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Northern Circumferential Highway (State Route 128) which skirts the congested areas of Boston, Mass.

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U. S. DEPARTMENT OF COMMERCE
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Highway-User Tax Schedules Recommended in State Highway Finance Studies

BY THE FINANCIAL AND ADMINISTRATIVE RESEARCH BRANCH
BUREAU OF PUBLIC ROADS

Reported by G. P. St. CLAIR, Chief of Branch, and HUGO C. DUZAN, Transportation Economist

The findings of highway tax studies made in 9 States are compared in this article in terms of the tax payments that would be required of 8 vehicles or vehicle combinations under the recommended user-tax schedules. Comparative data on the payments that would be made under existing tax laws are also given. The payments are expressed in terms of payments per year, payments per mile of travel, and payments per gross ton-mile.

As might be expected, there is considerable variation from State to State in the recommended user-tax payments for each of the 8 vehicles. Nevertheless, there is a marked central tendency in that the study findings, particularly those for heavy vehicles, tend to group within relatively narrow intervals.

The median or "middle" values of the required tax payments per year are $40 for the light passenger car, $1,229 for the 4-axle tractor-semitrailer combination, and $1,836 for the 5-axle tractor-semitrailer-trailer combination. Expressed as indexes of the passenger-car payment, the values for the three vehicles are 1.0, 30.7, and 45.9.

Median tax payments per mile of travel are 0.43 cents for the passenger car, 3.07 cents for the 4-axle tractor-semitrailer combination and 3.67 cents for the tractor-semitrailer-trailer combination. The indexes are 1.0, 7.15, and 8.54.

The trend of median tax payments per gross ton-mile is downward, dropping from 2.2 mills for the passenger car to 1.2 mills for the 4-axle tractor-semitrailer combination and 1 mill for the 5-axle tractor-semitrailer-trailer combination. The median indexes of required tax payments per ton-mile are 1.0, 0.55, and 0.46.

THE findings of highway tax studies made by State personnel or consultants in individual States throw some light on the vexatious question of the relative tax responsibility of vehicles of different sizes and weights. Although studies have been made in numerous States, in only nine of them were the findings expressed in terms such that a comparative analysis could readily be made. These States are California, Colorado, Illinois, Louisiana, Minnesota, New York, Ohio, Utah, and Washington. The tables and charts which follow deal with the study findings in those nine States and with comparative data on actual payments under existing user-tax laws.

Appendix B (p. 83) gives a list of the State highway finance and taxation studies which provided the data for this analysis.

Vehicles Selected for Comparison

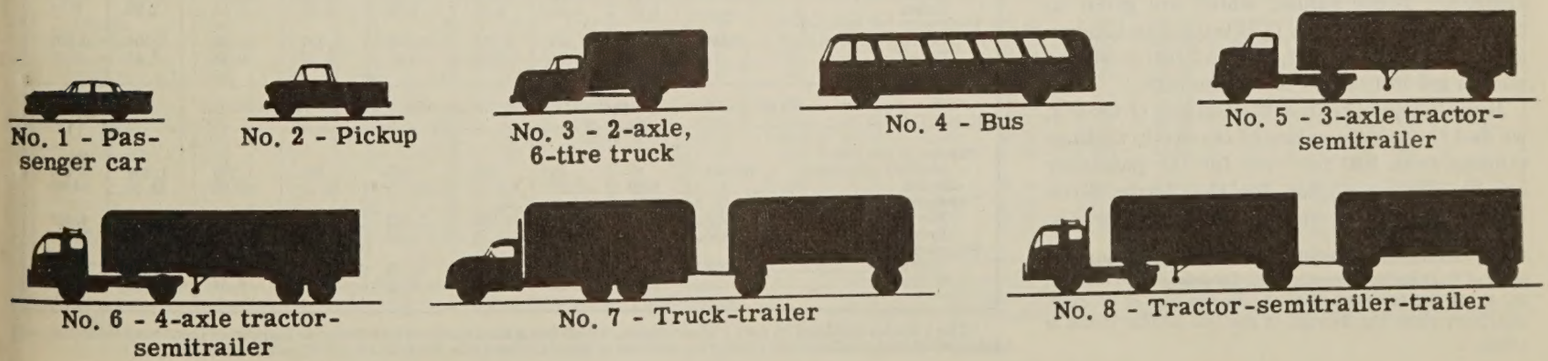
In order to run the gamut of motor-vehicle sizes and weights, eight typical vehicles or vehicle combinations shown in silhouette below were selected. These vehicles and their assumed operating conditions are briefly described in table 1.

The maximum gross weights chosen are typical of the weights for which vehicles and combinations of these several types would be registered. Annual mileages also are reasonably close to average. For purposes of State-to-State comparison it is assumed that a vehicle travels its entire mileage in the particular State. It is recognized that over-the-road trucking combinations may divide their actual travel among several States, and also that such vehicles may have much greater total mileages than those used in this comparison. The values chosen, although not averages of those used in the studies, are considered moderate and fair. For uniformity of comparison all of the vehicles were taken as gasoline-powered.

In calculating required tax payments for the eight selected vehicles from the schedules recommended by the investigators, the effort was made to render an accurate interpretation of the findings of the tax studies in each of the nine States. Values were calculated by two methods. First, the required tax payments for each vehicle were computed on the basis of the values of vehicle weight, annual mileage, and miles per gallon used in each State study. These values, which are excluded from the body of the report because they are not truly comparable from State to State, are given in Appendix A (pp. 79–82). The second method, which affords direct State-to-State comparisons, utilizes the values of maximum gross weight, annual travel, and miles per gallon given in table 1. It is believed that the resulting comparisons are accurate and fair; but it is not unlikely that minor differences in interpretation would occur in similar calculations made by others.

It was desired to present a comparison of the tax-study findings in these nine States with the taxes that would have been paid by the same vehicles under the user-tax rates prevailing in 1955. For this comparison two more States were added to the list: Oregon, which has a tax structure based on the findings of incremental studies; and Idaho, which has a mileage tax similar in coverage to those in Colorado, New York, Ohio, and Oregon.

In each of the tables and charts presented the user-tax payments shown for a given vehicle were obtained by adding (*1*) the registration fee or weight tax that the vehicle



No. 1 - Passenger car
No. 2 - Pickup
No. 3 - 2-axle, 6-tire truck
No. 4 - Bus
No. 5 - 3-axle tractor-semitrailer
No. 6 - 4-axle tractor-semitrailer
No. 7 - Truck-trailer
No. 8 - Tractor-semitrailer-trailer

Table 1.—Characteristics of vehicles selected for tax-study comparisons

Vehicle number	General description	Empty weight	Maximum gross weight		Annual travel		Ton-miles at maximum gross weight		Fuel consumption rate [1]
			Pounds	Index	Miles	Index	Ton-miles	Index	
		Pounds							*Miles/gal.*
1	Passenger car	2,982	[2] 3,882	1.00	9,300	1.00	18,051	1.00	16.7
2	Pickup truck	3,266	4,800	1.24	8,000	.86	19,200	1.06	15.6
3	2-axle, 6-tire truck	7,675	19,000	4.89	10,000	1.08	95,000	5.26	7.8
4	Bus	20,565	27,000	6.96	50,000	5.38	675,000	37.39	5.3
5	3-axle tractor-semitrailer	15,215	40,000	10.30	38,000	4.09	760,000	42.10	4.8
6	4-axle tractor-semitrailer	19,050	50,000	12.88	40,000	4.30	1,000,000	55.40	4.2
7	5-axle truck-trailer	27,500	68,000	17.52	50,000	5.38	1,700,000	94.18	3.5
8	5-axle tractor-semitrailer-trailer	27,445	72,000	18.55	50,000	5.38	1,800,000	99.72	3.4

[1] All vehicles were gasoline-powered.
[2] Six passengers at 150 pounds each assumed.

would pay under the tax-study recommendations (or existing law); (*2*) the gasoline tax that would be paid under the assumed annual mileage and miles per gallon; and (*3*) the amount of third-structure tax (such as the New York weight-distance tax or the Ohio axle-mile tax) that would be required. Values are expressed in three ways as follows: (*1*) Tax payment per year, (*2*) tax payment per mile of travel, and (*3*) tax payment per gross ton-mile (obtained by dividing the tax payment by the product of maximum gross weight and annual mileage). The latter is a rather controversial figure, as there is no general agreement that gross ton-miles are a true measure of tax responsibility. Values are also expressed in the form of indexes, the index value for the passenger car being 1.00 in all cases.

Since vehicles do not travel fully loaded all of the time, average operating gross weights might well have been used instead of maximum gross weights to compute the tax payments per ton-mile. Average operating weights, however, are affected by the type of operation and those for vehicles of a given maximum gross weight may vary widely. Maximum gross vehicle weight, which is the registration basis in the majority of States and represents the potential of the vehicle, was therefore chosen.

Median Values of Tax-Study Recommendations

The first question to be asked about these State tax-study findings is, "What is the trend?" As arithmetic averages are likely to be deceptive in such a case, it was decided to compare the median [1] values, from among the findings in these nine States, of the user-tax payments required of each of the eight selected vehicles. These values, which are given in the upper section (part 1) of table 2 and shown graphically in figure 1, are indicative of the middle ground of tax-study findings.

Running quickly over the top line of table 2, we find the middle values of tax-study findings ranging from $40 per year for the passenger car to $207 per year for the 2-axle, 6-tire truck; $1,009 for the bus; $1,229 for the 4-axle, 50,000-pound tractor-semitrailer; and $1,836 for the 5-axle, 72,000-pound tractor-semitrailer-trailer combination. Expressed in terms of index values the range is from 1.00 for the passenger car to 45.90 for the biggest combination.

Expression of the tax-study findings in terms of required tax payment per mile of travel eliminates the effect of the greater mileages traveled by the heavier vehicles, and thus narrows the range of variation. The median values of recommended tax payments per mile are found to vary from 0.43 cents in the case of the passenger car to 3.67 cents for the biggest combination. In terms of index values the range is from 1.00 to 8.54.

By the expression of the tax-study findings in terms of recommended tax payments per gross ton-mile, the trend-line is caused to decrease rather than increase with weight of vehicle. Although a number of the tax studies in these nine States were based on the gross ton-mile theory, which holds that user taxes should be paid in proportion to the product of weight and distance traveled, there was a tendency for the investigators to mitigate their theoretical findings somewhat when faced with the task of devising and recommending an actual schedule of taxation.

The downward trend in payments per ton-mile under tax-study recommendations is shown very plainly in the bottom panel of figure 1. If the gross ton-mile concept were fully accepted this trend would be horizontal.

Median User-Tax Payments at 1955 Rates

The lower portion of table 2 gives the median values, for the same nine States plus Idaho and Oregon, of the user-tax payments required of the eight selected vehicles under the tax schedules prevailing in 1955. The actual values are shown graphically in figure 2.

The median values of actual required tax payments show similar trends to those of the tax-study recommendations, the values being higher in some cases and lower in others. Although the existing tax schedules in most of the nine tax-study States impose lower requirements on the heavy truck combinations than those recommended, the median values fail to reflect this tendency. This is largely due to the inclusion of values for Idaho and Oregon, which were not in the tax-study group. Since the tax schedules in these two States are generally on the high side, the median values are definitely higher than they would have been if the two States had not been included. The median values for the 11 States are, however, indicative of the trend of required tax payments in States that have, in recent years, given definite attention to the problem of allocating user-tax responsibility among vehicles of different sizes and weights. The ranges in required values may be expressed briefly as follows:

	From passenger-car payment of—	*To tractor-semitrailer-trailer payment of—*
Per year	$41	$2,214.
Per mile	0.44 cents	4.43 cents.
Per ton-mile	0.23 cents	0.12 cents.

Table 2.—Median road-user tax payments for selected vehicles

Basis for payment	No. 1: Passenger car	Single-unit trucks		No. 4: Bus	Truck combinations			
		No. 2: Pickup	No. 3: 2-axle, 6-tire		Tractor-semitrailer		No. 7: Truck-trailer	No. 8: Tractor-semitrailer-trailer
					No. 5: 3-axle	No. 6: 4-axle		
PART 2.—TOTAL USER-TAX PAYMENTS UNDER TAX-STUDY RECOMMENDATIONS IN 9 STATES								
Payments per year:								
Median payments—dollars	40	46	207	1,009	965	1,229	1,710	1,836
Index	1.00	1.15	5.18	25.23	24.13	30.73	42.75	45.90
Payments per mile:								
Median payments—cents	0.430	0.575	2.070	2.018	2.540	3.073	3.419	3.672
Index	1.00	1.34	4.81	4.69	5.91	7.15	7.95	8.54
Payments per ton-mile:								
Median payments—cents	0.222	0.240	0.218	0.149	0.127	0.123	0.100	0.102
Index	1.00	1.08	0.98	0.67	0.57	0.55	0.45	0.46
PART 2.—TOTAL USER-TAX PAYMENTS AT 1955 RATES IN 11 STATES[1]								
Payments per year:								
Median payments—dollars	41	48	182	866	881	1,220	1,860	2,214
Index	1.00	1.17	4.44	21.12	21.49	29.76	45.37	54.00
Payments per mile:								
Median payments—cents	0.441	0.600	1.820	1.732	2.318	3.050	3.720	4.428
Index	1.00	1.36	4.13	3.93	5.26	6.92	8.44	10.04
Payments per ton-mile:								
Median payments—cents	0.227	0.250	0.192	0.128	0.116	0.122	0.109	0.123
Index	1.00	1.10	0.85	0.56	0.51	0.54	0.48	0.54

[1] The median is the middle value of a series arranged in order of magnitude; for example, in the series of numbers, 27, 36, 40, 51, 63, the median is 40. In the case of an even numbered series the average of the two middle values is taken.

[1] The 9 States included in part 1 plus Oregon, which has a tax structure based on the findings of incremental studies, and Idaho, which has a mileage tax similar in coverage to those in Colorado, New York, Ohio, and Oregon.

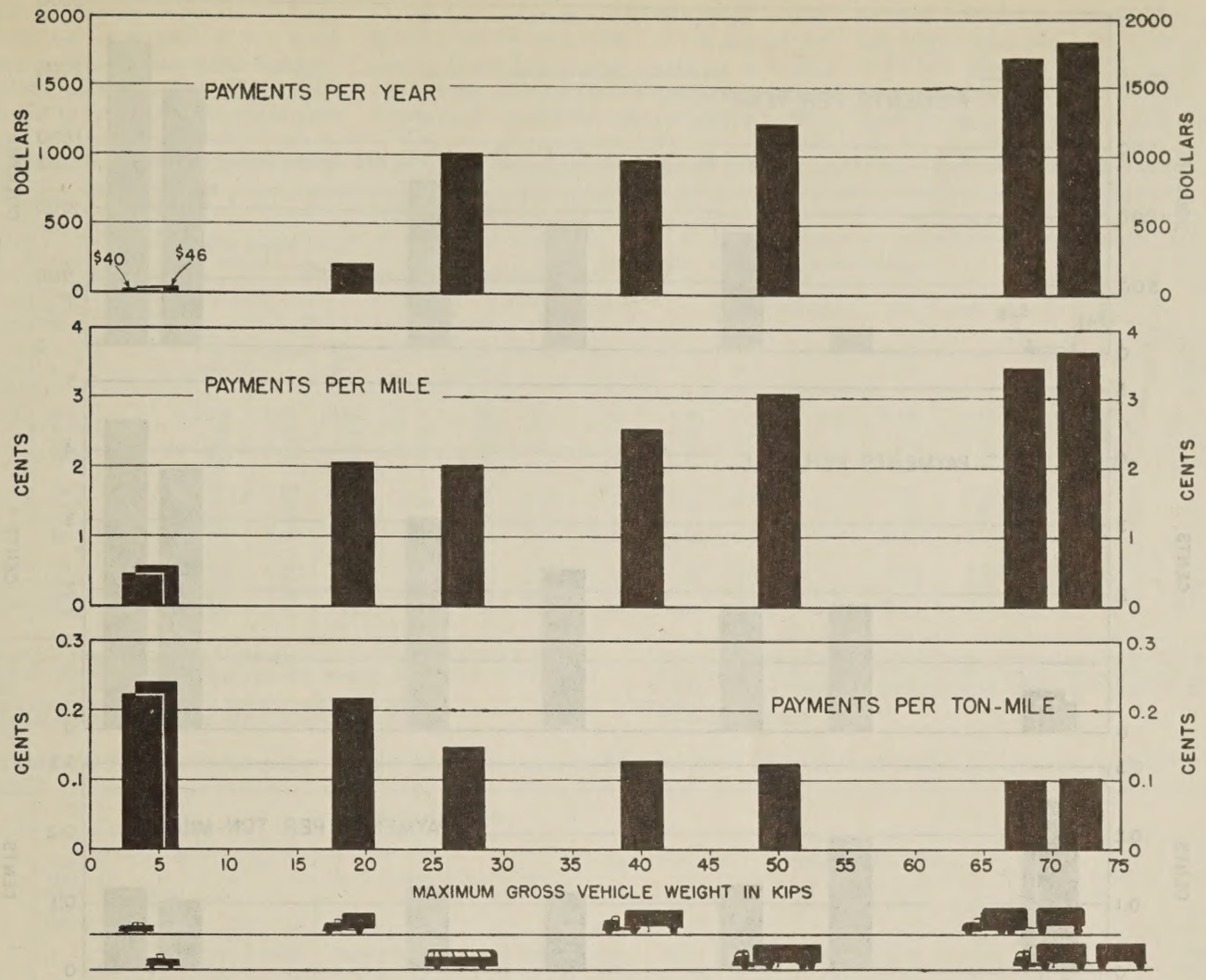


Figure 1.—Median user-tax payments under tax-study recommendations in nine States.

State-by-State Comparisons of Tax-Study Recommendations

The data on tax-study recommendations for the nine States for which comparable data were available are presented in tables 3, 5, and 6, the values being given respectively in terms of tax payments per year, per mile, and per ton-mile. In the third column of each table there is given a series of symbols indicating for each State the type of tax study or studies on which the findings in that State were based. As indicated by the symbol "T" the majority of studies were based on the gross ton-mile concept, previously discussed. Of the two studies made in Ohio the one symbolized "S" was conducted by the standard-cost method which, as applied to motor-vehicle taxation, was a modified ton-mile solution.

The incremental method, denoted by the symbol "I" and used in Louisiana, Minnesota, and Ohio, is based on the concept that successive increments of highway cost are occasioned by vehicle groups of successively

Table 3.—Total user-tax payments per year (in dollars) for selected vehicles under tax-study recommendations

State	Year tax study published	Method[1]	Single-unit trucks								Truck combinations							
			No. 1: Passenger car		No. 2: Pickup		No. 3: 2-axle, 6-tire		No. 4: Bus		Tractor-semitrailer				No. 7: Truck-trailer		No. 8: Tractor-semitrailer-trailer	
											No. 5: 3-axle		No. 6: 4-axle					
			Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index
California	1946	T	25	1.00	29	1.16	128	5.12	870	34.80	885	35.40	1,135	45.40	1,672	66.88	1,847	73.88
Colorado [2]	1950	T	55	1.00	51	.93	292	5.31	1,749	31.80	2,423	44.05	3,112	56.58	5,126	93.20	5,392	98.04
Colorado [3]	1950	T	52	1.00	49	.94	282	5.42	1,665	32.02	2,265	43.56	2,921	56.17	4,841	93.10	5,098	98.04
Illinois	1948	T	40	1.00	51	1.28	264	6.60	972	24.30	1,161	29.03	1,241	31.03	1,479	36.98	1,500	37.50
Louisiana	1955	IC	46	1.00	46	1.00	220	4.78	1,009	21.93	934	20.30	1,217	26.46	1,680	36.52	(4)	-----
Minnesota	1954	I	52	1.00	47	.90	207	3.98	2,063	39.67	1,234	23.73	1,833	35.24	(4)	-----	(4)	-----
New York [5]	1950	T	47	1.00	65	1.38	287	6.11	1,255	26.70	1,540	32.77	2,639	56.15	(4)	-----	(4)	-----
New York [6]	1950	T	22	1.00	26	1.18	106	4.82	549	24.95	610	27.73	1,010	45.91	(4)	-----	(4)	-----
Ohio	1951	S	38	1.00	58	1.53	169	4.45	1,107	29.13	1,016	26.74	1,351	35.55	1,651	43.45	2,310	60.79
Ohio	1953	I	39	1.00	38	.97	208	5.33	1,389	35.62	996	25.54	1,353	34.69	2,327	59.67	2,118	54.31
Utah	1950	T	33	1.00	36	1.09	159	4.82	(7)	-----	836	25.33	1,156	35.03	1,739	52.70	1,825	55.30
Washington	1948	T	40	1.00	36	.90	177	4.43	982	24.55	790	19.75	1,061	26.53	1,874	46.85	1,768	44.15

[1] Method used to allocate tax responsibility indicated thus: I=Incremental; IC=Recommendations based on findings of incremental and cost-function solutions; S=Standard cost; T=Ton mile.
[2] Motor-fuel tax rate of 8.5 cents per gallon and low registration fees.
[3] Motor-fuel tax rate of 6.5 cents per gallon and high registration fees.
[4] Vehicle combination not permitted by State size and weight regulations.
[5] Maximum expenditure program with motor-fuel tax rate of 4 cents per gallon.
[6] Continuation of "current" (1949) expenditure level with motor-fuel tax rate of 3 cents per gallon.
[7] No recommendation.

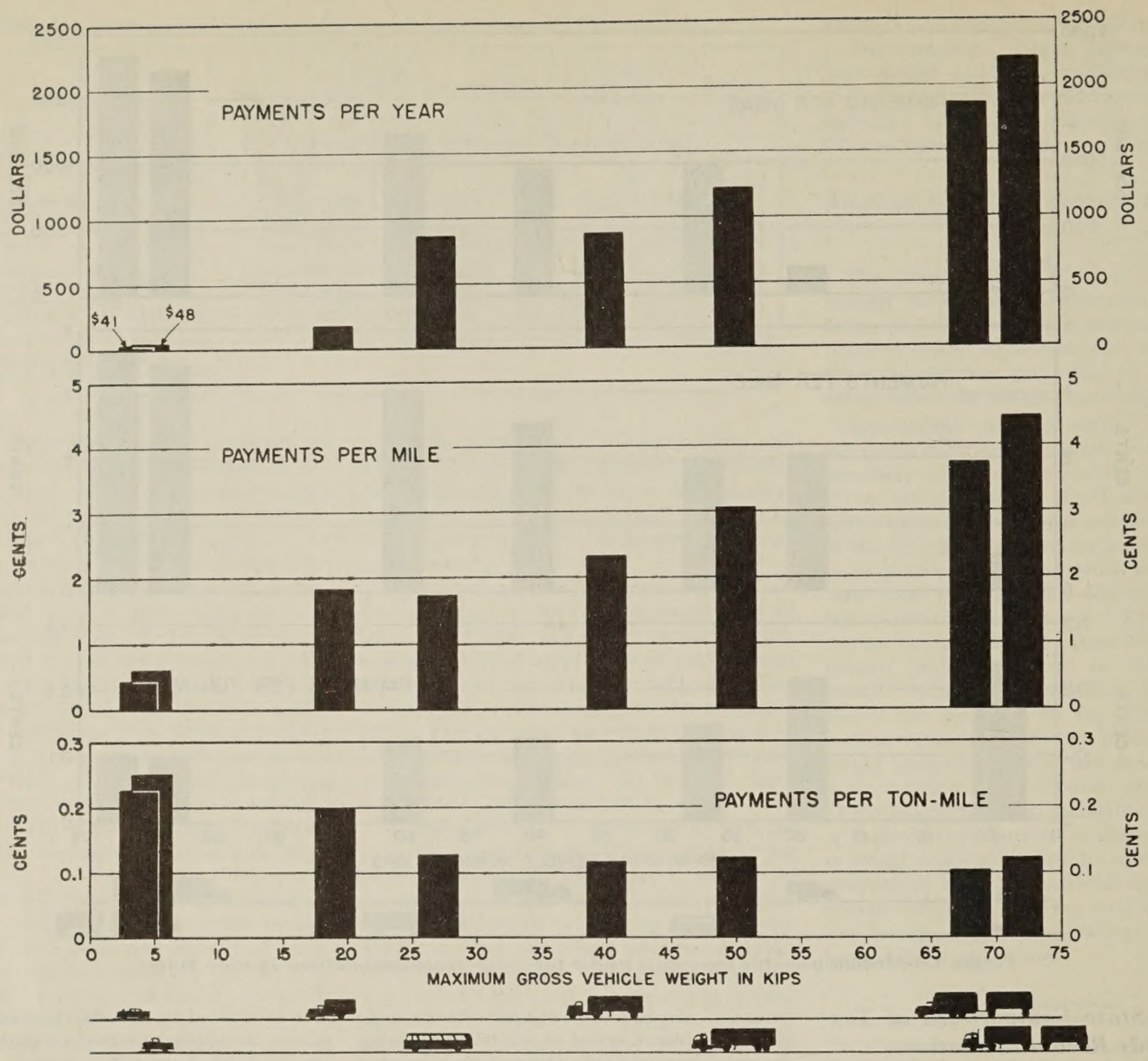


Figure 2.—Median user-tax payments at 1955 rates in 11 States (includes the 9 States for which tax-study recommendations are reported in figure 1 plus Idaho and Oregon).

greater size and weight. The cost-function method, which was combined with an incremental study to produce the Louisiana findings, divides highway costs into three groups: (*1*) Those assignable on a per-vehicle basis, (*2*) those assignable on a per-mile basis, and (*3*) those assignable on a weight or ton-mile basis.

It will be noted that two sets of findings are reported for Colorado and New York, as well as for Ohio. Since the investigators in both Colorado and New York offered several alternatives and expressed no decided preference for any one of them, two proposals were selected to illustrate the findings in each of those States. In the Colorado case two different assumptions were made regarding the relative magnitudes of gasoline-tax rates and registration fees. In New York two different levels of required revenue were postulated.

A glance at each column of table 3 (p. 75) will disclose a wide disparity among the States in the study findings for the several selected vehicles. Similar glances along successive lines will reveal no consistent pattern of upward variation with size of vehicle. Several reasons can be definitely assigned to account for this dispersion. The principal reason, perhaps, lies in the relative magnitudes of the highway programs which the various recommended tax schedules were designed to finance. States differ in the relative extent of their highway needs, and also in the adequacy of the programs designed to meet those needs. The number of motor vehicles in relation to the required revenues affects the general level of user taxation; and the composition of the vehicle population with respect to size and weight may affect the charges to the several size groups.

Table 4.—Comparison of tax-study findings for selected truck combinations indicating the range of required tax payments

Class interval of required tax payment	Number of tax studies		
	No 5: 3-axle tractor-semi-trailer	No 6: 4-axle tractor-semi-trailer	No 8: 5-axle tractor-semi-trailer-trailer
Dollars			
500–749	1	-----	-----
750–999	5	-----	-----
1,000–1,249	3	6	-----
1,250–1,499	-----	2	-----
1,500–1,999	1	1	4
2,000–2,999	2	2	2
3,000 and over	-----	1	2

The study findings are naturally affected by the particular method (incremental, ton-mile, etc.) used for the assignment of tax responsibility. There is a tendency also for investigators, when converting the tax-study results into the form of a recommended schedule of tax rates, to modify, in the interest of simplicity and uniformity, the findings derived from the strict application of theory or formulated procedure.

In spite of the apparent shotgun scatter of study findings, some rudiments of a pattern, or at least a discernible central tendency, begin to emerge when the recommended payments for a given vehicle are grouped by intervals as shown in table 4.

It will be observed that for all three truck combinations the modal class interval (the

interval within and about which the findings cluster) lies in the lower part of the total range of values covered by the study findings.

Turning to the lighter weight vehicles, we find that 6 out of 12 tax studies recommended annual passenger-car payments lying within the interval $37.50 to $50. In the case of the pickup truck the central tendency is weak, the recommendations being distributed rather evenly over a range extending from $26 to $65. So also with the bus, for which the findings are widely scattered over a range from $549 to $2,063. By contrast 7 out of 12 tax studies recommend annual payments for the 2-axle, 6-tire truck lying between $200 and $300.

Table 5.—Total user-tax payments per mile (in cents) for selected vehicles under tax-study recommendations

State	Year tax study published	Method[1]	Single-unit trucks						Truck combinations							
			No. 1: Passenger car		No. 2: Pickup		No. 3: 2-axle, 6-tire		No. 4: Bus		Tractor-semitrailer				No. 7: Truck-trailer		No. 8: Tractor-semitrailer-trailer	
											No. 5: 3-axle		No. 6: 4-axle					
			Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index
California	1946	T	0.269	1.00	0.363	1.35	1.280	4.76	1.740	6.47	2.329	8.66	2.838	10.55	3.344	12.43	3.694	13.73
Colorado[2]	1950	T	.591	1.00	.638	1.08	2.920	4.94	3.498	5.92	6.376	10.79	7.780	13.16	10.252	17.35	10.784	18.25
Colorado[3]	1950	T	.559	1.00	.613	1.10	2.820	5.04	3.330	5.96	5.961	10.67	7.303	13.06	9.682	17.32	10.196	18.24
Illinois	1948	T	.430	1.00	.638	1.48	2.640	6.14	1.944	4.52	3.055	7.10	3.103	7.22	2.958	6.88	3.000	6.98
Louisiana	1955	IC	.495	1.00	.575	1.16	2.200	4.44	2.018	4.08	2.458	4.97	3.043	6.15	3.360	6.79	(4)	-----
Minnesota	1954	I	.559	1.00	.588	1.05	2.070	3.70	4.126	7.38	3.247	5.81	4.583	8.20	(4)	-----	(4)	-----
New York[5]	1950	T	.505	1.00	.813	1.61	2.870	5.68	2.510	4.97	4.053	8.03	6.598	13.06	(4)	-----	(4)	-----
New York[6]	1950	T	.237	1.00	.325	1.37	1.060	4.47	1.098	4.63	1.605	6.77	2.525	10.65	(4)	-----	(4)	-----
Ohio	1951	S	.409	1.00	.725	1.77	1.690	4.13	2.214	5.41	2.674	6.54	3.378	8.26	3.302	8.07	4.620	11.30
Ohio	1953	I	.419	1.00	.475	1.13	2.080	4.96	2.778	6.63	2.621	6.26	3.383	8.07	4.654	11.11	4.236	10.11
Utah	1950	T	.355	1.00	.450	1.27	1.590	4.48	(7)	-----	2.200	6.20	2.890	8.14	3.478	9.80	3.650	10.28
Washington	1948	T	.430	1.00	.450	1.05	1.770	4.12	1.964	4.57	2.079	4.83	2.653	6.17	3.748	8.72	3.532	8.21

[1] Method used to allocate tax responsibility indicated thus: I=Incremental; IC=Recommendations based on findings of incremental and cost-function solutions; S=Standard cost; T=Ton mile.
[2] Motor-fuel tax rate of 8.5 cents per gallon and low registration fees.
[3] Motor-fuel tax rate of 6.5 cents per gallon and high registration fees.
[4] Vehicle combination not permitted by State size and weight regulations.
[5] Maximum expenditure program with motor-fuel tax rate of 4 cents per gallon.
[6] Continuation of "current" (1949) expenditure level with motor-fuel tax rate of 3 cents per gallon.
[7] No recommendation.

Table 6.—Total user-tax payments per ton-mile (in cents) for selected vehicles under tax-study recommendations

State	Year tax study published	Method[1]	Single-unit trucks						Truck combinations							
			No. 1: Passenger car		No. 2: Pickup		No. 3: 2-axle, 6-tire		No. 4: Bus		Tractor-semitrailer				No. 7: Truck-trailer		No. 8: Tractor-semitrailer-trailer	
											No. 5: 3-axle		No. 6: 4-axle					
			Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index
California	1946	T	0.139	1.00	0.151	1.09	0.135	0.97	0.129	0.93	0.116	0.83	0.114	0.82	0.098	0.71	0.103	0.74
Colorado[2]	1950	T	.304	1.00	.266	.87	.307	1.01	.259	.85	.319	1.05	.311	1.02	.302	.99	.299	.98
Colorado[3]	1950	T	.288	1.00	.255	.89	.297	1.03	.247	.86	.298	1.03	.292	1.01	.285	.99	.283	.98
Illinois	1948	T	.222	1.00	.266	1.20	.278	1.25	.144	.65	.153	.69	.124	.56	.087	.39	.083	.37
Louisiana	1955	IC	.255	1.00	.240	.94	.232	.91	.149	.58	.123	.48	.122	.48	.099	.39	(4)	-----
Minnesota	1954	I	.288	1.00	.245	.85	.218	.76	.306	1.06	.162	.56	.183	.64	(4)	-----	(4)	-----
New York[5]	1950	T	.260	1.00	.339	1.30	.302	1.16	.186	.72	.203	.78	.264	1.02	(4)	-----	(4)	-----
New York[6]	1950	T	.122	1.00	.135	1.11	.112	.92	.081	.66	.080	.66	.101	.83	(4)	-----	(4)	-----
Ohio	1951	S	.211	1.00	.302	1.43	.178	.84	.164	.78	.134	.64	.135	.64	.097	.46	.128	.61
Ohio	1953	I	.216	1.00	.198	.92	.219	1.01	.206	.95	.131	.61	.135	.62	.137	.63	.118	.55
Utah	1950	T	.183	1.00	.187	1.02	.167	.91	(7)	-----	.110	.60	.116	.63	.102	.56	.101	.55
Washington	1948	T	.222	1.00	.187	.84	.186	.84	.145	.65	.104	.47	.106	.48	.110	.50	.098	.44

[1] Method used to allocate tax responsibility indicated thus: I=Incremental; IC=Recommendations based on findings of incremental and cost-function solutions; S=Standard cost; T=Ton mile.
[2] Motor-fuel tax rate of 8.5 cents per gallon and low registration fees.
Motor-fuel tax rate of 6.5 cents per gallon and high registration fees.
[4] Vehicle combination not permitted by State size and weight regulations.
[5] Maximum expenditure program with motor-fuel tax rate of 4 cents per gallon.
[6] Continuation of "current" (1949) expenditure level with motor-fuel tax rate of 3 cents per gallon.
[7] No recommendation.

Table 7.—Total user-tax payments per year (in dollars) for selected vehicles at 1955 tax rates in selected States

State	Single-unit trucks						Truck combinations							
	No. 1: Passenger car		No. 2: Pickup		No. 3: 2-axle, 6-tire		No. 4: Bus		Tractor-semitrailer				No. 7: Truck-trailer		No. 8: Tractor-semitrailer-trailer	
									No. 5: 3-axle		No. 6: 4-axle					
	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index
California	41	1.00	53	1.29	152	3.71	734	17.90	650	15.85	806	19.66	1,232	30.05	1,230	30.00
Colorado	39	1.00	40	1.03	168	4.31	1,668	42.77	1,211	31.05	1,529	39.21	2,505	64.23	2,627	67.36
Idaho	51	1.00	48	.94	191	3.75	979	19.20	1,082	21.22	1,415	27.75	2,359	46.25	2,491	48.84
Illinois	38	1.00	46	1.21	223	5.87	866	22.79	1,036	27.26	1,265	33.29	1,860	48.95	1,937	50.97
Louisiana	42	1.00	46	1.10	190	4.52	917	21.83	834	19.86	1,007	23.98	1,440	34.29	(1)	-----
Minnesota	51	1.00	51	1.00	154	3.02	1,748	34.27	756	14.82	986	19.33	(1)	-----	(1)	-----
New York	37	1.00	46	1.24	182	4.92	467	12.62	881	23.81	1,220	32.97	(1)	-----	(1)	-----
Ohio	38	1.00	62	1.63	208	5.47	865	22.76	1,057	27.82	1,467	38.61	2,632	69.26	2,542	66.89
Oregon	43	1.00	53	1.23	216	5.02	1,187	27.60	1,304	30.33	1,765	41.05	3,050	70.93	3,225	75.00
Utah	33	1.00	33	1.00	124	3.76	812	24.61	546	16.55	691	20.94	1,219	36.94	1,165	35.30
Washington	41	1.00	48	1.17	158	3.85	743	18.12	675	16.46	944	23.02	1,594	38.88	1,446	35.27

[1] Vehicle combination not permitted by State size and weight regulations.

Table 8.—Comparison of tax payments per year required of a 50,000-pound, 4-axle tractor-semitrailer (No. 6) under tax-study recommendations and under 1955 rates in nine States

State	Tax payments per year		Excess of tax-study recommendations over 1955 payments
	Tax-study recommendations	Required tax payments at 1955 rates	
California	$1,135	$806	$329
Colorado [1]	3,112	1,529	1,583
Colorado [2]	2,921		1,392
Illinois	1,241	1,265	−24
Louisiana	1,217	1,007	210
Minnesota	1,833	986	847
New York [3]	2,639	1,220	1,419
New York [4]	1,010		−210
Ohio [5]	1,351	1,467	−116
Ohio [6]	1,353		−114
Utah	1,156	691	465
Washington	1,061	944	117

[1] Motor-fuel tax rate of 8.5 cents per gallon and low registration fees.
[2] Motor-fuel tax rate of 6.5 cents per gallon and high registration fees.
[3] Maximum expenditure program with motor-fuel tax rate of 4 cents per gallon.
[4] Continuation of "current" (1949) expenditure level with motor-fuel tax rate of 3 cents per gallon.
[5] Standard-cost method used to allocate tax responsibility.
[6] Incremental method used to allocate tax responsibility.

In table 5 (p. 77) the study findings are expressed in required user-tax payments per mile. The range of variation among the several vehicle classes is narrowed by the elimination of the mileage factor. From State to State the pattern is unchanged by this conversion, and comparisons would reveal the same central tendency.

Recommended payments per ton-mile are shown in table 6 (p. 77). The ton-miles used in computing this table are the products of assumed annual mileage and maximum gross weight. Had average operating weights been used instead of maximum gross weights, the payments for the heavier vehicles would have been higher and the indexes relative to the passenger-car value would generally have been nearer to unity.

There is a general, although by no means entirely consistent, tendency for the recommended payments per ton-mile to decline as the size of vehicle increases. This trend is evidenced even in those States where a gross ton-mile solution was used. An exception occurs in the case of Colorado, where the values hover about 3 mills per ton-mile throughout the range of vehicle size.

Although size and weight as well as miles traveled are important considerations in motor-vehicle taxation, there is no scientific basis for the contention that such taxes should be made directly proportional to gross ton-miles. For example, the required thickness of a slab or beam varies as the square root of the load, rather than directly with the load itself. Numerous students of the subject have rejected the ton-mile theory and have resorted to the incremental solution, which attempts to assign tax responsibility in proportion to the costs occasioned by the traffic of vehicles of different sizes.

State-by-State Comparisons of Tax Payments at 1955 Rates

Tables 7 (p. 77), 9, and 10 give corresponding values of actual required tax payments at 1955 rates, per year, per mile, and per ton-mile, respectively. Values for Idaho and Oregon are given in addition to those for the nine tax-study States.

The appearance and general import of these tables are not unlike what is found in the tax-study tables, 3, 5, and 6. It is of interest nonetheless to compare the actual required tax payments in 1955 with the recommendations of the several tax studies. A single example, that of the 50,000-pound, 4-axle tractor-semitrailer—a widely used type of combination—will suffice. The comparison is given in table 8 for the required tax payments per year.

Quite evidently the general trend is for the tax laws enacted by the State legislatures to fall short of the tax-study recommendations. In 8 of the 12 comparisons shown the required payments are less than those recommended. In Illinois and Ohio the required payments somewhat exceed the tax-study recommen-

Table 9.—Total user-tax payments per mile (in cents) for selected vehicles at 1955 tax rates in selected States

State	No. 1: Passenger car		Single-unit trucks				No. 4: Bus		Truck combinations							
			No. 2: Pickup		No. 3: 2-axle, 6-tire				Tractor-semitrailer				No. 7: Truck-trailer		No. 8: Tractor-semitrailer-trailer	
									No. 5: 3-axle		No. 6: 4-axle					
	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index
California	0.441	1.00	0.663	1.50	1.520	3.45	1.468	3.33	1.711	3.88	2.015	4.57	2.464	5.59	2.460	5.58
Colorado	.419	1.00	.500	1.19	1.680	4.01	3.336	7.96	3.187	7.61	3.823	9.12	5.010	11.96	5.254	12.54
Idaho	.548	1.00	.600	1.09	1.910	3.49	1.958	3.57	2.847	5.20	3.538	6.46	4.718	8.61	4.982	9.09
Illinois	.409	1.00	.575	1.41	2.230	5.45	1.732	4.23	2.726	6.66	3.163	7.73	3.720	9.10	3.874	9.47
Louisiana	.452	1.00	.575	1.27	1.900	4.20	1.834	4.06	2.195	4.86	2.518	5.57	2.880	6.37	(1)	---
Minnesota	.548	1.00	.638	1.16	1.540	2.81	3.496	6.38	1.989	3.63	2.465	4.50	(1)	-----	(1)	---
New York	.398	1.00	.575	1.44	1.820	4.57	.934	2.35	2.318	5.82	3.050	7.66	(1)	-----	(1)	---
Ohio	.409	1.00	.775	1.89	2.080	5.09	1.730	4.23	2.782	6.80	3.668	8.97	5.264	12.87	5.084	12.43
Oregon	.462	1.00	.663	1.44	2.160	4.68	2.374	5.14	3.432	7.43	4.413	9.55	6.100	13.20	6.450	13.96
Utah	.355	1.00	.413	1.16	1.240	3.49	1.624	4.57	1.437	4.05	1.728	4.87	2.438	6.87	2.330	6.56
Washington	.441	1.00	.600	1.36	1.580	3.58	1.486	3.37	1.776	4.03	2.360	5.35	3.188	7.23	2.892	6.56

[1] Vehicle combination not permitted by State size and weight regulations.

Table 10.—Total user-tax payments per ton-mile (in cents) for selected vehicles at 1955 tax rates in selected States

State	No. 1: Passenger car		Single-unit trucks				No. 4: Bus		Truck combinations							
			No. 2: Pickup		No. 3: 2-axle, 6-tire				Tractor-semitrailer				No. 7: Truck-trailer		No. 8: Tractor-semitrailer-trailer	
									No. 5: 3-axle		No. 6: 4-axle					
	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index	Payment	Index
California	0.227	1.00	0.276	1.22	0.160	0.70	0.109	0.48	0.086	0.38	0.081	0.36	0.072	0.32	0.068	0.30
Colorado	.216	1.00	.208	.96	.177	.82	.247	1.14	.159	.74	.153	.71	.147	.68	.146	.68
Idaho	.282	1.00	.250	.89	.201	.71	.145	.51	.142	.50	.142	.50	.139	.49	.138	.49
Illinois	.211	1.00	.240	1.14	.235	1.11	.128	.61	.136	.64	.127	.60	.109	.52	.108	.51
Louisiana	.233	1.00	.240	1.03	.200	.86	.136	.58	.110	.47	.101	.43	.085	.36	(1)	-----
Minnesota	.282	1.00	.266	.94	.162	.57	.253	.90	.099	.35	.099	.35	(1)	-----	(1)	-----
New York	.205	1.00	.240	1.17	.192	.94	.069	.34	.116	.57	.122	.60	(1)	-----	(1)	-----
Ohio	.211	1.00	.323	1.53	.219	1.04	.128	.61	.139	.66	.147	.70	.155	.73	.141	.67
Oregon	.238	1.00	.276	1.16	.227	.95	.176	.74	.172	.72	.177	.74	.179	.75	.179	.75
Utah	.183	1.00	.172	.94	.131	.72	.120	.66	.072	.39	.069	.38	.072	.39	.065	.36
Washington	.227	1.00	.250	1.10	.166	.73	.110	.48	.089	.39	.094	.41	.094	.41	.080	.35

[1] Vehicle combination not permitted by State size and weight regulations.

dations. In New York the tax-study findings based on continuation of the current expenditure level are lower than the required tax payments at 1955 rates; but the findings based on highway needs (the "maximum expenditure program") are much greater than the actual required payments. The Louisiana report was released only recently and there has been insufficient time for the legislature to deal with its recommendations. In Minnesota no legislative action had been taken subsequent to the tax-study findings.

State-by-State comparisons of required tax payments per mile are set forth in table 9. The comparisons on a ton-mile basis are given in table 10. The downward trend in payments per ton-mile is notable. There is, however, a tendency, in States where weight-distance or similar taxes have been enacted, for the rates per ton-mile on truck combinations to hold steady, or even to increase slightly with increasing size. This trend may be observed in the amounts for Colorado, Idaho, New York, Ohio, and Oregon.

Summary

The results of this brief review of State tax-study recommendations regarding the rates of user-tax payments by vehicles of different sizes and weights are summarized in the following numbered paragraphs:

1. Median values of tax-study findings range from $40 per year for a light passenger car to $1,836 per year for a 5-axle tractor semitrailer-trailer combination; and from 0.43 to 3.67 cents per mile of travel.

2. With respect to the rate of recommended tax payments per gross ton-mile, the trend of median tax-study values is downward. The variation among the vehicles selected for study extends from 2.2 mills per ton-mile for the light passenger car to 1.2 mills for the 4-axle tractor-semitrailer and 1.0 mill for the 5-axle tractor-semitrailer-trailer.

3. There is a wide variation from State to State in the recommended user-tax payments for each of the eight vehicles selected for comparison. In spite of this dispersion there is a marked central tendency, particularly among the heavy vehicle combinations, in that the study findings tend to group within relatively narrow intervals. Thus, for the 3-axle tractor-semitrailer, 5 out of 12 studies recommend annual tax payments within the range $750 to $1,000. In 6 out of 12 studies the recommended payment for the 4-axle tractor-semitrailer lies between $1,000 and $1,250 per year. For the largest combination in the group, the 5-axle tractor-semitrailer-trailer, 4 out of 8 studies recommended annual tax payments lying between $1,500 and $2,000.

4. Comparison of the tax-study findings with the payments required under 1955 tax rates reveals a general tendency (with exceptions) for the tax laws enacted by State legislatures to fall short of tax-study recommendations in the payments required of heavy motor vehicles and combinations. For example, 8 out of 12 tax-study findings recommended greater user-tax payments for the 4-axle tractor-semitrailer than were imposed under the corresponding 1955 tax laws in the nine States in which the studies were made.

Appendix A

Tables 11–18 give the results of this analysis in full. Each table presents the data for one of the eight selected vehicles, beginning with the passenger car in table 11 and ending with the 5-axle tractor-semitrailer-trailer combination in table 18.

Part 1 of each table gives, for the particular vehicle, the recommended tax payments as derived from the tax studies in all of the nine States. Part 1 is again divided into two sections. That on the left gives the tax-study findings according to the values of annual mileage and miles per gallon used for the given vehicle in each study. In the case of those States where registered gross weight was used as a basis of vehicle grouping, the required tax payments were evaluated directly for the given vehicle group. In States where a different vehicle grouping was used (Ohio, for example, registers vehicles by empty weight), it was necessary to determine into what group according to the State's classification the vehicle, as described in table 1, would properly fall. The information obtained and tabulated in this manner was omitted from the main body of the report because of the defectiveness of State-to-State comparisons.

The right-hand section of part 1 in tables 11–18 gives the tax-study findings as computed on a uniform basis by the use of the values of gross weight, annual mileage, and miles per gallon listed in table 1. Part 2 gives the user-tax payments as required under tax rates prevailing in 1955. In all three sections of these tables values are given in terms of required tax payment per year, per mile, and per ton-mile.

The most pertinent comparisons among vehicles and among States are discussed in the text. The inclusion of tables 11–18 in the appendix provides the opportunity for more detailed comparisons, with particular reference to the tax-study findings on the bases established in the individual studies made in nine States.

Table 11.—Tax payments under tax-study recommendations and at 1955 tax rates in selected States on a lightweight passenger car (No. 1)

State	Part 1.—Tax study recommendations									Part 2.—Total 1955 user-tax payments based on uniform amount of travel and fuel usage [2]		
	Year tax study published	Method [1]	State's own basis					Total user-tax payments based on uniform amount of travel and fuel usage [2]				
			Annual travel	Fuel consumption rate	Total user-tax payments							
					Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile
			Miles	*Miles/gal.*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*
California	1946	T	8,554	15.5	25	0.292	0.150	25	0.269	0.139	41	0.441	0.227
Colorado [3]	1950	T	9,200	16.3	56	.609	.314	55	.591	.304	39	.419	.216
Colorado [4]	1950	T	9,200	16.3	53	.576	.297	52	.559	.288	-----	-----	-----
Idaho	--------	--------	--------	--------	-----	-----	-------	-----	-----	-------	51	.548	.282
Illinois	1948	T	9,250	15.5	42	.454	.234	40	.430	.222	38	.409	.211
Louisiana	1955	IC	10,143	14.8	55	.542	.279	46	.495	.255	42	.452	.233
Minnesota	1954	I	8,935	14.9	55	.616	.317	52	.559	.288	51	.548	.282
New York [5]	1950	T	8,500	15.7	47	.553	.285	47	.505	.260	37	.398	.205
New York [6]	1950	T	8,500	15.7	21	.247	.127	22	.237	.122	-----	-----	-----
Ohio	1951	S	9,230	15.9	39	.423	.218	38	.409	.211	38	.409	.211
Ohio	1953	I	9,235	15.0	42	.455	.234	39	.419	.216	-----	-----	-----
Oregon	--------	--------	--------	--------	-----	-----	-------	-----	-----	-------	43	.462	.238
Utah	1950	T	10,000	15.5	37	.370	.191	33	.355	.183	33	.355	.183
Washington	1948	T	8,085	16.2	36	.445	.229	40	.430	.222	41	.441	.227

[1] Method used to allocate tax responsibility indicated thus: I=Incremental; IC=Recommendations based on findings of incremental and cost-function solutions; S=Standard cost; T=Ton-mile.
[2] Travel, 9,300 miles per year; fuel consumption rate, 16.7 miles per gallon.
[3] Motor-fuel tax rate of 8.5 cents per gallon and low registration fees.
[4] Motor-fuel tax rate of 6.5 cents per gallon and high registration fees.
[5] Maximum expenditure program with fuel-tax rate of 4 cents per gallon.
[6] Continuation of "current" (1949) expenditure level with fuel-tax rate of 3 cents per gallon.

Table 12.—Tax payments under tax-study recommendations and at 1955 tax rates in selected States on a pickup truck (No. 2)

State	Part 1.—Tax study recommendations							Part 1.—Tax study recommendations			Part 2.—Total 1955 user-tax payments based on uniform amount of travel and fuel usage [3]		
	Year tax study published	Method [1]	State's own basis					Total user-tax payments based on uniform amount of travel and fuel usage [2]					
			Annual travel	Fuel consumption rate	Total user-tax payments								
					Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile
			Miles	*Miles/gal.*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*
California	1946	T	11,400	15.5	37	0.325	0.135	29	0.363	0.151	53	0.663	0.276
Colorado [3]	1950	T	8,500	14.5	57	.671	.280	51	.638	.266	40	.500	.208
Colorado [4]	1950	T	8,500	14.5	54	.635	.265	49	.613	.255	-----	-----	-----
Idaho	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	48	.600	.250
Illinois	1948	T	10,000	14.3	60	.600	.250	51	.638	.266	46	.575	.240
Louisiana	1955	IC	7,305	13.0	49	.671	.280	46	.575	.240	46	.575	.240
Minnesota	1954	I	5,064	13.3	38	.750	.312	47	.588	.245	51	.638	.266
New York [5]	1950	T	8,500	12.8	71	.835	.348	65	.813	.339	46	.575	.240
New York [6]	1950	T	8,500	12.8	30	.353	.147	26	.325	.135	-----	-----	-----
Ohio	1951	S	12,214	12.5	81	.663	.276	58	.725	.302	62	.775	.323
Ohio	1953	I	10,700	13.0	53	.495	.206	38	.475	.198	-----	-----	-----
Oregon	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	53	.663	.276
Utah	1950	T	8,600	15.17	38	.442	.184	36	.450	.187	33	.413	.172
Washington	1948	T	8,068	12.75	44	.545	.227	36	.450	.187	48	.600	.250

[1] Method used to allocate tax responsibility indicated thus: I=Incremental; IC=Recommendations based on findings of incremental and cost-function solutions; S=Standard cost; T=Ton-mile.
[2] Travel, 8,000 miles per year; fuel consumption rate, 15.6 miles per gallon.
[3] Motor-fuel tax rate of 8.5 cents per gallon and low registration fees.
[4] Motor-fuel tax rate of 6.5 cents per gallon and high registration fees.
[5] Maximum expenditure program with fuel-tax rate of 4 cents per gallon.
[6] Continuation of "current" (1949) expenditure level with fuel-tax rate of 3 cents per gallon.

Table 13.—Tax payments under tax-study recommendations and at 1955 tax rates in selected States on a 2-axle, 6-tire truck (No. 3)

State	Part 1.—Tax study recommendations							Part 1.—Tax study recommendations			Part 2.—Total 1955 user-tax payments based on uniform amount of travel and fuel usage [2]		
	Year tax study published	Method [1]	State's own basis					Total user-tax payments based on uniform amount of travel and fuel usage [2]					
			Annual travel	Fuel consumption rate	Total user-tax payments								
					Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile
			Miles	*Miles/gal.*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*
California	1946	T	17,500	8.83	212	1.211	0.127	128	1.280	0.135	152	1.520	0.160
Colorado [3]	1950	T	13,900	7.4	343	2.468	.260	292	2.920	.307	168	1.680	.177
Colorado [4]	1950	T	13,900	7.4	321	2.309	.243	282	2.820	.297	-----	-----	-----
Idaho	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	191	1.910	.201
Illinois	1948	T	23,500	7.8	351	1.494	.157	264	2.640	.278	223	2.230	.235
Louisiana	1955	IC	25,344	5.8	436	1.723	.181	220	2.200	.232	190	1.900	.200
Minnesota	1954	I	15,000	8.1	247	1.647	.173	207	2.070	.218	154	1.540	.162
New York [5]	1950	T	15,000	8.0	311	2.073	.218	287	2.870	.302	182	1.820	.192
New York [6]	1950	T	15,000	8.0	123	.820	.086	106	1.060	.112	-----	-----	-----
Ohio	1951	S	17,593	7.6	221	1.256	.132	169	1.690	.178	208	2.080	.219
Ohio	1953	I	19,800	7.3	279	1.409	.148	208	2.080	.219	-----	-----	-----
Oregon	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	216	2.160	.227
Utah	1950	T	14,300	8.88	176	1.231	.130	159	1.590	.167	124	1.240	.131
Washington	1948	T	11,483	7.0	201	1.750	.184	177	1.770	.186	158	1.580	.166

[1] Method used to allocate tax responsibility indicated thus: I=Incremental; IC=Recommendations based on findings of incremental and cost-function solutions; S=Standard cost; T=Ton-mile.
[2] Travel, 10,000 miles per year; fuel consumption rate, 7.8 miles per gallon.
[3] Motor-fuel tax rate of 8.5 cents per gallon and low registration fees.
[4] Motor-fuel tax rate of 6.5 cents per gallon and high registration fees.
[5] Maximum expenditure program with fuel-tax rate of 4 cents per gallon.
[6] Continuation of "current" (1949) expenditure level with fuel-tax rate of 3 cents per gallon.

Table 14.—Tax payments under tax-study recommendations and at 1955 tax rates in selected States on a 41-passenger bus (No. 4)

State	Part 1.—Tax study recommendations									Part 2.—Total 1955 user-tax payments based on uniform amount of travel and fuel usage [2]		
	Year tax study published	Method [1]	State's own basis					Total user-tax payments based on uniform amount of travel and fuel usage [2]				
			Annual travel	Fuel consumption rate	Total user-tax payments							
					Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile
			Miles	*Miles/gal.*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*
California	1946	T	39,300	4.5	737	1.875	0.139	870	1.740	0.129	734	1.468	0.109
Colorado [3]	1950	T	50,060	5.1	1,780	3.560	.264	1,749	3.498	.259	1,668	3.336	.247
Colorado [4]	1950	T	50,000	5.1	1,689	3.378	.250	1,665	3.330	.247	-----	-----	-----
Idaho	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	979	1.958	.145
Illinois	1948	T	30,000	4.8	813	2.710	.201	972	1.944	.144	866	1.732	.128
Louisiana	1955	IC	65,000	4.8	1,303	2.005	.149	1,009	2.018	.149	917	1.834	.136
Minnesota	1954	I	100,000	6.1	3,944	3.944	.292	2,063	4.126	.306	1,748	3.496	.253
New York [5]	1950	T	27,500	5.2	1,089	3.960	.293	1,255	2.510	.186	467	.934	.069
New York [6]	1950	T	27,500	5.2	424	1.542	.114	549	1.098	.081	-----	-----	-----
Ohio	1951	S	50,000	5.0	1,136	2.272	.168	1,107	2.214	.164	865	1.730	.128
Ohio	1953	I	57,000	7.0	1,323	2.321	.172	1,389	2.778	.206	-----	-----	-----
Oregon	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,187	2.374	.176
Utah [7]	1950	T	-----	-----	-----	-----	-----	-----	-----	-----	812	1.624	.120
Washington	1948	T	48,182	4.5	1,065	2.210	.164	982	1.964	.145	743	1.486	.110

[1] Method used to allocate tax responsibility indicated thus: I=Incremental; IC=Recommendations based on findings of incremental and cost-function solutions; S=Standard cost; T=Ton-mile.
[2] Travel, 50,000 miles per year; fuel consumption rate, 5.3 miles per gallon.
[3] Motor-fuel tax rate of 8.5 cents per gallon and low registration fees.
[4] Motor-fuel tax rate of 6.5 cents per gallon and high registration fees.
[5] Maximum expenditure program with fuel-tax rate of 4 cents per gallon.
[6] Continuation of "current" (1949) expenditure level with fuel-tax rate of 3 cents per gallon.
[7] No recommendation.

Table 15.—Tax payments under tax-study recommendations and at 1955 tax rates in selected States on a 3-axle tractor-semitrailer (No. 5)

State	Part 1.—Tax study recommendations									Part 2.—Total 1955 user-tax payments based on uniform amount of travel and fuel usage [2]		
	Year tax study published	Method [1]	State's own basis					Total user-tax payments based on uniform amount of travel and fuel usage [2]				
			Annual travel	Fuel consumption rate	Total user-tax payments							
					Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile
			Miles	*Miles/gal.*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*
California	1946	T	17,500	4.41	424	2.423	0.121	885	2.329	0.116	650	1.711	0.086
Colorado [3]	1950	T	38,000	5.1	2,383	6.271	.314	2,423	6.376	.319	1,211	3.187	.159
Colorado [4]	1950	T	38,000	5.1	2,234	5.879	.294	2,265	5.961	.298	-----	-----	-----
Idaho	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,082	2.847	.142
Illinois	1948	T	36,500	4.3	1,189	3.258	.163	1,161	3.055	.153	1,036	2.726	.136
Louisiana	1955	IC	32,500	3.7	1,001	3.080	.154	934	2.458	.123	834	2.195	.110
Minnesota	1954	I	47,002	4.9	1,447	3.079	.154	1,234	3.247	.162	756	1.989	.099
New York [5]	1950	T	30,500	4.3	1,507	4.941	.247	1,540	4.053	.203	881	2.318	.116
New York [6]	1950	T	30,500	4.3	586	1.921	.096	610	1.605	.080	-----	-----	-----
Ohio	1951	S	44,500	4.0	1,181	2.654	.133	1,016	2.674	.134	1,057	2.782	.139
Ohio	1953	I	41,500	4.0	1,114	2.684	.134	996	2.621	.131	-----	-----	-----
Oregon	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1,304	3.432	.172
Utah	1950	T	34,100	4.81	794	2.328	.116	836	2.200	.110	546	1.437	.072
Washington	1948	T	25,035	4.4	647	2.584	.129	790	2.079	.104	675	1.776	.089

[1] Method used to allocate tax responsibility indicated thus: I=Incremental; IC=Recommendations based on findings of incremental and cost-function solutions; S=Standard cost; T=Ton mile.
[2] Travel, 38,000 miles per year; fuel consumption rate, 4.8 miles per gallon.
[3] Motor-fuel tax rate of 8.5 cents per gallon and low registration fees.
[4] Motor-fuel tax rate of 6.5 cents per gallon and high registration fees.
[5] Maximum expenditure program with fuel-tax rate of 4 cents per gallon.
[6] Continuation of "current" (1949) expenditure level with fuel-tax rate of 3 cents per gallon.

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Table 16.—Tax payments under tax-study recommendations and at 1955 tax rates in selected States on a 4-axle tractor-semitrailer (No. 6)

State	Part 1.—Tax study recommendations									Part 2.—Total 1955 user-tax payments based on uniform amount of travel and fuel usage [2]		
	Year tax study published	Method [1]	State's own basis					Total user-tax payments based on uniform amount of travel and fuel usage [2]				
			Annual travel	Fuel consumption rate	Total user-tax payments							
					Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile
			Miles	*Miles/gal.*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*
California	1946	T	23,500	3.86	689	2.932	0.117	1,135	2.838	0.114	806	2.015	0.081
Colorado [3]	1950	T	40,000	5.1	2,969	7.423	.297	3,112	7.780	.311	1,529	3.823	.153
Colorado [4]	1950	T	40,000	5.1	2,812	7.030	.281	2,921	7.303	.292	-----	-----	-------
Idaho	--------	--------	--------	--------	-----	-----	-------	-----	-----	-------	1,415	3.538	.142
Illinois	1948	T	36,500	4.3	1,189	3,258	.130	1,241	3.103	.124	1,265	3.163	.127
Louisiana	1955	IC	32,500	3.3	1,233	3.794	.152	1,217	3.043	.122	1,007	2.518	.101
Minnesota	1954	I	47,002	4.4	2,118	4.506	.180	1,833	4.583	.183	986	2.465	.099
New York [5]	1950	T	36,500	3.5	2,675	7.329	.293	2,639	6.598	.264	1,220	3.050	.122
New York [6]	1950	T	36,500	3.5	1,037	2.841	.114	1,010	2.525	.101	-----	-----	-------
Ohio	1951	S	46,700	3.4	1,553	3.325	.133	1,351	3.378	.135	1,467	3.668	.147
Ohio	1953	I	46,300	3.8	1,484	3.205	.128	1,353	3.383	.135	-----	-----	-------
Oregon	--------	--------	--------	--------	-----	-----	-------	-----	-----	-------	1,765	4.413	.177
Utah	1950	T	39,600	4.57	1,113	2.811	.112	1,156	2.890	.116	691	1.728	.069
Washington	1948	T	19,805	4.0	762	3.848	.154	1,061	2.653	.106	944	2.360	.094

[1] Method used to allocate tax responsibility indicated thus: I=Incremental; IC=Recommendations based on findings of incremental and cost-function solutions; S=Standard cost; T=Ton mile.
[2] Travel, 40,000 miles per year; fuel consumption rate, 4.2 miles per gallon.
[3] Motor-fuel tax rate of 8.5 cents per gallon and low registration fees.
[4] Motor-fuel tax rate of 6.5 cents per gallon and high registration fees.
[5] Maximum expenditure program with fuel-tax rate of 4 cents per gallon.
[6] Continuation of "current" (1949) expenditure level with fuel-tax rate of 3 cents per gallon.

Table 17.—Tax payments under tax-study recommendations and at 1955 tax rates in selected States on a truck-trailer combination (No. 7)

State	Part 1.—Tax study recommendations									Part 2.—Total 1955 user-tax payments based on uniform amount of travel and fuel usage [2]		
	Year tax study published	Method [1]	State's own basis					Total user-tax payments based on uniform amount of travel and fuel usage [2]				
			Annual travel	Fuel consumption rate	Total user-tax payments							
					Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile
			Miles	*Miles/gal.*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*
California	1946	T	39,300	2.98	1,394	3.547	0.104	1,672	3.344	0.098	1,232	2.464	0.072
Colorado [3]	1950	T	50,000	5.1	4,745	9.490	.279	5,126	10.252	.302	2,505	5.010	.147
Colorado [4]	1950	T	50,000	5.1	4,549	9.098	.268	4,841	9.682	.285	-----	-----	-------
Idaho	--------	--------	--------	--------	-----	-----	-------	-----	-----	-------	2,359	4.718	.139
Illinois	1948	T	36,500	4.3	1,189	3.258	.096	1,479	2.958	.087	1,860	3.720	.109
Louisiana	1955	IC	37,000	2.7	1,626	4.395	.129	1,680	3.360	.099	1,440	2.880	.085
Minnesota [5]	--------	--------	--------	--------	-----	-----	-------	-----	-----	-------	-----	-----	-------
New York [5]	--------	--------	--------	--------	-----	-----	-------	-----	-----	-------	-----	-----	-------
Ohio	1951	S	19,262	2.5	1,314	6.822	.201	1,651	3.302	.097	2,632	5.264	.155
Ohio	1953	I	55,500	2.8	2,597	4.679	.138	2,327	4.654	.137	-----	-----	-------
Oregon	--------	--------	--------	--------	-----	-----	-------	-----	-----	-------	3,050	6.100	.179
Utah	1950	T	42,000	4.46	1,496	3.562	.105	1,739	3.478	.102	1,219	2.438	.072
Washington	1948	T	26,333	3.2	1,485	5.639	.166	1,874	3.748	.110	1,594	3.188	.094

[1] Method used to allocate tax responsibility indicated thus: I=Incremental; IC=Recommendations based on findings of incremental and cost-function solutions; S=Standard cost; T=Ton-mile.
[2] Travel, 50,000 miles per year; fuel consumption rate, 3.5 miles per gallon.
[3] Motor-fuel tax rate of 8.5 cents per gallon and low registration fees.
[4] Motor-fuel tax rate of 6.5 cents per gallon and high registration fees.
[5] This vehicle combination not permitted by State size and weight regulations.

Table 18.—Tax payments under tax-study recommendations and at 1955 tax rates in selected States on a tractor-semitrailer-trailer combination (No. 8)

State	Part 1.—Tax study recommendations									Part 2.—Total 1955 user-tax payments based on uniform amount of travel and fuel usage [2]		
	Year tax study published	Method [1]	State's own basis					Total user-tax payments based on uniform amount of travel and fuel usage [2]				
			Annual travel	Fuel consumption rate	Total user-tax payments							
					Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile	Per year	Per mile	Per ton-mile
			Miles	*Miles/gal.*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*	*Dollars*	*Cents*	*Cents*
California	1946	T	26,000	2.58	1,062	4.085	0.113	1,847	3.694	0.103	1,230	2.460	0.068
Colorado [3]	1950	T	50,000	5.1	4,975	9.950	.276	5,392	10.784	.299	2,627	5.254	.146
Colorado [4]	1950	T	50,000	5.1	4,779	9.558	.265	5,098	10.196	.283	-----	-----	-------
Idaho	--------	--------	--------	--------	-----	-----	-------	-----	-----	-------	2,491	4.982	.138
Illinois	1948	T	36,500	4.3	1,189	3.249	.090	1,500	3.000	.083	1,937	3.874	.108
Louisiana [5]	--------	--------	--------	--------	-----	-----	-------	-----	-----	-------	-----	-----	-------
Minnesota [5]	--------	--------	--------	--------	-----	-----	-------	-----	-----	-------	-----	-----	-------
New York [5]	--------	--------	--------	--------	-----	-----	-------	-----	-----	-------	-----	-----	-------
Ohio	1951	S	45,500	2.3	2,568	5.644	.157	2,310	4.620	.128	2,542	5.084	.141
Ohio	1953	I	47,900	2.6	2,303	4.808	.134	2,118	4.236	.118	-----	-----	-------
Oregon	--------	--------	--------	--------	-----	-----	-------	-----	-----	-------	3,225	6.450	.179
Utah	1950	T	42,000	4.45	1,562	3.719	.103	1,825	3.650	.101	1,165	2.330	.065
Washington	1948	T	26,333	3.1	1,354	5.142	.143	1,766	3.532	.098	1,446	2.892	.080

[1] Method used to allocate tax responsibility indicated thus: I=Incremental; S=Standard cost; T=Ton mile.
[2] Travel, 50,000 miles per year; fuel consumption rate, 3.4 miles per gallon.
[3] Motor-fuel tax rate of 8.5 cents per gallon and low registration fees.
[4] Motor-fuel tax rate of 6.5 cents per gallon and high registration fees.
[5] This vehicle combination not permitted by State size and weight regulations.

Appendix B

Following is a reference list of the reports of State highway finance and taxation studies that were consulted in the preparation of this article. Eleven studies in nine States are included. In Ohio the study made by H. D. Simpson was based on the gross ton-mile concept; that by D. F. Pancoast was a solution by the incremental method. In Washington there was only one study, utilizing the gross ton-mile method; but two reports were prepared successively by James C. Nelson.

Of the numerous other State highway finance studies available, some were too far removed in time, and others afforded no clear-cut basis for comparison. Studies now in progress, notably the incremental studies in Washington, Kentucky, and Montana, should provide further comparative data.

California

A proposed system of highway financing for the State of California, by Bertram H. Lindman. A report submitted to the Joint Fact-Finding Committee of the California Legislature on Highways, Streets and Bridges. Sacramento, Nov. 1946.

Colorado

Colorado's highway needs and highway financing. Preliminary report of the Colorado Highway Planning Committee. Denver, Oct. 1950.

Illinois

A highway improvement program for Illinois, prepared by Griffenhagen and Associates for the Illinois Division of Highways. Springfield, Nov. 1948.

Louisiana

Financing highway improvements in Louisiana, by William D. Ross. A financial analysis for the Legislative Council. Louisiana State University, Baton Rouge, 1955.

Minnesota

Financing a proposed highway program in Minnesota, by the Public Administration Service. A report to the Minnesota Highway Study Commission. St. Paul, Oct. 1954.

New York

Highway finance and taxation in New York, prepared by Griffenhagen and Associates for the Citizens Public Expenditure Survey, Inc., of New York State. New York, Feb. 1950.

Ohio

Highway finance, by Herbert D. Simpson. A study prepared for the Ohio Program Commission of the Ohio Department of Highways. Columbus, Sept. 1951. *Allocation of highway costs in Ohio by the incremental method,* by D. F. Pancoast, Ohio Department of Highways. Columbus, Dec. 1953.

Utah

Financing needs and allocating costs of highways among highway users in Utah, by the Bureau of Economics and Business Research, Utah University. Prepared for the Legislative Council of Utah. Salt Lake City, 1950.

Washington

Financing Washington's highways, roads, and streets, by Dr. James C. Nelson. A report submitted to the Joint Fact-Finding Committee on Highways, Streets and Bridges of the State of Washington. Olympia, Oct. 1948. *Taxing Washington's motor vehicles equitably for highway services,* by Dr. James C. Nelson. A report submitted to the Joint Fact. Finding Committee on Highways, Streets and Bridges of the State of Washington. Olympia, Sept. 1950

United States-Canadian Border Commercial Traffic

BY THE HIGHWAY TRANSPORT RESEARCH BRANCH
BUREAU OF PUBLIC ROADS

Reported by DANIEL O'FLAHERTY
Head, Traffic and Travel Studies Unit

In this article, the results of a study made of commercial vehicles crossing the United States-Canadian border on an average weekday in July or August of 1954 are reported. Vehicle operators interviewed at 16 stations along the border supplied the following information: origin and destination of trips, average distances traveled in each of the two countries, frequency of trips, classification of trip (private or for hire), commodity being hauled, State and/or Province of vehicle registration, and licensing authority of the operator's permit.

The weekday commercial travel at the 16 stations approximated three-fourths of the annual average daily commercial traffic crossing the border on all highways connecting the two countries. The average daily commercial traffic for July and August was found to be about the same as the annual average daily volume.

Approximately two-thirds of the commercial vehicles crossing the border were registered in Canada, whereas two-thirds of the mileage traveled was in the United States. The majority of these vehicles were traveling between Provinces and States adjacent to the border. At some border stations many of the trips were very short, being less than 5 miles in length (one way). There were, however, nearly 200 trips which were over 1,000 miles in length and at least 68 which were over 2,000 miles. Four trips of the latter group were estimated to be more than 3,000 miles. The average trip distance for all commercial vehicles crossing the border was 251 miles of which 169 miles involved travel in the United States and 82 miles in Canada.

Single-unit trucks accounted for 56 percent of the trips and 25 percent of the mileage traveled, and truck combinations with 37 percent of the trips accounted for 69 percent of the travel. The remaining 7 percent of trips and 6 percent of travel was by buses.

About one-third of the travel was by vehicles classed as private carriers and two-thirds by vehicles classed as for-hire carriers. A comparison of truck body types indicates that stake or platform bodies were the most numerous, closely followed by van and box-type bodies.

Approximately one-eighth of the trips across the border were nonrepetitive or very infrequent, whereas over half were repeated more often than once a week, and about a fifth were more often than once a day.

About half of all trucks were carrying loads. Two-thirds of the loaded vehicles carried manufactured and miscellaneous products. No other single classification of products was hauled by as many as 10 percent of the vehicles, although vehicles hauling agricultural and animal products each approached that figure.

Less than 200 operators of the 3,093 interviewed in this study reported that they were licensed to drive by both State and Province authorities.

AT the request of the Department of State and in cooperation with that Department and other agencies of the Federal Government, the Bureau of Public Roads undertook a study of the commercial traffic crossing the United States-Canadian border. The field work was done by the highway departments of 8 of the 12 States bordering on Canada as a part of the cooperative highway planning survey program carried out jointly by the States and the Bureau of Public Roads.

Information was obtained regarding truck and bus travel on a typical summer weekday at 16 stations located along the border. Roadside interviews were made at these locations on a weekday in July or August 1954. The drivers of all commercial vehicles passing the interview stations during a 24-hour period were interviewed except in Maine where only 76 percent of the drivers at the 3 stations in the State were interviewed. The analysis of the border traffic was limited to the actual sample. It would be necessary, therefore, to increase the Maine figures about 32 percent if it were desired to compare the number of crossings on the Maine border with the number of crossings at other border States.

Information Obtained at Border Stations

Operators of commercial vehicles were questioned concerning the origin and destination of trip, the commodity hauled (when not obvious), the trip distance in the United States and Canada separately, the States and/or Provinces of vehicle registration, the classification of trip ("private" or "for hire"), the frequency of trips across the border, and the licensing authority of the driving permit.

In the study there were 3,093 vehicle records obtained of which 222 were for buses and 2,871 for trucks. This number amounted to more than three-fourths of the daily commercial traffic crossing the border at all points for the summer period and for the whole year on the basis of Canadian ports of entry data.

The average daily commercial traffic crossing the border during the summer months of July and August 1954 combined, based on reports published by the Dominion Bureau of Statistics of Canada,[1] was about the same as for an average day of the year; that is, 3,950, and 4,028, respectively. To arrive at these amounts, the data included in the Canadian report were converted from monthly and annual figures to average daily traffic volumes and multiplied by two in order to account for vehicles leaving Canada as well as those entering.

The fact that more than three-fourths of the average daily traffic at all points was intercepted at 16 locations on weekdays indicates that an adequate sample was obtained for the border as a whole. That is true, notwithstanding that the number of vehicles crossing the border for certain Provinces as shown in the Canadian report vary considerably in volume from that reported in this article. The travel between individual Provinces and States having many minor roads crossing the border was not as well represented in the sample as the travel for the whole border, which was the subject of this study.

Trip Origins and Destinations

A basic fact developed from this study is the division of registration and travel for commercial vehicles between the two countries. This is illustrated in figure 1 which shows that almost two-thirds of the home country registration is Canadian, yet slightly more than

[1] *Travel between Canada and other countries 1954*, by the Dominion Bureau of Statistics, International Trade Division, Balance of Payments Section. Ottawa, 1955. Tables 13 and 17, pp. 40 and 45.

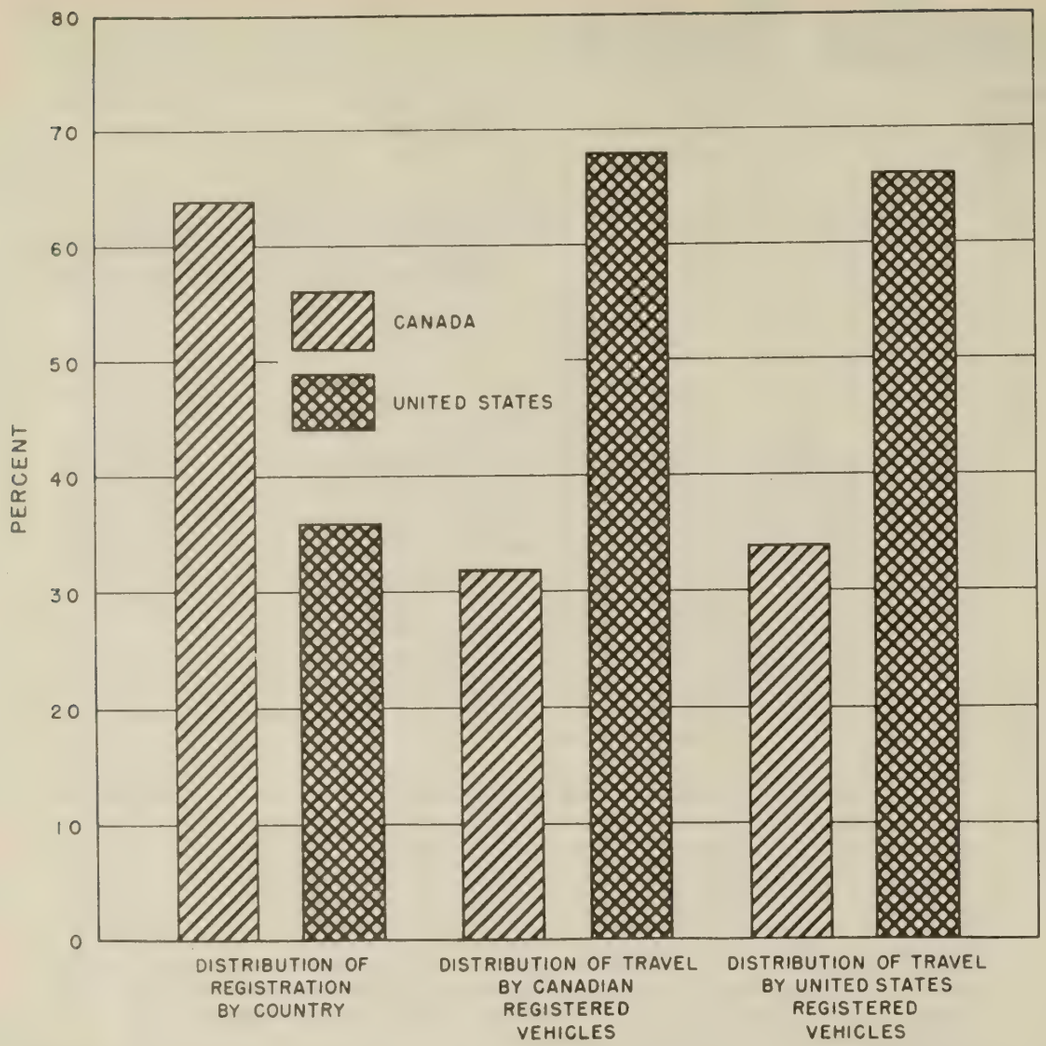

Figure 1.—Percentage distribution of commercial vehicles crossing the border on an average summer weekday in 1954, according to country of registration and area of travel.

two-thirds of the travel is in the United States.

Travel between the United States and Canada involved trips with origin or destination in 35 States, Alaska, and 9 Provinces. Most of the trips were between adjacent States and Provinces; there were, however, some very long trips of which at least four exceeded 3,000 miles in length.

Table 1 shows the origin and destination of all trips recorded in this study. Ontario was the origin or destination of more trips (1,585) than any other Province or State, and 13 of these trips had both origin and destination in Ontario. Michigan was the origin or destination of more trips than any other State with 1,079 trips, followed by New York and Maine with 620 and 536 trips, respectively. Approximately 88 percent of the trips across the border originated or terminated in a border State.

The 886 vehicles recorded as traveling between Ontario and Michigan are the highest number between any specific State and Province. There were 413 vehicles traveling between New Brunswick and Maine, 334 between Ontario and New York, 143 between Ontario and Minnesota, 134 between Quebec and Vermont, and 133 between British Columbia and Washington.

By studying table 2 in conjunction with table 1, it is found that there were 218 trips with both origins and destinations within the United States of which 158 were between Michigan and New York. These vehicles passed through Canada and since the more important Michigan and New York border crossings were in operation in this study, it is probable that most of the 158 vehicles were duplicated in the reporting at stations 6, 7, or 8 and at stations 9, 10, or 11.

There were 190 trips with both origin and destination in Canada. Had all the stations on the border been operated, these trips would need to be divided by two since they would have crossed the border twice. However, an analysis of the detailed origin and destination as well as the mileage traveled in the United States and Canada definitely established that a considerable number of these trips were not duplicated.

Of the 3,093 trips across the border, no more than 204 [(218+190)÷2=204] could be duplicated trips and, as stated, many of these were not. Five of the United States-to-United States trips were between Alaska and the States, and four were between the mainland of Washington and Point Roberts, Wash., on the tip of a peninsula that can be reached by highway from the United States only by passing through Canada. The five Alaska trips would involve only one crossing and it is known that the four Washington trips were recorded but once. Therefore, the relatively few duplicated trips included in this study have not been eliminated or adjusted because they involved so small a percentage of the sample and lacking complete information on crossings at all border stations, it could not be definitely determined which trips should be eliminated.

Distribution of Travel by Border Stations

The number of commercial vehicles crossing the border at each of the 16 stations is shown in table 2 and figure 2. For example, 189 vehicles crossed at station 1 in Washington of which 83 were registered in the United States and 106 were registered in Canada.

Figures 3–8 show origins and destinations of trips between States and Provinces by stations. Code numbers beside the line to a State or Province show the termini of trips with the number of trips indicated at the end of the line. For example, the codes 04–62 in figure 3 along with the numeral 5 at each end of the line indicate that there were five California-British Columbia trips recorded at station 1.

Travel data between States and Provinces at station 1 and at stations 9 and 10 combined are shown in figure 3. For instance, there were 133 trips between Washington and British Columbia at station 1, and 333 trips between New York and Ontario at stations 9 and 10. Note the two very long trips between California and Ontario, the four trips between Michigan and British Columbia, and also the seven trips between Ontario and British Columbia via the United States.

Trips involving crossings at station 2 and at stations 12 and 13 combined are shown in figure 4. A long trip between Texas and Quebec was recorded at the border station in Vermont, and three vehicles traveling between Texas and Alberta crossed at the Montana border station. Other long trips through station 2 were between Alaska and Montana, Illinois, and Wisconsin. Here also found 22 Canada-to-Canada trips between Ontario and Alberta via the United States.

Trips across the border at station 3 in North Dakota and at station 11 in New York are shown in figure 5 (p. 90). Traffic at these locations is of relatively low volume. An unusually long trip between California and Quebec was recorded at station 11.

Trips recorded at stations 4 and 5 in Minnesota and 14 and 15 in Maine are presented in figure 6 (p. 90). Except for station 4, most of the trips at these locations were between adjacent States and Provinces. Although 15 trips (table 2) were recorded at station 5 and only 110 trips at station 4, the termini distribution was more varied at station 4.

Trips recorded at stations 6 and 16 are shown in figure 7 (p. 91). At station 6, Port Huron, Mich., there were 36 trips between Michigan and New York via Canada. There were also six trips between Alberta and Ontario and eight trips between Manitoba and Ontario by way of the United States. Sim-

Table 1.—Origin and destination and number of trips made by commercial vehicles crossing the Canadian-United States border on an average summer weekday in 1954

Origin of trip	Destination of trip																												
	Province									Border States												Nonborder States, by regions				Territory of Alaska	Total trips
	Alberta	British Columbia	Manitoba	New Brunswick	Nova Scotia	Ontario	Prince Edward Island	Quebec	Saskatchewan	Total	Idaho	Maine	Michigan	Minnesota	Montana	New Hampshire	New York	North Dakota	Ohio	Vermont	Washington	Wisconsin	Total	Eastern States [1]	Central States [2]	Western States [3]	Total		
Province:																													
Alberta	--	2	4	---	--	19	---	1	--	26	--	---	1	---	52	---	4	--	--	--	1	2	60	1	3	6	10	---	96
British Columbia	16	6	2	---	--	8	---	1	1	34	--	---	1	1	1	---	---	--	--	--	72	-	75	--	1	7	8	---	117
Manitoba	3	3	--	---	--	28	---	4	--	38	--	---	---	27	--	---	1	7	--	--	--	-	35	--	4	--	4	---	77
New Brunswick	--	--	--	3	--	---	---	1	--	4	--	224	---	---	--	---	---	--	--	--	--	-	224	8	--	--	8	---	236
Nova Scotia	--	--	--	---	--	---	---	---	--	-----	--	10	---	---	--	---	---	--	--	--	--	-	10	9	--	--	9	---	19
Ontario	22	4	23	---	--	13	---	---	12	74	--	---	447	78	--	---	188	--	12	--	2	2	729	13	6	1	20	---	823
Prince Edward Island	--	--	--	---	--	---	---	1	--	1	--	---	---	---	--	---	---	--	--	--	--	-	-----	2	--	--	2	---	3
Quebec	1	--	2	4	--	---	---	---	--	7	--	50	1	---	--	3	52	--	--	86	--	-	192	25	2	--	27	---	226
Saskatchewan	--	1	--	---	--	5	---	---	--	6	--	---	---	---	1	---	---	17	--	--	--	-	18	--	1	--	1	---	25
Total	42	16	31	7	--	73	---	8	13	190	--	284	450	106	54	3	245	24	12	86	75	4	1,343	58	17	14	89	---	1,622
Border States:																													
Idaho	--	--	--	---	--	1	---	---	--	1	--	---	---	---	--	---	---	--	--	--	--	-	-----	--	--	--	---	----	1
Maine	--	--	--	189	4	---	---	40	--	233	--	17	2	---	--	---	---	--	--	--	--	-	19	--	--	--	---	---	252
Michigan	1	3	--	---	--	439	---	3	1	447	--	---	---	---	--	---	98	--	--	--	--	-	98	10	--	--	10	---	555
Minnesota	--	--	17	---	--	65	---	---	1	83	--	---	---	---	--	---	---	--	--	--	--	-	-----	--	--	--	---	---	83
Montana	40	--	--	---	--	---	---	---	--	40	--	---	---	---	--	---	---	--	--	--	--	-	-----	--	--	--	---	2	42
New Hampshire	--	--	--	---	--	1	---	3	--	4	--	---	---	---	--	---	---	--	--	--	--	-	-----	--	1	--	1	---	5
New York	--	--	--	---	--	146	---	64	--	210	--	---	60	---	--	---	---	--	--	--	--	-	60	--	5	--	5	---	275
North Dakota	1	1	7	---	--	1	---	---	8	18	--	---	---	---	--	---	---	--	--	--	--	-	-----	--	--	--	---	---	18
Ohio	--	--	--	---	--	16	---	---	--	16	--	---	---	---	--	---	---	--	--	--	--	-	-----	--	--	--	---	---	16
Vermont	--	--	--	---	--	---	---	48	--	48	--	---	---	---	--	---	---	--	--	--	--	-	-----	--	--	--	---	---	48
Washington	--	61	--	---	--	1	---	---	--	62	--	---	---	---	--	---	---	--	--	--	4	-	4	--	--	--	---	---	66
Wisconsin	--	--	1	---	--	1	---	---	--	2	--	---	---	---	--	---	---	--	--	--	--	-	-----	--	--	--	---	1	3
Total	42	65	25	189	4	671	---	158	10	1,164	--	17	62	---	--	---	98	--	--	--	4	-	181	10	6	--	16	3	1,364
Nonborder States, by regions:																													
Eastern States [1]	--	--	--	7	9	16	4	18	--	54	--	---	12	---	--	---	---	--	--	--	--	1	13	--	1	--	1	---	68
Central States [2]	2	--	3	---	--	12	---	2	5	24	--	---	---	---	--	---	1	--	--	--	--	-	1	--	--	--	---	1	26
Western States [3]	4	3	--	---	--	3	---	1	--	11	--	---	---	---	--	---	1	--	--	--	--	-	1	--	--	--	---	---	12
Total	6	3	3	7	9	31	4	21	5	89	--	---	12	---	--	---	2	--	--	--	--	1	15	--	1	--	1	1	106
Territory of Alaska	--	--	--	---	--	---	---	---	--	-----	--	---	---	---	1	---	---	--	--	--	--	-	1	--	--	--	---	---	1
Total, all trips	90	84	59	203	13	775	4	187	28	1,443	--	301	524	106	55	3	345	24	12	86	79	5	1,540	68	24	14	106	4	3,093

[1] Includes the following States: Connecticut, Maryland, Massachusetts, New Jersey, Pennsylvania, Rhode Island, South Carolina, and Virginia.
[2] Includes the following States: Alabama, Arkansas, Illinois, Indiana, Iowa, Kentucky, Missouri, Nebraska, Oklahoma, and Texas.
[3] Includes the following States: California, Colorado, Nevada, Oregon, and Wyoming.

trips between Oklahoma and Ontario and South Carolina and Ontario were also recorded. At station 16 in Maine, 183 trips were recorded between Maine and New Brunswick. Only three States other than Maine were involved in trips at station 16.

The greatest number of trips across the border at any one general location were recorded at Detroit (stations 7–8). Travel data for the two stations are combined in figure 8 (p. 91). Of the 938 vehicle operators interviewed at Detroit, 784 were traveling between Michigan and Ontario. Including crossings at Port Huron (station 6; fig. 7), there were 886 trips between Michigan and Ontario. The total United States-to-United States and Canada-to-Canada trips recorded at stations 7–8 exceeded that of any other border area. Here there were 51 Canada-to-Canada trips of which 22 were between Manitoba and Ontario, and 56 United States-to-United States trips of which 39 involved travel between Michigan and New York. At stations 9–10 combined (fig. 3) there were 98 United

Table 2.—Number of commercial vehicles crossing the border at 16 stations on an average summer weekday in 1954, classified by country of vehicle registration and country of origin and destination

Station number	Location of station	Origin and destination of travel of United States registered vehicles					Origin and destination of travel of Canadian registered vehicles					Origin and destination of travel of all vehicles				
		Canada to Canada	Canada to United States	United States to Canada	United States to United States	Total	Canada to Canada	Canada to United States	United States to Canada	United States to United States	Total	Canada to Canada	Canada to United States	United States to Canada	United States to United States	Total
1	Blaine, Wash	1	35	43	4	83	32	49	25	-----	106	33	84	68	4	189
2	Sweetgrass, Mont	-----	21	15	5	41	29	49	33	-----	111	29	70	48	5	152
3	Portland, N. Dak	-----	11	11	-----	22	4	8	2	-----	14	4	19	13	-----	36
4	Noyes, Minn	6	18	15	-----	39	36	20	15	-----	71	42	38	30	-----	110
5	International Falls, Minn	-----	14	7	-----	21	4	62	58	-----	124	4	76	65	-----	145
6	Port Huron, Mich	2	21	23	36	82	14	41	28	1	84	16	62	51	37	166
7	Detroit Tunnel, Mich	-----	43	42	5	90	4	138	164	-----	306	4	181	206	5	396
8	Detroit Bridge, Mich	1	52	56	46	155	46	179	157	5	387	47	231	213	51	542
9	Buffalo, N. Y	1	28	59	86	174	1	128	85	-----	214	2	156	144	86	388
10	Rainbow Bridge, Niagara Falls, N. Y	-----	3	9	9	21	-----	42	20	3	65	-----	45	29	12	86
11	Champlain, N. Y	-----	26	33	1	60	-----	37	33	-----	70	-----	63	66	1	130
12	Swanton, Vt	-----	21	25	-----	46	-----	18	15	-----	33	-----	39	40	-----	79
13	Derby Line, Vt	-----	26	19	-----	45	1	38	9	-----	48	1	64	28	-----	93
14	Jackman, Maine	-----	6	4	17	27	-----	42	30	-----	72	-----	48	34	17	99
15	Madawaska, Maine	-----	67	63	-----	130	-----	60	48	-----	108	-----	127	111	-----	238
16	Calais, Maine	4	40	33	-----	77	4	89	74	-----	167	8	129	107	-----	244
----	Total	15	432	457	209	1,113	175	1,000	796	9	1,980	190	1,432	1,253	218	3,093

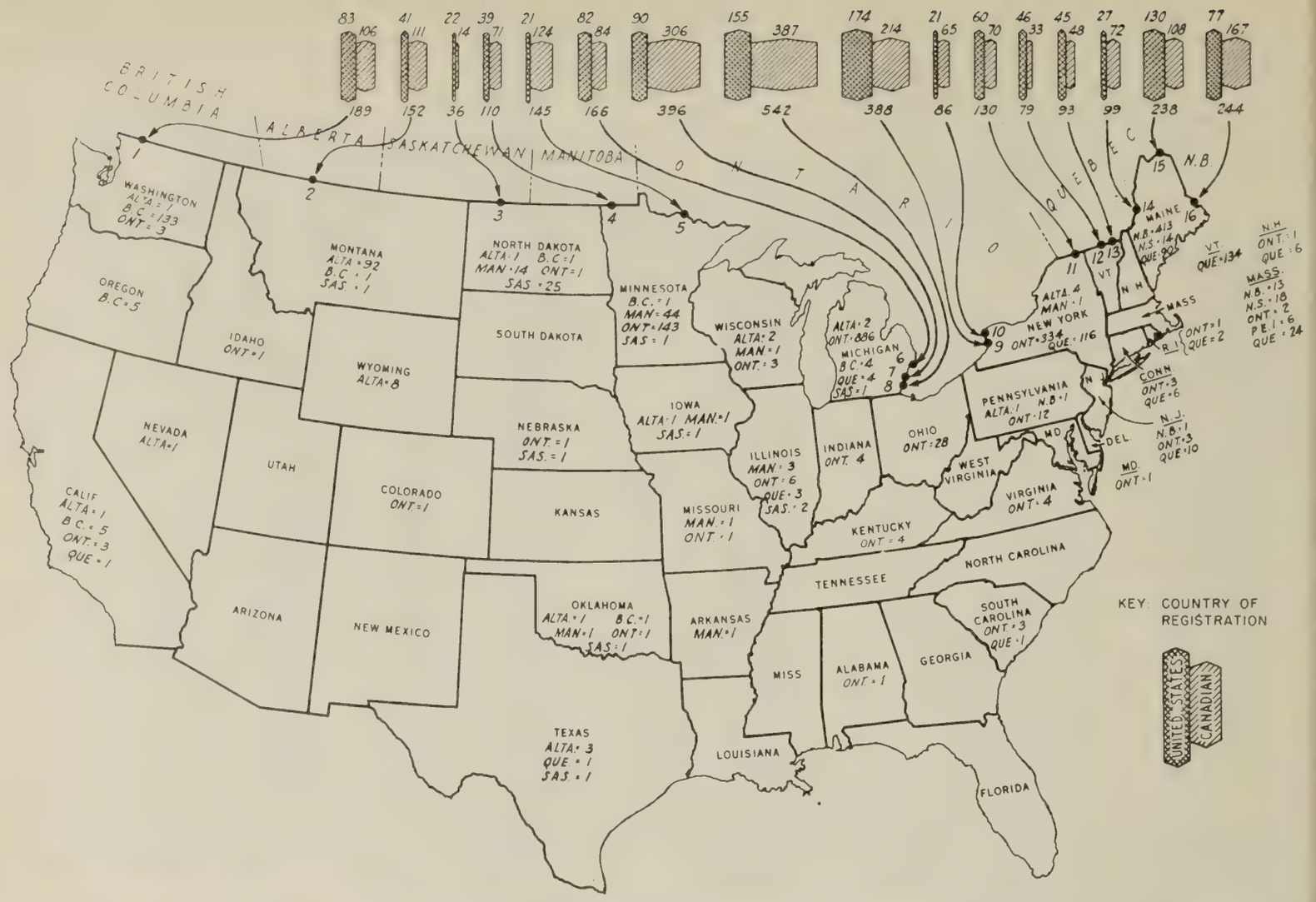

Figure 2.—Number of commercial vehicles crossing the border at 16 stations on an average summer weekday in 1954, according to country of registration.

States-to-United States trips of which 82 were between Michigan and New York, but only 2 trips with origin and destination in Canada were recorded.

The 39 Michigan-New York trips recorded at stations 7–8 plus the 36 such trips at station 6 (fig. 7) nearly equal the 82 trips having the same termini recorded at New York stations 9–10 (fig. 3). This of course is a duplication of sampling.

Major Portion of Travel in the United States

The average lengths of trips for major classes of commercial vehicles, according to country of vehicle registration and area of travel, are shown in figure 9 (p. 92). Except for Canadian registered buses, the average distance traveled in the United States substantially exceeds that in Canada. This is true regardless of country of vehicle registration. The average length of trip in the United States for all truck combinations was considerably more than twice the distance traveled in Canada. For all vehicles, the portion of the trip in the United States averaged 169 miles as compared with 82 miles in Canada.

Identical information to that shown in figure 9 is provided in table 3 (p. 93), but the latter contains more detailed data on average trip distances for the various types of vehicles as well as average trip distances according to class of operation.

The term "class of operation" indicates whether a commercial vehicle is operated as a "private" or "for-hire" carrier. Actually, three classes—private, contract carrier, and common carrier—were recorded in the study, but distinction between the latter two classes is difficult to obtain from the driver during the limited time available at roadside interview stations. The three terms may be briefly defined as follows:

A *private vehicle* is one which is owned by an individual or company and its use is limited to the transportation of his or its own goods or products.

A *contract carrier* enters into a specific contract, written or otherwise, for the transportation of property or goods owned by another. The owner of the vehicle does not haul for the public generally and he may refuse to accept a job.

A *common carrier* hauls for the public without discrimination. His rates are published and he must accept any job that his equipment is capable of handling within the area and terms of the certificate issued.

There were so few contract-carrier vehicles recorded in this study that it was concluded that a term covering both contract- and common-carrier vehicles would better serve the purpose of this survey. Therefore, only the two major classes of private and for hire are reported here.

Table 3 shows that average distances traveled in the United States exceed those in Canada, except for a small percentage of single-unit for-hire trucks, 19 truck and trailer combinations of United States registry, and 124 Canadian registered buses.

The distribution of travel by private and for-hire classes of vehicle operation is similar regardless of country of vehicle registration. Privately operated vehicles accounted for 34.8 percent of the travel, and the for-hire class, 65.2 percent. When the major types of vehicles are considered separately, it is found that the relation of travel for private and for-hire classes is as follows: single-unit trucks, 88.1 and 11.9 percent; truck combinations, 17.4 and 82.6 percent; and buses, 11.5 and 88.5 percent, respectively.

Forty percent of the trucks and 19 percent of the buses crossing the border traveled less than 10 miles in each country (total trip distance less than 20 miles). Nine percent of the trucks and 7 percent of the buses traveled between 10 and 99 miles in each country. More than two-thirds of all trucks traveled less than 100 miles in each country, or stated another way, the trip distance was

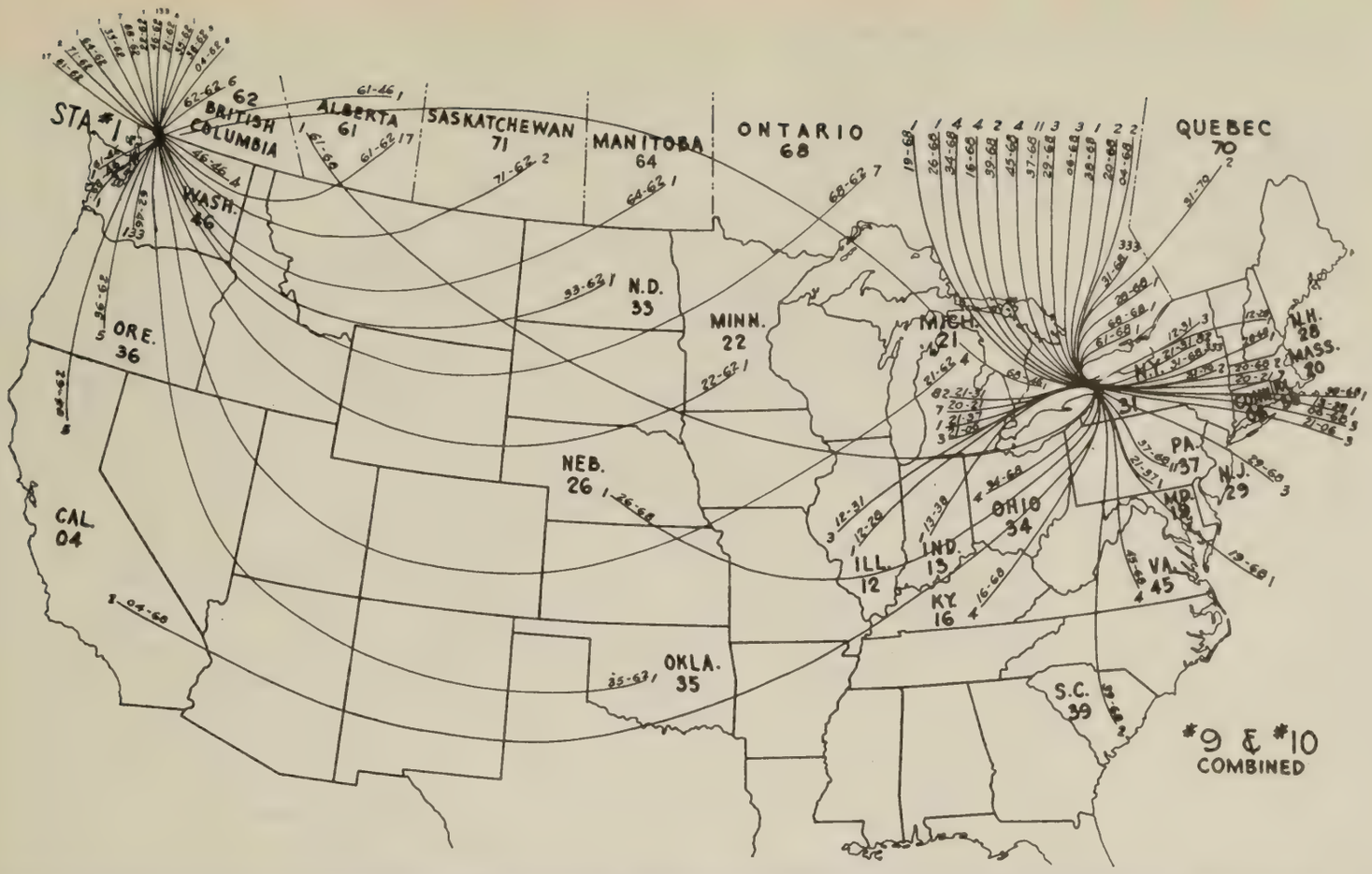

Figure 3.—Origin and destination and number of trips made by commercial vehicles crossing the border at station 1 and stations 9 and 10 (combined) on an average summer weekday in 1954.

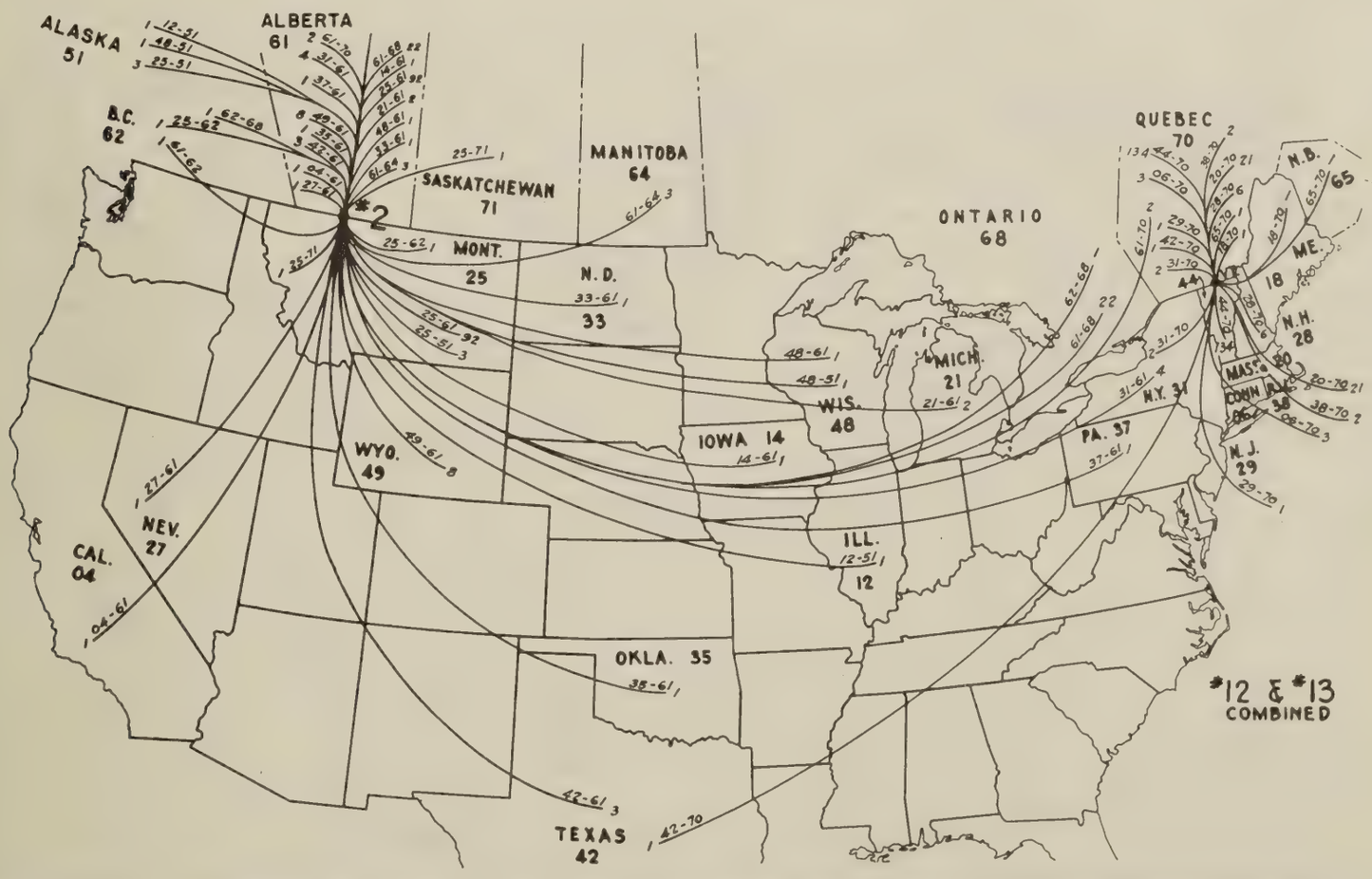

Figure 4.—Origin and destination and number of trips made by commercial vehicles crossing the border at station 2 and stations 12 and 13 (combined) on an average summer weekday in 1954.

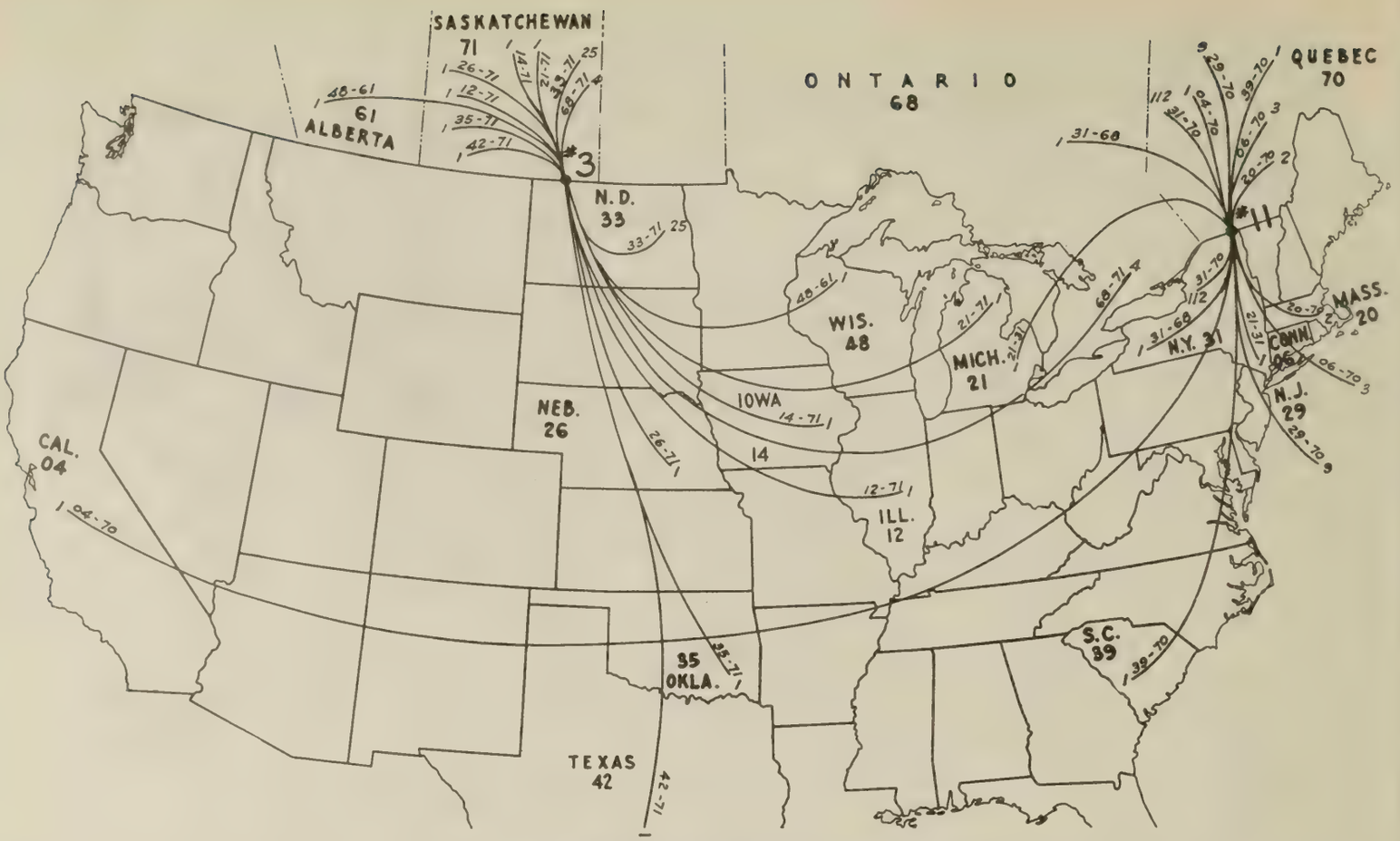

Figure 5.—Origin and destination and number of trips made by commercial vehicles crossing the border at stations 3 and 11 on an average summer weekday in 1954.

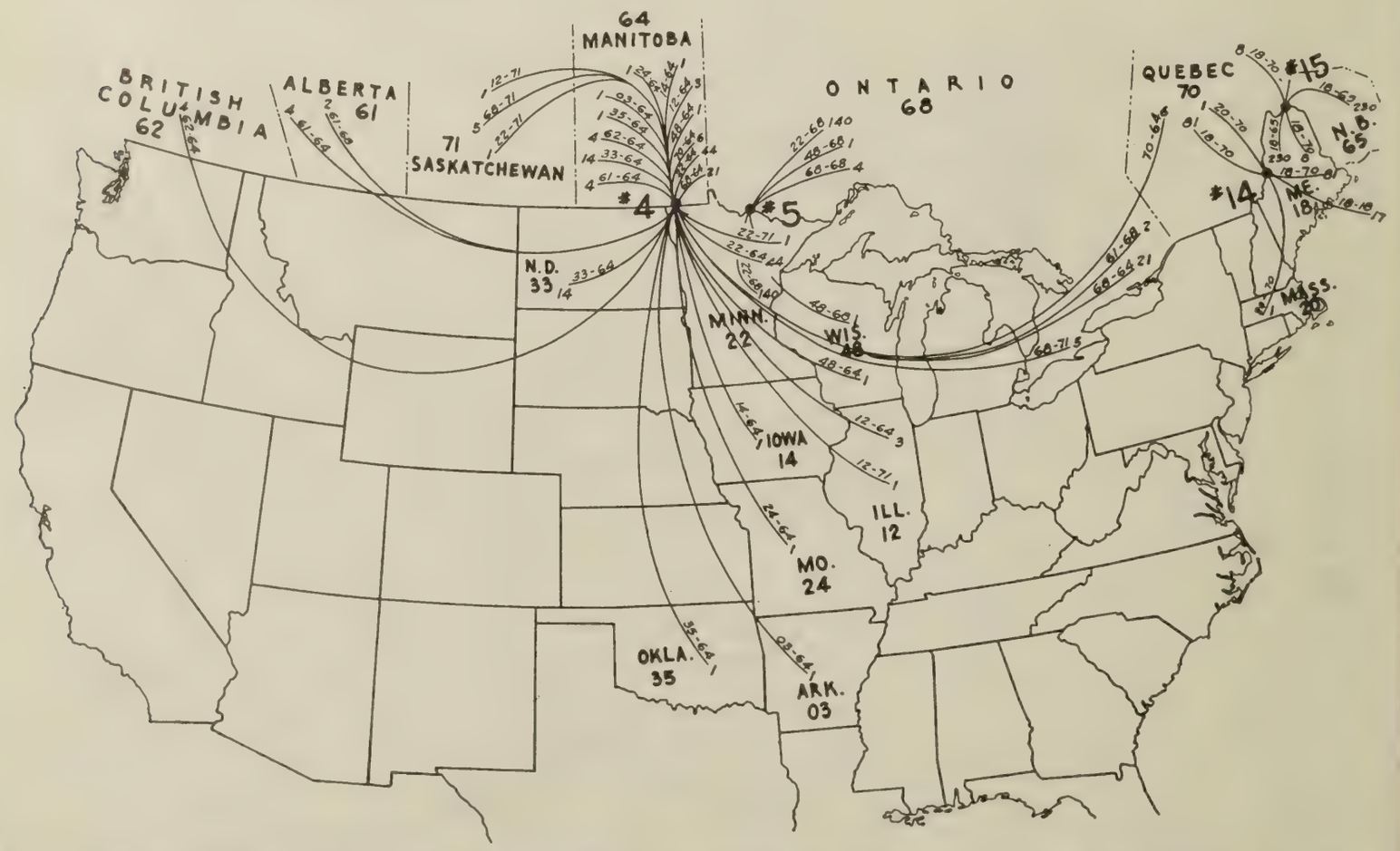

Figure 6.—Origin and destination and number of trips made by commercial vehicles crossing the border at stations 4, 5, 14, and 15 on an average summer weekday in 1954.

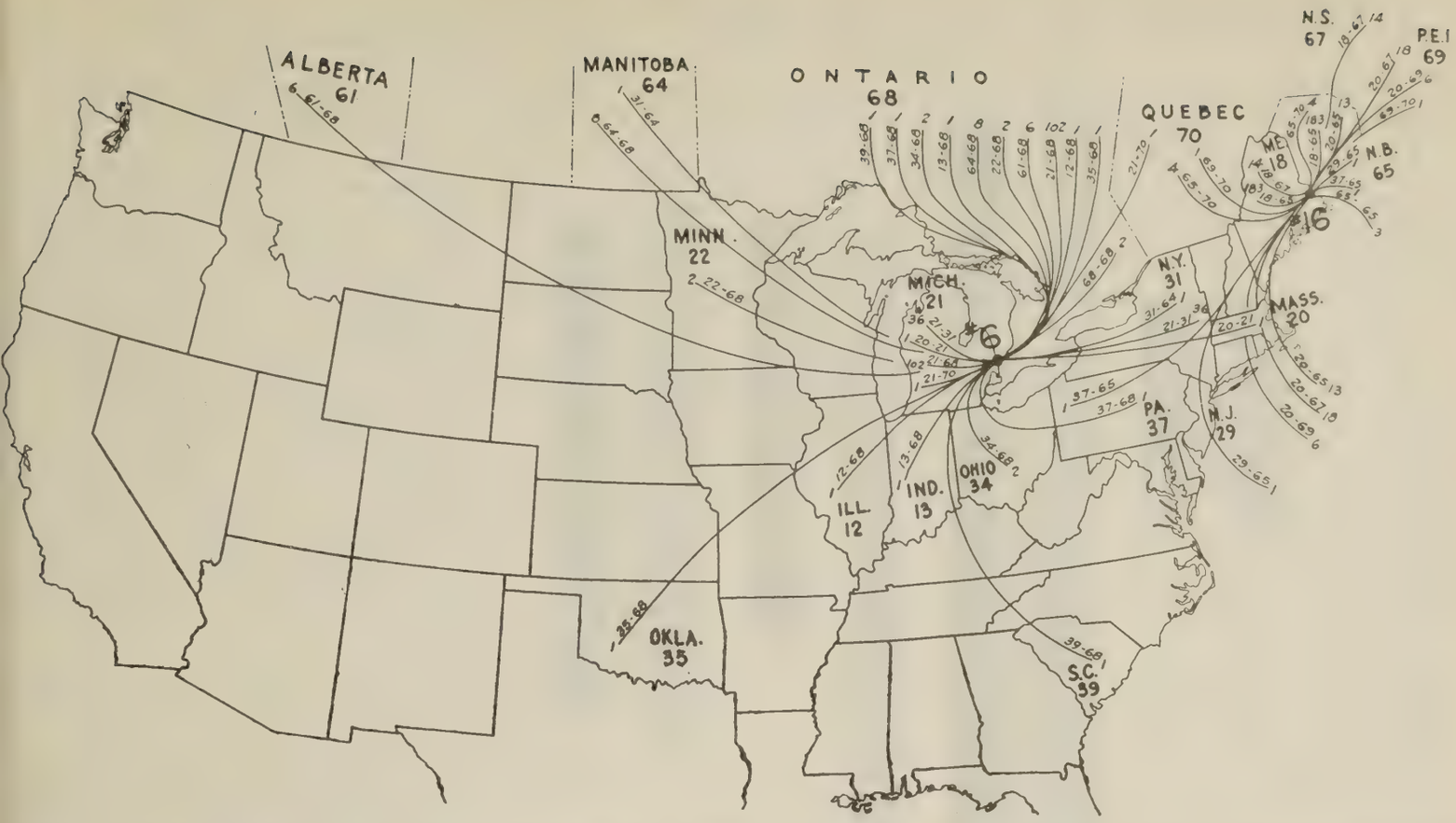

Figure 7.—Origin and destination and number of trips made by commercial vehicles crossing the border at stations 6 and 16 on an average summer weekday in 1954.

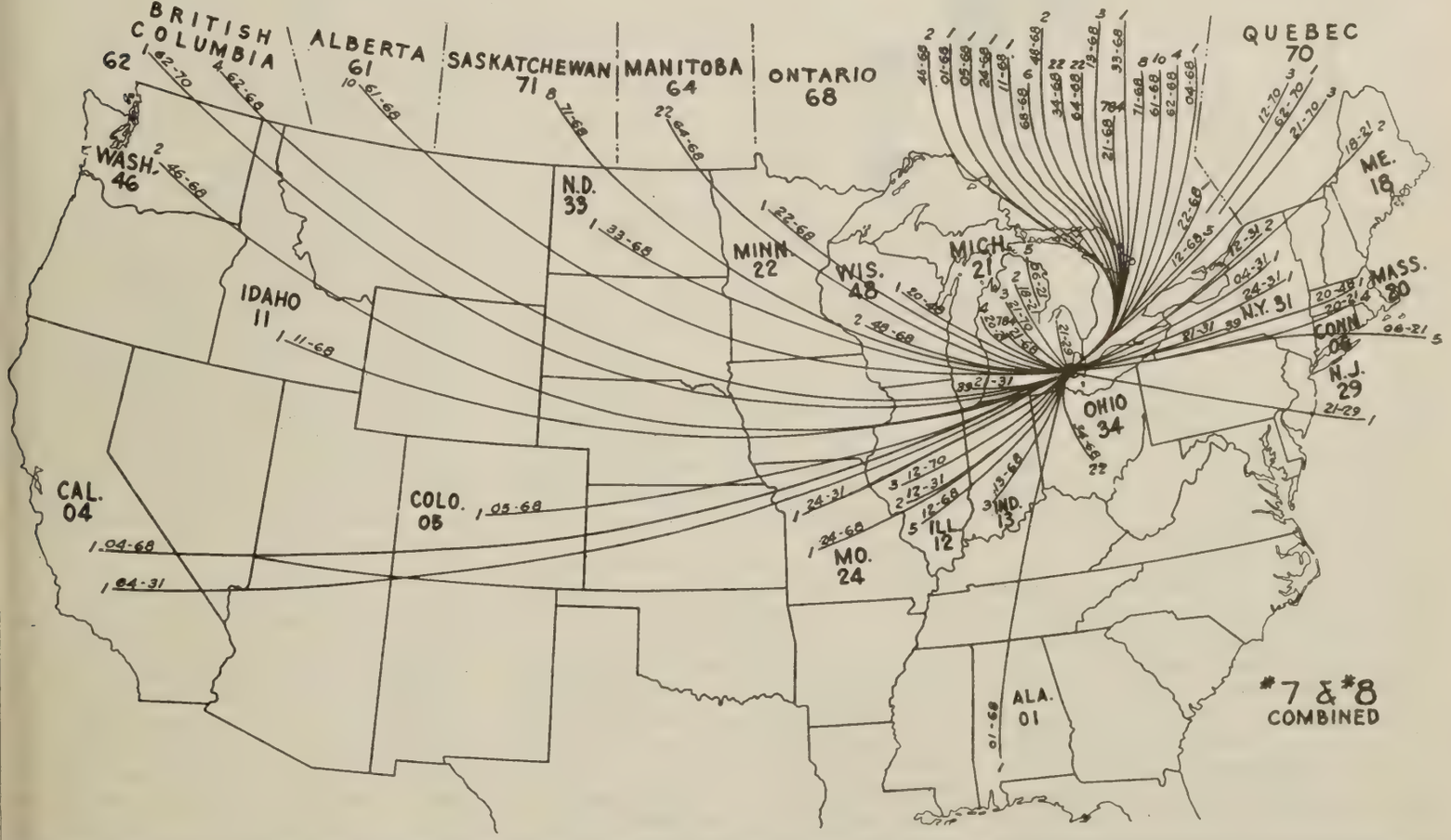

Figure 8.—Origin and destination and number of trips made by commercial vehicles crossing the border at stations 7 and 8 combined on an average summer weekday in 1954.

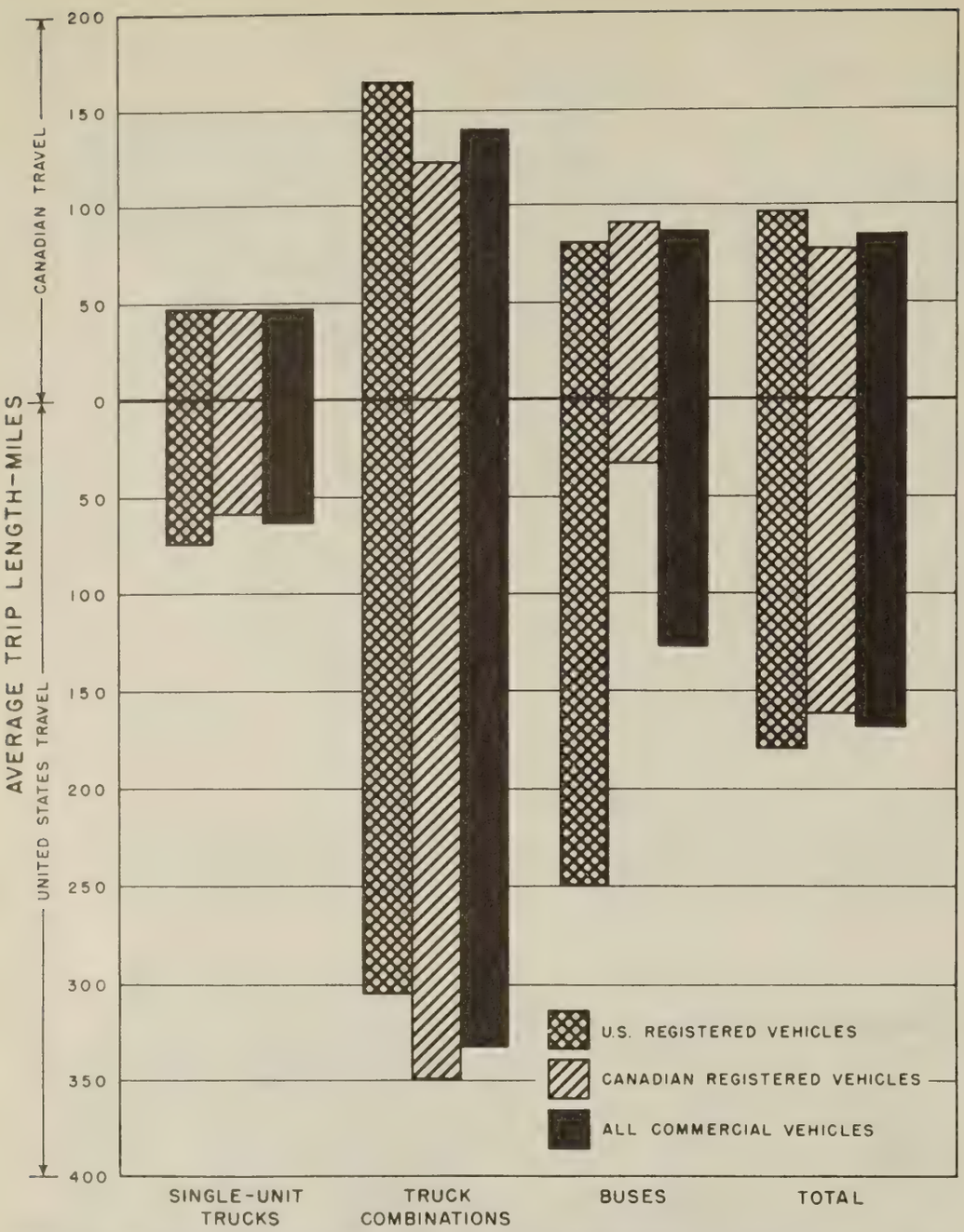

Figure 9.—Average length of trips made by commercial vehicles crossing the border on an average summer weekday in 1954, according to type of vehicle, country of registration, and area of travel.

less than 200 miles in both countries. About half (46 percent) of the buses fell in this category.

About 6 percent of the trucks and less than 1 percent of the buses traveled 1,000 miles or more in the United States. Less than 1 percent of the trucks and no buses traveled as much as 1,000 miles in Canada.

For most of the very long trips the major portion of travel was in the United States and some of these trips had both origins and destinations in Canada. One of the longest trips of the latter type was between Toronto, Ontario, and Vancouver, British Columbia, and was made by a vehicle of Canadian registration. The total length of trip was reported as 3,000 miles—300 miles in Canada and 2,700 miles in the United States. The vehicle was a 4-axle tractor-semitrailer combination hauling paper. A number of other vehicles moving from Canada to Canada traveled more than 1,000 miles in the United States. A trip of 3,032 miles between Vancouver, British Columbia, and Oklahoma City, Okla., involved 3,000 miles of travel in the United States. This vehicle was a pickup truck carrying personal luggage and was registered in Texas.

Majority of Heavy Vehicles in For-Hire Class

The percentage distribution of the number of commercial vehicles crossing the border, classified according to vehicle type, country of registration, and class of operation, is shown in table 4.

Single-unit trucks were largely operated as private carriers. Only 4.2 percent of the 2-axle, 4-tire trucks were operated as for-hire carriers, and only 17.4 percent of the 2-axle, 6-tire vehicles were reported in this category. In contrast, 64.6 percent of the 3-axle tractor-semitrailer combinations and 81.1 percent of the 4-axle tractor-semitrailer combinations were reported in the for-hire classification. Of the few truck-trailer combinations recorded in the study, 56.6 percent were in the for-hire class. For-hire operated buses accounted for 94.1 percent of the total. Of the 222 buses reported, 13 were private carriers and only 25 had a seating capacity of less than 30 passengers.

The relation of the number of private and for-hire vehicles is almost the opposite of their respective travel when all vehicles are considered as a group. This cannot be said, however, for the individual types of vehicles when they are compared separately.

The percentages of United States registered vehicles in the private and for-hire categories were 55.5 and 44.5 percent, respectively; Canadian registered vehicles in the two classes were 63.6 and 36.4 percent. For all vehicles the percentage in the privately operated class was 60.7 percent, and the for-hire class, 39.3 percent.

Truck Combinations Travel Greater Distances

In table 5, the number of vehicles and mileage traveled are shown for single-unit trucks, truck combinations, and buses. Although single-unit trucks represented 56 percent of the vehicles recorded, this type of vehicle accounted for only 25 percent of the travel.

Truck combinations amounted to less than 37 percent of the total vehicles recorded, yet these vehicles accounted for almost 69 percent of the total travel. This indicates that trip lengths are much greater for the heavier type vehicles than for the lighter types. Buses accounted for slightly more than 7 percent of the vehicles recorded and 6 percent of the travel.

The percentage of vehicles registered in the United States and Canada is compared with the percentage of travel in each country by type of vehicle in table 6. For each type of vehicle the greater proportion are registered in Canada and the greater proportion of the travel is in the United States.

This table indicates that 2-axle, 4-tire single-unit trucks, mostly panels and pickups, have a larger proportion of Canadian registration than any other type of vehicle. However, the travel by these vehicles, although greater in the United States than in Canada, accounted for a smaller percentage of total travel in the United States than any other vehicle. Only 32 percent of these vehicles were registered in the United States, yet 57 percent of the travel occurred in the United States.

Of the total number of single-unit trucks recorded, approximately 34 percent were registered in the United States and 66 percent in Canada, whereas 58 percent of the travel was in the United States and 42 percent was in Canada.

About 40 percent of the number of 4-axle tractor-semitrailer combinations crossing the border were registered in the United States but nearly three-fourths (73 percent) of the travel by vehicles of this type was in the United States.

Table 3.—Number of commercial vehicles crossing the border on an average summer weekday in 1954, according to type of vehicle and class of operation, country of registration, and average length of trip [1]

Type of vehicle and class of operation	United States registered vehicles				Canadian registered vehicles				All vehicles			
	Number of vehicles	Average length of trip (in miles) traveled in—			Number of vehicles	Average length of trip (in miles) traveled in—			Number of vehicles	Average length of trip (in miles) traveled in—		
		United States	Canada	Total		United States	Canada	Total		United States	Canada	Total
Single-unit trucks:												
2-axle, 4-tire:												
Private	277	83	47	130	605	58	48	106	882	65	48	113
For hire	18	78	92	170	21	34	49	83	39	54	69	123
2-axle, 6-tire:												
Private	239	61	39	100	434	66	44	110	673	64	42	106
For hire	50	114	68	182	92	50	51	101	142	73	56	129
All single-unit trucks:												
Private	516	72	44	116	1,039	61	46	107	1,555	65	45	110
For hire	68	104	74	178	113	47	50	97	181	69	59	128
Total	584	(76)	(47)	(123)	1,152	(60)	(47)	(107)	1,736	(65)	(47)	(112)
Truck-tractor and semitrailer combinations:												
3-axle:												
Private	47	293	122	415	128	108	55	163	175	158	73	231
For hire	131	212	190	402	188	428	134	562	319	339	157	496
4-axle or more:												
Private	41	336	158	494	70	277	118	395	111	299	133	432
For hire	193	394	155	549	284	448	150	598	477	426	152	578
Truck and trailer combinations:												
Private	6	81	165	246	17	120	89	209	23	110	109	219
For hire	13	33	132	165	17	259	61	320	30	161	92	253
All combinations:												
Private	94	298	141	439	215	164	78	242	309	205	97	302
For hire	337	309	168	477	489	434	140	574	826	383	152	535
Total	431	(307)	(162)	(469)	704	(351)	(121)	(472)	1,135	(334)	(137)	(471)
Buses:												
Private	8	583	70	653	5	3	33	36	13	360	56	416
For hire	90	219	80	299	119	34	90	124	209	114	86	200
Total	98	(249)	(79)	(328)	124	(33)	(88)	(121)	222	(128)	(84)	(212)
All vehicles:												
Private	618	113	59	172	1,259	78	52	130	1,877	90	54	144
For hire	495	265	139	404	721	307	118	425	1,216	290	127	417
Total	1,113	(181)	(94)	(275)	1,980	(162)	(76)	(238)	3,093	(169)	(82)	(251)

[1] Numbers in parentheses are averages.

For all truck combinations, United States registration amounted to 38 percent and Canadian registration, 62 percent. Combinations traveled 71 percent of their mileage in the United States and 29 percent in Canada.

Vehicles Registered in Both Countries

Of the 1,113 vehicles with home registration in the United States as reported in table 7, 268 vehicles or 24.1 percent were also registered in one or more Canadian Provinces. Registrations in two Provinces accounted for 0.7 percent of the vehicles and in three Provinces, 0.8 percent.

There were 1,980 vehicles with home registration in Canada of which 841 or 42.5 percent were also registered in at least one State. Of this total 709 vehicles, or more than one-third, were registered in one State, 54 in two States, 49 in three States, 19 in four States, and 7 in five States. The remaining three vehicles were registered in six, seven, and nine States, respectively. In total, there were 1,109 or 36 percent of all vehicles that were registered in both countries.

Truck Body Types

Classification of vehicles according to vehicle and body types and country of registration is shown in table 8. The leading body-type classification was stake or platform with 752 vehicles. Vehicles with van or covered and box-type bodies followed closely with 664 and 626, respectively.

All but one of the panel body-type vehicles recorded were single-unit trucks. Sixty-one percent of the stake and platform body types and 92 percent of the box-body types were single-unit trucks. Slightly more than 93 percent of the refrigerator body types and about 72 percent of the vehicles with tank-body types were truck combinations. Ninety-two percent of the dump bodies and 63 percent of the cattle-rack body types were single-unit trucks. Eight percent of the dump-type bodies and 37 percent of the cattle-rack bodies were mounted on combinations.

Buses were included in the "other" classification along with 188 trucks of miscellaneous body types. Generally the distribution of vehicles by body type was found to be similar regardless of country of registration.

Trip Frequencies

The frequency of trips across the border between the same origins and destinations,

Table 4.—Percentage distribution of commercial vehicles crossing the border on an average summer weekday in 1954, according to type of vehicle, country of registration, and class of operation

Type of vehicle	United States registered vehicles			Canadian registered vehicles			All vehicles		
	Private	For hire	Total	Private	For hire	Total	Private	For hire	Total
Single-unit trucks:									
2-axle, 4-tire	93.9	6.1	100.0	96.6	3.4	100.0	95.8	4.2	100.0
2-axle, 6-tire	82.7	17.3	100.0	82.5	17.5	100.0	82.6	17.4	100.0
All single-unit trucks	88.4	11.6	100.0	90.2	9.8	100.0	89.6	10.4	100.0
Truck-tractor and semitrailer combinations:									
3-axle	26.4	73.6	100.0	40.5	59.5	100.0	35.4	64.6	100.0
4-axle or more	17.5	82.5	100.0	19.8	80.2	100.0	18.9	81.1	100.0
Truck and trailer combinations	31.6	68.4	100.0	50.0	50.0	100.0	43.4	56.6	100.0
All combinations	21.8	78.2	100.0	30.5	69.5	100.0	27.2	72.8	100.0
Buses	8.2	91.8	100.0	4.0	96.0	100.0	5.9	94.1	100.0
All commercial vehicles	55.5	44.5	100.0	63.6	36.4	100.0	60.7	39.3	100.0

Table 5.—Number and percentage distribution of commercial vehicles crossing the border on an average summer weekday in 1954, according to type of vehicle and mileage of travel

Type of vehicle	Vehicles		Travel	
	Number	Percent	Miles	Percent
Single-unit trucks	1,736	56.1	194,866	25.1
Truck combinations	1,135	36.7	534,890	68.8
Buses	222	7.2	47,155	6.1
Total	3,093	100.0	776,911	100.0

Table 6.—Percentage distribution of commercial vehicles crossing the border on an average summer weekday in 1954, according to type of vehicle, country of registration, and area of travel

Type of vehicle	Percent registered in—			Percent of travel in—		
	United States	Canada	Total	United States	Canada	Total
Single-unit trucks:						
2-axle, 4 tire	32.0	68.0	100.0	57.2	42.8	100.0
2-axle, 6 tire	35.5	64.5	100.0	59.4	40.6	100.0
All single-unit trucks	33.6	66.4	100.0	58.2	41.8	100.0
Truck-tractor and semitrailer combinations:						
3-axle	36.0	64.0	100.0	68.4	31.6	100.0
4-axle or more	39.8	60.2	100.0	73.1	26.9	100.0
Truck and trailer combinations	35.8	64.2	100.0	58.3	41.7	100.0
All combinations	38.0	62.0	100.0	71.0	29.0	100.0
Buses	44.1	55.9	100.0	60.4	39.6	100.0
All commercial vehicles	36.0	64.0	100.0	67.1	32.9	100.0

Table 7.—Number of commercial vehicles crossing the border on an average summer weekday in 1954, according to country of home registration, number registered in more than one place, and class of truck operation

Place of registration	Class of truck operation		Buses	Total
	Private	For hire		
United States registered vehicles:				
Registered in United States only	533	256	56	845
Registered in United States and one province	75	138	38	251
Registered in United States and two provinces	-----	8	---	8
Registered in United States and three provinces	2	3	4	9
Total	610	405	98	1,113
Canadian registered vehicles:				
Registered in Canada only	831	229	79	1,139
Registered in Canada and one State	389	284	36	709
Registered in Canada and two States	9	41	4	54
Registered in Canada and three States	19	26	4	49
Registered in Canada and four States	1	17	1	19
Registered in Canada and five States	3	4	---	7
Registered in Canada and six States	1	---	---	1
Registered in Canada and seven States	1	---	---	1
Registered in Canada and nine States	-----	1	---	1
Total	1,254	602	124	1,980

classified according to country of registration and major vehicle types, is shown in table 9.

Trips made no oftener than once a year constituted 11.4 percent of the total. At the other extreme, trips made oftener than once a day amounted to 19.1 percent. More than half of the trips, 56.0 percent, were repeated more often than once a week, on the average. There was no consistent difference in trip frequency with respect to United States and Canadian registered vehicles.

The trips made very frequently were, of course, short trips. One trip was reported to have been made as frequently as 6,000 times per year and was only 1½ miles long—one-half mile of travel in the United States and one mile in Canada. The vehicle was registered in the United States and hauled coal from Canada and returned empty. The very long trips were mostly nonrepetitive or very infrequent.

Trip Length Varies with Commodity Hauled

The commodities hauled by commercial vehicles are classified in tables 10 and 11 according to the 1954 edition of the *Freight Commodity Statistics Classification* published by the Association of American Railroads.

Of the 3,093 vehicles recorded, as shown in table 10, 222 or 7.2 percent were buses, 1,432 or 46.3 percent were empty trucks, and 1,439 or 46.5 percent were loaded trucks. That is, 92.8 percent of the commercial vehicles were trucks and about half were empty. The average length of trip by empty trucks was 155 miles compared with 353 miles for loaded trucks. However, the proportion of travel by empty and loaded trucks in the United States and Canada was about the same, being 66 and 34 percent for empty trucks and 68 and 32 percent for loaded trucks, respectively.

Agricultural products

Trucks hauling agricultural products accounted for 4.5 percent of all commercial vehicles and 4.2 percent of the mileage traveled. Over 61 percent of the mileage traveled was in the United States. The average length of trip was 231 miles: 142 miles in the United States and 89 miles in Canada. The largest movement of agricultural products occurred at Detroit, stations 7–8, with the next heaviest movements at Champlain, N. Y., station 11,

Table 8.—Number of commercial vehicles crossing the border on an average summer weekday in 1954, according to type of vehicle, country of registration, and truck body type

Type of vehicle and country of registration	Truck body type								Other truck body types and buses	All vehicles
	Panel	Tank	Stake or platform	Refrigerator	Van or covered	Dump	Box	Cattle rack		
Single-unit trucks:										
2-axle, 4 tire:										
United States	88	1	20	1	10	-------	155	3	17	295
Canada	225	1	60	-------	16	1	305	-------	18	626
2-axle, 6 tire:										
United States	8	6	116	1	35	81	15	3	24	289
Canada	2	11	262	4	87	43	98	11	8	526
All single-unit trucks:										
United States	96	7	136	2	45	81	170	6	41	584
Canada	227	12	322	4	103	44	403	11	26	1,152
Total	323	19	458	6	148	125	573	17	67	1,736
Truck-tractor and semitrailer combinations:										
3-axle:										
United States	1	5	37	4	65	-------	5	2	59	178
Canada	-------	12	130	3	129	-------	5	3	34	316
4-axle or more:										
United States	-------	8	42	24	120	-------	32	1	7	234
Canada	-------	9	69	49	186	10	10	4	17	354
Truck and trailer combinations:										
United States	-------	5	6	-------	5	1	-------	-------	2	19
Canada	-------	9	10	1	11	-------	1	-------	2	34
All combinations:										
United States	1	18	85	28	190	1	37	3	68	431
Canada	-------	30	209	53	326	10	16	7	53	704
Total	1	48	294	81	516	11	53	10	121	1,135
Buses:										
United States	-------	-------	-------	-------	-------	-------	-------	-------	98	98
Canada	-------	-------	-------	-------	-------	-------	-------	-------	124	124
Total	-------	-------	-------	-------	-------	-------	-------	-------	222	222
All vehicles:										
United States	97	25	221	30	235	82	207	9	207	1,113
Canada	227	42	531	57	429	54	419	18	203	1,980
Total	324	67	752	87	664	136	626	27	410	3,093

and Sweetgrass, Mont., station 2. About 60 percent of the movement was from Canada to the United States. More than three-fourths of the trucks moving agricultural products were registered in Canada and two-thirds of these vehicles were hauling from Canada to the United States.

Animals and animal products

Approximately the same number and percentage of trucks were hauling animals or animal products as were hauling agricultural products, namely, 142 trucks or 4.6 percent of all vehicles. However, the mileage traveled by trucks hauling animals and animal products was quite different—almost three times that for agricultural products. The average trip length was 650 miles: 456 miles in the United States and 194 miles in Canada. Seventy percent of the travel was in the United States.

About two-thirds of the movement of animals and animal products was from Canada to the United States and the major portion of the vehicles were registered in Canada. More trucks hauling animal products were recorded at the Detroit, Buffalo, and Calais, Maine stations than at other stations. The most frequent item at Calais was fish and lobsters.

Table 9.—Frequency of identical trips made by commercial vehicles crossing the border on an average summer weekday in 1954, according to country of registration and type of vehicle

Country of registration and type of vehicle	Frequency of identical trips						All trips
	Trip made no oftener than—					Oftener than twice a day	
	Once a year	Once a month	Once a week	Once a day	Twice a day		
United States registered vehicles:							
Single-unit trucks	88	87	67	200	27	115	584
Truck combinations	54	101	106	146	9	15	431
Buses	16	7	4	65	4	2	98
Total	158	195	177	411	40	132	1,113
Canadian registered vehicles:							
Single-unit trucks	134	172	210	438	97	101	1,152
Truck combinations	53	66	176	219	102	88	704
Buses	9	7	4	74	10	20	124
Total	196	245	390	731	209	209	1,980
All commercial vehicles:							
Single-unit trucks	222	259	277	638	124	216	1,736
Truck combinations	107	167	282	365	111	103	1,135
Buses	25	14	8	139	14	22	222
Total	354	440	567	1,142	249	341	3,093

Table 10.—Number and percentage distribution of commercial vehicles (loaded and empty) crossing the border on an average summer weekday in 1954, according to commodity hauled, mileage traveled, and average length of trip

Commodity or vehicle classification	Vehicles crossing border			Total distance traveled			Average distance traveled in—					
	Number of vehicles	Percent of all vehicles	Percent hauling commodities	Miles	Percent of all mileage	Percent hauling commodities	United States		Canada		Total	
							Miles	Percent	Miles	Percent	Miles	Percent
TRUCKS HAULING COMMODITIES												
Products of agriculture	141	4.5	9.8	32,636	4.2	6.4	142	61.5	89	38.5	231	100.0
Animals and animal products	142	4.6	9.9	92,300	11.9	18.2	456	70.2	194	29.8	650	100.0
Products of mines	76	2.5	5.3	2,293	.3	.4	15	50.0	15	50.0	30	100.0
Products of forests	111	3.6	7.7	9,583	1.2	1.9	47	54.7	39	45.3	86	100.0
Manufactured and miscellaneous products	969	31.3	67.3	370,898	47.7	73.1	264	68.9	119	31.1	383	100.0
All commodities	1,439	46.5	100.0	507,710	65.3	100.0	241	68.3	112	31.7	353	100.0
BUSES AND EMPTY TRUCKS												
Empty trucks	1,432	46.3	-------	222,046	28.6	-------	102	65.8	53	34.2	155	100.0
Buses	222	7.2	-------	47,155	6.1	-------	128	60.4	84	39.6	212	100.0
ALL COMMERCIAL VEHICLES												
All commercial vehicles	3,093	100.0	-------	776,911	100.0	-------	169	67.3	82	32.7	251	100.0

Table 11.—Number of commercial vehicles (loaded and empty) crossing the border on an average summer weekday in 1954, according to country of registration, origin and destination of trip, and commodity hauled

Commodity or vehicle classification	Origin and destination of travel of United States registered vehicles					Origin and destination of travel of Canadian registered vehicles					Origin and destination of travel of all vehicles				
	Canada to Canada	Canada to United States	United States to Canada	United States to United States	Total	Canada to Canada	Canada to United States	United States to Canada	United States to United States	Total	Canada to Canada	Canada to United States	United States to Canada	United States to United States	Total
TRUCKS HAULING COMMODITIES															
Products of agriculture	-----	14	18	2	34	4	71	32	-----	107	4	85	50	2	141
Animals and animal products	2	34	19	4	59	14	59	10	-----	83	16	93	29	4	142
Products of mines	-----	39	13	-----	52	-----	18	6	-----	24	-----	57	19	-----	76
Products of forests	-----	13	21	7	41	1	41	28	-----	70	1	54	49	7	111
Manufactured and miscellaneous products	7	89	131	135	362	108	178	319	2	607	115	267	450	137	969
All commodities	9	189	202	148	548	127	367	395	2	891	136	556	597	150	1,439
BUSES AND EMPTY TRUCKS															
Empty trucks	2	207	204	54	467	47	555	362	1	965	49	762	566	55	1,432
Buses	4	36	51	7	98	1	78	39	6	124	5	114	90	13	222
ALL COMMERCIAL VEHICLES															
All commercial vehicles	15	432	457	209	1,113	175	1,000	796	9	1,980	190	1,432	1,253	218	3,093

Mine products

The smallest number of trips, 76 or only 2.5 percent of the total, were made by vehicles carrying mine products. Mileage traveled by these vehicles was only 0.3 percent of the total. The trip length was the shortest for any commodity hauled and amounted to only 30 miles, equally divided between the United States and Canada. This is the only product hauled where the portion of travel in Canada equaled that in the United States.

Of the 76 vehicles hauling mine products, 52 were registered in the United States and 39 of these vehicles were moving from Canada to the United States. Nearly half of the vehicles hauling mine products were recorded at the Madawaska, Maine, station.

Forest products

Vehicles transporting forest products accounted for 3.6 percent of all vehicles, but their travel amounted to only 1.2 percent of the total. The average length of trip was 86 miles: 47 miles in the United States and 39 miles in Canada.

The heavier movements in this category occurred at Jackman, Maine, and International Falls, Minn. Almost 50 percent of the vehicles hauling forest products were recorded at these two stations. It is somewhat surprising to find that the movement of forest products from the United States to Canada almost equaled that from Canada to the United States being 44 and 49 percent, respectively. The remaining 7 percent was made up of trips with both origins and destinations in the same country.

Of the five vehicles hauling pulpwood, all were traveling from Canada to the United States and the vehicles were registered in the United States.

Manufactured and miscellaneous products

Almost a third of the total vehicles crossing the border carried manufactured products and accounted for almost one-half (47.7 percent) of the total travel. Two-thirds of all loaded vehicles carried these products. With the exception of animals and animal products, trip lengths of vehicles carrying manufactured products were the longest, 383 miles. Travel was divided as follows: 264 miles in the United States and 119 miles in Canada. Sixty-three percent of the vehicles hauling manufactured products were registered in Canada and 37 percent in the United States. Previously it was noted that there were more trips to the United States than to Canada by trucks hauling products of agriculture, animal products, and products of mines and forests. However, there were more trips to Canada than to the United States by vehicles loaded with manufactured and miscellaneous products.

Nearly half (45 percent) of the vehicles hauling manufactured products crossed the border at Port Huron and Detroit, Mich. A large number of trucks hauling this type of commodity were also recorded at Buffalo, N. Y. In fact, more vehicles hauling manufactured products crossed the border at Buffalo than at any other station except the bridge at Detroit. Seventeen vehicles were transporting gasoline and 16 of these were registered in Canada. All trips but one were from the United States to Canada.

Of the 47 vehicles loaded with manufactured iron and steel items, 35 were registered in Canada. There were 28 such vehicles traveling from the United States to Canada.

Vehicles hauling automobiles, trucks, and parts pertaining to the motor industry totaled 211. Of these, 143 were registered in Canada and 68 in the United States. There were 119 such vehicles traveling from the United States to Canada, 25 from Canada to the United States, 40 with both origins and destinations in the United States, and 27 with both origins and destinations in Canada. New autos and trucks were usually being moved between points in the same country, but a portion of the trip was made in the other country.

Of the 12 vehicles hauling newsprint paper, 8 were moving from the United States to Canada, 2 from Canada to the United States, and 2 had origins and destinations within Canada.

New Publication

A new publication entitled *Specifications for Aerial Surveys and Mapping by Photogrammetric Methods for Highways, 1956: a reference guide outline* is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 55 cents a copy.

This reference guide outline was prepared by the Photogrammetry for Highways Committee with active participation by the Bureau of Public Roads. The Photogrammetry for Highways Committee is jointly sponsored by The American Society of Photogrammetry and The American Congress on Surveying and Mapping.

The purpose of this publication is to aid highway officials in establishing specifications for the procurement by contract of photogrammetric and aerial survey services. Under the provisions of the Federal-Aid Highway Act of 1956, the Secretary of Commerce may authorize the use of photogrammetric methods in mapping, and the utilization of commercial enterprise for such services.

The specifications are a reference guide outline, and should be modified to fulfill special requirements not discussed in detail in this publication.

U. S. GOVERNMENT PRINTING OFFICE: 1956

A list of the more important articles in PUBLIC ROADS may be obtained upon request addressed to Bureau of Public Roads, Washington 25, D. C.

PUBLICATIONS of the Bureau of Public Roads

The following publications are sold by the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Orders should be sent direct to the Superintendent of Documents. Prepayment is required.

ANNUAL REPORTS

Work of the Public Roads Administration:
1941, 15 cents. 1948, 20 cents.
1942, 10 cents. 1949, 25 cents.
Public Roads Administration Annual Reports:
1943; 1944; 1945; 1946; 1947.
(*Free from Bureau of Public Roads*)
Annual Reports of the Bureau of Public Roads:
1950, 25 cents. 1952, 25 cents. 1954 (out of print).
1951, 35 cents. 1953, 25 cents. 1955, 25 cents.

PUBLICATIONS

Bibliography of Highway Planning Reports (1950). 30 cents.
Braking Performance of Motor Vehicles (1954). 55 cents.
Construction of Private Driveways, No. 272MP (1937). 15 cents.
Criteria for Prestressed Concrete Bridges (1954). 15 cents.
Design Capacity Charts for Signalized Street and Highway Intersections (reprint from PUBLIC ROADS, Feb. 1951). 25 cents.
Electrical Equipment on Movable Bridges, No. 265T (1931). 40 cents.
Factual Discussion of Motortruck Operation, Regulation, and Taxation (1951). 30 cents.
Federal Legislation and Regulations Relating to Highway Construction (1948). Out of print.
Financing of Highways by Counties and Local Rural Governments: 1931–41, 45 cents; 1942–51, 75 cents.
General Location of the National System of Interstate Highways, Including All Additional Routes at Urban Areas Designated in September 1955. 55 cents.
Highway Bond Calculations (1936). 10 cents.
Highway Bridge Location No. 1486D (1927). 15 cents.
Highway Capacity Manual (1950). $1.00.
Highway Needs of the National Defense, House Document No. 249 (1949). 50 cents.
Highway Practice in the United States of America (1949). 75 cents.
Highway Statistics (annual):
1945 (out of print). 1949, 55 cents. 1953, $1.00.
1946, 50 cents. 1950 (out of print). 1954, 75 cents.
1947, 45 cents. 1951, 60 cents.
1948, 65 cents. 1952, 75 cents.
Highway Statistics, Summary to 1945. 40 cents.
Highways in the United States, *nontechnical* (1954). 20 cents.
Highways of History (1939). 25 cents.
Identification of Rock Types (reprint from PUBLIC ROADS, June 1950). 15 cents.
Interregional Highways, House Document No. 379 (1944). 75 cents.
Legal Aspects of Controlling Highway Access (1945). 15 cents.
Local Rural Road Problem (1950). 20 cents.
Manual on Uniform Traffic Control Devices for Streets and Highways (1948) (*including 1954 revisions supplement*). $1.00.
Revisions to the Manual on Uniform Traffic Control Devices for Streets and Highways (1954). *Separate*, 15 cents.

PUBLICATIONS (Continued)

Mathematical Theory of Vibration in Suspension Bridges (1950). $1.25.
Model Traffic Ordinance (revised 1953). Out of print.
Needs of the Highway Systems, 1955–84, House Document No. 120 (1955). 15 cents.
Opportunities in the Bureau of Public Roads for Young Engineers (1955). 25 cents.
Principles of Highway Construction as Applied to Airports, Flight Strips, and Other Landing Areas for Aircraft (1943). $2.00.
Progress and Feasibility of Toll Roads and Their Relation to the Federal-Aid Program, House Document No. 139 (1955). 15 cents.
Public Control of Highway Access and Roadside Development (1947). 35 cents.
Public Land Acquisition for Highway Purposes (1943). 10 cents.
Public Utility Relocation Incident to Highway Improvement, House Document No. 127 (1955). 25 cents.
Results of Physical Tests of Road-Building Aggregate (1953). $1.00.
Roadside Improvement, No. 191MP (1934). 10 cents.
Selected Bibliography on Highway Finance (1951). 60 cents.
Specifications for Aerial Surveys and Mapping by Photogrammetric Methods for Highways, 1956: a reference guide outline. 55 cents.
Specifications for Construction of Roads and Bridges in National Forests and National Parks, FP–41 (1948). $1.50.
Standard Plans for Highway Bridge Superstructures (1953). $1.25.
Taxation of Motor Vehicles in 1932. 35 cents.
Tire Wear and Tire Failures on Various Road Surfaces (1943). 10 cents.
Transition Curves for Highways (1940). $1.75.

MAPS

State Transportation Map series (available for 39 States). Uniform sheets 26 by 36 inches, scale 1 inch equals 4 miles. Shows in colors Federal-aid and State highways with surface types, principal connecting roads, railroads, airports, waterways, National and State forests, parks, and other reservations. Prices and number of sheets for each State vary—see Superintendent of Documents price list 53.
United States System of Numbered Highways. 28 by 42 inches, scale 1 inch equals 78 miles. 20 cents.

Single copies of the following publications are available to highway engineers and administrators for official use, and may be obtained by those so qualified upon request addressed to the Bureau of Public Roads. They are not sold by the Superintendent of Documents.

Bibliography on Automobile Parking in the United States (1946).
Bibliography on Highway Lighting (1937).
Bibliography on Highway Safety (1938).
Bibliography on Land Acquisition for Public Roads (1947).
Bibliography on Roadside Control (1949).
Express Highways in the United States: a Bibliography (1945).
Indexes to PUBLIC ROADS, volumes 17–19 and 23.
Title Sheets for PUBLIC ROADS, volumes 24–28.

UNITED STATES
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OFFICIAL BUSINESS

DEPARTMENT OF COMMERCE—BUREAU OF PUBLIC ROADS

STATUS OF FEDERAL-AID HIGHWAY PROGRAM

AS OF AUG. 31, 1956

State	Unprogramed balances [1]	Active program											
		Programed only			Plans approved, construction not started			Construction under way			Total		
	(Thousand dollars)	Thousand dollars		Miles	Thousand dollars		Miles	Thousand dollars		Miles	Thousand dollars		Miles
		Total cost	Federal funds		Total cost	Federal funds		Total cost	Federal funds		Total cost	Federal funds	
Alabama	$69,025	$20,878	$12,944	312.0	$3,837	$2,050	41.0	$50,011	$27,010	649.2	$74,726	$42,004	1,002.2
Arizona	41,540	6,127	3,958	55.4	3,655	2,644	40.0	11,419	8,608	123.2	21,201	15,210	218.6
Arkansas	57,840	16,190	8,127	506.9	7,044	3,709	56.3	21,530	11,284	388.2	44,764	23,120	951.4
California	183,965	46,445	31,356	280.0	9,868	5,004	14.2	142,142	73,616	229.6	198,455	109,976	523.8
Colorado	56,019	11,359	6,964	135.6	1,266	464	5.6	28,210	16,950	240.2	40,835	24,378	381.4
Connecticut	54,668	2,876	1,438	2.6	990	600	.8	11,437	5,812	24.2	15,303	7,850	27.6
Delaware	24,660	1,260	630	22.3	3,264	1,652	17.9	5,936	2,952	50.4	10,460	5,234	90.6
Florida	60,868	18,844	9,481	340.7	8,622	4,859	32.6	42,063	21,713	328.8	69,529	36,053	702.1
Georgia	90,086	36,612	19,050	633.1	6,602	3,135	31.8	58,821	28,638	875.9	102,035	50,823	1,540.8
Idaho	36,833	10,801	7,561	69.7	2,662	1,750	74.0	13,412	8,552	203.1	26,875	17,863	346.8
Illinois	160,702	42,061	25,669	502.2	16,077	9,006	55.1	110,740	61,921	776.6	168,878	96,596	1,333.9
Indiana	107,701	20,777	11,295	79.9	11,631	6,205	113.2	40,459	22,301	261.0	72,867	39,801	454.1
Iowa	60,879	34,848	24,996	496.0	3,966	2,302	38.6	34,083	19,349	1,064.1	72,897	46,647	1,598.7
Kansas	65,044	16,126	8,939	841.8	5,834	3,282	63.7	38,717	20,169	1,189.0	60,677	32,390	2,094.5
Kentucky	75,069	4,282	2,164	43.8	2,434	1,226	10.5	44,319	23,820	616.6	51,035	27,210	670.9
Louisiana	62,468	16,032	8,267	75.3	9,550	4,782	2.8	40,212	19,793	338.4	65,794	32,842	416.5
Maine	31,436	8,042	4,190	66.7	1,966	1,067	12.5	15,428	7,946	108.3	25,436	13,203	187.5
Maryland	35,527	22,838	14,439	119.9	15,249	8,393	23.3	29,672	15,644	121.3	67,759	38,476	264.5
Massachusetts	73,769	28,414	15,023	29.7	16,188	11,067	8.7	46,330	22,839	59.5	90,932	48,929	97.9
Michigan	120,786	41,696	27,358	493.6	13,530	6,891	67.9	65,109	34,264	655.7	120,335	68,513	1,217.2
Minnesota	73,997	12,390	7,794	340.8	10,994	5,291	124.4	56,659	31,452	1,535.8	80,083	44,537	2,001.0
Mississippi	63,539	11,282	5,783	425.9	6,927	3,939	66.0	22,792	11,537	678.5	41,001	21,259	1,170.4
Missouri	92,121	28,212	16,423	1,105.8	11,058	7,046	44.4	70,234	36,524	1,184.5	109,504	59,993	2,334.7
Montana	62,860	8,542	5,183	171.1	4,567	2,977	39.3	31,229	19,343	528.6	44,338	27,503	739.0
Nebraska	66,223	6,661	3,600	202.9	2,998	1,503	35.2	34,638	17,884	1,131.1	44,297	22,987	1,369.2
Nevada	40,180	9,699	8,129	117.7	92	77	------	10,904	9,213	193.8	20,695	17,419	311.5
New Hampshire	24,485	3,523	2,195	16.5	884	433	4.7	10,173	5,420	56.2	14,580	8,048	77.4
New Jersey	92,416	6,526	3,263	51.1	9,791	4,723	9.6	32,197	15,826	47.5	48,514	23,812	108.2
New Mexico	44,298	2,805	1,787	25.4	5,985	4,309	87.0	12,883	8,230	168.8	21,673	14,326	281.2
New York	270,447	23,126	12,948	56.8	30,703	15,556	49.8	267,763	127,650	445.4	321,592	156,154	552.0
North Carolina	96,186	17,672	8,610	254.4	3,426	1,667	48.3	59,688	29,272	747.7	80,786	39,549	1,050.4
North Dakota	43,969	5,785	2,948	812.9	7,398	3,912	491.8	13,642	6,897	821.7	26,825	13,757	2,126.4
Ohio	151,327	61,592	36,375	177.4	13,585	8,955	53.6	91,989	45,999	147.0	167,166	91,329	378.0
Oklahoma	55,681	33,523	22,206	389.1	19,500	10,120	273.0	39,228	20,591	355.9	92,251	52,917	1,018.0
Oregon	40,004	12,033	9,702	75.1	1,810	1,117	24.5	32,042	20,976	261.9	45,885	31,795	361.5
Pennsylvania	203,532	36,937	19,254	127.9	18,677	9,844	46.7	131,989	66,069	382.0	187,603	95,167	556.6
Rhode Island	23,138	2,762	1,381	5.0	223	117	------	20,090	10,359	28.1	23,075	11,857	33.1
South Carolina	51,792	17,286	9,480	353.2	4,827	2,604	24.0	22,210	12,062	495.9	44,323	24,146	873.1
South Dakota	42,619	12,906	7,406	499.3	3,730	2,167	118.6	19,541	11,332	605.0	36,177	20,905	1,222.9
Tennessee	87,116	20,610	9,733	398.9	9,037	4,520	30.9	46,041	21,285	432.3	75,688	35,538	862.1
Texas	198,425	16,078	9,002	448.5	36,888	24,645	219.0	118,724	62,651	1,536.2	171,690	96,298	2,203.7
Utah	35,564	5,556	4,038	88.6	1,576	1,168	8.3	12,469	9,457	168.3	19,601	14,663	265.2
Vermont	24,640	774	387	15.3	308	154	1.4	11,016	5,668	86.9	12,098	6,209	103.6
Virginia	78,117	17,714	9,483	260.0	6,037	3,211	87.8	33,888	17,271	330.9	57,639	29,965	678.7
Washington	56,776	14,092	8,847	119.4	7,610	4,338	99.4	31,315	16,970	259.6	53,017	30,155	478.4
West Virginia	52,941	11,999	6,204	49.2	6,249	3,142	38.9	18,083	9,166	38.2	36,331	18,512	126.3
Wisconsin	86,525	18,285	9,271	218.2	5,958	3,321	17.5	48,428	23,919	470.3	72,671	36,511	706.0
Wyoming	35,854	5,237	3,634	70.6	3,080	1,994	47.1	17,268	11,417	292.6	25,585	17,045	410.3
Hawaii	7,502	2,117	1,043	4.5	4,532	2,215	7.5	1,839	892	2.9	8,488	4,150	14.9
District of Columbia	24,966	11,801	6,931	3.7	1,007	496	.1	9,211	4,579	1.9	22,019	12,006	5.7
Puerto Rico	12,997	5,554	2,259	18.0	3,301	1,515	1.4	18,362	8,538	63.3	27,217	12,312	82.7
Alaska	15,074	------	------	-------	------	------	------	--------	--------	-------	--------	--------	-------
Total	3,724,196	849,587	499,148	12,010.4	386,993	217,164	2,810.7	2,196,585	1,151,630	21,802.1	3,433,165	1,867,942	36,623.2

[1] Includes funds for fiscal year 1958, apportioned Aug. 1, 1956.