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Chapter 2

Growth and Decline of Traffic since 1889

Combined passenger and freight traffic of all commercial agencies (land, water, and air) quintupled between 1889 and 1939, and almost doubled once again between 1939 and 1946. Between 1889 and 1920 freight traffic rose twice as fast as commodity output; since 1920 it has just kept pace with the latter. During the early years passenger traffic grew faster than population. To be sure, railroad accommodations in the late nineteenth century were less luxurious than today; yet our ancestors do not seem to have been as fond of traveling as we are. In 1889 the average American traveled 200 miles by commercial intercity agencies; in 1920 nearly 500 miles. Despite the widespread private ownership of automobiles and the modern highway system he still traveled 260 miles by rail, bus, air or water in 1939 — or 60 miles further than in 1889.

A recurrent theme of this book is the substitution of newer for older forms of transportation. Yet one of the oldest — coastwise shipping — is as lusty as it ever was, and in 1940 carried more traffic (mainly oil) than ever before in its history. Estimates given here for ton-miles in coastwise shipping and American-flag foreign commerce are apparently the first to be compiled. They lead to the remarkable result that recently ton-miles of waterborne freight traffic have roughly equaled all other types — rail, highway, pipeline, and air — combined.

WEIGHTED AND UNWEIGHTED INDEXES

It is argued here that the natural units for measuring transportation service are the passenger-mile and the freight ton-mile, and where possible these units are employed. Sometimes we are forced to fall back upon passengers carried or freight shipped as the unit

of output, because of deficient data. The starting point of our study is fixed by the fact that the first satisfactory Census of Water Transportation relates to 1889, while the Interstate Commerce Commission began to collect railroad traffic statistics in the same year. However, coverage of the transportation industries on a continuous annual basis does not begin until 1920.

Simple summations of passenger-miles and of freight ton-miles yield unweighted indexes of traffic. Such indexes — for passenger and freight traffic, respectively — have a simple physical significance which makes their use attractive. If we wish to combine passenger and freight traffic, passenger-miles could readily be reduced to ton-miles, for passengers average about sixteen to the ton. The result would continue to possess a straightforward physical interpretation. Yet the economic significance of sixteen passenger-miles may obviously differ greatly from that of a ton-mile of freight. Consequently, an unweighted index that combined passenger and freight traffic in the fashion indicated would be of little interest.

In combining passenger and freight traffic we have chosen to weight passenger-miles (or passengers carried, where passenger-miles were not available) by revenue per passenger-mile (or per passenger) and ton-miles by revenue per ton-mile in 1939.[1] Railroad passenger revenue per ton-mile of passengers is perhaps thirty times freight revenue per freight ton-mile; thus passenger traffic is accorded far more importance than its ton-mileage would justify. The weighted indexes of output represent dollar totals measured in 1939 prices: i.e., we may speak of 1939 as the weight base. It has been convenient to choose 1939 as the comparison base also (i.e., the year when all series equal 100) in the summary tables partly because in that year all types of output are represented and none vanish, and partly because the outbreak of World War II seems a convenient reference point.

An obvious extension of the notion that sixteen passengers are not the economic equivalent of a ton of freight leads us to query the appropriateness of treating ton-miles and passengers-miles,

[1] However, the excellence of the data for steam railroads suggested the use of a slightly more sophisticated weighting scheme for that industry.

respectively, as homogeneous. Certainly the services of transporting a ton of oil in bulk and a ton of package freight over the same distance sell for different prices; moreover they may involve the use of different amounts of resources. The same thoughts apply to coach and pullman, or first and second class ocean travel.

Table 5

INDEXES OF TRANSPORTATION OUTPUT, 1889-1946
Weighted Indexes[a]
1939 : 100

	All Transportation Agencies			*Steam Railroads*	*Intercity Highways*	*Waterways*
	Passenger	Freight	All traffic	All traffic[b]	All commercial traffic[c]	All traffic[d]
1889	25.5	16.5	18.5	27.1	....	16.7
1920	127	96	103	136.7	3	119
1921	115	72	81	103.9	5	90
1922	116	81	88	110.8	7	101
1923	122	96	102	131.0	9	107
1924	121	91	98	123.6	11	106
1925	120	97	102	129.9	14	104
1926	121	104	108	136.9	17	111
1927	119	102	106	131.5	20	113
1928	117	103	106	131.2	24	109.8
1929	118	108	110	133.7	30	114.5
1930	108	95	97	114.6	34	102.4
1931	94	79	82	92.5	36	84.6
1932	79	62	66	70.0	36	69.2
1933	76	68	70	73.6	39	79.1
1934	84	74	76	79.8	46	84.3
1935	87	77	79	83.7	52	87.8
1936	99	92	93	100.9	62	97.4
1937	103	101	101	108.1	76	111.1
1938	97	87	89	88.1	84	90.6
1939	100	100	100	100.0	100	100.0
1940	108	114	113	111.0	123	115.6
1946	248	176	192	192.9	176	196.9

[a] Construction of these indexes is discussed in individual chapters. Basic data are printed in Appendices. Railroad data for 1889 refer to year ending June 30, 1890.

[b] See Table 17.

[c] Intercity buslines and for-hire trucking. This column combines indexes from Table 7 (column 4) and Table 8 (column 3), using 1939 unit revenues (Tables 3 and 4) as weights.

[d] See Table 32.

Whether or not such differentiation is desirable, the necessary data exist to a very limited extent only. The weighted indexes for individual industries are in fact based upon a very limited breakdown of transportation services, which is perhaps the reason their behavior closely resembles that of the unweighted indexes. Thus passenger-miles in parlor and sleeping cars, in coaches at regular rates, and at commutation rates, were separately weighted; and weights were assigned in combining the traffic (passenger or freight) for different transportation agencies. Lack of data precluded the construction of more elaborately weighted output indexes.

PASSENGER AND FREIGHT TRAFFIC COMBINED

The most comprehensive measures of transportation service are weighted indexes of traffic for all transportation agencies taken together (Table 5 and Chart 1). For passenger and freight traffic combined, the index of transportation output increased sixfold between 1889 and 1920, and, despite some fairly sharp fluctuations, showed little net change between 1920 and 1939, then rose to a new peak during World War II. The behavior of freight traffic resembles that of the total; because of its large weight in the total, this accords with expectation. Passenger traffic, on the other hand, grew somewhat more slowly than freight traffic between 1889 and 1920, and experienced a net decline between 1920 and 1939, recovering again sharply between 1939 and 1946.

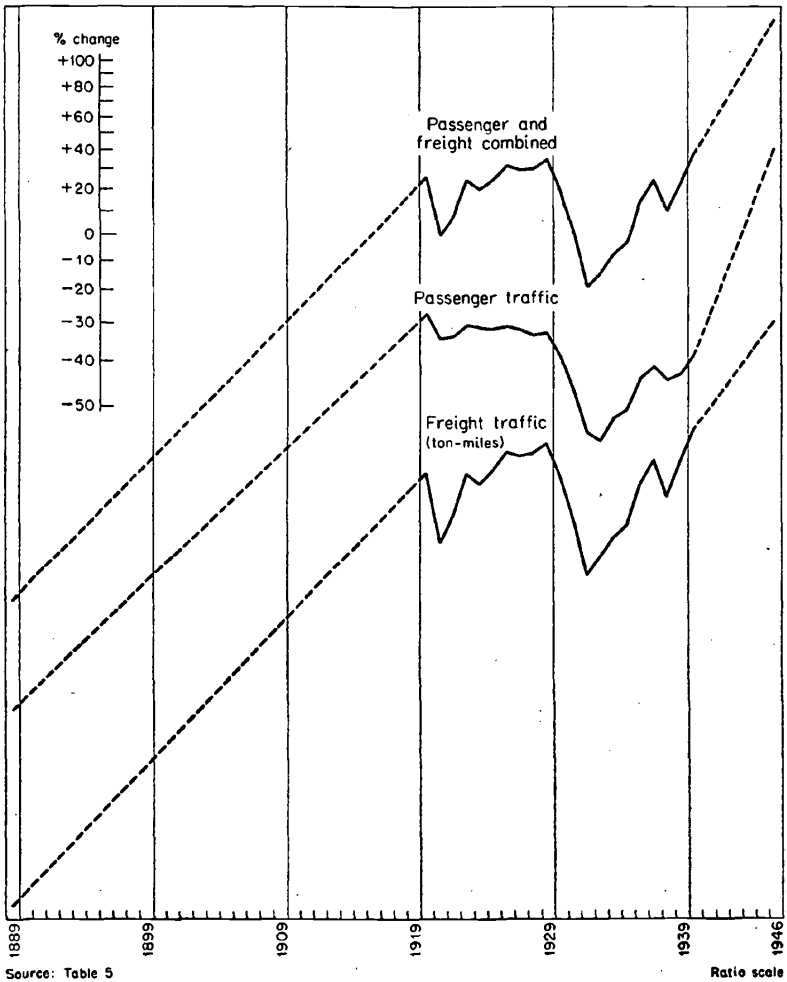
The contrast in behavior between passenger and freight traffic is illustrated from a different angle by the ratio of passenger to total traffic, measured in 1939 prices (Table 6). For all agencies taken together this ratio fell from 30 percent in 1889 to 27 percent in 1920, then declined irregularly to 22 percent in 1939.

It is possible that people's needs, direct and indirect, for freight transportation increased relatively to their ability or desire to travel. A much more likely explanation is that potential passengers shifted more rapidly to providing their own transportation by means of automobiles than did the owners of property to carrying that property in their own vehicles.

In Chart 2 traffic indexes are shown for the three principal

kinds of transportation — rail, water and highway. Steam railroads and waterways show generally similar movements in contrast with the meteoric rise of intercity highway traffic (buslines and for-hire trucking).

Chart 1
ALL TRANSPORTATION AGENCIES:
PASSENGER, FREIGHT, AND COMBINED TRAFFIC
Weighted indexes



Source: Table 5

Ratio scale

Table 6

RATIOS OF PASSENGER TO COMBINED PASSENGER AND FREIGHT TRAFFIC, 1889-1946[a]
Comparison made in 1939 Prices

	All Agencies	*Steam Railroads*	*Intercity Highways*[b]	*Waterways*
1889	0.30	0.21	....	0.16
1920	0.27	0.17	n.a.	0.08
1921	0.31	0.18	n.a.	0.14
1922	0.29	0.16	n.a.	0.09
1923	0.26	0.15	n.a.	0.08
1924	0.27	0.15	n.a.	0.09
1925	0.26	0.14	0.6	0.07
1926	0.25	0.13	0.6	0.06
1927	0.25	0.13	0.5	0.07
1928	0.24	0.12	0.5	0.08
1929	0.24	0.12	0.5	0.08
1930	0.24	0.11	0.4	0.09
1931	0.25	0.11	0.4	0.09
1932	0.26	0.11	0.4	0.09
1933	0.24	0.11	0.3	0.08
1934	0.24	0.11	0.3	0.08
1935	0.24	0.11	0.3	0.09
1936	0.23	0.11	0.3	0.09
1937	0.22	0.11	0.3	0.08
1938	0.24	0.12	0.2	0.08
1939	0.22	0.11	0.20	0.07
1940	0.21	0.11	0.21	0.06
1941	n.a.	0.10	0.22	n.a.
1942	n.a.	0.14	n.a.	n.a.
1943	n.a.	0.19	0.41	n.a.
1944	n.a.	0.20	0.39	n.a.
1945	n.a.	0.20	0.36	n.a.
1946	0.28	0.17	0.31	n.a.

n.a.: not available.
[a] For basic data, see Appendices.
[b] Intercity buslines and for-hire trucking.

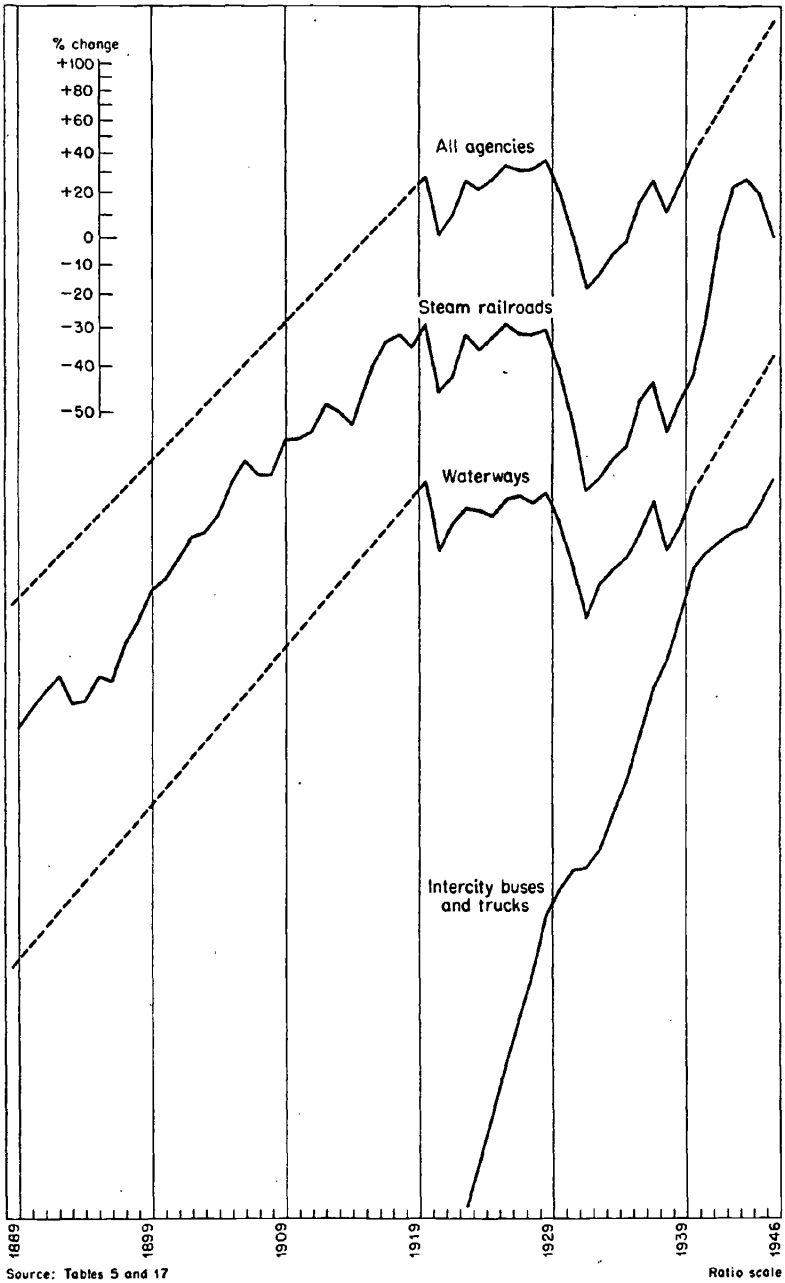
PASSENGER TRAFFIC

Diverse movements are reported by passenger traffic. As might be expected, the four agencies of long distance travel fall easily into two groups. On the one hand railroad and waterway travel each increased about four times between 1889 and 1920 and fell roughly 50 percent between 1920 and 1939 (Chart 3). In the other group the newcomers, intercity buslines and domestic air-

Chart 2

PASSENGER AND FREIGHT TRAFFIC COMBINED

Weighted indexes

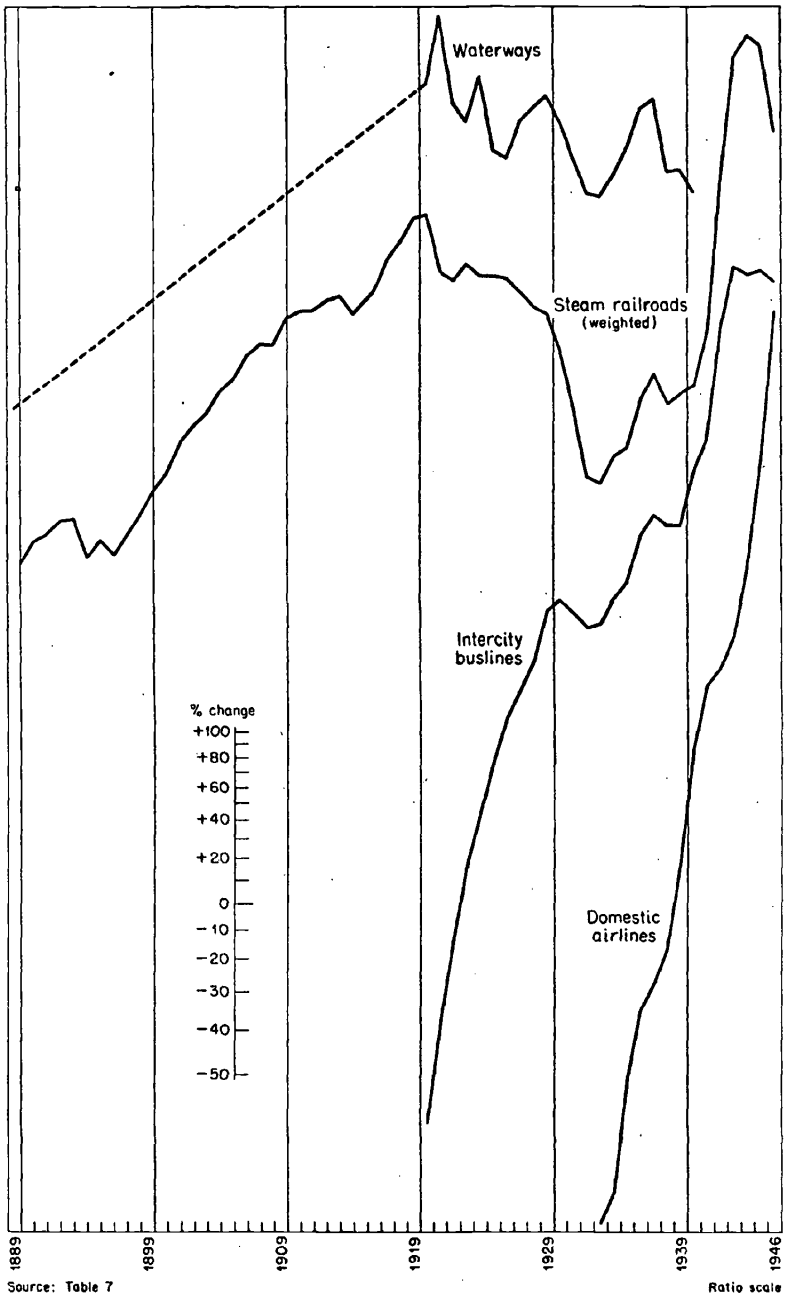


Source: Tables 5 and 17

Ratio scale

Chart 3

LONG DISTANCE AGENCIES: PASSENGER-MILE INDEXES



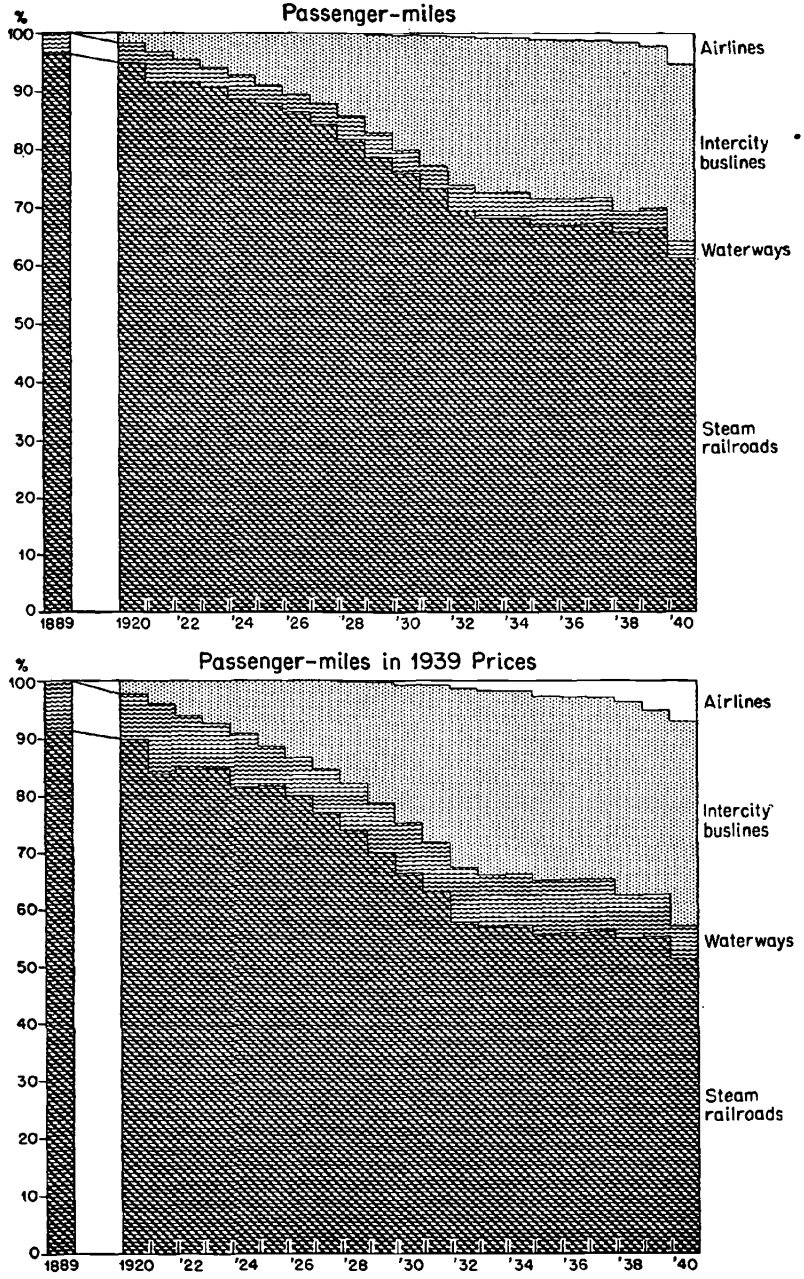
Source: Table 7

Ratio scale

Chart 4

PASSENGER TRAFFIC: PERCENTAGE DISTRIBUTION BY AGENCY

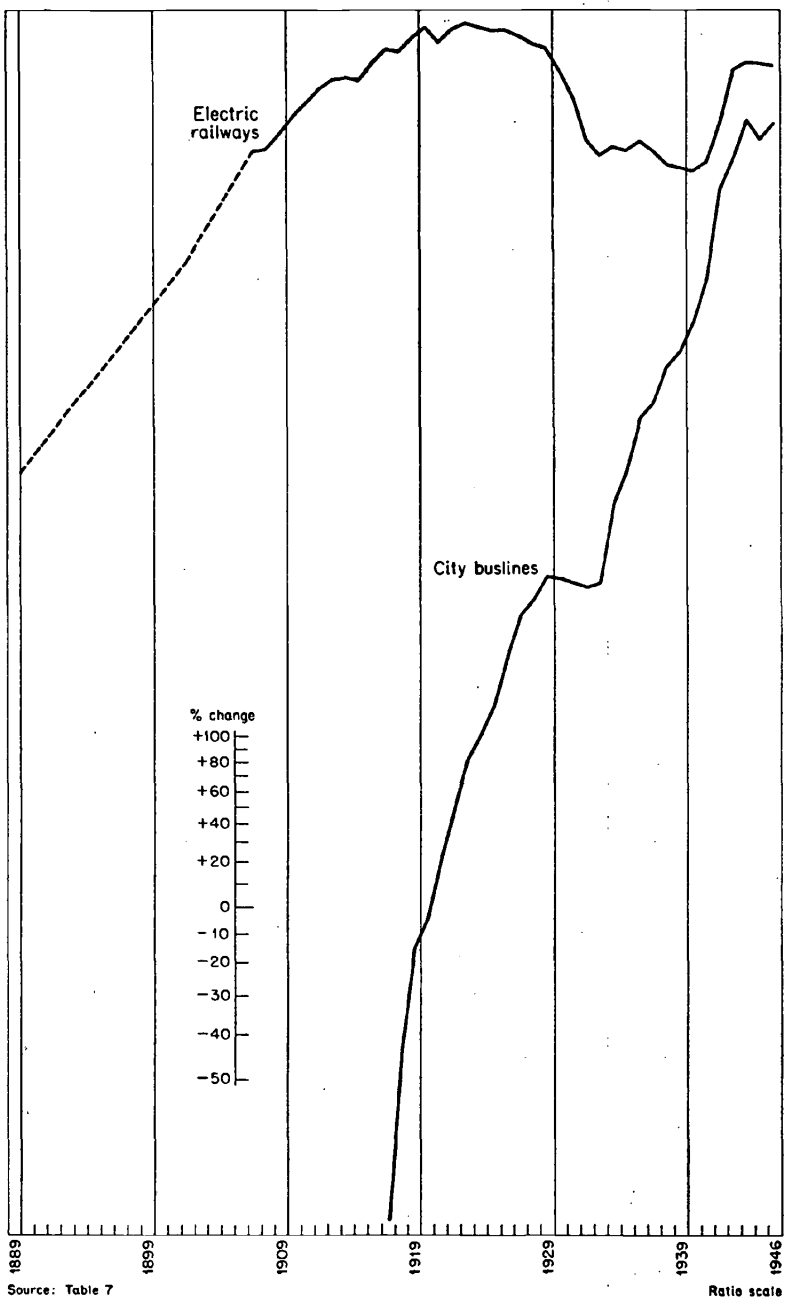
Long distance agencies only



Source: Appendices

Chart 5

LOCAL AGENCIES: INDEXES OF PASSENGERS CARRIED



Source: Table 7

Ratio scale

Table 7

INDEXES OF PASSENGER TRAFFIC, 1889-1946
1939 : 100

	Steam Railroads		*Electric Railways*	*Intercity Buslines*	*City Buslines*	*Waterways*	*Airlines*	*Long Distance Agencies*	*Local Agencies*	*Total Passenger Transportation*
	Passenger-miles (1)	Weighted passenger-miles (2)	Passengers (3)	Passenger-miles (4)	Passengers (5)	Passenger-miles (6)	Passenger-miles (7)	Passenger-miles (1+4+6+7) (8)	Passengers (3+5) (9)	Weighted Index (2 through 7) (10)
1889	....	....	....	....	....	38	....	36	19.6	25.5
1890	53.0	50.4	29.1	....	....	...				
1902	87.1	82.8	68.7	....	....	....	....	....	46.1	....
1907	123.5	117.3	106.9	....	....	....	....	....	72.0	....
1908	128.8	122.6	107.9	....	....	....	....	....	72.7	....
1909	128.7	122.5	115.0	....	....	....	....	....	77.5	....
1910	142.9	136.0	122.8	....	....	....	....	....	82.7	....
1911	146.7	139.6	129.7	....	....	....	....	....	87.4	....
1912	146.3	139.8	137.2	....	....	....	....	....	92.4	....
1913	152.7	146.2	143.5	....	....	....	....	....	96.7	....
1914	155.7	149.2	143.8	....	....	....	....	....	96.9	....
1915	143.0	138.1	142.3	....	....	....	....	....	95.8	....
1916	155.1	151.1	152.8	....	....	....	....	....	102.9	....
1917	176.6	172.7	162.5	....	....	....	....	....	110.4	....
1918	190.3	184.4	160.6	....	....	....	....	....	110.1	....
1919	206	204	168.4	....	....	....	....	....	116.3	....

1920	209	207	176.3	9	10	141	....	146	122.1	127
1921	166.0	164.2	165.6	14	13	188	....	120	115.7	115
1922	157.7	157.9	175.4	19	16	131	....	114	123.3	116
1923	168.6	169.9	179.3	25	19	122	....	123	127.0	122
1924	160.1	161.4	176.1	31	21	147	....	120	125.5	121
1925	159.2	161.3	173.8	36	24.0	108	....	120	124.9	120
1926	157.1	159.6	174.0	46	29.2	105	.1	121	126.7	121
1927	148.8	150.7	170.2	51	34.6	122	.3	117	126.0	119
1928	139.6	141.3	164.6	58	36.6	129.0	1.3	113	122.8	117
1929	137.2	138.2	162.4	71	40.3	135.4	4.9	116	122.6	118
1930	118.3	117.8	148.9	74	40.0	121.5	12.1	104	113.3	108
1931	96.6	94.3	132.0	70	39.3	104.4	14.0	88	101.8	94
1932	74.8	71.1	111.9	66	38.5	90.8	17.1	72	88.0	79
1933	72.1	69.2	104.8	67	39.2	90.0	23.2	70	83.4	76
1934	79.6	77.8	109.1	74	53.6	98.1	26.2	77	91.0	84
1935	81.5	80.3	107.6	80	61.8	109.3	42.0	81	92.6	87
1936	98.9	98.2	111.2	96	76.2	128.3	55.1	98	99.8	99
1937	108.7	108.7	106.9	104	81.1	133.6	61.6	107	98.5	103
1938	95.4	95.5	100.8	101	94.4	99.2	70.6	96	98.7	97
1939	100.0	100.0	100.0	100	100.0	100.0	100.0	100	100.0	100
1940	104.9	103.6	98.9	124	113.3	92	152.6	111	103.6	108
1941	129.5	129.5	102.0	142	134.7	....	205	134	112.7	124
1942	237	243	119.4	224	192.7	....	219	231	143.3	187
1943	387	390	148.7	286	219	....	249	352	171.6	256
1944	421	425	152.9	277	255	....	330	375	186.3	274
1945	404	409	152.9	281	235	....	505	368	179.6	272
1946	285	288	151.0	268	251	....	934	293	183.5	248

For notes, see next page

lines, have been growing rapidly since their appearance, and scarcely hesitated even during the Great Depression. The same tendencies are reflected in Chart 4, the upper panel of which shows for 1889 and for 1920-39 the distribution of total passenger-miles between the four long distance agencies, and the lower panel a similar distribution for passenger-miles weighted by 1939 revenue. The rising relative position of airlines and buses is plain. The smaller share of railroads in the lower panel is of course due to their relatively low revenue per passenger-mile (Table 3 above).

The two local passenger traffic agencies afford a similar contrast between the old and the new (Chart 5). The older form, electric railways, carried six times as many passengers in 1920 as in 1890, but between 1920 and 1939 travel was roughly halved. During World War II the traffic of other agencies rose to all-time records, but the number of electric railway passengers did not reach the peak of the early 1920's. Meanwhile the newer form of local transportation, city buslines, grew tenfold between 1920 and

Notes to Table 7

Col. (1) Class I, II, and III railroads. From 1890 to 1915 data refer to years ending June 30. Adjusted for coverage in 1912 and prior years on basis of passenger revenue; coverage always exceeded 97 percent. See Appendix Table B-1.

Col. (2) Same remarks as col. (1), except as follows. After 1911 data are based on class I railroads only, and passenger-miles are weighted by receipts per passenger-mile according to the following classification. 1911 to 1922: (a) commutation and coach, (b) parlor and sleeping car; 1922 and later years: (a) commutation, (b) coach, (c) parlor and sleeping car, (d) parlor and sleeping car passengers paying no railroad fare. See Table 17 and note a to that table.

Col. (3) Urban and interurban; electrically operated divisions of steam railroads not included. Figure for 1890 refers to year ending June 30. Trolleybus, but not motorbus, operations of street railway companies are included. See Table 26.

Col. (4) See Appendix Table E-1.

Col. (5) Includes buses operated by street railway companies. See Appendix Table E-1.

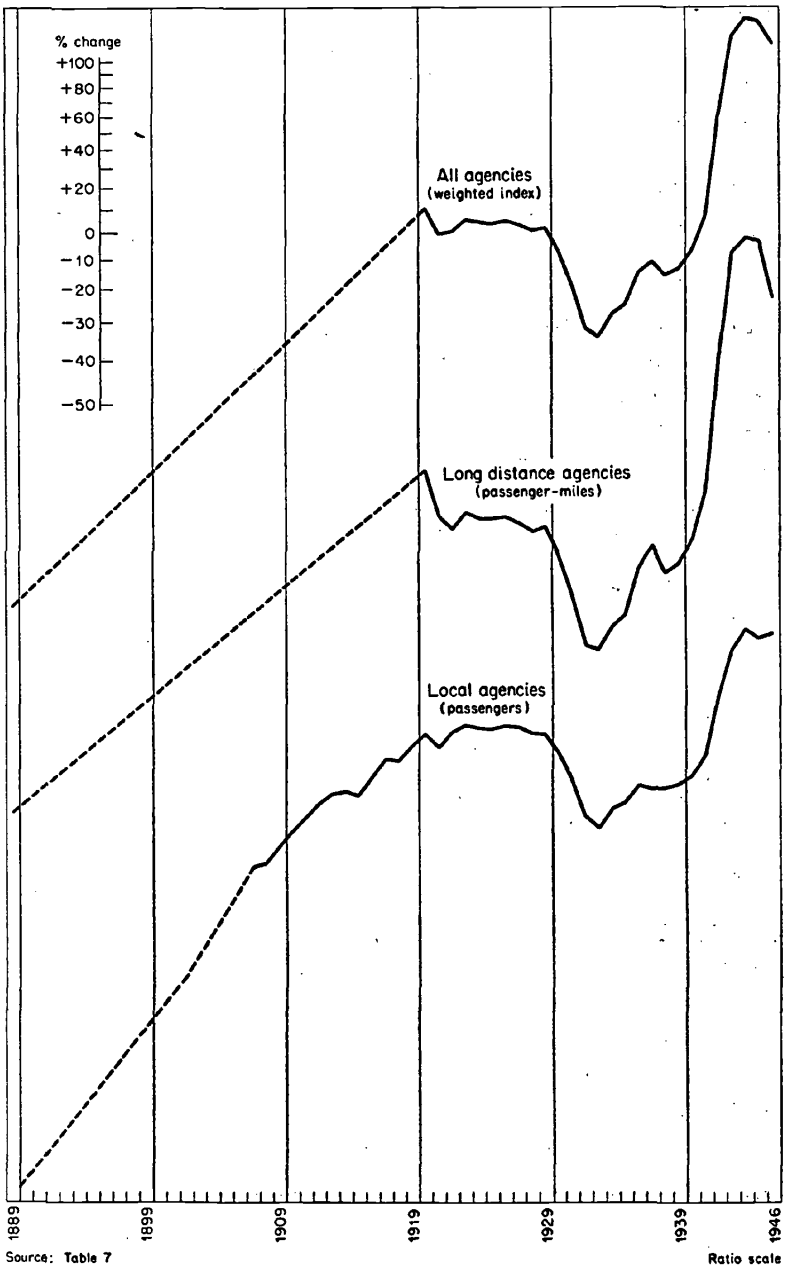
Col. (6) Intercoastal, noncontiguous, and American-flag international. Not available for 1941 and later years. See Table 33.

Col. (7) Domestic and international. See Appendix Table I-1.

Cols. (8), (9) and (10) In computing figures for 1889, data for railroads and electric railways for the year ending June 30, 1890, have been used. The relatives in cols. (8) and (9) represent simple aggregates of passenger-miles and passengers, respectively. In computing col. (10), 1939 revenues per passenger or per passenger-mile have been used as weights (see Table 3).

Chart 6

LONG DISTANCE AND LOCAL PASSENGER TRAFFIC: INDEXES OF OUTPUT



Source: Table 7

Ratio scale

1939, and has indeed since that time easily outpaced electric railway traffic.

Chart 6 compares travel on the four long distance agencies taken together with total traffic for the two forms of local transportation. From 1889 to 1920 local traffic grew six times, long distance three to four times. Between 1920 and 1939 the movement of the two series was similar, although local traffic was (as might be expected) the more stable.

FREIGHT TRAFFIC

As in Chart 3 (Passenger Traffic), a sharp contrast emerges in Chart 7 between the old and the new. Freight traffic carried by the older agencies (steam railroads and waterways) rises steeply between 1889 and 1920, and undergoes a small net decline between 1920 and 1939. On the other hand the newer agencies (pipelines and trucking) rise rapidly from a relatively insignificant level in the early 1920's.

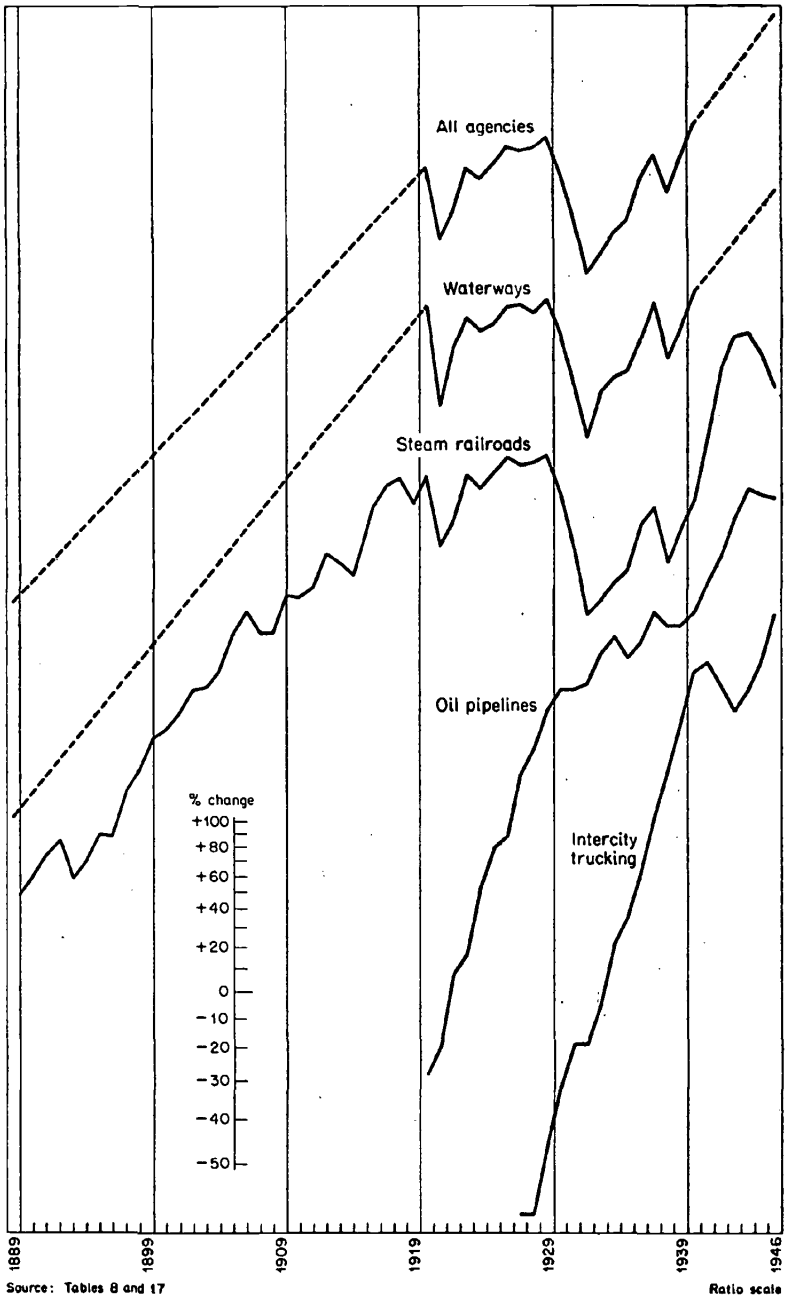
The expansion of freight traffic, both railroad and waterway, before 1920 is steeper, and the subsequent decline more gradual (Chart 7), than with passenger traffic (Chart 3). The diminishing proportion of passenger to total traffic, already noted in Table 6, is evidently not confined to railroads. Again the rise in freight traffic between 1889 and 1920 is steeper for waterways (sevenfold) than for railroads (fivefold); and after 1920 railroad freight traffic tends downward, whereas waterways show no appreciable trend (Chart 7).[2]

A partial explanation of these differences in behavior may plausibly be found in the greater diversion to highways of railroad than of waterway, and of passenger than of freight traffic. It might be thought the fact that intercity highways also exhibit a sharply declining ratio of passengers to freight after 1924 (Table 6) conflicts with the assumption that more passenger than freight traffic was diverted to highways. But the diversion of passenger traffic at the expense of the agencies considered here was of

[2] Between 1920 and 1940 absence of trend in the waterway total conceals a decline in American-flag international and a corresponding expansion in domestic (especially coastwise) traffic (see Table 32 and Chart 21).

Chart 7

FREIGHT TRAFFIC: TON-MILE INDEXES



Source: Tables 8 and 17

Ratio scale

Table 8

INDEXES OF FREIGHT TRAFFIC, 1889-1946
1939 : 100

	Steam Railroads Ton-miles (1)	*Interurban Electric Railways* Car-miles (2)	*For-hire Intercity Trucking* Ton-miles (3)	*Oil Pipelines* Ton-miles (4)	*Waterways* Ton-miles (5)	*Waterways* Weighted ton-miles (6)	*Domestic Airlines* Ton-miles (7)	*All Freight Traffic* Ton-miles (8)	*All Freight Traffic* Weighted ton-miles (9)
1889	22.7	....	....	....	13.5	15.2	....	16.2	16.5
1920	123.4	....	....	16	106	118	....	105	96
1921	92.3	....	....	18	73	83	....	76	72
1922	102.0	151	....	25	91	100	....	89	81
1923	124.1	....	....	27	104	107	....	105	96
1924	116.9	....	....	34	98	104	....	100	91
1925	124.5	....	7	40	101	104	....	104	97
1926	133.4	202	9	43	108	112	....	112	104
1927	128.8	213	12	54	109.0	112.8	....	111	102
1928	130.0	203	15	62	105.2	108.7	....	110	103
1929	134.2	208	20	72	111.6	113.2	....	116	108
1930	115.0	174.9	23	77	98.0	101.1	....	102	95
1931	92.8	144.7	27	77	79.9	83.5	....	84	79
1932	70.2	99.5	29	80	63.1	67.6	....	66	62
1933	74.7	87.2	32	89	76.7	78.6	....	76	68
1934	80.6	98.9	39	95	81.4	83.7	25	81	74
1935	84.6	108.7	45	86	83.2	86.4	46.2	83	77
1936	101.7	126.9	54	93.6	94.7	95.4	67.2	96	92
1937	108.2	122.3	69	104.8	109.9	109.7	78.2	108	101
1938	87.0	92.8	80	99.0	87.8	90.2	85.0	88	87
1939	100.0	100.0	100	100.0	100.0	100.0	100.0	100	100

1940	111.9	105.9	122	105.7	115.9	117.5	120.1	114	114
1941	142.4	119.5	128	121.3	....	....	162.3	....	....
1942	191.1	123.9	....	132.5	....	....	292	....	....
1943	218	133.4	105	155.7	....	....	452	....	....
1944	221	141.1	112	174.3	....	....	602	....	....
1945	204	133.2	126	169.9	....	....	771	....	....
1946	177.4	113.1	152	167.5	171.6	200	632	173	176

Col. (1) Class I, II, and III railroads. For 1889 data refer to year ending June 30, 1890. Adjusted for coverage in 1910 and prior years on basis of freight revenue; coverage always exceeded 97 percent. See Table 17.

Col. (2) See Appendix Table D-2.

Col. (3) See Appendix Table F-4.

Col. (4) Trunk-line movement, crude and refined oils, interstate and intrastate. See Table 29.

Col. (5) See Appendix Table H-1.

Col. (6) See Table 33. Separate ton-mile totals for coastwise, intercoastal, Great Lakes, inland, noncontiguous, and American-flag international traffic, respectively, were weighted by estimated revenue per ton-mile in 1939 (Table 4).

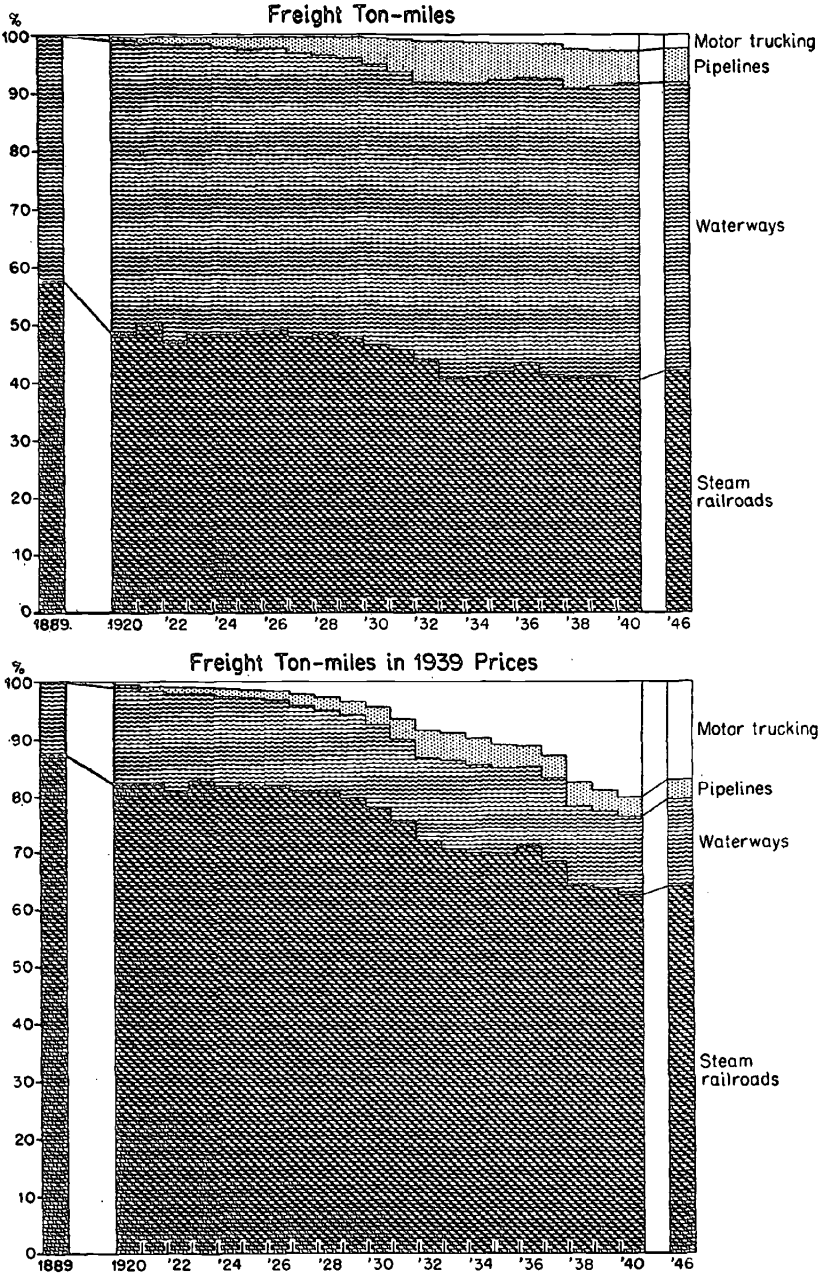
Col. (7) Express, freight, and mail traffic. See Appendix Table I-1.

Col. (8) Series represents a simple ton-mile total for data underlying columns (1) through (5) and (7). For interurban electric railways a uniform carloading of 17.75 tons was assumed.

Col. (9) Columns (1) through (4), (6), and (7) weighted by respective 1939 revenues (Table 4).

Chart 8

FREIGHT TRAFFIC: PERCENTAGE DISTRIBUTION BY AGENCY



Source: Appendices

course a diversion in favor of the private automobile rather than of the intercity bus, the only type of long-distance highway travel for which data are offered. Indeed the decline in the ratio of passenger to freight on intercity highways, i.e., the slower growth of bus travel than of trucking, can itself be viewed as evidence of the much greater expansion of private automobile travel than of private (i.e., not for-hire) trucking. As we saw in Chapter 1, private automobile travel measured in passenger-miles, had by 1929 reached a level many times that of all the agencies considered here taken together. Much of the new kind of travel would doubtless never have occurred had the private automobile failed to develop; yet a substantial part of such travel would doubtless have used existing agencies.

Through 1929 intercity trucking grew at about the same pace as buslines and pipelines (Charts 3 and 7). Like airline passenger travel, trucking's growth was scarcely slowed by the Great Depression; yet its rate of expansion cannot compare with that for airline passenger traffic. The more rapid and sustained rise in output for trucking (Chart 7) than for intercity buslines (Chart 3) explains the decline in the ratio of passenger to total highway traffic after 1924 (Table 6), upon which we have already commented.

The speedy rise of motor trucking and pipelines is also reflected in these agencies' increased share of total ton-miles and of ton-miles in constant prices (Chart 8). Here the much larger share of railroads and motor trucking in revenue than in ton-miles is apparent.

SOME FURTHER COMPARISONS

We have noted major trends in passenger and freight traffic. How do these movements compare with growth in other sectors of the economy? Table 9 reduces some physical measures of traffic to a per capita basis.

Per Capita Traffic

In 1889 electric railways were still in their infancy and mechanically operated buses had yet to be invented. The 33 trips per

person on street railways in that year grew to 118 in 1920 and declined to 79 in 1939. One might think that the 118 trips a year for every man, woman and child in the United States that obtained 30 years ago represented saturation.[3] Certainly the subsequent decline in trips per capita is associated with the introduction of the private automobile for suburban and even city travel. Yet in 1946 we consumed 136 local bus or streetcar trips apiece, despite considerable automobile commuting by car pool and otherwise (Table 9).

Passenger travel by railroads, intercity buses, airlines and waterways shows a similar pattern. On a per capita basis the annual consumption of passenger-miles rose between 1889 and 1920, then declined, to rise again to a fresh peak in 1946. The average person (if not the typical individual) traveled 200 miles a year at the opening of our period, nearly 500 in 1920, 260 in 1939, and about 700 in 1946 — not counting travel by local agencies or by private automobile. Freight traffic per capita also reached peaks in 1920 and 1946. Of course figures for 1946 reflect the aftermath of World War II, just as 1920 is influenced by World War I; it is still too early to chart new peacetime traffic levels.

Perhaps the most striking feature of Table 9 is the surprisingly small amount of travel and freight transportation in which the nation chose — or could afford — to indulge at the opening of our period. Admittedly the figures for 1890 do not measure transportation by animal power, any more than current figures take account of privately owned automobiles or trucks not plying for hire. Moreover our use of the 1889 Census of Waterways may possibly have understated the ton-mile volume of canal and river traffic at that date. Even when these qualifications have been made, the contrast still astonishes.

In 1889 the railroad and canal networks were substantially

[3] A possibly more appropriate figure might use the population in cities over 50,000 as the denominator. Trips per head on this basis were: 1890, 170; 1920, 386; and 1940, 236. Trips per head of working population in such cities may have been two or two and a half times bigger; perhaps 800 to 900 in 1920. Such a figure would allow two trips every working day for the gainfully employed and still leave a useful number of trips for the schoolboy and the housewife. It would seem therefore that urban and suburban local transportation needs were pretty well satisfied by the electric railways of 1920.

Table 9

PER CAPITA USE OF TRANSPORTATION FACILITIES, 1889-1946

	1889[a]	*1907*	*1920*	*1925*	*1929*	*1932*	*1939*	*1946*
United States population (million)	61.8	87.0	106.5	115.8	121.8	124.8	130.9	139.9
Passenger traffic per capita								
Local transportation agencies — annual trips by bus and electric railway	33	86	118	111	104	73	79	136
Long distance transportation agencies								
Steam railroads — annual passenger-miles	195	322	445	312	256	136	174	463
All intercity (steam railroads, intercity buses, and domestic airlines) — annual passenger-miles	195	322	453	344	312	188	252	697
All intercity and overseas (steam railroads, intercity buses, domestic airlines, and waterways) — annual passenger-miles	202	n.a.	469	355	325	196	261	n.a.
Freight traffic per capita								
Steam railroads — annual ton-miles (thous.)	1.23	2.72	3.88	3.60	3.70	1.89	2.56	4.25
Total rail and highway — annual ton-miles (thous.)	1.23	2.72	3.91	3.63	3.76	1.96	2.75	4.50
All land traffic (rail, highway and pipelines) — annual ton-miles (thous.)	1.23	2.72	3.98	3.80	4.05	2.28	3.12	5.09
All land and water traffic — annual ton-miles (thous.)	2.14	n.a.	8.06	7.37	7.80	4.35	6.26	10.12

n.a.: not available.

[a] Based on data for steam railroads and electric railways for year ending June 30, 1890.

complete, yet per capita passenger travel was not significantly higher than in the depression year 1932, and was about three-quarters of its 1939 level. And in 1889 there were no private automobiles to help out! Allowance for automobile travel, on the lines indicated in Chapter 1, would reduce the average American's total travel in 1889 to as little as a fifth of his travel in 1939. The figures in Table 9 suggest a similar scantiness in the amount of freight transportation with which the nation got by sixty years ago. It is hard to interpret the statement that in 1939 the average person used, directly or indirectly, about 6,000 freight ton-miles. But it is easy enough to grasp the thought that the average American got along in 1889 with only a third this amount — and furthermore had none of the privately owned motor trucks that in 1939 are necessarily left out of our calculations. Of course there were horses, but they would hardly be used for the intercity or long-distance traffic here in question.

The rapid rise in transportation output between 1889 and 1920 does little to explain transportation's declining share of national income and employment reported in Chapter 1. On the other hand the much slower growth, or even decline, of output after 1920 is in line with the decline in transportation's relative share.

Freight Traffic and Commodity Output

The growth of traffic may be compared also with other measures of the physical expansion of the economy. Between 1889 and 1920 freight traffic (measured in ton-miles) increased more rapidly than manufacturing or mining and nearly four times as fast as agricultural output (Table 10). For the fifty-year comparison 1889-1939, freight traffic grew sixfold and commodity output in general fourfold.

It will be recalled that our freight traffic index is based upon ton-mileage totals. In fact, its rapid growth in part reflects a long-time lengthening of haul. For example, for *railroad* freight traffic — the principal component — average haul increased about 35 percent from 1890 to 1920 or 55 percent from 1890 to 1939 (Chapter 4). These figures undoubtedly overstate the lengthening of haul for freight transportation as a whole. They suggest, however, that on a basis of tons shipped (in place of ton-miles) the increase in freight traffic would be more moderate. Yet growth

Table 10

OUTPUT TRENDS IN TRANSPORTATION AND OTHER INDUSTRIES, 1889-1946
1889-90 : 100

	1889-90[a]	*1920*	*1929*	*1939*	*1946*
All transportation agencies combined					
Passenger and freight traffic combined	100	560	600	540	1,040
Freight traffic					
Weighted ton-miles[b]	100	580	650	610	1,070
Unweighted ton-miles[b]	100	650	720	620	1,070
All transportation agencies, except noncontiguous and American-flag international waterways					
Freight traffic					
Weighted ton-miles[b]	100	540	640	610	1,030
Unweighted ton-miles[b]	100	500	680	640	930
Output of other industries					
Manufacturing[c]	100	350	520	530	870
Mining[d]	100	450	640	610	760
Agriculture[e]	100	160	180	200	260
Three commodity-producing industries combined[f]	100	260	360	370	560
Traffic/Output comparisons					
Ratio: Weighted ton-miles (excluding noncontiguous and international waterways) to total commodity output	100	210	180	170	180
Ratio: Unweighted ton-miles (excluding noncontiguous and international waterways) to total commodity output	100	190	190	170	170

[a] The principal component of traffic, that carried by railroads, relates to the year ending June 30, 1890.

[b] Weighted indexes of ton-miles combine ton-mile totals for individual agencies using respective revenues per ton-mile in 1939. Unweighted indexes represent simple ton-mile summations.

[c] Frickey and Persons agree that manufacturing output in 1889-90 was about 70 percent of its level in 1899; for comparing later years with 1899 we have Fabricant's index and (for 1946) the Federal Reserve Board index. See Frickey, *Production in the United States,* Table 6, p. 54; Warren M. Persons, *Forecasting Business Cycles* (Wiley, 1931), pp. 170-1; Solomon Fabricant, *Employment in Manufacturing, 1889-1939* (NBER, 1942), p. 331; *Federal Reserve Bulletin.*

[d] Using 1899 unit values, we may say that the combined output of iron ore, mercury, gold, silver, copper, lead, zinc, bituminous and anthracite coal, petroleum and phosphate rock increased about 65 percent between 1889-90 and 1899 (data from U. S. Geological Survey, *Mineral Resources of the United States*). Later years were compared with 1899 using the index in Harold Barger and Sam H. Schurr, *The Mining Industries* (NBER, 1944), Table 1, p. 14; and (in the case of 1946) the Federal Reserve Board index.

[e] For the first three comparisons, see Harold Barger and Hans H. Landsberg, *American Agriculture* (NBER, 1942), Table 39, p. 253. The last comparison is based upon U. S. Bureau of Agricultural Economics figures (see *Statistical Abstract of the United States*).

[f] The three preceding indexes were combined using 1929 value added in manufacturing ($30.1 billion), mine value of minerals ($4.1 billion) and value of net output of agriculture ($11.7 billion).

in freight traffic — however measured — would still appear to have exceeded the expansion of commodity output between 1889 and 1920 by a wide margin.

Comparison between freight traffic and commodity output is somewhat distorted by fluctuations in the share of the nation's water-borne foreign commerce carried in American-flag vessels. This share was much higher in 1920 and in 1946 than in other years. We have accordingly computed freight traffic indexes which exclude international (and, for technical reasons, also noncontiguous) waterways, and these indexes are compared with commodity output at the foot of Table 10.

Evidently such ton-mile indexes (weighted or unweighted) increased between 1889 and 1920 about twice as rapidly as commodity output. As just noted, this contrast is to be explained in minor degree only by the lengthening that occurred in average haul. We must suppose that it reflects also an increase in the fraction of all commodities transported by long-distance agencies (as distinct from local drayage) — or in the number of times each commodity was so transported. Certainly the average size of American factories grew during the period: perhaps centralized manufacture, requiring long-distance transportation of raw materials and finished products, was gradually being substituted for production in local workshops dependent mainly upon drayage.

After 1920 ton-mile indexes (excluding, as before, international and noncontiguous traffic) moved roughly in accordance with commodity output. The ratio of ton-miles to commodity output remained stable or tended slightly downward. Conflicting factors appear to have been at work during the interwar period. On the one hand some further lengthening of average haul may have occurred, and perhaps additional substitution of centralized for local manufacture. These influences would raise the ratio. On the other hand some traffic undoubtedly shifted from railroads or other commercial agencies to highway trucking in trucks owned by the shippers. Our indexes of freight traffic report waterway movements in 'captive' vessels, but not highway movements in

privately owned trucks. Such a shift would therefore tend to depress the ratio. We may conclude that the parallelism between freight traffic (ton-miles) and production since 1920 is roughly what might be expected.

HOW DID TOTAL TRANSPORTATION BEHAVE?

From the story of this chapter may be gleaned some evidence of retardation in the growth of transportation service by the commercial agencies considered here. In 1946 neither passenger nor freight traffic approached the level suggested by projections of the rates of growth between 1889 and 1920 (Chart 1). Had passenger traffic continued to grow after 1920 as before, at an annual rate of 5.4 percent, its 1946 volume would have been twice as large as it actually was. Continuation of the corresponding pre-1920 growth rate for freight traffic (6.3 percent annually) would have yielded in 1946 three times the volume actually observed in that year; if international traffic is excluded, the rate of growth is 5.4 percent and the projected 1946 level slightly more than twice the actual.

To this evidence of slackening of growth it may be objected that 1920 was a peak year, its levels inflated by the aftermath of World War I. Traffic fell sharply in 1921 to the lowest level of the 1920's. If we base a calculation of growth rates on a comparison of 1921 (instead of 1920) with 1889, the upward trends are less steep, but in each case the projections still lie above the actual 1946 level.

With respect to passenger traffic more convincing evidence of retardation of growth is given by the per capita data in Table 9. Annual trips on local agencies more than tripled during thirty years before 1920, but scarcely rose between 1920 and 1946. Per capita passenger-miles by all intercity agencies in 1920 were more than twice the 1889 level, but they did not double again by 1946. In our comparison of freight traffic with commodity output (Table 10), we noticed a very decided slackening of growth: traffic increased twice as fast before 1920, but barely kept pace with commodity output thereafter.

Such retardation of growth reflects — at least in part — diver-

sion of traffic from commercial agencies to private automobiles and privately owned trucks. The question arises whether diversion can entirely account for the slackening we observe in the growth of commercial transportation service. Would total transportation — commercial and private — exhibit retardation of growth?

In view of the paucity of data we cannot expect a conclusive answer to this question. Let us suppose the accompanying figures apply. It is assumed that an automobile runs 8,000 miles a year

	1889	*1920*	*1939*	*1946*
Private automobiles				
Registrations (million)	....	8	26	28
Passenger-miles (billion)	....	150	500	500
Commercial transportation				
Passenger-miles (billion)	12	50	34	100
Total transportation				
Passenger-miles (billion)	12	200	534	600

with an average load of 2½ persons (see note f to Table 3 above). If these figures are correct, annual growth rates for total transportation were 10 percent for 1889-1920, 5 percent for 1920-39, and 2 percent for 1939-46; retardation is clearly established. If per capita figures are used, corresponding growth rates are 8, 4, and ½ percent respectively.

Yet we may vary the assumptions plausibly and reach an opposite conclusion. In the first place we may prefer a lower figure than 8,000 miles per year for the use of an automobile in 1920, in view of the character of the automobile and the condition of the highway system at that period. We may note that if an average of only 4,000 miles per car is used for 1920, still with 2½ passengers, total travel drops from 200 to 125 billion passenger-miles, and the growth rate (without adjustment for population change) both before and after 1920 is 8 percent. Evidence of retardation is then confined to the comparison 1939-46, and can perhaps be explained away by the shortage of vehicles in the latter year. In the second place we have considered only the behavior of an (unweighted) ton-mile aggregate. Were we to value automobile travel at cost of operation, a passenger-mile of private travel would probably receive a smaller weight than a passenger-mile of commercial transportation service. A weighted

index of total transportation service would therefore rise somewhat less rapidly, and be somewhat more likely to show slackening of growth, than an unweighted index. Of course the growth of aggregate passenger travel (commercial and private) must eventually slow down. The figures we have been able to assemble are insufficient to determine whether retardation had already begun during our period of study.

For freight traffic the question posed above is easier to answer. Intercity ton-miles in private trucks rose from a negligible amount in 1920 to about 27 billion in 1939 and 1946 (Appendix Table F-4). Still only 2 or 3 percent of all ton-miles recorded for commercial agencies, the addition of private intercity trucking could plainly not significantly alter the trends in freight traffic already reported by our indexes. There remains the matter of local trucking, for-hire and private. Local trucking succeeded animal drayage in a continuous development. We are ignorant of the number of tons carried or ton-miles of service performed, and we do not know whether or how rapidly these have grown. Yet no traffic has been diverted here from an activity we can measure to one we cannot. And it seems inconceivable that major trends in long-distance freight traffic could be swamped by contrary trends in local transportation, could we add data for the latter. We must conclude that the retardation of growth observable in our indexes (Chart 1 and Table 10) would also characterize an index of total freight traffic, commercial and private, long-distance and local; and that such retardation is not to be explained in any appreciable degree by diversion to activities not covered by our indexes.