Department of Commerce, June 1981, Table 7.

operate fewer annual miles than for-hire carriers and tend to transport truckload shipments almost exclusively. The focus of the discussion on operating characteristics is on the intercity for-hire general freight carrier. Even in this more narrow segment of the trucking industry there are important cost and operating differences, especially between the less-than-truckload (LTL) and truckload (TL) components. The most common definition of a truckload carrier is one that hauls shipments of 10,000 pounds or more and normally directly transports the commodities from shipper dock to receiver dock without the use of its own terminal system.

One operating characteristic of the intercity general freight carrier in the United States is the practice of interlining freight with another carrier. Interlining involves the transfer of a shipment from one carrier to another via a terminal. In 1980 21.4 percent of all LTL shipments were interlined while only 10.2 of all TL shipments were interlined. The LTL interlined traffic is transshipped from the vehicle of one carrier to the vehicle of another carrier. Because regulatory reform since 1978 made it easier for trucking firms to expand into new geographical areas, the amount of interlining has been declining. In 1976, 28.4 percent and 14.9 percent of LTL and TL shipments were interlined respectively.[23] Carriers will also interline in cases where they have the authority to serve but because of economic reasons, usually the high costs of serving a small community off the main traffic lanes, choose to interline freight with another carrier.

As Table 9 indicates, the average length of haul has consistently increased each year since 1978 while the average load has steadily

declined for the regulated general freight carriers. The average length of haul has increased substantially over the last 35 years with the average length of hauls being 235 miles, 341 miles, and 365 miles respectively in 1950, 1960, and 1970.[24] Of course, these averages can hide as much information as they reveal. The largest Class I carriers of general freight have much longer average hauls and slightly higher average loads. For example, Consolidated Freightways, Yellow Freight, Inc., and Roadway Services had an average length of haul and average load of 1,367 miles and 15.9 tons, 1,161 miles and 14 tons, and 1,116 miles and 14.2 tons respectively in 1983.[25]

These average loads do not reflect full utilization of the truck or trailer capacity in terms of weight because carriers usually will not have completely full trailers or their trailers will cube out before they reach the legal weight limit for the truck or trailer. For example, the line-haul vehicle is usually a tractor-trailer combination of three or more axles. Most states allow a tractor-trailer combination with five axles to haul a maximum of 80,000 pounds gross weight. Assuming the empty vehicle weighs 30,000 pounds, a maximum net payload is 50,000 pounds or 25 tons.[26] The LTL general freight carriers, which dominate the statistics in Table 9, normally carry freight that has a low density and are, therefore, likely to cube out. In addition, the fleets of the commercial carriers will be comprised of a range of trucks and tractor having different capacities as indicated in Table 10.

Although there can be substantial differences in the level and nature of costs between the private trucking firm and for-hire trucking firm, and even among the various types of for-hire trucking operations,

TABLE 9

AVERAGE LENGTH OF HAUL AND AVERAGE LOAD
(TRUCKING)

YEAR	AVERAGE LENGTH OF HAUL (Miles)	AVERAGE LOAD (Tons)
1978	475	13.6
1980	503	13.2
1982	532	12.6
1984	538	12.4

NOTE: Average length of haul in miles for all trucks; average load in tons for regulated general freight carriers.

SOURCE: American Trucking Trends, 1985, American Trucking Associations, Inc., p. 52.

TABLE 10

ESTIMATED 1985 TRUCK POPULATIONS BY
WEIGHT CATEGORY AND TYPE OF CARRIER

GROSS VEHICLE WEIGHT (pounds-thousands)	REGULATED CARRIERS	LOCAL CARRIERS	OTHER	TOTAL COMMERCIAL
Under 26	85,385	128,776	32,076	246,237
26-32.99	27,139	38,108	24,735	89,982
33-49.99	35,806	49,446	32,306	117,558
50-69.99	86,277	43,998	46,341	176,616
70-75.00	78,960	16,153	57,636	152,749
Over 75	72,157	23,843	62,496	158,496
	385,724	300,324	255,590	941,638

NOTE: The "other" includes exempt carriers and independent owner operators who drive under contract for regulated carriers or transport exempt goods.

SOURCE: "The Surface Transportation Assistance Act of 1982: Comparative Economic Effects on the Trucking Industry," U.S. General Accounting Office, April 6, 1984, p. 14.

some generalizations can be made about costs per ton-mile. Table 11 contains data on the average freight revenue per ton-mile, which would be the cost to the shipper of using a carrier of the particular mode. Of course, the actual costs will vary substantially between different situations involving carriers of the same mode.

The data in Table 11 indicate that trucking is the second highest cost mode operating in the United States. Because of the use of a terminal system and unionized labor by more firms operating in the common carrier sector, its average cost per ton-mile is higher. Again, the three largest carriers had average revenue figures substantially different from those averages for the common carriers. In 1983, Consolidated Freightways, Yellow Freight, Inc. and Roadway Services had average revenue per ton-mile of 18.3, 19.84, and 22.4 cents per ton-mile respectively.[27] What is most meaningful in Table 11 is not the absolute costs, but the relative costs of the various modes. In 1983 the contract carrier, the railroad's closest competitor in many markets, had revenues per ton-mile that were 3.6 times larger than the railroad's revenues per ton-mile.

Other estimates have been made of the cost per vehicle mile. For example, it has been estimated that the cost of operating a tractor-trailer in the United States in 1985 was 116.8 cents per vehicle mile and that about 85 percent of those costs were variable costs.[28] For a carrier that specializes in LTL general freight operations, the costs would probably be higher and a smaller percentage of costs would be variable due in large part to its much larger terminal requirements. For example, Yellow Freight, Inc., one of the largest LTL general

TABLE 11

AVERAGE FREIGHT REVENUE PER TON-MILE, SELECTED YEARS
(in cents per ton-mile)

MODE	1973	1978	1980	1982	1983
Trucking-Common Carrier	8.31	10.57	12.91	14.09	13.55
Trucking-Contract Carrier	6.72	10.50	11.78	12.03	11.41
Trucking-Private Carrier*	9.10	11.60	14.20	16.90	16.30
Railroads	1.62	2.36	2.85	3.21	3.13
Barge Lines	.38	.62	.77	.84	.82
Air Freight	23.31	37.10	46.29	46.78	44.87
Oil Pipelines	.29	.77	1.00	1.16	1.23

*Private carrier costs were estimated by the authors.

SOURCE: National Transportation Statistics, Annual Report, June 1985, U.S. Department of Transportation, p. 52.

freight carriers, has more than 500 terminals located throughout the United States.

Several observations about recent developments with respect to the cost characteristics of the trucking industry in the United States are merited. First, salaries and wages have become less important in the cost structure and are likely to continue to become less important with the weakening of the Teamster Union. Salaries and wages have dropped from about 45 percent of ICC-regulated carriers' operating expenses to about 37 percent between 1978 and 1984.[29] Secondly, the drop in the diesel fuel prices during 1986 has had a significant impact on operating costs. Although the energy crises in the 1970s led to the adoption of new technology and operating practices in the trucking industry that increased fuel efficiency, trucking is still less energy efficient than rail in most situations as is indicated in Table 12.

IV. Government Support and Control of Motor Carriers

Each of the three levels of government in the United States, the federal government, state governments, and local governments, provides support for trucking through investment in highways and roads and each also regulates trucking operations to some degree.

Since the founding of the United States, the federal government has assumed some responsibility for providing roads and highways to meet national defense and commerce needs. Traditionally, highways, streets, and roads have been owned and maintained by government in the United States. The federal government, however, which established the federal-state cooperation in highway construction back in 1916, owns very few

TABLE 12

RAIL AND TRUCK FUEL EFFICIENCY

SERVICE TYPE	PERCENT LOADED MILES	NET TON-MILES PER GALLON
Long-haul unit train (100 tons)	50	350
Truck (25 tons)	50	69
Rail carload service (45 tons)	60	198
Truck (20 tons)	80	77
Rail short-haul TOFC service (40 tons)	65	97
Truck (15 tons)	70	54
Rail local service (45 tons)	55	210
Truck (20 tons)	60	61

SOURCE: Wayne K. Talley, Introduction to Transportation, Southwestern Publishing Company, 1983, p. 145.

roads. State and local governments own almost all of the highways and roads. Even the National System of Interstate and Defense Highways (interstate highways), which were 90 percent financed by the federal government, are owned by the states.

Although each of the three levels of government collects and disburses funds for highway construction and maintenance, the states are the most important contributors to the road system. The information in Table 13 indicates that the federal government collected almost 15 billion dollars for highway programs as did the local governments for streets. On the other hand, the 50 state governments collectively received more than 34 billion dollars for highway purposes. In contrast, in 1985 the rail industry had a record-high level of capital expenditures for roadway and structures of only $3.46 billion.[30]

The last row in Table 13 reflects the fact that intergovernmental transfers are used extensively in the highway program in the United States. The federal government transfers much of its money to the state governments although it maintains some control on where and how the funds are spent. Likewise, the state governments transfer some of their funds to the local governments to spend on their streets.

The two major sources of revenue for financing highway expenditures are user taxes and general taxes. User charges or taxes in the United States were first used for financing highway expenditures in 1919 and have grown to be the most important revenue source for financing highways, roads, and streets. User charges are levied on the highway users in the form of taxes on fuel, tires, and lubricants, taxes on vehicles

TABLE 13

TOTAL RECEIPTS FOR HIGHWAYS, 1985
(Millions of Dollars)

TYPE OF RECEIPT	FEDERAL	STATE	LOCAL	TOTAL
User Charge	11,571	23,283	745	35,599
Other Taxes	2,064	2,805	9,880	14,749
Total Receipts	14,929	30,929	14,000	59,858
Funds Available (After Transfers)	1,086	34,862	20,998	56,946

NOTE: The difference between total receipts ($59,358 million) and funds available after transfers ($56,946 million) reflects the $2,912 million that were placed in reserves.

SOURCE: Highway Statistics, 1985, U.S. Department of Transportation, 1985, p. 39.

when purchased and on parts, and special taxes levied against transportation firms. At the federal level the user taxes have more than doubled in the last five years. For example, a major tax for private and for-hire trucking firms, the diesel fuel tax, went from 4 cents per gallon in 1981 to 15 cents a gallon in 1984.[31] Although only 5 percent of the U.S. truck inventory used diesel fuel in 1982, diesel-powered accounted for 17 percent of the miles driven and accounted for more than 74 percent of long range truck miles (more than 200 miles to destination).[32] The line-haul fleets of most intercity for-hire carriers and many private carriers are powered by diesel engines.

The same basic user tax system exists in most of the states. Evidence exist, however, that suggests a growing divergence in how state governments finance highway investment. The gasoline and diesel fuel tax, the mainstay of state highway financing over the last 60 years, varies from 7 cents per gallon in one state to 19 cents per gallon in another.[33] Other taxes are becoming increasingly important as supplements to the diesel fuel tax.

The local governments depend largely upon general taxation including property taxes to finance street construction and repairs. Both state governments and local governments depend heavily upon intergovernmental transfers as a source for financing highway expenditures. For example, in 1985 the states received more than 12 billion dollars from the federal government and the local governments received more than 7 billion dollars mainly from the state governments.[34]

The users of the highway system in the United States pay for most of the costs of the construction, maintenance and administration of the

highway and road system. Because there are a number of classes of users, however, it is not clear if each class of users pays its fair share. The railroad industry in the United States has long argued that the trucking firms do not pay their fair share of the highway costs. Questions of how much do large trucks damage highways and what costs should be allocated to the trucking industry are involved in this debate. It has been estimated that the owner of a 5-axle diesel tractor, semi-trailer and full trailer, 80,000-pound capacity, pays more than $4,300 yearly in federal highway user charges alone under the present tax system.[35]

The data in Tables 14 and 15 indicate how the governments allocate their funds among the various types of highways and roads and between capital spending and maintenance. In 1985 there were more than 3,800,000 miles of roads, streets, and highways in the United States with about 55 percent of the mileage paved. In 1960 only 30 percent of the 3.5 million miles of roads, streets and highways was paved.[36]

More important than the absolute amounts spent by government on highways is the relative amounts spent by government on the different modes of transportation in the United States. Government outlays for transportation facilities and services totaled $74 billion in 1985 with highways receiving more than 73 percent of those outlays. In contrast, rail transportation received only about 1 percent of the government outlays.[37]

The generous investment program in highways by the various governments can be seen by the basic intercity transportation mileage within the continental United States. Table 16, which includes only Federal-aid

TABLE 14

DISBURSEMENTS BY LEVEL OF GOVERNMENT--1985
(Millions of Dollars)

TYPE OF OUTLAY	FEDERAL	STATE	LOCAL	TOTAL
Capital Outlay	629	20,289	5,970	26,888
Maintenance	140	6,439	9,453	16,032
Other	317	6,554	4,602	11,473

NOTE: The "other" type of outlay includes administration and research, highway law enforcement and safety, and interest payments on debt.

SOURCE: Highway Statistics, 1985, U.S. Department of Transportation, 1985, p. 39.

TABLE 15

DISBURSEMENTS FOR HIGHWAYS, ALL UNITS OF GOVERNMENT, 1984
(According to Type of Highway in Thousands of Dollars)

TYPE OF ROAD	CAPITAL OUTLAY	MAINTENANCE
State Administered Highways	15,757,546	5,824,109
Local Rural Roads	2,972,303	4,345,484
Local Municipal Streets	3,833,279	4,345,880

SOURCE: Highway Statistics, 1985, U.S. Department of Transportation, 1985, p. 41.

Primary, Secondary, and Urban Extensions highways, shows that this investment policy has made the highway system more extensive than any other transportation system in the United States. In 1982 Congress established the concept of a national network for trucks which designated the portion of the highway system in the United States that can be used by the largest vehicles. The network, which consisted of 180,772 miles in 1985 including all of the interstate highways, allows the operation of truck-tractor and 48-foot trailer combinations and truck-tractor and 28-foot twin trailer combinations that are 102 inches wide with no overall length limitations.[38]

Special note must be made of the nearly completed National System of Interstate and Defense Highways, or the interstate highways. This 42,000-mile system, which was conceived by Congress in 1944 but not funded until 1956, is about 97 percent completed. The cost of the system has been recently estimated to be 120 billion dollars.[39] The purpose of the system was to connect every major city in the United States with a four-lane, limited access road. The system consists of about 66 percent rural mileage and 34 percent urban mileage.[40] Some of the decrease in the real cost of trucking over the last 30 years and much of the improvement in trucking services, particularly transit time decreases, have been tied to the development of the interstate highway system.[41] Communities in the United States view interstate highways in the same way they viewed the railroads during the latter part of the last century--as very important infrastructure for economic development.

As noted above, governments in the United States have not promoted highway transportation through direct ownership or financial aid to

TABLE 16

BASIC INTERCITY TRANSPORTATION MILEAGE
WITHIN THE CONTINENTAL UNITED STATES

YEAR	AIRWAYS	HIGHWAYS	PIPELINES	RAILROADS	WATERWAYS
1940	36,947	311,378	124,255	233,670	24,670
1950	80,861	409,133	158,472	223,779	24,960
1960	293,003	557,729	190,944	217,552	25,253
1970	291,122	665,903	218,671	206,265	25,543
1980	341,283	668,767	218,393	179,000	25,543
1984	360,346	681,999	208,650	156,558	25,777

NOTE: Includes Federal-aid Primary, Secondary, and Urban Extension highways with exclusions.

SOURCE: Transportation in America, Transportation Policy Associates, March 1986, p. 26.

TABLE 17

DEVELOPMENT OF INTERSTATE HIGHWAY SYSTEM

YEAR	MILES COMPLETED	PERCENT OF MILES PLANNED
1960	9,000	21
1965	16,000	38
1970	29,000	69
1975	35,000	83
1980	38,000	90

SOURCE: David Paxson, "Changes in Intercity Truckload Costs and Services, 1950-80," Transportation Research Forum, Vol. XXII, No. 1, p. 511.

carriers or other operators of vehicles. Whether or not the government sector subsidizes trucking firms depends on whether or not the trucking industry pays its fair share of highway costs through the user charges. Even if the trucking industry pays its fair share of the costs of constructing and maintaining highways, it still has gained substantial benefits from the level of government investment in highways in the United States.

In addition to investing in highways and roads, the three levels of government also attempt to control certain aspects of the behavior of motor carrier firms through regulation. The nature of regulation of trucking in the United States is complex and has been undergoing substantial changes in the last several years. The following is a very brief overview of the nature and extent of regulation of the trucking industry in the United States.

Regulations, which are used by government to control or alter the behavior of firms or individuals, can be grouped into one of two categories, economic or social regulations. In the area of social regulation, the primary focus is in the area of safety and damage to highways caused by overweight trucks. These safety regulations include such items as traffic laws, licensing procedures and requirements, truck weight, length and width regulations, and regulations for the transportation of hazardous materials. All three levels of government have social regulations pertaining to trucking but the major efforts take place at the federal and state levels. Some of the regulatory control of the trucking industry, particularly in the environmental area, is provided by non-transportation agencies such as the Environmental

Protection Agency. Most of these social regulations are the result of legislation passed since 1960. The Motor Carrier Safety Act of 1984 is an example of a recent law passed to attempt to improve the safety record of the trucking industry.

On the other hand, economic regulation of trucking concerns the control of entry and exit of firms into the industry and particular markets, certain dimensions of pricing and service, and selected financial transactions. Only the state governments and the federal government have economic regulations pertaining to the trucking industry. States started regulating intrastate motor carriers in the 1920s. In 1935 the interstate trucking industry was brought under the economic regulatory control of the ICC, a commission established in 1887 to regulate certain practices of the railroad industry. Not only did the 1935 Motor Carrier Act give the ICC the power to the motor carrier practices outlined above, it also divided the industry into categories referred to earlier: common carriers, contract carriers, exempt carriers, and private carriers.

The 1935 legislation gave the ICC the most complete regulatory control over the common carrier trucking firms. On the other hand, private carriers are essentially unregulated except they cannot haul goods for another firm. As long as private carriers only haul goods for their own corporation or exempt goods, they essentially operate only under safety regulations. Carriers hauling only exempt goods, that is, exempt carriers, are not under any economic regulation.

The ICC maintained a tight regulatory control over the common carrier sector between 1935 and 1978. Few firms were permitted to enter

the industry and existing firms were not allowed to expand into many new markets or carry new commodities. Rates were regulated closely through the mechanisms called rate bureaus and indirectly by the ICC, which monitored the activities of the rate bureaus and ruled on rates appealed to it. The ICC maintained rates on all shipments for both common carriers and contract carriers. The trucking industry on the whole prospered in this regulated environment but more and more shippers started up their own trucking firms, that is, private carriers, because of their dissatisfaction with the costs and service associated with using common carriers. The private sector grew more rapidly than the regulated sector.

In 1978, without any legislative support, the ICC started to ease up on its regulatory control over the trucking industry. Entry was made easier, commodity restrictions were lessened and rates received less regulatory scrutiny. In 1980 the Motor Carrier Act established the framework for further regulatory reform by bringing about substantial changes in how the ICC regulates the trucking industry. Many small firms entered in the industry after 1980 and existing firms expanded into new markets. Rates in real terms have decreased for most shippers and service, particularly to the large shippers, has improved. The fact that almost all firms entering the industry have been nonunion carriers has had an adverse impact on the Teamsters Union and the existing firms that are highly unionized. The truckload component of the common carrier industry has been entered by numerous firms while the less-than-truckload component, due to its larger capital costs requirements, has not seen nearly as much entry. In fact, the less-than-truckload market

has become more concentrated. The top three LTL carriers, Yellow Freight, Inc., Roadway Services, and Consolidated Freightways, now control more than 25 percent of the market, up 10 points in the past five years.[42] Rates, although officially still under the control of the ICC, have largely been unregulated in the post-1980 environment. One recent forecast has private carriers losing much of their price-sensitive traffic with the lost traffic being picked up by the regulated sector, mainly by the contract carrier component.[43] Although common carrier traffic is forecasted to increase between 1985 and 1990, the growth in traffic by the common carrier sector will be smaller in relative and absolute terms than the growth in traffic by the exempt and contract carrier sectors.

Legislation has been introduced that would totally deregulate the interstate trucking industry. Included in this proposed legislation is the federal preemption of state economic regulation over trucking. Several states have deregulated intrastate trucking but more than 40 states still maintain economic regulation.

V. Current U.S. Trucking Industry Issues and Problems

The major issues and problems currently facing the trucking industry in the United States are too numerous to be adequately covered in this paper. For example, in 1985 a list of 80 major regulatory and congressional issues was published by the American Trucking Associations, Inc., the major association representing the trucking industry in the United States.[44] Many important managerial issues were not included on this list. Given the number and complexity of issues, only few of the major ones will be covered.

The most discussed issue facing the trucking industry in 1985 and 1986 was the increasing costs and decreased availability of insurance coverage for trucking operations. Although this problem affected a number of industries in the United States, the trucking industry, particularly the sector involved in the transportation of hazardous materials, faced an especially difficult situation. Without insurance, it is illegal and economically unwise for a trucking firm to haul goods in the United States. Though still a problem, the insurance difficulties are being alleviated in the early part of 1987.

A second major issue, an issue on which various sectors of the trucking industry disagree, is the amount of economic regulation that should be applied to the trucking industry. Private carriers tend to support the movement for less regulation if not complete deregulation while the ICC regulated for-hire carriers would like to retain if not regain some additional economic regulations. More regulation of entry and continued antitrust immunity of collective ratemaking are objectives of the ICC regulated for-hire sector.

A related issue that is tending to reduce the productivity of the trucking industry is the nonuniformity of state economic and safety regulations and the myriad regulations pertaining to registration and state taxes. Portions of the trucking industry, particularly the private carrier sector, would like to see federal preemption of state regulations. A movement is underway to minimize the problem but a solution is several years away. A particular problem in this area has been the reluctance of several states to allow much of their state's non-interstate highway system to be used by the trucking industry for the

longer and wider tractor-trailer units. As noted earlier, Congress established the concept of a national network of highways for these largers trucks. Apparently, some of the eastern states, which have a higher population density, have designated only a very limited amount of noninterstate highways for the operation of these units.

Another issue, created by the easier entry standards and increased competition in the regulated for-hire trucking sector, is the increase in the number of trucking firms going bankrupt. The lower cost operations of the nonunionized firms entering the industry have caused increased unemployment by members of the Teamsters Union involved in trucking and put financial pressures on unionized carriers. Some firms have renegotiated their union contracts and have started nonunion operations. Most of the entry (more than 17,000 firms since 1978) and failures (more than 6,400 have failed since 1978) have been in the truckload sector but some very large less-than-truckload carriers have also been forced out of business.[45] The fifth largest less-than-truckload carrier went bankrupt in 1986.

Railroad acquisition of trucking firms has become an issue with two of the largest trucklines in the United States having recently been purchased by railroads. One of the acquisitions is still under review by the ICC which must approve such mergers or acquisitions. The regulated for-hire carriers have opposed such mergers before the ICC and in the courts.

Another issue that has the potential of causing substantial harm to the trucking industry is its perceived poor safety performance. Programs to reduce the safety problems of the trucking industry have been

started both by the federal government and the industry itself. Because the trucking industry shares its roadway with millions of automobile drivers and passengers, the perceived and real safety performance of the industry is important to the trucking industry. The industry fears political backlash and restrictive safety regulations if safety is perceived to be a problem. The problems associated with the transportation of hazardous materials by truck and other modes are receiving increasing visibility and could create problems for the trucking industry.

NOTES

1. Statistical Abstract of the United States, 1986, U.S. Department of Commerce, December, 1985, p. 431 and p. 470.

2. Op. cit., p. 5 and Countries of the World and their Leaders Yearbook, 1984.

3. Density of population estimates are based upon data in the Rand McNally Road Atlas, 1984 and Countries of the World and their Leaders Yearbook, 1984, Vol. 2 published by the Gale Research Company in 1984, p. 945.

4. Charles A. Taff, Commercial Motor Transportation (Centreville, Maryland: Cornell Maritime Press, Inc., 1980), p. 5.

5. Ibid, p. 10.

6. Wayne K. Talley, Introduction To Transportation (Cincinnati, Ohio: South-Western Publishing Co., 1983), p. 184.

7. See Denis Breen, "Changing Motor Carrier Share of Intercity Manufactures Traffic: Alternative Explanations," Transportation Journal, Vol. 18, No. 1, Fall, 1978, pp. 19-27 for additional discussion of the determinants of the growth of trucking.

8. Transportation in America (Washington, D.C.: Transportation Policy Associates, March, 1986), p. 6.

9. "American Trucking Trends 1985," American Trucking Associations, Inc., p. 9.

10. Transportation Policy Associates, op. cit., p. 4.

11. Highway Statistics--1985, U.S. Department of Transportation, p. 19.

12. 1982 Census of Transportation Truck Inventory and Use Survey--United States, U.S. Department of Commerce, September 1985, p. 3.

13. John J. Coyle, Edward J. Bardi and Joseph L. Cavinato, Transportation, 2nd ed. (St. Paul: West Publishing Company, 1986), p. 120.

14. 1982 Census of Transportation Truck Inventory and Use Survey--United States, op. cit., p. Table 2.

15. Coyle, Bardi and Cavinato, op. cit., p. 120.

16. Fortune, June 9, 1986.

17. "American Trucking Trends--1985," op. cit., p. 17.

18. Coyle, Bardi and Cavinato, op. cit., p. 120.

19. Taft, op. cit., p. 113.

20. Donald V. Harper, Transportation in America (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1982), p. 245.

21. See Roy Dale Voorhees, Benjamin J. Allen and Dale J. PinneKamp, "An Examination and Analysis of the 'Invisible' Full-Service Truck Leasing Industry," Transportation Journal, Vol. 22, No. 3, Spring 1983 for additional discussion of the truck leasing industry in the United States.

22. "Highway Statistics--1985," op. cit., p. 19.

23. Collective Ratemaking in the Trucking Industry, Motor Carrier Ratemaking Study Commission Report, June 1, 1983, p. 417.

24. Transportation Policy Associates, op. cit., p. 24.

25. Trinc's Blue Book Trucking Industry, 1984 ed., Trinc Transportation Consultants, September 1984, pp. 72, 80 and 83.

26. Coyle, Bardi and Cavinato, op. cit., p. 128.

27. Trinc Transportation Consultants, op. cit., pp. 73, 80 and 83.

28. Coyle, Bardi and Cavinato, op. cit., p. 124.

29. "American Trucking Trends--1985," op. cit., p. 36.

30. "Railroad Facts 1986," Association of American Railroads, September 1986, p. 4.

31. See "Highway Statistics--1985," op. cit., pp. 47 and 48 for additional details on the changes made in the federal highway taxes.

32. 1982 Census of Transportation Truck Inventory and Use Survey--United States, op. cit., p. 4.

33. See Kant Rao, "Policy Issues in Financing Future Highway Investments in the United States," Transportation Journal, Vol. 26, No. 1, Fall, 1986, p. 45 and Traffic World, July 7, 1986, p. 106.

34. "Highway Statistics--1985," op. cit., p. 39.

35. "American Trucking Trends--1985," op. cit., p. 44.

36. "Selected Highway Statistics and Charts 1985," U.S. Department of Transportation, 1985, p. 24.

37. Transportation Policy Associates, op. cit., p. 16.

38. "Highway Statistics--1985," op. cit., p. 132.

39. Rao, op. cit., p. 45.

40. Taft, op. cit., p. 32.

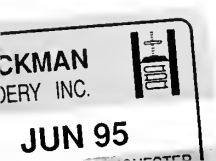
41. David Paxson, "Changes in Intercity Truckload Costs and Services, 1950-80," Transportation Research Forum, Vol. XXII, No. 1, p. 511.

42. "Truckers Brace For Plenty Of Head-On Collisions," Business Week, January 12, 1987, p. 99.

43. Data Resource, Inc., "Strategy '84! Crossing New Business Thresholds," Fleet Owner, January 1984, p. 62.

44. American Trucking Associations, Inc., Congressional and Regulatory Issues 1985, February 1985.

45. "Is Deregulation Working," Business Week, December 22, 1986, p. 22.


CKMAN
DERY INC.
JUN 95