Gasoline Consumption, Weight, and Mileage of Commercial Vehicles

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From a study conducted by the Ford Motor Company in 1950 through cooperation of the owners of 5,591 Ford trucks of 1948-, 1949-, and 1950-year models, a summary of monthly mileage, gross vehicle weight, and gasoline consumption is presented for eight models of single-unit trucks and three models of tractor-semitrailer combinations.

These summaries show a wide variation in each of these three characteristics of use. The range of mileage for the middle 80 percent of the lightest-capacity truck was from 600 to 2,300 miles a month, with 100 percent of these models being driven between 100 and 11,000 miles a month. The range in mileage for the middle 80 percent of the tractor-semitrailer combinations was 1,300 to 7,000 miles a month.

The middle 80 percent of the lightest trucks ranged in gross weight from 3,625 to 4,700 lb. Other single-unit trucks with four tires ranged from 4,625 to 8,150 lb. for the middle 80 percent. The middle 80 percent of the single-unit trucks with dual rear tires ranged from 10,000 to 22,600 lb. The tractor-semitrailer combinations ranged from 28,500 to 53,000 lb. in weight for the middle 80 percent. The median weight was close to 40,000 lb.

The gasoline consumption of the lightest models ranged from 11.1 to 17.2 miles per gallon for the middle 80 percent with the other single-unit, four-tired vehicles having a range of 8.6 to 15.0 miles per gallon. Similarly, the single-unit, six-tired trucks ranged from 6.2 to 10.8 miles per gallon. The tractor-semitrailer combinations had a range of 4.6 to 8.7 miles per gallon for the middle 80 percent.

These wide ranges in monthly mileage, gross vehicle weight, and gasoline consumption indicate that the performance of any particular vehicle or fleet of vehicles should not be used as representing the average for all vehicles of that class until thorough investigation has shown the particular data to be representative.

The correlation of mileage and gasoline consumption with weight lacks exactness because of not having a sufficient number of vehicles in each 1,000-lb. gross-weight class to fix the location of the gasoline consumption curve throughout its range. The analyses show an increase in rate of gasoline consumption with increasing weight. There is also an increase in monthly mileage with increase in weight. The miles per gallon of gasoline consumed is somewhat higher for weights above 8,000 lb. than given in past published reports for all vehicles. Information available is not sufficient to determine which reports are the more appropriate to use in highway financial and taxation analyses.

A desirable approach to the determination of the average annual mileage and fuel consumption of vehicles registered in a given state would be to statistically select the sample of vehicles, then have accurate records on these vehicles kept for one year.

●ANNUAL mileage, gross weight, and fuel consumption of motor vehicles are three important sets of information needed in highway planning, financial-need studies, studies of highway-user contributions, and in setting rates of highway-user taxes. Despite the importance of these three items to highway and motor vehicle administration, there is a scarcity of reliable data with which to work or on which to base practical applications in planning legislation.

Because of the scarcity of reliable information on annual mileages and road weights of vehicles as related to fuel consumption, investigators and analysts, of necessity,

have used what information was available. Because of the wide variation, vehicle to vehicle, in annual mileage, vehicle gross weight, and fuel consumption, the applicability to general studies of just any data available can justifiably be questioned.

The objective of this paper is not to present data for general application in studies which require annual mileage, gross vehicle weight, and fuel consumption, but the objective is to present information to show that extreme care should be exercised in selecting such values for any study involving highway planning, financial needs, taxation, and engineering economy analyses.

The range of annual mileage, the range of gross vehicle weight, and the range of fuel consumption per mile for the vehicles in any specific class are so great that any given report of the performance of a specific vehicle or a fleet of vehicles should be questioned and thoroughly checked before accepting the report for use in any general highway investigation or analysis.

Another point of caution that should be observed is related to the ownership of vehicles. Perhaps less than 2 percent of passenger-car owners keep complete and accurate cost of their operation; the percentage for commercial vehicles may be somewhat larger. But even when accurate costs are available, there is still the need for verification of the cost data to ascertain what cost items are included and how the unit costs were determined. The author has examined reports of passenger-car operation as kept by many individual owners. Rarely did he find two owners that kept their records on the same basis of accounting classification. Likewise, commercial firms have submitted to him reports of their motor-truck operation, but because of the basic differences in accounting systems, it was seldom possible to combine these reports to reach a composite figure of operating cost.

When it is realized that so few vehicle owners keep records of their operating costs, mileages, and weights and that those owners who do keep such records use their own scheme of accounting and record keeping, it should be evident that any offhand report by an owner of what his fuel consumption is, what his annual mileage is, or what his general operating cost is, is information that should be received with but little note. That individual reports of mileage, gross vehicle weight, and fuel consumption bear no known relation to statewide or nationwide average performance should be evident from an examination of the data reported herein for Ford trucks.

THE FORD MOTOR COMPANY STUDY

The data reported in this paper were made available to the author by the Ford Motor Company. It was gathered by the Company in 1950 through the cooperation of 5,591 owners of Ford trucks distributed throughout the 48 states. The detailed data for each of the 5,591 trucks were published by the Ford Motor Company in 1951 under the title, "Final Results—50-Million Mile Ford Truck Economy Run."

The Ford study was conducted for 6 months, July through December 1950. The records for trucks operating less than 4 months were excluded from the final tabulations. The trucks were 1948-, 1949-, and 1950-year models, thus comparatively new when considered in relation to the complete registration in any state for a given year.

The published report by Ford gives the truck body type, place of ownership, and owner's vocation for each truck. Geographical distribution is countrywide; all normal uses of the truck and truck combinations are represented. Twenty-four single-unit, three-axle trucks were removed from this analysis because of the small number.

Table 1 presents the main descriptive information for each of the basic eight models of the Ford truck line. Bodies include a typical selection of the types commonly encountered in general use.

The data on miles driven, load carried, and fuel consumption as published by Ford forms the basis of this analysis. The original publication did not assemble the information in a manner to bring out the wide range of variation, or the relationship of gasoline consumption and monthly mileage to gross vehicle weight.

Any application of the data herein presented should be made with appropriate consideration of the source and quality of the data as originally published.

ADJUSTMENTS IN THE DATA

The original survey did not report the weight of the vehicles empty, or what is sometimes referred to as curb weight.

TABLE 1

NUMBER AND DESCRIPTION OF FORD TRUCK MODELS INCLUDED IN THE FIELD STUDY

Model[a]	Number Vehicles in Study	Recommended Tire Size and Ply Rating		Maximum Brake Horsepower		Manufacturers' Gross Vehicle Weight Rating	
		Min.	Max.	Min.	Max.	Min.	Max
						lb.	lb.
F-1	1,756	6.00-16-6	6 50-16-6	95	100	4,000	4,700
F-2	303	6 50-16-6	7.50-16-6	95	100	4,900	5,700
F-3	514	7.00-17-6	7.50-17-8	95	100	5,600	6,800
F-4	171	7 20-18-8	7.00-20-8	95	100	7,500	10,000
F-5	618	6 50-20-6	7.50-20-8	95	100	10,000	14,000
F-6	1,325	7.50-20-8	8.25-20-10	95	110	14,000	16,000
F-7	120	8.25-20-10	9.00-20-10	-	145	17,000	19,000
F-8	92	9 00-20-10	10.00-20-12	-	145	20,000	22,000
F-5s[b]	21	-	7.50-20-8	95	100	-	24,000
F-6s	216	-	8.25-20-10	95	110	-	28,000
F-7s	144	-	9.00-20-10	-	145	-	35,000
F-8s	292	-	10.00-20-12	-	145	-	39,000
Total	5,572	-	-	-	-	-	-

[a] The trucks were 1948, 1949, and 1950 models. The 24 three-axle, single-unit trucks reported are not included in any of the tables herein presented. The letter "s" denotes a tractor-semitrailer combination.

[b] These 21 Model F-5s tractor-semitrailers are consolidated with the Model F-6s in all summaries and analyses

Note The F-5 to F-8 models are with dual rear wheels. The heavier gross vehicle weight rating in the F-4, also is for dual rear wheels.

These weights were supplied by reference to the Ford Truck Handbook for F-1 to F-6 models and body types supplied by the company, mainly panel, pickup, express, stake, and platform. For Models F-7 and F-8 and for other body types, the chassis weight was taken from the Ford Handbook to which was added an appropriate weight for the body as selected from information furnished by body manufacturers. The empty weight of the semitrailers was supplied by selection from the equipment supplied by other manufacturers. To the empty vehicle weight was added the "average monthly load carried" to obtain the average gross vehicle weight.

A few trial listings of the cards disclosed two dozen or so punchings that appeared completely out of reasonable range. In such case the card was discarded, or repunched to a reasonable figure if a basis for ascertaining the reasonable value was discovered.

There is no reason not to accept the data as being reliable and honestly supplied. As is true with any study dealing with a large cross-section of individuals, the information so supplied will include certain errors of judgment, omissions, duplications, and arithmetical mistakes. Perhaps a few fillings of the fuel tank were not recorded and the loads carried may have been estimated, but the mileage reported should be accurate because of the control of the odometer. It is acknowledged that this study lacks the controls which the true researcher would provide, but such a research person has not yet found the means to conduct a fully controlled study of the use and overall performance of motor trucks. Until he does conduct such a study, applications of mileage, fuel consumption, and the related gross weight to highway planning, financial, and taxation analyses must be based upon less-reliable, but nevertheless useful, reports.

ANALYSIS OF THE MILEAGE DATA

The range of miles driven per month for each model is given in Table 2. The lighter-capacity models were driven as little as 100 to 199 miles a month and the heavier capacity models as little as 400 to 499 miles a month. The heavier vehicles, particularly the tractor-semitrailer combinations, have a concentration in the range of 3,000 to 7,000 miles a month. This concentration decreases as the vehicle capacity becomes less until for the Model F-1, the most-frequent monthly mileage is 900 to 999 miles. The upper limit of mileage is about 10,000 miles a month for most of the models.

The mileage frequencies of Table 2 were summed for Model F-1; Models F-2, F-3, F-4; Models F-5, F-6, F-7, F-8; and for the tractor-semitrailer combinations and converted to percentage of the total in each class. The F-1 model is kept separate because of the large number of vehicles in proportion to other models and because of

its type of use. The cumulative percentage curves plotted in Figure 1 show that the spread of monthly mileage becomes greater as the load capacity of vehicle increases. The spread for the lower 10 percent is relatively small, and the spread for the upper 10 percent is relatively great. For the F-1 vehicles the percentage group from 10 to 90 percent ranges from 600 to 2,250 miles with 100 percent of the vehicles falling below 11,000 miles a month.

The group of other single-unit, four-tired trucks have a spread for the middle 80 percent of from 500 to 2,350 miles a month, and the distribution curve is approximately the same as for the F-1 group. The middle 80 percent of the single-unit, six-tired trucks (F-5 to F-8 models) spread from 700 to 3,600 miles a month. The tractor-semitrailer combinations range from 1,400 to 7,000 miles a month considering only the middle 80 percent. Thus, these heavier capacity vehicles exhibit a much greater spread in monthly mileage above and below the average mileage than do the lighter-capacity models.

ANALYSIS OF GROSS VEHICLE WEIGHT

In Table 3 the frequency distribution of average gross vehicle weight (empty ve-

TABLE 2

DISTRIBUTION OF VEHICLES BY MILES PER MONTH FOR EACH VEHICLE MODEL

Miles Per Month Class Interval	Number of Vehicles by Models											
	F-1	F-2	F-3	F-4	F-5	F-6	F-7	F-8	F-6s	F-7s	F-8s	All
0- 99	-	-	-	-	-	1	-	-	-	-	-	1
100- 199	1	-	2	1	2	1	-	-	-	-	-	7
200- 299	12	4	8	3	11	8	-	-	-	-	-	46
300- 399	27	13	12	9	14	9	-	-	-	-	-	84
400- 499	53	22	33	5	20	15	-	-	2	-	1	151
500- 599	90	12	27	5	44	25	4	-	1	1	1	210
600- 699	105	20	33	14	30	24	3	2	5	2	0	238
700- 799	110	20	30	6	26	38	3	3	2	4	3	243
800- 899	120	29	32	7	42	48	3	2	2	2	2	289
900- 999	157	21	37	4	42	43	3	1	6	2	3	319
1,000- 1,099	113	22	41	10	28	54	4	2	3	0	1	278
1,100- 1,199	123	16	40	16	26	50	5	3	5	1	2	287
1,200- 1,299	117	20	22	6	29	64	5	5	4	0	2	274
1,300- 1,399	101	15	30	8	22	50	3	4	7	2	2	244
1,400- 1,499	87	13	28	8	28	87	8	1	7	1	2	250
1,500- 1,599	75	12	16	9	23	56	5	3	6	2	3	210
1,600- 1,699	62	8	15	5	28	46	2	4	5	3	2	180
1,700- 1,799	55	13	14	4	24	41	1	2	9	1	4	168
1,800- 1,899	40	8	10	2	11	50	3	2	5	1	3	135
1,900- 1,999	36	5	12	5	17	47	0	1	10	2	4	139
2,000- 2,099	41	3	7	5	30	35	5	4	8	0	4	142
2,100- 2,199	36	1	9	2	14	26	6	1	5	3	3	106
2,200- 2,299	21	3	8	6	7	42	2	3	10	1	3	106
2,300- 2,399	28	1	6	1	4	31	2	1	3	3	5	85
2,400- 2,499	21	2	3	1	8	31	4	3	5	1	7	86
2,500- 2,599	16	1	3	1	9	45	6	7	5	5	2	100
2,600- 2,699	19	1	4	4	10	25	5	5	8	2	6	89
2,700- 2,799	15	2	5	1	9	31	1	4	10	7	3	88
2,800- 2,899	17	1	2	1	7	26	3	1	5	2	5	70
2,900- 2,999	6	2	4	1	3	27	2	2	4	0	3	54
3,000- 3,499	20	4	9	9	21	105	6	9	17	13	15	228
3,500- 3,999	13	1	5	3	17	68	9	3	21	17	26	183
4,000- 4,499	4	2	2	4	5	42	5	2	15	11	18	110
4,500- 4,999	4	2	2	2	2	22	4	7	9	14	26	94
5,000- 5,499	4	0	1	1	2	19	2	0	7	9	28	73
5,500- 5,999	2	1	1	0	2	6	3	2	6	6	27	56
6,000- 6,999	2	1	1	2	0	4	1	3	12	13	32	71
7,000- 7,999	1	1	-	-	0	2	1	-	4	9	21	39
8,000- 8,999	1	1	-	-	0	2	0	-	3	2	12	21
9,000- 9,999	0	-	-	-	1	1	1	-	0	1	4	8
10,0000-10,999	1	-	-	-	-	-	-	-	1	0	3	5
11,000 & over	-	-	-	-	-	-	-	-	-	1	4	5
Totals	1,756	303	514	171	618	1,325	120	92	237	144	292	5,572

TABLE 3

DISTRIBUTION OF VEHICLES BY GROSS VEHICLE ROAD WEIGHT FOR EACH VEHICLE MODEL

Gross Vehicle Weight Class Interval in Pounds	Number of Vehicles by Models											
	F-1	F-2	F-3	F-4	F-5	F-6	F-7	F-8	F-6s	F-7s	F-8s	Total
3,200- 3,299	10	-	-	-	-	-	-	-	-	-	-	10
3,300- 3,399	9	-	-	-	-	-	-	-	-	-	-	9
3,400- 3,499	39	-	-	-	-	-	-	-	-	-	-	39
3,500- 3,599	80	-	-	-	-	-	-	-	-	-	-	80
3,600- 3,699	119	-	-	-	-	-	-	-	-	-	-	119
3,700- 3,799	193	-	-	-	-	-	-	-	-	-	-	193
3,800- 3,899	160	-	-	-	-	-	-	-	-	-	-	160
3,900- 3,999	177	-	-	-	-	-	-	-	-	-	-	177
4,000- 4,099	156	4	1	-	-	-	-	-	-	-	-	161
4,100- 4,199	124	5	0	-	-	-	-	-	-	-	-	129
4,200- 4,299	185	1	0	-	-	-	-	-	-	-	-	186
4,300- 4,399	96	14	6	-	-	-	-	-	-	-	-	116
4,400- 4,499	112	10	4	-	-	-	-	-	-	-	-	126
4,500- 4,599	41	18	6	-	-	-	-	-	-	-	-	65
4,600- 4,699	60	17	10	-	-	-	-	-	-	-	-	87
4,700- 4,799	44	15	15	-	-	-	-	-	-	-	-	74
4,800- 4,899	25	22	11	-	-	-	-	-	-	-	-	58
4,900- 4,999	34	17	21	-	-	-	-	-	-	-	-	72
5,000- 5,099	19	18	28	-	-	-	-	-	-	-	-	65
5,100- 5,199	15	16	17	-	-	-	-	-	-	-	-	48
5,200- 5,299	12	15	25	-	-	-	-	-	-	-	-	52
5,300- 5,399	9	26	23	-	-	-	-	-	-	-	-	58
5,400- 5,499	4	14	26	-	-	-	-	-	-	-	-	44
5,500- 5,599	9	13	37	-	-	-	-	-	-	-	-	59
5,600- 5,699	10	11	11	4	-	-	-	-	-	-	-	36
5,700- 5,799	6	10	22	2	-	-	-	-	-	-	-	40
5,800- 5,899	5	15	22	0	-	-	-	-	-	-	-	42
5,900- 5,999	1	4	16	4	-	-	-	-	-	-	-	27
6,000- 6,499	2	15	97	14	2	1	-	-	-	-	-	131
6,500- 6,999	-	13	45	16	5	1	-	-	-	-	-	80
7,000- 7,499	-	6	34	27	7	1	-	-	-	-	-	75
7,500- 7,999	-	5	22	30	24	3	-	-	-	-	-	84
8,000- 8,499	-	1	11	21	22	10	-	-	-	-	-	65
8,500- 8,999	-	-	1	18	34	2	-	-	-	-	-	55
9,000- 9,499	-	-	1	10	32	5	-	-	-	-	-	48
9,500- 9,999	-	-	-	9	61	13	-	-	-	-	-	83
10,000- 10,499	-	-	-	5	40	20	-	-	-	-	-	65
10,500- 10,999	-	-	-	5	41	28	-	-	-	-	-	74
11,000- 11,499	-	-	-	1	48	16	-	-	-	-	-	65
11,500- 11,999	-	-	-	2	49	31	-	-	-	-	-	82
12,000- 12,499	-	-	-	2	35	46	1	-	-	-	-	84
12,500- 12,999	-	-	-	1	48	50	0	-	-	-	-	99
13,000- 13,499	-	-	-	-	31	44	1	-	-	-	-	76
13,500- 13,999	-	-	-	-	38	42	0	-	1	-	-	79
14,000- 14,499	-	-	-	-	11	52	1	-	0	-	-	64
14,500- 14,999	-	-	-	-	24	65	0	1	1	-	-	91
15,000- 15,499	-	-	-	-	13	58	4	0	0	-	-	75
15,500- 15,999	-	-	-	-	15	75	2	0	0	-	-	92
16,000- 16,499	-	-	-	-	9	63	0	2	0	-	-	74
16,500- 16,999	-	-	-	-	10	62	5	0	2	-	-	79
17,000- 17,499	-	-	-	-	5	61	2	3	-	-	-	68
17,500- 17,999	-	-	-	-	4	58	3	2	-	-	-	67
18,000- 18,499	-	-	-	-	3	64	3	1	1	-	-	72
18,500- 18,999	-	-	-	-	4	60	4	1	0	-	-	69
19,000- 19,499	-	-	-	-	3	46	4	1	0	-	-	54
19,500- 19,999	-	-	-	-	1	64	7	2	1	-	-	75
20,000- 20,999	-	-	-	-	1	87	9	4	3	1	-	105
21,000- 21,999	-	-	-	-	-	86	9	1	1	0	-	97
22,000- 22,999	-	-	-	-	-	54	9	6	2	0	-	70
23,000- 23,999	-	-	-	-	-	46	9	5	6	0	1	67
24,000- 24,999	-	-	-	-	-	10	14	7	5	2	0	38
25,000- 25,999	-	-	-	-	-	1	12	7	9	1	0	30
26,000- 26,999	-	-	-	-	-	-	9	10	5	7	0	31
27,000- 27,999	-	-	-	-	-	-	6	13	10	0	2	31
28,000- 28,999	-	-	-	-	-	-	3	10	15	1	2	31
29,000- 29,999	-	-	-	-	-	-	2	3	7	1	3	16
30,000- 30,999	-	-	-	-	-	-	1	7	17	0	1	26
31,000- 31,999	-	-	-	-	-	-	-	7	16	1	2	26
32,000- 32,999	-	-	-	-	-	-	-	1	10	5	4	20
33,000- 33,999	-	-	-	-	-	-	-	2	11	6	4	23
34,000- 34,999	-	-	-	-	-	-	-	-	17	2	3	22
35,000- 35,999	-	-	-	-	-	-	-	-	20	7	2	29
36,000- 36,999	-	-	-	-	-	-	-	-	17	4	6	27
37,000- 37,999	-	-	-	-	-	-	-	-	8	13	8	29
38,000- 38,999	-	-	-	-	-	-	-	-	10	9	20	39
39,000- 39,999	-	-	-	-	-	-	-	-	7	7	13	27
40,000- 40,999	-	-	-	-	-	-	-	-	11	10	18	39
41,000- 41,999	-	-	-	-	-	-	-	-	3	6	16	25
42,000- 42,999	-	-	-	-	-	-	-	-	3	7	13	23
43,000- 43,999	-	-	-	-	-	-	-	-	3	11	13	27
44,000- 44,999	-	-	-	-	-	-	-	-	4	5	16	25
45,000- 45,999	-	-	-	-	-	-	-	-	2	5	21	28
46,000- 46,999	-	-	-	-	-	-	-	-	2	6	10	18
47,000- 47,999	-	-	-	-	-	-	-	-	2	2	10	14
48,000- 48,999	-	-	-	-	-	-	-	-	1	5	12	18
49,000- 49,999	-	-	-	-	-	-	-	-	1	2	12	15
50,000- 50,999	-	-	-	-	-	-	-	-	1	3	7	11
51,000- 51,999	-	-	-	-	-	-	-	-	1	0	7	8
52,000- 52,999	-	-	-	-	-	-	-	-	0	1	11	12
53,000- 53,999	-	-	-	-	-	-	-	-	0	3	6	9
54,000- 54,999	-	-	-	-	-	-	-	-	1	2	7	10
55,000- 55,999	-	-	-	-	-	-	-	-	-	2	4	6
56,000- 56,999	-	-	-	-	-	-	-	-	-	2	9	11
57,000- 57,999	-	-	-	-	-	-	-	-	-	3	10	13
58,000- 58,999	-	-	-	-	-	-	-	-	-	0	3	3
59,000- 59,999	-	-	-	-	-	-	-	-	-	0	2	2
60,000- 60,999	-	-	-	-	-	-	-	-	-	1	2	3
61,000- 61,999	-	-	-	-	-	-	-	-	-	0	2	2
62,000- 62,999	-	-	-	-	-	-	-	-	-	0	1	1
63,000- 63,999	-	-	-	-	-	-	-	-	-	0	0	0
64,000- 64,999	-	-	-	-	-	-	-	-	-	-	2	2
65,000- 65,999	-	-	-	-	-	-	-	-	-	-	3	3
66,000- 66,999	-	-	-	-	-	-	-	-	-	-	1	1
67,000- 67,999	-	-	-	-	-	-	-	-	-	-	2	2
68,000- 69,000	-	-	-	-	-	-	-	-	-	-	1	1
77,000- 78,000	-	-	-	-	-	-	-	-	-	1	-	1
Totals	1,756	303	514	171	618	1,325	120	92	237	144	292	5,572

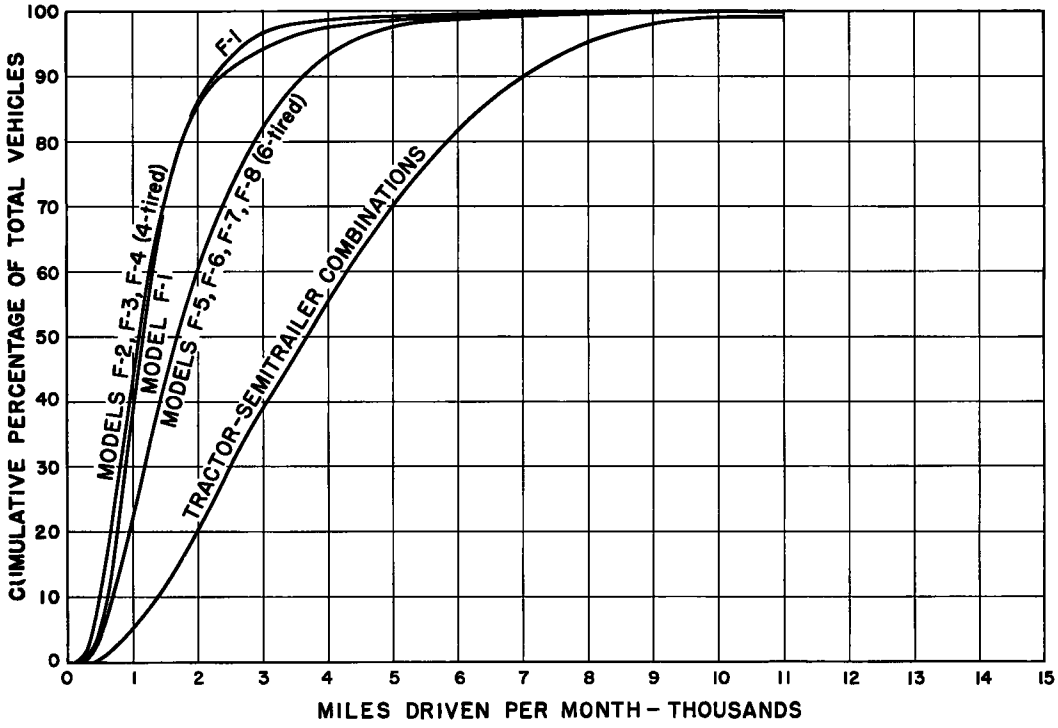

Figure 1. Cumulative percentage distribution of vehicles in order of increasing number of miles driven per month.

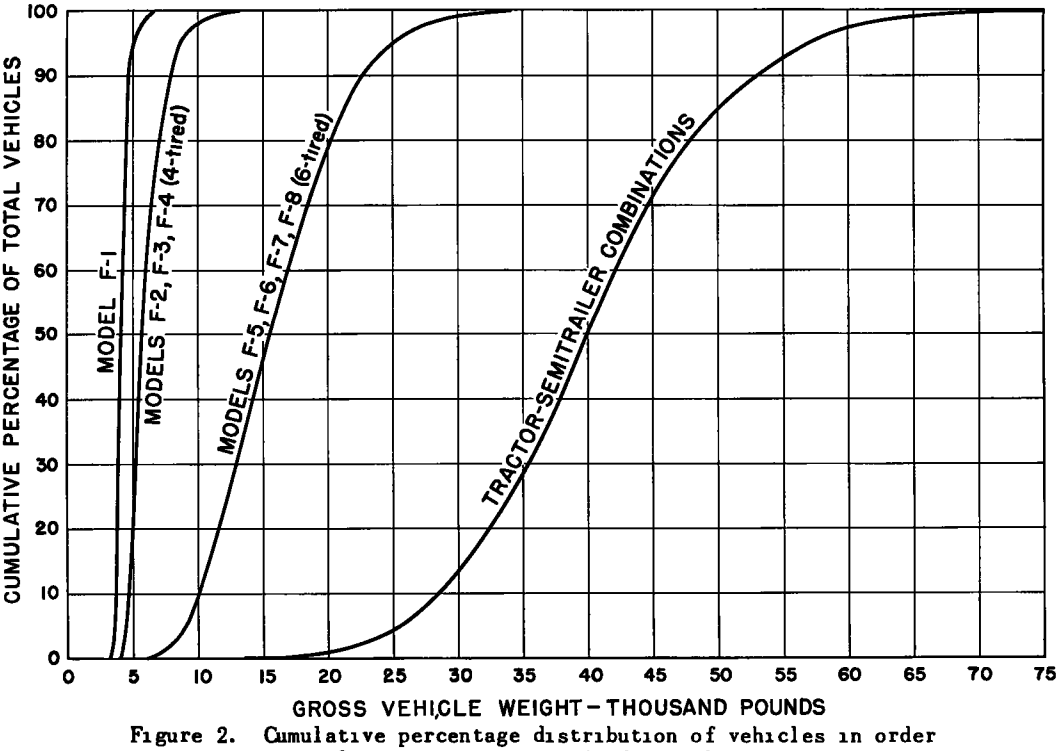

Figure 2. Cumulative percentage distribution of vehicles in order of increasing gross vehicle weight.

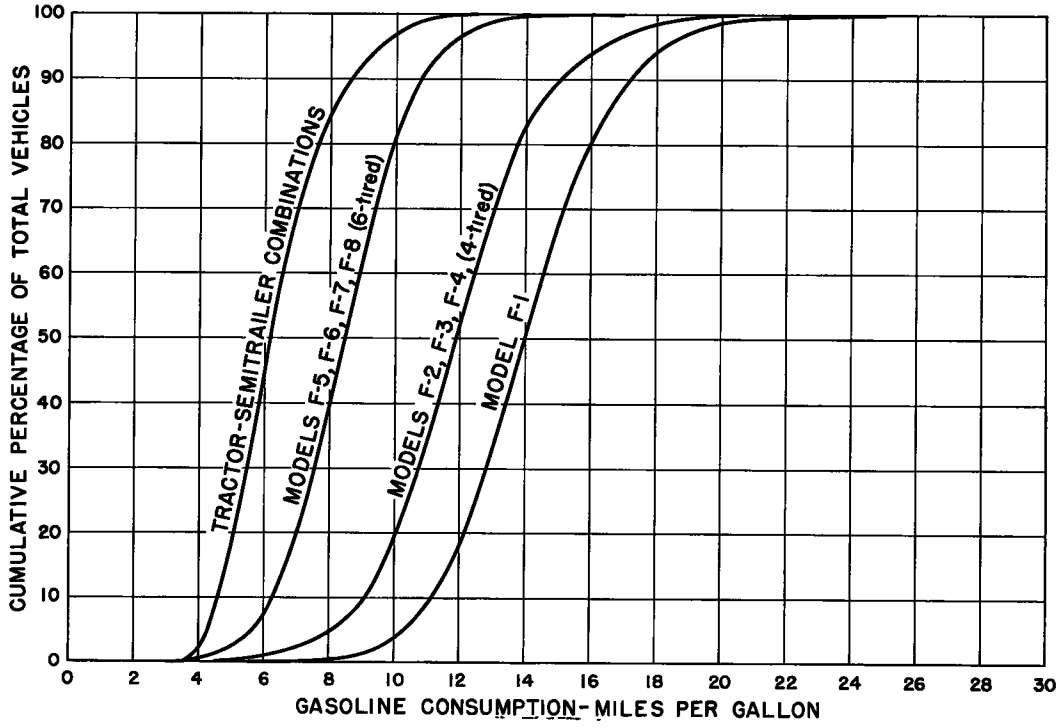

Figure 3. Cumulative percentage distribution of vehicles in order of increasing gasoline consumption in miles per gallon.

hicle weight plus average payload carried) is shown for each truck model. Here again, there is a considerable range in weight for each model, with the heavier models having the greater range. Because the empty weight of the light models has a small range and because the gross load limits of the light models are relatively low, it follows that the range in gross weight is correspondingly low as compared to the heavier models. The single-unit trucks show but a small range of overlap in gross weight with the tractor combinations. Although Table 3 lists one tractor-semitrailer combination Model F-6s in the 13,500-to-13,999-lb. group and two single-unit F-8 models in the 33,000-to-33,999-lb. group, the only significant overlap comes in the range of 23,000 to 32,000 lb.

The cumulative percentage distribution curves of weight are shown in Figure 2. The Model F-1 curve is practically a straight line, nearly vertical, between 5 percent and 90 percent, and covering the range of 3,600 to 4,700 lb. The 10-and 90-percent levels include the range of 3,650 to 4,700 lb.

The curve in Figure 2 for the other single-unit, four-tired models follows

TABLE 4

DISTRIBUTION OF VEHICLES BY MILES PER GALLON OF GASOLINE FOR FOR EACH VEHICLE MODEL

Miles Per Month Class Interval	Number of Vehicles by Models										
	F-1	F-2	F-3	F-4	F-5	F-6	F-7	F-8	F-6s	F-7s	F-8s	Total
Less than 3 0	-	-	-	-	-	1	-	-	-	-	-	1
3 0 - 3 4	-	-	-	-	-	2	-	1	-	-	-	3
3 5 - 3 9	-	-	-	-	-	2	1	4	-	3	10	20
4 0 - 4 4	-	-	1	-	2	4	2	8	-	4	37	58
4 5 - 4 9	-	-	1	-	3	5	5	11	3	9	50	87
5 0 - 5 4	-	-	0	-	4	16	8	12	8	20	63	129
5 5 - 5 9	1	-	7	-	6	35	17	11	18	38	52	185
6 0 - 6 4	0	-	3	3	13	69	13	17	28	17	30	202
6 5 - 6 9	0	1	5	1	25	92	19	12	27	22	20	224
7 0 - 7 4	3	1	5	1	35	141	17	5	38	11	9	266
7 5 - 7 9	3	1	6	5	41	158	16	7	26	9	8	280
8 0 - 8 4	8	0	9	13	61	186	9	2	24	5	3	320
8 5 - 8 9	12	3	8	12	76	149	6	0	22	4	2	294
9 0 - 9 4	10	6	16	19	88	128	5	1	9	2	1	287
9 5 - 9 9	27	10	27	23	70	116	1	1	14	-	-	291
10 0 - 10 4	36	22	28	23	66	70	1	-	9	-	-	255
10 5 - 10 9	60	16	38	17	32	55	-	-	8	-	-	226
11 0 - 11 4	67	33	46	11	34	36	-	-	0	-	-	227
11 5 - 11 9	93	34	47	16	25	27	-	-	1	-	-	242
12 0 - 12 4	121	26	47	7	10	18	-	-	2	-	-	231
12 5 - 12 9	134	33	47	7	8	5	-	-	-	-	-	234
13 0 - 13 4	158	34	38	8	6	1	-	-	-	-	-	245
13 5 - 13 9	148	20	33	1	6	3	-	-	-	-	-	211
14 0 - 14 4	171	12	25	2	1	1	-	-	-	-	-	212
14 5 - 14 9	122	9	18	0	2	1	-	-	-	-	-	152
15 0 - 15 4	125	9	15	1	1	0	-	-	-	-	-	151
15 5 - 15 9	108	5	12	1	1	2	-	-	-	-	-	127
16 0 - 16 4	86	9	7	0	1	-	-	-	-	-	-	103
16 5 - 16 9	75	4	6	0	1	-	-	-	-	-	-	86
17 0 - 17 4	58	2	6	1	-	-	-	-	-	-	-	67
17 5 - 17 9	28	6	5	-	-	-	-	-	-	-	-	39
18 0 - 18 4	32	2	3	-	-	-	-	-	-	-	-	37
18 5 - 18 9	27	2	3	-	-	-	-	-	-	-	-	32
19 0 - 19 4	14	2	-	-	-	-	-	-	-	-	-	16
19 5 - 19 9	10	0	-	-	-	-	-	-	-	-	-	10
20 0 - 20 4	9	1	-	-	-	-	-	-	-	-	-	10
20 5 - 20 9	4	-	-	-	-	-	-	-	-	-	-	4
21 0 - 21 4	3	-	-	-	-	-	-	-	-	-	-	3
21 5 - 21 9	2	-	-	-	-	-	-	-	-	-	-	2
22 0 - 22 4	1	-	-	-	-	-	-	-	-	-	-	1
22 5 - 22 9	1	-	-	-	-	-	-	-	-	-	-	1
23 0 - 23 4	2	-	-	-	-	-	-	-	-	-	-	2
23 5 - 23 9	0	-	-	-	-	-	-	-	-	-	-	0
24 0 & over	1	-	-	-	-	-	-	-	-	-	-	1
Totals	1,756	303	514	171	618	1,325	120	92	237	144	292	5,572

closely to the F-1 curve. The 80-percent range is from 4,700 to 7,900 lb. For the six-tired, single-unit trucks, the curve in Figure 2 at the 10- and 90-percent levels intercepts the weight range from 10,000 to about 22,700 lb.

The tractor-semitrailer combinations present a weight-distribution curve that approaches the statistical normal frequency distribution. The center of the curve at 50 percent is at about 40,000 lb. The 10- and 90-percent levels intercept the range of 28,500 to 53,000 lb., with the minimum and maximum gross vehicle weights being 13,500 and 78,000 lb.

As discussed in a subsequent section on the relation of gasoline consumption to gross vehicle weight, the weights used in this analysis are perhaps overstated. The original study seems to include as the "average monthly load carried" the total payload hauled instead of the average payload hauled over the full round-trip distance or for the total miles driven daily. Further, the weights estimated for the single-unit bodies and the complete semitrailers are probably too high.

ANALYSIS OF GASOLINE CONSUMPTION

Tables 2 and 3 and Figures 1 and 2 for mileage and weight present variations in vehicle use that vary mainly with the type of use the owner subjects the vehicle to, rather than with fundamental characteristics of the vehicle. In Table 4 and Figure 3 the gasoline-consumption distribution is shown for the same four groups of vehicles. Fuel consumption varies with the characteristics of the engine, gear ratios, type of use, gross weight, care of the vehicle, technique of the driver, topography, weather, and many other factors not within the control of the owner or driver. The distributions of miles per gallon in Table 4 are of consistent pattern with respect to range and with the relative vehicle weights of the models. The F-1 models range in gasoline consumption from 5.5 miles per gallon to over 24.0, with the model consumption being about 14 miles. The F-8s semitrailer combination varied in gasoline consumption from 3.5 to 9.4 miles per gallon.

The range in gasoline consumption is

TABLE 5

RELATION OF GROSS VEHICLE WEIGHT TO MILES PER GALLON AND MILES PER MONTH FOR SINGLE-UNIT TRUCKS, ALL MODELS

Gross Vehicle Weight Class Interval lb.	Number of Vehicles	Average GVW lb.	Average Miles Per Gallon	Average Miles Per Month
3,000- 3,999	787	3,704	14.07	1,278
4,000- 4,999	1,072	4,356	13.53	1,319
5,000- 5,999	471	5,397	12.51	1,324
6,000- 6,999	211	6,370	11.13	1,418
7,000- 7,999	159	7,429	10.49	1,512
8,000- 8,999	120	8,416	9 92	1,502
9,000- 9,999	138	9,494	9.17	1,557
10,000-10,999	139	10,480	8.92	1,533
11,000-11,999	147	11,476	9.02	1,595
12,000-12,999	183	12,482	8.77	1,779
13,000-13,999	154	13,460	8.49	1,739
14,000-14,999	154	14,493	8.37	1,923
15,000-15,999	167	15,451	8.20	1,899
16,000-16,999	151	16,454	8 52	2,140
17,000-17,999	135	17,418	8.44	1,925
18,000-18,999	140	18,432	7.99	2,052
19,000-19,999	128	19,431	8.23	2,091
20,000-20,999	101	20,363	7.86	2,270
21,000-21,999	96	21,414	7.84	2,544
22,000-22,999	68	22,401	7.91	2,432
23,000-23,999	60	23,440	7.64	2,862
24,000-24,999	31	24,248	7.15	2,874
25,000-25,999	20	25,190	6 59	2,745
26,000-26,999	19	26,353	6.39	3,040
27,000-27,999	19	27,463	5.73	2,086
28,000-28,999	13	28,415	6.09	2,749
29,000-29,999	5	29,440	6.08	2,483
30,000-30,999	8	30,175	4.88	2,653
31,000-31,999	7	31,314	5.81	3,118
32,000-32,999	1	32,500	4.95	1,614
33,000-33,999	2	33,100	5.92	3,785
Total & Average	4,899	9,700	9.85	1,614

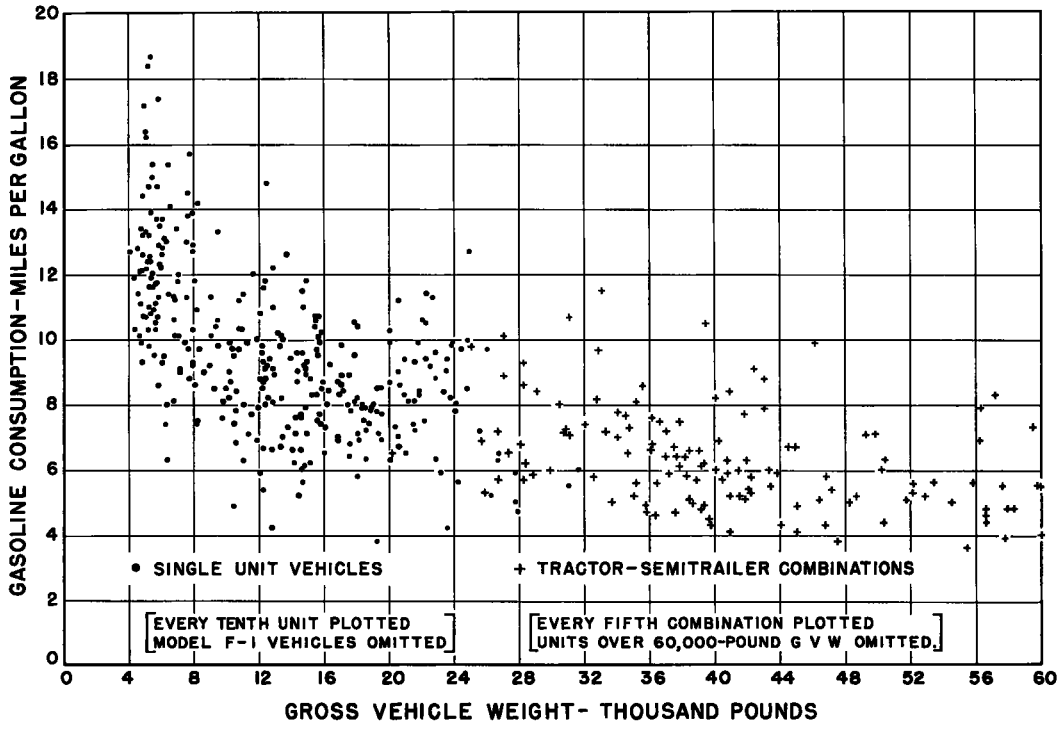

Figure 4. Range of gasoline consumption related to gross vehicle weight.

illustrated in Figure 3. The F-1 model ranges between the 10- and 90-percent levels from 11.1 to 17.2 miles per gallon. Other single-unit, four-tired trucks range from 9.1 to 15.0 miles per gallon for the same percentage levels. The six-tired, single-unit trucks range from 6.2 to 10.8 miles per gallon for the middle 80 percent. The tractor-semitrailer combinations range from 4.6 to 8.7 miles per gallon between the 10- and the 90-percent intercepts.

The preceding discussion of mileage, weight, and gasoline consumption illustrates typical ranges in these three items of vehicle use and performance. The ranges are rather widespread. These data are good evidence that for specific models of vehicles the ranges in mileage, road weight, and fuel consumption are such that it is unsafe to use any specific value in highway studies unless reasonable certainty is at hand to prove that such value is applicable to the purposes and conditions of the analysis. When other makes, models, and selections of vehicles are available, frequencies and ranges of values differing from those presented here may be expected. It is to be kept in mind that the trucks reported upon in this study were all of the same make and all of 1948, 1949, and 1950 models.

RELATION OF GASOLINE CONSUMPTION TO GROSS VEHICLE WEIGHT

The tables presented so far indicate that gasoline consumption in gallons per mile and monthly mileage both increase as the loading capacity of the vehicle becomes greater. In many types of taxation, economy, and financial studies, motor-vehicle fuel consumption is related to the gross weight of the vehicle. It is in order, therefore, to see what the relationship is between gasoline consumption and weight for the vehicles reported upon in this Ford study.

Figure 4 is a scatter-diagram plot of the gasoline consumption in miles per gallon against the gross vehicle weight for every tenth single-unit truck and every fifth tractor-semitrailer combination. Figure 4 indicates that there is a tendency for the miles per gallon to decrease with the increase in gross weight, though the exact path of the decrease is uncertain. The scattering of the points both horizontally and vertically is great. For instance, a

fuel consumption of between 9 and 10 miles per gallon is shown for vehicles ranging in weight from 5,000 lb. to 46,000 lb. Similarly, for a range of weight from 14,000 to 15,000 lb. the gasoline consumption ranges from 5.2 to 11.8 miles per gallon. The combination vehicles show only slight evidence of increase in gasoline consumption with increase in weight for weights above 40,000 lb. It is evident from Figure 4 that to arrive at a reliable estimate of fuel consumption for any weight class, great statistical care is needed in the selection of the vehicles to study as well as in the analysis of the data collected.

RELATION OF GROSS VEHICLE WEIGHT TO FUEL CONSUMPTION AND TO MONTHLY MILEAGE

Of the three factors—miles driven, gross vehicle weight, and fuel consumption—weight is the one that perhaps has the widest use in highway design, taxation, and financial studies. Weight is also a factor that can be readily determined by weighing on the road. On the other hand, mileage and fuel consumption need to be taken from information furnished by the owners, a not-too-easily accomplished method. As shown by Figure 5, there is a reasonable correlation of weight with both monthly mileage and gasoline consumption.

Tables 5 and 6 were prepared by sorting the tabulating cards into gross-weight groups by 1,000-lb. intervals. From tabulations prepared for each of the weight groups, the average gross vehicle weight, average miles per gallon, and average mileage per month were calculated. The averages are plotted in Figure 5 for all single-unit vehicles and all tractor-semitrailer combinations.

The upper curve of Figure 5 presents a positive indication that the monthly mileage increases with an increase in weight. Beyond 24,000 lb., the exact trend of this increase is not positively defined. The scatter of plotted points is attributed to lack of a sufficient number of vehicles in each 1,000-lb. grouping. Should at least 50 vehicles have been included in each weight group, perhaps the path of the curve would have been accurately defined. In addition to the lack of a sufficiently large number of trucks to determine a reliable average for each weight group, there is a tendency for the vehicles to fall into particular weight groups and particular monthly mileages. The fact that the 5,572 vehicles in the total

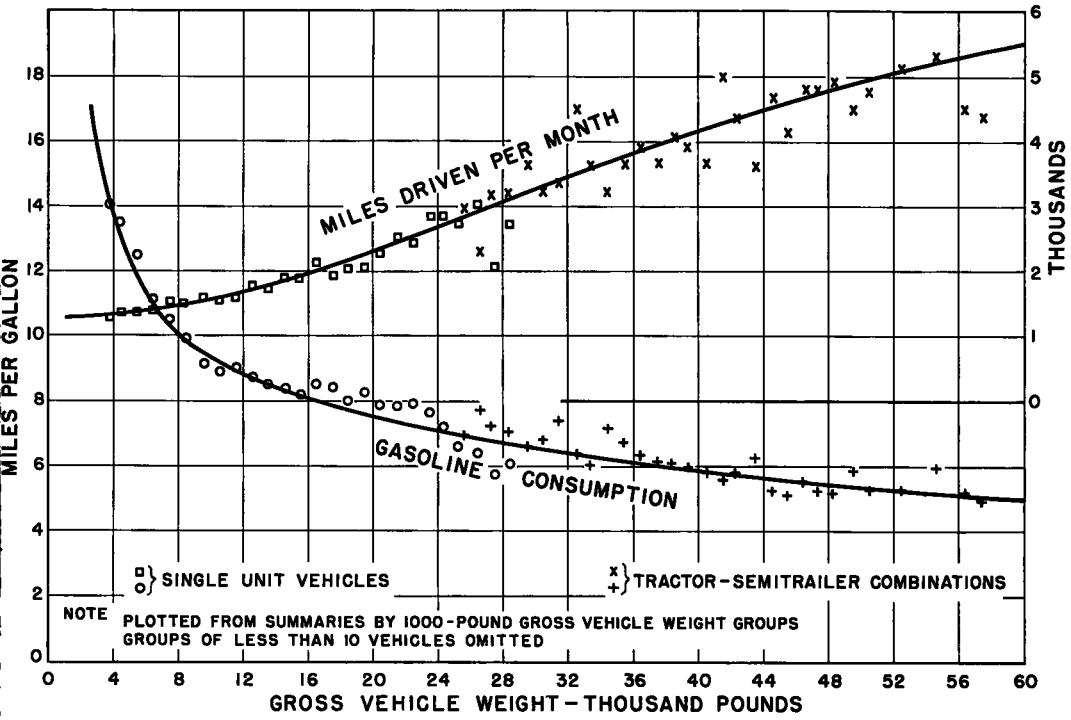

Figure 5. Average gasoline consumption and miles driven per month.

TABLE 6

RELATION OF GROSS VEHICLE WEIGHT TO MILES PER GALLON AND MILES PER MONTH FOR TRACTOR-SEMI TRAILER COMBINATIONS, ALL MODELS

Gross Vehicle Weight Class Interval	Number of Vehicles	Average GVW	Average Miles Per Gallon	Average Miles Per Month
lb.		lb.		
13,000-13,999	1	13,800	5 45	2,496
14,000-14,999	1	14,700	7.07	601
15,000-15,999	0	-	-	-
16,000-16,999	2	16,700	8.87	3,102
17,000-17,999	0	-	-	-
18,000-18,999	1	18,400	9.67	4,260
19,000-19,999	1	19,500	7.04	1,835
20,000-20,999	4	20,175	8.82	2,071
21,000-21,999	1	21,300	7.15	2,274
22,000-22,999	2	22,500	8 05	3,570
23,000-23,999	7	23,500	6.70	2,124
24,000-24,999	7	24,300	7.49	2,202
25,000-25,999	10	25,510	6.85	2,971
26,000-26,999	12	26,483	7 71	2,318
27,000-27,999	12	27,242	7 43	3,177
28,000-28,999	18	28,333	7.06	3,210
29,000-29,999	11	29,454	6 53	3,639
30,000-30,999	18	30,422	6 74	3,233
31,000-31,999	19	31,384	7.36	3,284
32,000-32,999	19	32,468	6 29	4,498
33,000-33,999	21	33,314	6.06	3,615
34,000-34,999	22	34,436	7.16	3,251
35,000-35,999	29	35,410	6 74	3,652
36,000-36,999	27	36,407	6 33	3,926
37,000-37,999	29	37,469	6 11	3,683
38,000-38,999	39	38,413	6 08	4,060
39,000-39,999	27	39,367	5.93	3,936
40,000-40,999	39	40,500	5.77	3,663
41,000-41,999	25	41,492	5.57	5,041
42,000-42,999	23	42,296	5.73	4,382
43,000-43,999	27	43,459	6.26	3,640
44,000-44,999	25	44,476	5.43	4,685
45,000-45,999	28	45,382	5.10	4,192
46,000-46,999	18	46,455	5.60	4,840
47,000-47,999	14	47,307	5.22	4,812
48,000-48,999	18	48,344	5 19	4,936
49,000-49,999	15	49,480	5.91	4,490
50,000-50,999	11	50,445	5.27	4,788
51,000-51,999	8	51,575	5.97	4,640
52,000-52,999	12	52,408	5.25	5,112
53,000-53,999	9	53,378	5 53	4,615
54,000-54,999	10	54,590	5 95	5,321
55,000-55,999	6	55,533	5.20	4,018
56,000-56,999	11	56,382	5 19	4,519
57,000-57,999	13	57,431	4.90	4,368
58,000-58,999	3	58,233	4.67	7,313
59,000-59,999	2	59,650	6.71	3,919
60,000-60,999	3	60,367	4.54	4,581
61,000-61,999	2	61,550	4 67	6,371
62,000-62,999	1	62,700	5 05	3,578
63,000-63,999	0	-	-	-
64,000-64,999	2	64,600	5 06	4,398
65,000-65,999	3	65,333	5.97	4,488
66,000-66,999	1	66,500	4.41	4,197
67,000-67,999	2	67,600	6.43	4,048
68,000-68,999	1	68,100	4.84	5,073
... ...				
77,000-77,999	1	77,500	4.00	2,522
Total & Average	673	40,272	5.91	3,975

were all of the same manufacture and all 1948, 1949, and 1950 models would cause a certain "bunching" of use characteristics. A wider inclusion of manufacturers' makes and models, would have brought into the data a wider and more-even distribution of weight and mileage. An improved plotting in Figure 5 would probably result should the observations be based on a full year's use rather than for the 4 to 6 months of operation pertaining to these trucks.

Truck mileage increases with the gross vehicle weight because of economic reasons and because of character of usage. The vehicles built for heavy gross weights are likewise proportionally heavier in curb

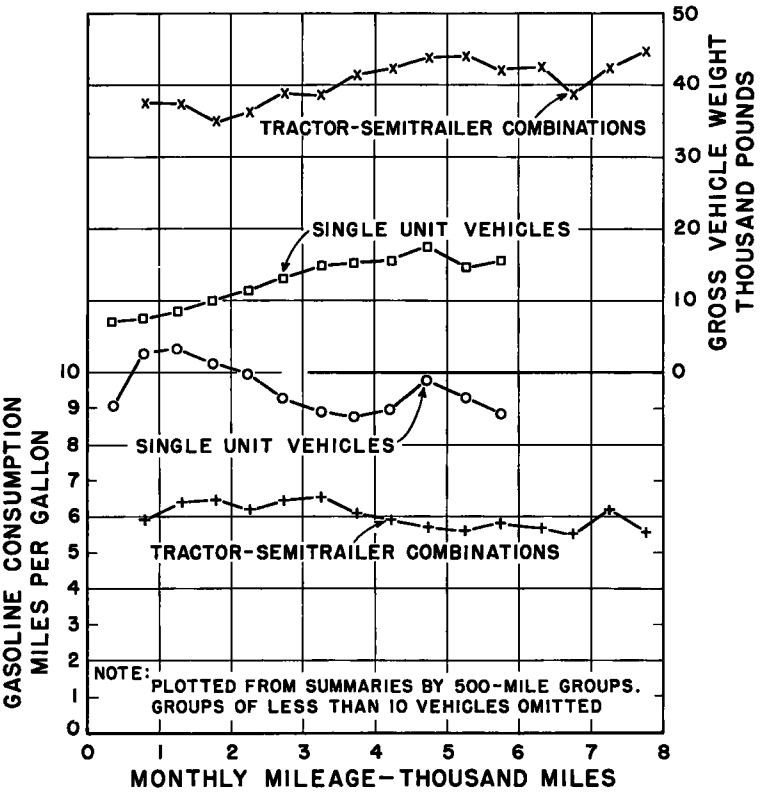

Figure 6. Gasoline consumption and gross vehicle weight related to monthly mileage.

(empty) weight. Their initial investment cost is greater. High annual mileage is therefore desirable in order to keep the unit-mile or ton-mile operating cost low. Generally, the high-load-capacity vehicles are fitted to over-the-road types of use which require large daily mileage. Lighter trucks are adapted to urban types of pickup and delivery services, with slow speeds, many stops, and much idle time. Usually, too, the light types used in commercial services are used only throughout the normal business day. The over-the-road type of vehicle is kept in service with little regard to the hours of the working day or days of the week.

The scattering of the plotting exhibited in Figure 4 is brought fairly well under control in Figure 5, where the gasoline consumption in miles per gallon is plotted from the average consumption for the vehicles by 1,000-lb. groups. For the same reasons as discussed in the preceding section with reference to monthly mileage, the plotted points for gasoline consumption vary from the smooth curve.

For both the single-unit trucks and the combination vehicles, there is uncertainty of the exact location of the miles per gallon curve in the weight range common to the two types of vehicles. Whether or not there is a difference in average fuel consumption in the two types of vehicles for the same weight is not ascertainable from the data in this study. Rolling resistance, air resistance, and type of usage vary and may result in a difference in fuel consumption for the single-unit truck as compared to the combination train at the same gross vehicle weight.

From about 8,000 lb. upward in weight, the corresponding miles per gallon of gasoline indicated in Figure 5, is greater than that shown in other published reports (note paper by Cope, Lynch, and Steele in this bulletin.) For instance, at 20,000 lb. the curve in Figure 5 gives 7.5 miles per gallon as compared to 5.80 in the Cope-Lynch-Steele paper. At 40,000 lb., the miles per gallon are 6.0 and 3.87, respectively. Although there is no positive explanation of this difference in gasoline consumption be-

tween that shown in Figure 5 and that in the Cope-Lynch-Steele paper and other reports, some discussion of possible causes of the differences is in order.

The available reports in the literature of fuel consumption of motor vehicles by gross weight of vehicle originated from two basic sources. First, they come from observations made on a particular vehicle, a particular type of operation on which a small fleet of vehicles under one management was used, or they were obtained by averaging other reports. Second, the literature reports fuel consumption on the basis of an estimate made by the particular author on the basis of his experience and his interpretation and evaluation of such reports as were available to him. Thus, when the available published reports of the fuel consumption of motor vehicles are examined in the light of these two basic sources and in the light that fuel consumption varies widely (see Fig. 4) owner to owner, vehicle to vehicle, and use to use, the logical conclusion is that variation in these reports is to be expected. These differences can be reconciled only through a thorough field study of fuel consumption of motor vehicles under conditions which will afford satisfactory statistical control of the study. Perhaps someday a study will be conducted in which the vehicles to be included will be statistically selected, the records systematically and uniformly kept, and the data analyzed by proper statistical methods.

The following statements may explain why the gasoline consumption in miles per gallon indicated in Figure 5 may be higher than that reported by other authors:

1. The field records were maintained only during July to December, thus the amount of winter driving is less than would be included on a full 12-month record.

2. The vehicles were only 0 to 2 years old at the beginning of the observation period. Although there is no material decrease in miles per gallon of motor vehicles with age and usage, new vehicles are used in types of service that require more-constant use and steadier miles with fewer starts and stops than is experienced with older vehicles. This heavier and more steady use of new vehicles as compared to old vehicles probably requires less gasoline per mile.

3. Although the operators of the vehicles could be relied upon to make proper reports of mileage, weight, and gasoline consumption, there is more likelihood that the gasoline gallonage reported is understated rather than overstated. The driver of a vehicle may easily forget to record the purchase of gasoline. Mileage of the vehicle is probably properly stated for the reason that the odometer is a reliable recorder of mileage, which was reported each day during the test period.

4. The gross vehicle weight as computed for this analysis is perhaps overstated. Subsequent analysis of the weights of truck bodies and semitrailers indicates that the weights of the body types estimated for the F-5 to F-8 single-unit models may be 500 lb. to 1,000 lb. too high and that the semitrailers, chassis, and body combined, may be 1,000 lb. to 2,000 lb. too high.

Operators of the vehicles reported daily the payload carried. When no load was carried on a round trip, this zero load was

TABLE 7

WEIGHT, GASOLINE CONSUMPTION, AND MONTHLY MILEAGE OF EACH MODEL

Model	Weight, Pounds					Fuel Consumption, Miles Per Gallon	Average Miles Driven Per Month
	Chassis With Cab	Empty (curb) Weight	Average Monthly Carried Load	Average GVW	Manufacturers' Gross Vehicle Weight Rating		
F-1	2,850	3,264	822	4,086	4,700	13 95	1,337
F-2	3,272	3,772	1,467	5,239	5,700	12.16	1,258
F-3	3,460	4,064	1,784	5,848	6,800	11.69	1,283
F-4	4,020	5,026	2,910	7,936	10,000	10 30	1,605
F-5	4,710	6,211	5,407	11,618	14,000	9 16	1,504
F-6	4,985	6,921	9,821	16,742	16,000	8.28	2,107
F-7	6,465	8,501	13,586	22,087	19,000	6.87	2,478
F-8	6,885	9,994	15,889	25,883	22,000	5 80	2,527
F-5s	4,650	16,133	13,424	29,557	24,000	8.20	2,287
F-6s	4,785	14,927	18,638	33,565	28,000	7 41	3,118
F-7s	6,071	16,669	24,276	40,945	35,000	5 94	3,982
F-8s	6,451	17,464	28,209	45,673	39,000	5 36	4,730

TABLE 8

AVERAGE MILES DRIVEN PER MONTH RELATED TO GROSS VEHICLE WEIGHT AND GASOLINE CONSUMPTION, SINGLE-UNIT VEHICLES

Mileage Per Month Class Interval	Number of Vehicles	Average GVW	Average Miles Per Gallon	Average Miles Per Month
0- 499	286	7,291	9.11	344
500- 999	1,263	7,458	10.54	770
1,000- 1,499	1,294	8,585	10 65	1,241
1,500- 1,999	772	10,029	10.25	1,723
2,000- 2,499	464	11,343	9.98	2,220
2,500- 2,999	334	13,330	9.28	2,717
3,000- 3,499	183	14,810	8.92	3,245
3,500- 3,999	119	15,254	8 78	3,697
4,000- 4,499	66	15,664	8 93	4,221
4,500- 4,999	45	17,527	8.76	4,733
5,000- 5,499	29	14,745	9.29	5,247
5,500- 5,999	17	15,565	8.86	5,741
6,000- 6,499	8	19,612	9.33	6,132
6,500- 6,999	6	13,450	10.75	6,686
7,000- 7,499	2	12,150	12 88	7,327
7,500- 7,999	3	14,667	10.31	7,801
8,000- 8,499	2	9,750	10.32	8,118
8,500- 8,999	2	12,100	10.48	8,811
9,000- 9,499	2	20,000	8.43	9,483
9,500- 9,999	1	12,100	10.03	9,621
10,000-10,499	-	-	-	-
10,500-10,999	1	5,600	13 71	10,712
Total & Average	4,899	9,700	9 85	1,613

averaged in with the reported loads to obtain the average monthly load carried. However, there is reason to believe that the reports do not include the appropriate return mileage at zero load on trips that were made with payload carried in only one direction. Thus a payload of 10,000 lb. hauled a distance of 75 miles with the return trip at zero payload was probably included in the summary as a load of 10,000 lb. at a mileage of 150 rather than as an average payload of 5,000 lb. at a mileage of 150.

To show the effect of such an adjustment, the calculation was made for each of the truck models as a group, but not for the individual 1,000-lb. groupings which were used in the plotting of Figure 5. The revised gross vehicle weight including the payload carried at half its reported poundage resulted in bringing the fuel-consumption curve of Figure 5 for the single-unit vehicles down to the average miles per gallon curve reported by Cope, Lynch, and Steele. The points for the tractor-semitrailer combinations did not come down to the curve, however, by about 2 miles per gallon. Table 7 gives for each model of truck the average monthly load carried as reported and other average weights used in making this trial revision of the gross vehicle weight.

5. Another factor that might contribute to the high miles per gallon of gasoline consumption of these trucks as related to weight is the fact that the vehicles were of materially heavier gross vehicle weights than the manufacturers' rating (see Table 7). Since the heavier trucks did not increase in curb weight proportionally to the increase in payload carried and since 50 percent of the combinations were operated at a gross vehicle weight (as computed from unadjusted reports) in excess of 40,000 lb. as compared to a maximum manufacturers' rating of 39,000 lb., the speed, acceleration, and grade ability of these vehicles were materially reduced.

The purpose of this paper is not to establish the rate of fuel consumption of vehicles, but rather to show that the consumption varies over wide limits as the conditions of use and the source of the information change. The above explanation is important, however, to point out that the gasoline consumption plotted in Figure 5 probably is not appropriate for use in general studies of the performance of trucks.

RELATION OF AVERAGE MONTHLY MILEAGE TO GROSS VEHICLE WEIGHT, AND TO GASOLINE CONSUMPTION

Tables 8 and 9 summarize the weight, miles per gallon of gasoline, and monthly mileage by 500-mile groupings. The averages are plotted in Figure 6. The single-unit vehicles and the combinations produce

TABLE 9

AVERAGE MILES DRIVEN PER MONTH RELATED TO GROSS VEHICLE WEIGHT AND GASOLINE CONSUMPTION, TRACTOR-SEMITRAILER COMBINATIONS

Mileage Per Month Class Interval	Number of Vehicles	Average GVW	Average Miles Per Gallon	Average Miles Per Month
0- 499	3	32,367	6.60	446
500- 999	36	37,522	5 90	783
1,000- 1,499	39	37,400	6.39	1,291
1,500- 1,999	60	35,003	6 49	1,766
2,000- 2,499	61	36,259	6 22	2,249
2,500- 2,999	67	38,837	6.44	2,724
3,000- 3,499	45	38,600	6 54	3,241
3,500- 3,999	64	41,444	6.09	3,743
4,000- 4,499	44	42,441	5 96	4,221
4,500- 4,999	49	43,826	5.70	4,738
5,000- 5,499	44	44,131	5.57	5,247
5,500- 5,999	39	42,264	5.82	5,730
6,000- 6,499	35	42,537	5 64	6,294
6,500- 6,999	22	38,764	5.48	6,748
7,000- 7,499	15	42,427	6.18	7,215
7,500- 7,999	19	44,721	5.56	7,774
8,000- 8,499	7	43,514	4 80	8,164
8,500- 8,999	10	43,300	5.77	8,080
9,000- 9,499	2	42,550	5.95	9,279
9,500- 9,999	3	43,300	5.66	9,790
10,000-10,499	2	43,200	5 95	10,214
10,500-10,999	2	47,400	6.06	10,723
11,000-11,499	-	-	-	-
11,500-11,999	1	54,800	6 85	11,674
12,000-12,499	1	55,400	6 46	12,096
12,500-12,999	1	49,100	7.79	12,686
13,000-13,499	1	36,300	8 35	13,415
13,500-13,999	1	31,200	7.78	13,896
Total & Average	673	40,272	5 91	3,975

a gasoline-consumption rate that is only roughly correlated with monthly mileage. Both of these two types of vehicle classes, however, show an increase in weight with an increase in monthly mileage which agrees with Figure 5. A comparison of Figures 5 and 6 shows that gross vehicle weight is a better index of both gasoline consumption and monthly mileage than is mileage an index of gross vehicle weight and gasoline consumption.

SUMMARY AND CONCLUSIONS

The study conducted by the Ford Motor Company has resulted in a worthwhile contribution to the available information on the mileage, weight, and gasoline consumption of motor trucks. The numerical results of the study furnish certain data that can be appropriately used in highway economy, financial, and taxation studies, though not without proper regard to the source of the information, types of vehicle operation, and probable reliability.

Before the broad field of highway transportation may be blessed with reliable and appropriate information on vehicular mileage, gross vehicle weight, and fuel consumption, a scientifically planned, conducted, and analyzed study of these characteristics of vehicle use and performance is necessary.

Unless adequate information is available about the vehicle, its use, and how the information was assembled, individual reports of the mileage, weight, and fuel consumption of a particular vehicle or a fleet of vehicles should not be taken as being representative of any particular class of vehicles.

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