AUTOMOTIVE VEHICLE FEES AND TAXES IN MICHIGAN

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A SOUND ANSWER TO THE QUESTION, "WHO PAYS FOR THE HIGHWAYS?" BASED ON THOROUGH ESEARCH AND THE APPLICATION OF APPROVED PRINCIPLES

HIGHWAY USERS CONFERENCE
ATIONAL PRESS BUILDING
WASHINGTON, D. C.

FOREWORD

"Who Pays for the Highways?" is a question frequently asked, but not often satisfactorily answered because of the lack of familiarity with the facts and figures or the failure to apply well-considered principles.

Propagandists unfriendly to highway transportation have widely circulated charts and compilations purporting to show that motor vehicle owners pay only a small portion of the cost of all the highways and city streets.

For what highways should the motorist pay, and how much are they now paying? Several independent agencies studying the whole question during the past year have, in general, reached the same conclusion—that motor vehicle owners should pay for highways of general motor use.

Professor John S. Worley has performed a splendid service in making a scholarly and thorough study of highway taxation in Michigan. By applying approved formulae to the results of actual traffic surveys made by governmental agencies, he has demonstrated that in that State the motorists are paying annually for the highways which they use and, in excess of their requirements, an amount equal to the taxes paid by public utilities, and that the allocation between the different classes of motor vehicles is fair.

This is not special pleading on behalf of the motor vehicle owner. It is a deliberate and thoughtful study by an eminent authority, and should do much to clarify the general confusion which exists on the subject of motor vehicle taxation.

It is hoped that Professor Worley's study may be the inspiration and basis for studies in other states. No doubt the application of the same principles and formulae will reveal similar results. If state officials and organizations interested in highway transportation undertake such work, it will be a service in the public interest.

ROY F. BRITTON, *Director*
National Highway Users Conference.

NOTE: For convenient reference, we have appended a summary of the Michigan Traffic Survey, and also a summary of the comments on this survey made by Thomas H. MacDonald, Chief of the Bureau of Public Roads, United States Department of Agriculture.

Automotive Vehicle Fees and Taxes in Michigan

By JOHN S. WORLEY

Since time immemorial, in all countries, the use of all highways, with a few exceptions has been free. This has been so, not because they were a gift from the state, but because they had been conceived, planned, constructed, repaired, maintained and paid for by adjoining land owners, and local districts such as counties, townships, shires, boroughs, cities, towns and villages whose inhabitants were beneficiaries thereof. Even today the adjoining land-owners hold the fee in the land occupied by the highways. As the road pattern of each district grew it was made to join the pattern of one or more other districts thus providing a continuous pattern. Where and when the volume of traffic on any highway became heavy because of intercourse between two cities or towns or for any other reason, and the repair and maintenance became a burden upon the local communities, or it was not of a quality and character to properly serve the traffic; then the state provided funds so that adequate facilities would be furnished. Prior to this present century, these principal roads, which in England became the King's Highway, were provided and improved in the main because of the commercial need of the country. A large part of the traffic was the transportation of goods and passengers for hire. In our modern day in America, the principal traffic is that of the private vehicle.

In some cases the state licensed private parties to improve these main arteries of travel, for the use of which the users were chargd a fee or toll—these became known as toll roads or turnpikes. This method of providing state highways by toll roads or turnpikes was confined almost solely to rural areas, seldom having been resorted to in cities, towns or villages.

The mileage of the state or primary roads compared with the local roads has always been small. Today, when there are more state roads in the United States than ever before, these constitute only 10.8 percent.

The total highway mileage in Michigan, December 31, 1931, consisted of:

State Trunk Line System—		
Rural	8,019 miles	Percent
Cities and towns	273 "	
	8,292 miles	8.4
Streets in cities and towns exclusive of State Trunk Line System	12,830 "	13.0
Rural roads	77,387 "	78.6
Total	98,509 miles	100

Our present day weight tax, gas tax, privilege tax, ton-mile tax and all other automotive vehicle taxes were conceived and have been continued as revenues for highway purposes. The main objective was the creation of a state system of improved highways more suitable to the needs of the automobile. In some cases funds were provided by the issuance of bonds, the interest and principal of which were to be met by automotive vehicle taxes. Great benefits have accrued to many interests by the construction of the State Trunk Line System in Michigan, but the automotive vehicle owner has been the one who has had to pay the whole cost.

We will now consider what the owners of automotive vehicles should pay for the use of the highways in Michigan.

On page 416 Interstate Commerce Commission Docket No. 23400 "Coordination of Motor Transportation" the Interstate Commerce Commission states the cardinal principle which determines what the cost for the use of the highways should be to automotive vehicles. This is nothing more or less than the standard of measure applied to all business under similar circumstances. This statement reads as follows:

"The true cost attaching to the use of highways in any year is not measured by that year's expenditures, but by that part of the interest, amortization, maintenance, and general expenses attributable to that period in comparison with preceding and succeeding ones."

On January 30th this year the Joint Committee of Railroads and Highway Users, of which General Wm. Atterbury, president of the Pennsylvania Railroad, and Alfred H. Swayne, vice president, General Motors Corporation, were joint chairmen, agree to the following which conforms to the principles stated by the Interstate Commerce Commission:

"Motor vehicles should pay the entire cost of the State Highway system. They should pay also a part of the cost of county and/or township highways, that part to be determined by the

extent to which such county and/or township highways are in general use rather than local use. Furthermore, motor vehicles should contribute in part to the cost of arterial routes through cities. The classification of highways between those of general use and those of local use, and the determination of the extent to which special motor vehicle taxes should be used to pay part of the cost of arterial routes through cities, should be made by the authorities in each State in the light of its local conditions."

"The annual cost of highways should include administration, maintenance, interest charges on highway debt, and amortization of capital expenditures."

At the present time there is [illegible]sted in the State Trunk Line System of this state, comprising [illegible]292 miles, the sum of $216,052,054, practically all of which h[illegible] been built since 1917.

The sum of these annual costs t[illegible] all users and beneficiaries of the State Trunk Line System for the years of 1918 to 1931 inclusive, according to the above principle would be for:

Interest	$61,791,799
Depreciation	35,338,658
Maintenance and repairs	43,405,461
Administration	4,026,044
	$144,561,962

In the administrative cost are included the total for the Highway Department some of which should have been charged to investment.

The details of these facts are shown in Table I.

That the total annual cost of the State Trunk Line System should not be charged to the automotive vehicles will be conceded by all, as others—telegraph, telephone, electric, and gas companies for a right of way, and others for hauling—use these roads and in addition a large benefit accrues to the adjoining and adjacent lands and other interests. But for the purpose of this paper we will assume that the whole annual cost is to be met by the automotive vehicle.

The automotive vehicle uses the county and township roads and should pay for these in accordance with the amount of use, which we will now consider.

The traffic survey in Michigan* which was made by the

* See Appendix.

Bureau of Public Roads in 1929 and 1930 shows the rural traffic distribution as follows:

1. The average traffic on the 7,691 miles of State Highways was 1,144 vehicles per day, being 65.7 percent of the total traffic.
2. The average traffic on the 17,175 miles of county roads was 190 vehicles per day, being 24.4 percent of the total traffic.
3. The average traffic on the 60,214 miles of township roads was 22 vehicles per day, being 9.9 percent of the total traffic.

From this we learn that 65.7 percent of the traffic is confined to the State Trunk Line System which is only 9 percent of the total rural road mileage.

From the foregoing it is seen that 24.4 percent of the automotive traffic is on the county roads and 9.9 percent on the township roads. Charging the automotive vehicle for the use of these at the same rate per traffic unit as that for the State Trunk Line System we have for the years 1918 to 1931 inclusive an amount of $53,688,149 and $21,783,066 respectively.

The application of the cardinal principle stated by the Interstate Commerce Commission shows that the automotive vehicles for the years 1918 to 1931 inclusive, should pay for the use of the State Trunk Line System (including as such 273 miles of streets in cities and towns) and all other rural highways, an amount of $220,033,177.

In column 4, Table I are included for construction within the corporate limits of cities and towns, the following amounts:

1919 to 1923	$10,959,064
1924 to 1931	24,022,354
	$34,981,418

There is also included in "Trunk Line Maintenance" column 8, of the same table, $3,403,137 spent within the corporate limits of cities and towns during the years of 1924 to 1931 inclusive.

In addition to the above—but not included in any of the computations—the cities and towns during the years of 1928 to 1931 inclusive, received from the gas and weight taxes, as maintenance rewards $2,154,236. The three foregoing items make a total of $40,538,791, or 13.8 percent of the total weight and gas tax, for the years of 1918 to 1931 inclusive, spent in or received by cities and towns, the total street mileage of which constitute only 13.0 percent of the highway mileage of the state.

TABLE I

INVESTMENTS AND COSTS FOR USE OF THE STATE TRUNK LINE SYSTEM

Years 1918 to 1931 Inclusive

Year	Road Construction Accumulated	Trunk Line Bridge Construction Annual	Total Investment Accumulated	*Depreciation Annual	Investment Less Depreciation Accumulated	Interest on Investment Less Depreciation on Annual	Trunk Line Maintenance (Actual) Annual	Administration (Actual) Annual	Total Annual Cost Annual
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10) Columns 5, 7, 8, 9
1918.....	$14,267,588	$418,346	$14,685,934	$367,148	$14,318,786	$715,939	$.....	$35,918	$1,119,005
1919.....	17,644,348	1,102,357	19,165,051	479,126	18,318,777	915,938	799,155	37,692	2,231,911
1920.....	25,144,927	430,714	27,096,344	677,409	25,572,661	1,278,633	1,647,779	252,426	3,856,247
1921.....	48,010,661	644,944	50,607,022	1,265,175	47,818,164	2,390,008	1,646,008	274,212	5,577,138
1922.....	56,265,605	873,937	59,735,903	1,493,398	55,453,647	2,772,682	1,740,864	365,351	6,372,295
1923.....	69,117,784	1,119,526	73,707,608	1,842,690	67,582,662	3,379,133	1,739,323	783,469	7,744,615
1924.....	86,469,930	1,165,728	92,225,482	2,305,637	83,794,899	4,189,745	1,964,390	332,560	8,792,332
1925.....	96,587,158	1,080,893	103,423,603	2,585,591	92,407,429	4,620,371	1,846,440	253,826	9,306,228
1926.....	104,433,923	1,106,009	112,376,377	2,809,409	98,550,794	4,927,539	3,911,433	226,337	11,874,718
1927.....	122,494,194	1,102,077	131,538,725	3,288,468	114,424,674	5,721,233	4,796,391	280,636	14,086,728
1928.....	140,228,251	1,597,860	150,930,642	3,773,266	130,043,325	6,502,166	5,597,156	278,806	16,151,394
1929.....	161,172,819	1,785,458	173,600,668	4,340,017	148,373,334	7,418,666	6,244,109	283,267	18,286,059
1930.....	173,578,579	2,394,471	188,400,911	4,710,023	158,463,554	7,923,177	5,895,005	300,846	18,829,051
1931.....	198,992,150	2,237,584	216,052,054	5,401,301	180,713,396	9,035,669	5,576,573	320,698	20,334,241
Total	$198,992,150	$17,059,904	$216,052,054	$35,338,658	$180,713,396	$61,791,799	$43,405,461	$4,026,044	$144,561,962

*Depreciation is calculated upon 2½% of the whole investment or 5% upon the perishable parts.

During the years of 1918 to 1931 inclusive the counties received, as rewards of various kinds $82,706,270 all of which came from the gas and weight taxes. Tables II-A, II-B, and II-C, give the registration of vehicles total amount of gas and weight taxes, deductions therefrom and the net which was available to the state for highway purposes.

TABLE II-A

GROSS GASOLINE TAXES
LESS
REFUNDS AND COST OF COLLECTION

1925 to 1931 Inclusive

Year	Gross	Deductions			Net
		Refunds	Cost of collection	Total	
1925.....	$8,019,084	$458,382	$41,317	$499,699	$7,519,385
1926.....	10,700,455	662,066	23,737	685,803	10,014,652
1927.....	15,160,047	917,856	58,362	976,218	14,183,829
1928.....	19,552,542	1,678,453	90,122	1,768,575	17,783,967
1929.....	23,549,879	2,380,333	40,286	2,420,619	21,129,260
1930.....	23,659,125	1,949,409	41,373	1,990,782	21,668,343
1931.....	23,830,271	2,333,187	54,639	2,387,826	21,442,445
Total.....	$124,471,403	$10,379,686	$349,836	$10,729,522	$113,741,881

TABLE II-B

GROSS WEIGHT TAXES
LESS
COST OF COLLECTING, LICENSE PLATES, ETC.

1918 to 1931 Inclusive

Year	Total Vehicle Registration	Gross Tax	Deductions			Net
			Cost of Collecting	Cost of Plates	Total	
1918.....	262,125	$2,875,266	*$115,011	†$39,819	$154,830	$2,720,936
1919.....	325,818	3,719,433	*148,777	48,872	197,649	3,521,784
1920.....	416,428	5,764,901	*230,196	62,464	292,660	5,462,241
1921.....	481,367	6,751,925	*270,077	72,205	342,282	6,409,643
1922.....	584,291	8,385,032	345,205	87,644	432,849	7,952,183
1923.....	737,888	10,500,786	402,797	110,608	513,405	9,987,381
1924.....	877,222	12,404,546	512,558	131,583	644,141	11,760,405
1925.....	1,001,310	14,526,002	557,517	150,197	707,714	13,818,288
1926.....	1,134,077	16,953,685	644,079	170,111	814,190	16,139,495
1927.....	1,174,209	17,984,210	667,127	176,131	843,258	17,140,952
1928.....	1,274,456	20,056,848	751,416	191,168	942,584	19,114,264
1929.....	1,429,817	23,212,816	837,344	214,397	1,051,741	22,160,575
1930.....	1,375,097	22,482,412	882,992	206,264	1,089,256	21,393,156
1931.....	1,294,876	21,821,290	842,453	194,231	1,036,684	20,784,606
Total ...	12,367,976	$187,428,652	$7,207,549	$1,855,194	$9,062,743	$178,365,909

* Estimated.
† Estimated at 15 cents per set of plates.

TABLE II-C

NET WEIGHT AND GASOLINE TAXES AFTER DEDUCTIONS

1918 to 1931 Inclusive

TABLES II-A AND II-B

Year	Net Gasoline Taxes TableII-A	Net Weight Taxes Table II-B	Total
1918	$.....	$2,720,936	$2,720,936
1919	.....	3,521,784	3,521,784
1920	.....	5,462,241	5,462,241
1921	.....	6,409,643	6,409,643
1922	.....	7,952,183	7,952,183
1923	.....	9,987,381	9,987,381
1924	.....	11,760,405	11,760,405
1925	7,519,385	13,818,288	21,337,673
1926	10,014,652	16,139,495	26,154,147
1927	14,183,829	17,140,952	31,324,781
1928	17,783,967	19,114,264	36,898,231
1929	21,129,260	22,160,575	43,289,835
1930	21,668,343	21,393,156	43,061,499
1931	21,442,445	20,784,606	42,227,051
Total	$113,741,881	$178,365,909	$292,107,790

To recapitulate the foregoing we have:

Net gas and weight taxes after deductions, 1918 to 1931 inclusive		$292,107,790
Proper charges to automotive vehicles for use of State Trunk Line System	$144,561,962	
Proper charges to automotive vehicles for use of county roads	55,688,149	
Proper charges to automotive vehicles for use of township roads	21,783,066	
		220,033,177
Balance		$72,074,613

In whatever amounts, if any, the cities and towns remain to be compensated above what is already included above and other monies received, should come from the $72,074,613. The remainder has been furnished the state for capital account in the construction of highways for the use of which the state has paid no interest.

The annual cost to the automotive vehicle for the use of the highways in the state for the year of 1931 in accordance with the cardinal principle stated by the Interstate Commerce Commission would be for:

State Trunk Line System:	
Interest	$9,035,669
Depreciation	5,401,301
Maintenance and repairs	5,576,573
Administration	320,698
Total	$20,334,241
County roads	7,552,137
Township roads	3,064,370
Grand total	$30,950,748

The net weight and gasoline taxes after cost of collecting, refunds and similar items for the year of 1931 was $42,227,051. This leaves an excess of $11,286,303 which might be considered as equivalent to a personal property tax on motor vehicles. The amount of advalorem Public Utility Taxes for the year of 1931 were:

Railroads	$10,398,304
Telephone and telegraph	8,843,179
Car loaning	141,089
Express companies	33,898
Sleeping car companies	50,453

Included in the investment in the State Trunk Line System are the amounts received from Federal Aid, the total of which for all years up to June 30, 1932, amounts to $35,000,553, or an average annual amount of $2,500,000. Effective in the year 1932, the United States government collected a gas tax of 1 cent per gallon which on the basis of the gas used in 1931 would have amounted to $6,729,334. If Federal Aid is continued at the average annual rate as in the past, the Federal gasoline tax on the basis of 1931 will by 1940 not only be sufficient to meet the annual Federal Aid but will be sufficient to liquidate the $35,000,553 advanced prior to July, 1932. If Federal Aid is not continued then the $35,000,553 will be returned to the Federal government within five and one-half years.

This gasoline tax should be considered as additional compensation paid by the automotive vehicles for the use of the highways of Michigan. Table III shows the annual amounts of Federal Aid received by the State of Michigan.

Having considered what automotive vehicle owners as a whole are paying for the use of the highways of the State, we will now inquire as to whether the owners of heavy vehicles pay their just proportion.

In 1931 the registration of automotive vehicles and the weight taxes in Michigan were as follows:

	No.	%	Weight tax	%
Passenger cars	1,079,532	87.6	$15,184,680	77.2
Commercial cars	153,332	12.4	4,484,010	22.8
	1,232,864	100	$19,668,690	100

From the foregoing we see that the commercial cars comprising only 12.4 percent of the total pay 22.8 percent of the weight tax.

The amount each individual vehicle should pay for the use of the highway depends upon the use thereof and the depreciation which takes place upon each passage of the vehicle over the road.

Mr. Thomas MacDonald in 1931 testified before the Interstate Commerce Commission as to the additional thickness to be added to paving surfaces because of heavy loads as follows:

"We would not build roads much less than 7 inches at the edge and 6 inches in the center, no matter what kind of loads we were going to carry. If we built thinner surfaces they would curl up like tissue paper in the rays of the sun. They would

TABLE III

MICHIGAN STATE HIGHWAY DEPARTMENT
FEDERAL AID FUNDS RECEIVED
By Six Month Periods to June 30th, 1932

From	To	Year	Funds Received	Total Received
7-1	12-31	1918.....	$219,247.18	
1-1	6-30	1919.....	151,734.42	$370,981.60
7-1	12-31	1919.....	466,473.89	837,455.49
1-1	6-30	1920.....	60,142.77	897,598.26
7-1	12-31	1920.....	335,016.40	1,232,614.66
1-1	6-30	1921.....	230,894.83	1,463,509.49
7-1	12-31	1921.....	2,687,542.96	4,151,052.45
1-1	6-30	1922.....	326,133.61	4,477,186.06
7-1	12-31	1922.....	1,027,978.66	5,505,164.72
1-1	6-30	1923.....	433,286.01	5,938,450.73
7-1	12-31	1923.....	1,233,998.97	7,172,449.70
1-1	6-30	1924.....	1,083,175.02	8,255,624.72
7-1	12-31	1924.....	3,153,818.19	11,409,442.91
1-1	6-30	1925.....	454,599.08	11,864,041.99
7-1	12-31	1925.....	2,315,168.91	14,179,210.90
1-1	6-30	1926.....	484,143.79	14,663,354.69
7-1	12-31	1926.....	2,044,646.86	16,708,001.55
1-1	6-30	1927.....	640,338.27	17,348,339.82
7-1	12-31	1927.....	1,795,051.48	19,143,391.30
1-1	6-30	1928.....	532,862.67	19,676,253.97
7-1	12-31	1928.....	2,546,009.74	22,222,263.71
1-1	6-30	1929.....	550,350.80	22,772,614.51
7-1	12-31	1929.....	1,223,664.47	23,996,278.98
1-1	6-30	1930.....	1,077,198.86	25,073,477.84
7-1	12-31	1930.....	1,856,741.10	26,930,218.94
1-1	6-30	1931.....	1,090,362.12	28,020,581.06
7-1	12-31	1931.....	3,485,022.26	31,505,603.32
Advance Fund		1931.....	2,521,382.00	34,026,985.32
1-1	6-30	1932.....	973,568.33	35,000,553.65

warp; the frost heave would destroy them" . . . "it is not until we get to the 5-ton truck that it is necessary to increase the dimensions of the road and then only by one-half inch in thickness; so that as between the passenger cars and the lighter trucks—farm trucks, if you wish, taken as a value of one or as a unit, when you get to the 5-ton truck, in order to keep out stress, get the working stress of the material, 350 pounds, we must increase the thickness of road one-half inch or about 7.7 percent and for a 7½-ton truck, 1:154 or about 15.4 percent."

In the current January (1933) number of *Bus Transportation* he has the following to say on the same subject:

"It is a popular idea that the heavier vehicles must necessarily cause greater road damage than the lighter ones. This idea is the basis for the demand that vehicles of the various sizes shall be taxed according to the highway wear and tear for which they are severally responsible."

"The idea lacks factual support and the method of proportioning taxation is both improper and impracticable. Highways must be built to withstand the forces of climate at work continuously over long periods as well as to resist the forces of traffic; and it is generally true that the road design, based upon consideration of long-time durability and resistance to climatic forces and subgrade conditions, will be adequate to support nearly all classes of vehicles, including the larger, if not the largest classes permitted to operate under reasonable restrictions as to wheel loads, tire equipment and speeds."

Our experience in Michigan, with a maximum axle load of 18,000 pounds, confirms Mr. McDonald's later views. However, we will accept Mr. McDonald's earlier and more unfavorable statement for a further inquiry as to the amounts which the heavier motor vehicles might be asked to pay annually for the use of the highway, which requires a maximum additional thickness of the pavement of 15.4 percent over and above that necessary to carry the heavier passenger cars. The adding of this 15.4 percent does not increase the cost of the pavement in direct proportion to the increase of the thickness. This lesser cost being difficult of ascertainment we will take 15.4 percent of the total investment in the surface.

There are in the State Trunk Line System 3,437 miles of permanent surfaced roads having 40,445,045 square yards of paving surface, with an investment of $83,913,887. Fifteen and four-tenths percent of this investment amounts to $12,922,738.

The annual cost, in 1931, chargeable to the heavier vehicles on this basis would be:

For Depreciation:	
$12,922,728 @ 5%.....	$646,138
For Interest:	
$12,922,728 @ 5%.....	646,138
Total.....	$1,292,276

Which total is too large due to the fact the interest should have been computed upon the investment less the accumulated depreciation of the permanent surface which amount is not known. For the year of 1931 vehicles of 2½-ton and greater capacity paid above the average weight taxes paid by passenger cars an amount of $1,686,467. The registration and weight taxes paid by commercial cars of various sizes are shown in Table IV.

To the foregoing must be added the amount of taxes paid by the trucks under Acts 212 and 312 which became effective in September, 1931. These acts require that automotive vehicles for hire pay to the Public Utilities Commission a privilege tax. This tax from July 1, 1931, to June 30, 1932, amounted to $282,412.

The expense of its administration amounted to.	$55,151
Leaving a net of.....	$227,261
which, added to the.....	$1,686,728
amounts to	$1,913,728

which is the annual amount which the motor truck is paying because of a theoretical extra thickness to our paving surfaces made necessary by heavy trucks passing thereover. It is estimated that for the coming years under Acts 212 and 312 this net amount will approximate $400,000 a year in which case, motor trucks of 2½ tons capacity and greater would be paying for the use of the extra thickness of pavement approximately $2,000,000 a year. This, of course, is readily seen to be far in excess of the amount which would be required by the cardinal principle set up by the Interstate Commerce Commission, and the Joint Committee of Railway and Highway Users.

As has probably already been observed in making the foregoing analysis, every element of doubt has been resolved against the automotive vehicle. The analysis itself brings a conclusion which seems to be beyond refutation that the automotive vehicle is paying more annually for the use of the highways of the state than should be charged therefor and that the motor truck is paying more than its fair share.

TABLE IV

REGISTRATION AND WEIGHT TAXES COMMERCIAL VEHICLES, 1931

Tons capacity and rates per 100 pounds

Vehicles	$0.65 1 ton and less		$0.80 1 to 2½ tons		$1.00 2½ to 4 tons		$1.25 4 tons and more		Totals	
	No. of cars	Total Tax	No. of cars	Total Tax	No. of cars	Total Tax	No. of cars	Total Tax	No. of cars	Total Tax
Trucks	62,000	$822,427	55,129	$1,406,343	14,583	$683,009	10,563	$1,186,798	142,275	$4,098,577
Busses	24	296	66	1,756	112	4,584	1,270	201,757	1,472	208,393
Passenger cars	6,081	74,802	2,726	68,527	774	33,681	.....	.....	9,581	177,010
Miscellaneous	.....	.....	.....	.....	.....	.....	.....	.....	4	30
Total	68,105	$897,525	57,921	$1,476,626	15,469	$721,274	11,833	$1,388,555	153,332	$4,484,010
Average cost per vehicle.		$13.18		$25.50		$46.63		$117.35		$29.24
Average tax private passenger car		$15.51		$15.51		$15.51		$15.51		$15.51
Excess tax per vehicle...				$9.99		$31.12		$101.84		$13.73
Total excess over average				$578,530		$481,395		$1,205,072		$2,105,248

Excess paid by vehicles with 2½ to 4-ton capacity...	$481,395
Excess paid by vehicles with 4 tons plus capacity...	1,205,072
	$1,686,467

APPENDIX

Summary of the "Michigan Traffic Survey"

The Michigan survey of highway transportation, conducted under a cooperative agreement between the United States Bureau of Public Roads and the State Highway Department of Michigan, marks a departure in traffic and vehicular movement studies. It is the first of this nature in which data indicative of the character and amount of use of city streets, state trunk routes and county and township roads, has been gathered simultaneously.

Traffic was observed throughout a full year at more than 1,000 points covering about 4,000 sections of roads, and at 400 points in the seven cities of Detroit, Grand Rapids, Flint, Lansing, Jackson, Ann Arbor, and Niles. It included local and non-local vehicles on the various trunk routes and streets, and on county and township roads, and of vehicles owned within and without the county or township.

A secondary objective of the survey was to obtain information on tourist travel in Michigan, its origin, number of tourists, number of cars, the length of stay, the mileage traveled, the types of accommodation used, and the monetary value of this traffic to the state. A study was made also of the volume of city traffic during "peak" hours, total street widths and effective widths after deductions for parked vehicles, safety zones and other obstructions and the presence of street car tracks.

In the state at the start of the survey there was 60,214 miles of township roads, 17,175 miles of county roads, approximately 8,000 miles of state trunk road, in addition to several thousand miles of city streets. Stations were established in certain "key" townships, and at strategic points along county and state roads and in municipalities.

Trucks were classified by tons capacity, and other vehicles as a passenger car, bus or trailer. Fach vehicle was further classified as to whether the owner lived in the township in which the survey station was located, or by county in the state, or by other states, according to registration.

Variations in traffic month by month from the monthly average was found for all types of vehicles. The variation was greater for passenger cars—from 61 to 153 per cent—than for light trucks which was 79 per cent in January and 131 per cent in October. Bus traffic was more stable than any other form of vehicle and varied from 92 per cent in February to 114 per cent in October. The range of variation was practically the same on each type of road. Traffic on Sunday was about 140 per cent of the average daily traffic.

The survey developed that 65.7 per cent of the total traffic moved on the 9 per cent of state routes; 24.4 per cent of the total traffic was on the 20 per cent of county roads, and 9.9 per cent of the traffic was on the 71 per cent of township roads. Traffic volumes per day averaged 1.144 vehicles upon trunk lines, 190 vehicles a day on county roads, and 22 vehicles a day on township roads.

With gasoline tax at 4 cents a gallon, and estimating the average travel per gallon at 13.4 miles, it is easy to figure the daily and yearly earning capacity of each mile of road. It was found in the survey that more than 60 per cent of the traffic on township roads originated within the local township, and more than 81 per cent within the county, while on the state roads more than 80 per cent of the traffic originated at points outside of the township in which the survey station was located.

Two thirds of the usage of township roads was by rurally owned cars, 44 per cent on the county roads, and 19 per cent on the trunk roads. City owned cars were found to be nearly 70 per cent of the traffic on the road system, and 75 per cent of their travel on trunk roads. Only 5 per cent of the travel on township roads consisted of city-owned cars.

In a study of gasoline consumption, it was found that there was an average travel of 13.4 miles per gallon for all types of vehicle. On this basis it was found that the average daily vehicle travel on rural roads was 13,400,000 miles, and 13,200,000 miles on city streets.

In the study of city street movement, 31 per cent of the traffic was found to be of non-local origin. Part of it is from other cities and the remainder from rural areas.

Records of the State Highway Department indicate that $45,582,894 was disbursed on roads from July 1, 1930, to June 30, 1931. Of this sum, $10,622,880 represented the direct payments of registration fees to the counties, and $1,060,014 to municipalities for maintaining and widening trunk lines within corporate limits. In addition to the sum of over $45,000,000, the counties spent $28,185,300, the townships $6,264,384 and the cities $37,822,997, or making a grand total for the year of $106,172,681.

On this basis the expenditure per vehicle mile for each of the highway systems of the state, including streets, was 1.29 cents on township roads, 2.37 cents on county roads, 1.05 cents on trunk roads, and .78 of a cent on streets. This was an average for all highways and streets of 1.18 cents per vehicle mile.

The full text of the Michigan Survey is published in "Public Roads" (Journal of Highway Research, Bureau of Public Roads, U. S. Department of Agriculture) Vol. 13, No. 12, February, 1933.

Comments of Thos. H. MacDonald on the "Michigan Traffic Survey"

Thomas H. MacDonald, chief of the United States Bureau of Public Roads, in discussing recently the results of the traffic survey in Michigan, said:

"Economic factors which should determine no particular part of the highway improvement program, but the program as a whole, fall naturally into three general lines—administration, financial, and technical. The most important factor of administration is the planning of the road system as a whole and obtaining the legislative acceptance of the plan.

"By the expression, a planning of the system as a whole, I am endeavoring to break away from any narrow conception of highways as legally classified, and to consider them from the standpoint of traffic requirements, present or potential. This distinction possibly can be best explained by the use of the recent traffic survey in Michigan.

"This classification is the existing order based upon legal and administrative control, and is subject to large revision upon the basis of the traffic importance of the individual roads within these three groups. Some roads of Classes 2 and 3 would be lifted to Class 1 and interchanged between these two classes.

"When this is done, from the record of their use each individual road would be properly placed in its class, but probably the total mileages of each class would not be materially altered. This means that in the two upper classes there are approximately 25,000 to 30,000 miles whose use justifies improvement with a surfacing adequate for the travel to be carried, and that can be provided within the earnings of these roads as a whole.

"But there remain 50,000 to 60,000 miles of roads which average not more than 22 vehicles per day, and an adjustment as suggested of this classification would reduce this average. It is not necessary to figure minutely the earnings from serving vehicular travel of these roads carrying 22 vehicles a day. It may be indicated by assuming a gas tax of 4 cents and 10 miles

per gallon. Each mile would then earn about 8 cents per day, or $29 annually.

"We will trip over our own feet in trying to draw sound conclusions based on the present classes of roads as legally defined. No one will seriously question the care and improvement, through the earnings of vehicular travel, of Classes 1 and 2 when revised for Michigan, to the extent possible within the limits of the income. The maximum total income will limit the taxation imposed upon the individual motor vehicle through the law of diminishing returns. But there is a very definite line between these roads of general motor use which, in the case of Michigan, amount to a total of 29 per cent of the total road mileage and those whose purpose is purely local.

"Farm to market roads are coincident with the lines of general community use. Following these thoughts through, we find they are reasonably representative, and based on a careful survey of other states in which a similar division has been worked out, the indicated general classification for all existing public roads might be as follows:

	Mileage	Percent of total
"A. Federal and state highway systems: (to include all routes where traffic is heavy and where terminal to terminal traffic predominates)	330,000	11
"B. County highways: (to include all important market to market roads where through traffic is lighter and where highway service to adjacent property or to roads of Class C is more than the through traffic)	600,000	20
"C. Local roads: (comprising all other local roads and those whose use is closely related to crop production and disposal. These are, in general, short roads, tributary to Classes A and B)	2,070,000	69
"Total	3,000,000	100

"I am not setting up a final classification for our existing roads, or these precise percentages for any particular state. Such a classification obviously will rest upon the area, density and distribution of population, topography, types of development, etc., since these determine highway usage. Thus, the

sparcely settled states of the West would vary widely from the percentages given here, but the principle would apply.

"Rather, this classification indicates a top limit now for our general-use roads at from 30 to 35 per cent of our public road mileage, or roughly, a division in Classes A and B of one-third, and in Class C, two-thirds. What this means in terms of service to the agricultural population is indicated by the fact that a strip one mile wide on either side of a mileage so extensive as 35 per cent of our public road mileage in Classes A and B would include over 2,000,000 square miles out of a total area of 3,026,789 square miles for the continental United States.

"There is no doubt that the time has come now for those states that have not already adopted such a program to make a study and classification of roads here included under Classes A and B. A considerable number of states have already adopted such a plan and are devoting a portion of the income from the motor vehicles to improving the roads either through state operation or through assistance to the counties under general state direction.

"To make reasonable provision from road user taxes for Classes A and B is not, in general, impossible. Class C roads, or those carrying we will say an average of about 20 vehicles per day, which make up the big percentage of our road mileage, but consist essentially of short sections of very local roads tributary to those of general use, certainly can not in fairness be supported from the road user revenues.

"Since we are contemplating a mileage of general-use roads so extensive that two-thirds of the whole land surface is directly served—that is, within a maximum distance of one mile—these would include not only all the main state and inter-county roads, but all of those which could by any stretch of the imagination be called the real farm-to-market roads.

"The classifications for A and B roads total 930,000 miles, a figure that seems almost fantastic perhaps, yet according to our best estimates we have now a grand total of 720,000 miles of surfaced roads, leaving a difference of 210,000 miles yet to be improved with surface if the reported improvements were all on the roads that would fall in Classes A and B. This would be by

no means an impossible task within a reasonable period in the future had these improvements been so systematized.

"We have for the past several years recorded an annual increase in surfaced roads up to a total of about 30,000 miles. At this rate there is ahead, theoretically, only say 10 years, even at the considerably reduced rate which we now face. This, however, is simply a fantasy which we wish were true, since a very large part of the mileage reported as surfaced is not located upon roads of Classes A and B, or improved to a degree consistent with either traffic requirements or minimum maintenance costs.

"Here are more nearly the real facts:

"The state highway systems, which I have called Class A highways, comprise 330,000 miles. There remain of these approximately 100,000 miles yet to be surfaced. Of the county road systems placed above at a maximum of 600,000 miles, we may estimate 325,000 miles surfaced, leaving 275,000 miles yet to be surfaced. This leaves of the total reported surfacing, 165,000 miles to be distributed back to the Class C roads of 2,000,000 plus miles.

"I do not intend to represent these figures as accurate but they are reasonably indicative of the road surfacing status at the present time. Under this traffic classification of the roads which should be surfaced, there are in these groups which I have termed A and B a total of at least 375,000 miles yet to be improved with some type of all-year usable surfaces. To this total must be added a considerable mileage of streets within municipalities which is logically a part of the general-use system and which involves, in general, improvements of a more extensive character.

"These are sufficient facts upon which to base the principle that we must plan our annual highway improvement program as a continuous activity and not one that will be finished in a definite and now foreseen time. The administrative program, therefore, for any state should not depart too widely from the following considerations:

"1. The definite classification of the roads based on traffic, present and prospective, and

"2. The setting up of a budget providing for fixed charges, maintenance, reconstruction and new construction.

"We have to face the facts that under present conditions all road revenues from local to Federal will be very materially reduced. I do not know to what extent, but I do know it will be very serious—so serious that the result will be to endanager both our very large capital investment in highway construction and the experienced and competent technical organizations in our highway departments.

"I propose, therefore, as a sound national program based on the economic factors involved:

"1. Road classification, to include in addition to the state highway system, the county and municipal roads and streets on the basis of general traffic use, into classes as defined, and the selection of types consistent with the use which will be required;

"2. The placing of all motor vehicle imposts under the administration and the direct or general control of the state highway department;

"3. That fixed debts and maintenance be made the first priorities followed by reconditioning, reconstruction and then new construction;

"4. That an amount equal or even greater than is proposed for diversion to other purposes or to other divisions of government, such as the counties or cities, be set aside for the roads and streets of these divisions which are included in the above classification as general-use highways under direct or general control of the state highway department.

"5. That taxes on real or personal property within the counties or cities be reduced by an amount equal to the sums provided from the motor vehicle imposts. Or, if these amounts are needed to balance the budget for other purposes, that they be taken to the extent necessary from the property taxes now used for road purposes which would be met under this proposal by allotments from the motor vehicle imposts.

"Such a program offers the best defense in the present situation—a constructive attack. It would assure traffic service and maintain income. It would protect credit and capital investment.

It would insure continuance of the competent control of expenditures and engineering operations of the state highway departments. In them we have a national asset that no nation is wealthy enough to sacrifice."