A Discussion of Gasoline Tax Rates and Gasoline Consumption

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The gasoline tax has come increasingly to the fore as a subject of discussion. Growing recognition of the need for highway modernization, and the means of financing it, has resulted in the enactment, in recent years, of gasoline tax increases at both state and Federal levels.

Although these increases have not fully restored the gasoline tax to the relative purchasing power it had prior to the war, they have been subjected to considerable scrutiny, and in some cases, strong objections.

It is the purpose of this study to examine the relationship between the gasoline tax and other costs and price levels encountered by the vehicle user, particularly in connection with his use of highways.

• THE EFFECT of the price of gasoline on the demand for gasoline is one of the most persistent questions in the field of transportation. In the economists' language, the question is, "Is the demand elastic, or inelastic?" There are many barriers to finding a satisfactory answer. Perhaps the most important of these is the absence of retail price and sales data in sufficient detail to permit precise analysis. But there are other substantial difficulties, some of which can be better stated as questions rather than as reasons:

1. How much of the operation of motor vehicles is optional, and how much is "necessary"; and how can the degrees of necessity be measured?

2. What products or services compete with gasoline for the same dollar?

3. How much have the relative costs of gasoline and gasoline taxes changed, compared with other prices and costs, in recent years?

4. What part of the cost of operating a motor vehicle does the cost of gasoline comprise?

5. How rigid or flexible are the highway users' commitments (in selection of vehicles, amounts of their use, and selection of bases of operation)?

It would be impractical, in analyzing the effect of price on gasoline demand, to assume a stable background against which the effects of price changes could be noted. The total price of gasoline is made up of two principal components—the price of the product, and the tax. To the purchaser, there is no difference, and it must be assumed that any effect of price on demand is solely the result of the total price, totally unaffected by the proportion that is either price or tax. There is, of course, one major qualification to be

TABLE 1

STATE AND FEDERAL MOTOR-FUEL TAX RATES, IN CENTS PER GALLON [1]

STATE	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	[2] 1958	[2] 1959	[2] 1960
Alabama	6	6	6	6	6	6	6	6	6	6-7	7	7	7	7	7
Alaska															5-7
Arizona	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Arkansas	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
California	3	3-4.5	4.5	4.5	4.5	4.5	4.5	4.5-6	6	6	6	6	6(7)	6(7)	6(7)
Colorado	4	4-6	6	6	6	6	6	6	6	6	6	6	6	6	6
Connecticut		3-4	4	4-5	4	4	4	4	4	4-6	6	6	6	6	6
Delaware	3	3-4	4	4.5	6-7	5	5	5	5	5	5	5	5	5	5
Florida	7	7	7	7	7	7-6	7	7	7	6-6.5	7	7	7	7	7
Georgia	6	6	6	6-7	7	7-6	6	6	6	6-6.5	6.5	6.5	6.5	6.5	6.5
Hawaii						5/							3/ 5	3/ 5	3/ 5
Idaho	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Illinois	3	3	3	3	3	3-4	4	4-5	4	4	4	4-5	5	5	5
Indiana	4	4	4	4	4	4	4	4-5	4	5-6	6	6	6(7)	6(7)	6(7)
Iowa	4	4	4	4	4	4	4	4	5	5	5	5	5(7)	5(7)	5(7)
Kansas	3-4	5	5	4.5	5	5	5	5	5	5	5	5	5	5	5
Kentucky	5	5	5-7	7	7	7	7	7	7	7	4/ 7	4/ 7	4/ 7	4/ 7	4/ 7
Louisiana	7	7-6	7-9	9	9	9	9-7	7	7	6-7	7	7	7	7	7
Maine	4	4.5	6	6	6	6	6	6	6	6	6	6	7	7	7
Maryland	4	5	5	5	5	5	5	5-6	6	6	6	6	6	6	6
Massachusetts	3	3	3	3	3	3-4.5	4.5	4.5	4.5	4.5-5.6	5	5.5-5.5	5.5	5.5	5.5
Michigan	3	3	3	3	3	3-4.5	4.5	4.5	4.5	5	5	5	5	5	5
Minnesota	3	3	4	4-5	6-7	5	5	5	5	5	5	5	5	5	5
Mississippi	6	6	6	6	6-7	7	7	7	7	7	7	7	7(8)	7(8)	7(8)
Missouri	2	2	2	2	2	2	2-3	3	3	3	3	3	3	3	3
Montana	5	5	5	5-6	6	6	5.5	5-6	6	6-7	6	7	7(9)-6(9)	6(9)	6(9)
Nebraska	5	5	5	5-6	6	6	5.5	5.5	5.5	6	6	6-7	7	7	7
Nevada	4	5	5	4-4.5	4.5	5.5	5.5	5.5	5.5	5.5-6	6	6	6	6	6
New Hampshire	4	4	4	3	4	4-5	5	5	5	5	5	5-6	6	6-7	7
New Jersey	3	3	3	3	3	3	3	3	3-4	4	4	4	4-5	6	6
New Mexico	5	5	5	5-7	7-4	7-6	6	6	6	6	4	6	6	6	6(9)
New York	4	4	4	4.5	5	5.5	6.5	6.5	6.5	6.5	6.5	6.5-7.5	6.5	4(6)-6(9)	
North Carolina	6	6	6	6	7	7	7	7	7	7	7	7	6	6-7	7
North Dakota	4	4	4	4	4	4-5	5	5-6	5	5-6	6	6	6	5-7	6
Ohio	4	4	4	5-6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Oklahoma	7.5	5.5	5.5	5.5-6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5-7.5	6.5	6.5	6.5
Oregon	5	5	5	5-6	6	6	6	6	6	6	6	6	6	6	6
Pennsylvania	4	4-5	5	4.5	5	5	5	5	5	5-6	6	6-5	4-6	5	5
Rhode Island	3	5-6	4	5	6-7	7	7	7	7	7	7	7	7	7	6-7
South Carolina	6	6	6	6	6-7	7	7	7	7	7	7	7	7	7	7
South Dakota	4	4	4	4	4	4-5	5	5	5	5	5	5-6	6(7)	6(7)	6(7)
Tennessee	7	7	7	7	7	7	7	7	7	7	7	7	7	5(6.5)	5(6.5)
Texas	4	4	4	4	4	4.5	5	4	4	4-5	5	5-6	5(6.5)	5(6.5)	6
Utah	4	4	5	4	4	4.5	5	5	5	5	5	5-6	6	6	6
Vermont	4	4-4.5	4.5	4.5-5.5	5	5	5	5	5	5.5-5.5	5.5	6.5	6.5(0)	6.5(0)	6.5(0)
Virginia	5-6	6	6	6	6.5	6.5	6.5	6.5	6.5	6	4/ 6.5	4/ 6.5	4/ 6	4/ 6	4/ 6-7
Washington	5	5	5	5-6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6	6	6.5
West Virginia	5	5	5	5	5	6.5	6.5	6.5	5.5-6	5.5	6	6	6	6-7	7
Wisconsin	4	4	4	4	4	4	5	5	4	4-6	6	6	6	6	6
Wyoming	3	3-4	4	4	4	4.5	4.5	5	5-6	6	6	6	5(7)	5(7)	5(7)
Dist. of Col.					6-7										
State Avg. [6]	4.16	4.25	4.35	4.52	4.65	4.74	4.83	5.10	5.19	5.35	5.54	5.58	5.65	5.86	
Federal Tax	1.5	1.5	1.5	1.5	1.5	1.5-2	2	2	2	2	2-3	3	3	3-4	4

1/ This table gives the tax rates at the beginning of each year, the changes during the year, and the rates in effect at the end of the year. For 1960, the final rates shown are those in effect August 1. For tax rates in earlier years, see page 13 of "Highway Statistics, Summary to 1955". Some local governments in Alabama, Florida, Hawaii, Mississippi, New Mexico and Wyoming levy motor-fuel taxes at rates that range from 1/5 cent to 5 cents per gallon.
2/ Diesel-fuel tax rates, where they differ from the gasoline rates, are shown in parentheses beginning in 1958, but not for earlier years.
3/ The State tax rate is 8 cents per gallon in Hawaii County and the State tax rate is 5 cents per gallon in the other counties.
4/ Trucks or combinations with more than two axles pay motor-fuel tax rates of 9 cents per gallon in Kentucky and 9 cents per gallon in Virginia.
5/ The 5.5-cent tax rate in Nevada does not represent a tax increase but rather the inclusion of one cent formerly classed as an optional county gasoline tax. This one cent tax is collected by the State and is now in effect in all counties.
6/ Weighted average rate based on net gallons taxed.

noted. If an increase in price is reflected in the performance or quality of the product, there is a good chance that the "plus" effect of this tends to balance, in a way not measurable, the "minus" effect of the higher price. Similarly, if the proceeds of an increase in the gasoline tax are used to build more or better highways, the plus effect of the additional highways would tend to offset the minus effect of the additional taxes, that is, the better highways would induce greater use of highways.

It is possible to wander far afield in speculating whether better highways, by reducing congestion and opening better routes, tend to reduce the amount of fuel consumed, and the tax revenue; or whether a specific level of gasoline tax tends to have the opposite effect. The net effects of the many factors that bear on the demand for gasoline are not separable, and any impact on demand must result from the total cost of fuel to the consumer. The division between the cost of the fuel alone and the tax can make no difference to the consumer in the short run, although the indirect effects can be substantial over a longer period.

TRAFFIC AND GASOLINE SALES

Although the basic question concerns the extent to which the demand for motor fuel is affected by its total cost to the consumer, there is little doubt that local or regional variations in cost can influence the pattern of motor fuel sales; or that a persistently higher or lower retail price of gasoline in an area (even as large as a state) can affect the point-of-purchase of substantial amounts of fuel. It would be difficult, however, if not impossible, to distinguish the effects of price on the point-of-purchase from the effects on total demand, that is, when it is known that gasoline can be purchased elsewhere

at a lower cost, the customer will almost inevitably exercise his option to do so. Decreases in sales in one area will be reflected in increases in another area. That motor-fuel retailers are firmly convinced that a high degree of point-of-purchase mobility exists is reflected in the size of their price signs, and the frequent controversies over them.

That the price of motor fuel does, however, affect the time of its purchase (as contrasted to point-of-purchase) can be clearly established. Even though the public has no advance notice of other price changes, changes in tax rates are always publicized well in advance, and it is invariably anticipated that they will be reflected in the retail price. The result, in every instance, has been a clear and substantial fluctuation in fuel sales. Foreknowledge by the public, and publicity, seem to be the key to substantial time-of-purchase variances.

In the 36-month period beginning January 1, 1957, there were 14 increases and 3 decreases in state fuel tax rates, and one increase in the Federal tax rate (Table 1). (Gasoline tax rate changes are usually one cent per gallon, and are well publicized in advance.) In the same period there were 44 net changes of 0.5 cent per gallon or more in the price of fuel, excluding tax, in the individual states. Of these, 22 were increases, and 22 were decreases.

The net effect of the changes was an increase of 0.32 cent in the weighted average of state gasoline tax rates, an increase of 1 cent in the Federal rate, and an increase of 0.8 cent per gallon in the average price of gasoline excluding tax.

For the over-all period January 1946 to March 1960, there were numerous changes in both gasoline prices (excluding taxes) and tax rates (Table 2). This was a period in which price levels rose substantially, and the general trend of both gaso-

TABLE 2

CHANGES IN GASOLINE PRICE AND TAX PER GALLON, JANUARY 1946 TO MARCH 1960 [1]

STATE	CHANGES JANUARY 1946 TO MARCH 1960						PRICE MARCH 1960	
	NUMBER OF CHANGES				NET AMOUNT OF CHANGE		PRICE EXCLUDING TAX	STATE AND FEDERAL TAX
	PRICE EXCLUDING TAX		STATE AND FEDERAL TAX		PRICE EXCLUDING TAX	STATE AND FEDERAL TAX		
	INCREASES	DECREASES	INCREASES	DECREASES				
					Cents	Cents	Cents	Cents
Alabama	22	19	4	-	1.6	3.5	16.9	11.0
Arizona	25	18	3	-	1.6	2.5	17.9	9.0
Arkansas	20	10	3	-	4.7	2.5	18.4	10.5
California	28	16	5	-	7.4	5.5	21.9	10.0
Colorado	28	17	4	-	9.4	4.5	23.9	10.0
Connecticut	31	31	5	-	5.4	5.5	18.9	10.0
Delaware	23	14	4	-	5.1	3.5	18.9	9.0
Florida	29	20	3		5.2	2.5	18.9	11.0
Georgia	30	19	5	1	8.1	3.0	21.4	10.5
Idaho	32	20	3	-	8.7	2.5	27.5	10.0
Illinois	25	13	5	-	7.9	4.5	21.9	9.0
Indiana	33	27	4	-	4.0	4.5	19.9	10.0
Iowa	34	18	5	-	8.5	4.5	21.9	10.0
Kansas	26	21	5	-	1.5	4.5	19.9	9.0
Kentucky	30	15	4	-	5.4	4.5	21.9	11.0
Louisiana	23	12	4	1	6.5	2.5	18.9	11.0
Maine	31	29	5	-	3.6	5.5	15.9	11.0
Maryland	31	17	5	-	9.6	4.5	21.9	10.0
Massachusetts	37	31	6	-	2.2	5.0	15.4	9.5
Michigan	33	20	5	-	3.5	5.5	16.9	10.0
Minnesota	36	32	4	-	6.7	3.5	20.4	9.0
Mississippi	32	22	4	-	4.5	3.5	21.8	11.0
Missouri	30	17	4	-	7.5	3.5	21.4	7.0
Montana	19	6	5	1	10.4	3.5	26.9	10.0
Nebraska	26	18	6	1	8.3	4.5	20.9	11.0
Nevada	27	8	6	-	10.9	4.5	28.0	10.0
New Hampshire	23	17	6	-	2.3	5.5	16.9	11.0
New Jersey	31	25	5	-	5.6	4.5	18.9	9.0
New Mexico	24	13	5	-	8.4	3.5	22.4	10.0
New York	33	23	4	-	2.7	4.5	17.6	10.0
North Carolina	30	22	4	-	6.0	3.5	19.9	11.0
North Dakota	31	21	5	-	11.2	4.5	22.9	10.0
Ohio	18	11	5	-	8.4	5.5	20.9	11.0
Oklahoma	27	17	4	1	-0.2	1.5	12.4	10.5
Oregon	24	23	4	-	9.9	3.5	25.9	10.0
Pennsylvania	29	22	5	1	6.8	3.5	18.9	9.0
Rhode Island	43	53	5	-	-1.4	5.5	13.9	10.0
South Carolina	21	12	4	-	5.0	3.5	19.9	11.0
South Dakota	27	10	5	-	8.3	4.5	23.9	10.0
Tennessee	29	23	3	-	4.0	2.5	17.9	11.0
Texas	21	10	4	-	10.0	3.5	21.9	9.0
Utah	28	22	5	-	-2.6	4.5	15.9	10.0
Vermont	28	18	7	-	7.5	5.0	22.4	10.5
Virginia	24	20	4	-	7.2	3.5	19.9	10.0
Washington	20	14	4	-	8.9	4.0	26.4	10.5
West Virginia	17	14	5	-	2.4	4.5	19.9	11.0
Wisconsin	21	10	4	-	2.6	4.5	16.9	10.0
Wyoming	18	8	4	-	11.9	3.5	25.9	9.0
Dist. of Col.	23	12	6	-	6.9	5.5	19.9	10.0

1/ Based on Public Roads data from 1946 to 1953 and on petroleum industry series thereafter.

line prices and gasoline taxes was upward. The large number of gasoline price changes, both increases and decreases, were mainly fractions of a cent and resulted in state changes ranging from a decrease of 2.6 cents to an increase of 14.0 cents per gallon for the whole period. Tax rate changes showed net increases of from 1.5 to 5.5 cents per gallon.

Table 3 shows the relative changes in volume of sales of gasoline for use on highways and the changes in traffic for the two months prior to the month in which the tax rate was changed, the month in which the new rate was effective, and the following two months. The changes are in percent of 1957 sales and traffic compared to the same months of 1956 in all cases except for Oklahoma, Montana, Rhode Island, and New Jersey. These states changed their tax rates in 1958 and the comparisons are therefore of 1958 data with those of 1957. Detailed traffic data for 1959 were not available at the time this study was made. Since the relationship between tax changes, fuel sales, and traffic are similar to the comparisons of the effect of tax rate changes on fuel consumption and traffic that were made in a previous study (1), it was felt that if comparisons were shown for only two recent years instead of all years covered by the study, they would adequately demonstrate that the effects observed in this study were not significantly different from those observed in the earlier one.

Within each group of states in Table 3, the state in which a tax change occurred is listed first followed by adjoining states in which there were no changes in tax rates (except those that will be discussed later). Of the eleven changes shown, eight were increases in taxes and the remaining three (Pennsylvania, Oklahoma, and Montana) were decreases. In addition to these state tax rate changes, two Federal tax increases occurred during the period, a 1-cent increase effective July 1, 1956, and a 1-cent increase effective October 1, 1959 (the latter cent is scheduled to expire June 30, 1961).

It had been fairly well established that the impact of a tax increase is invariably reflected in increased cost to the consumer, and produces a distinguishable fluctuation in the sale of gasoline at the time the tax was imposed. This is undoubtedly the result of the great publicity given tax increases. The significance of Table 3 lies, therefore, more in the month-by-month figures than in the totals for the 5-month periods bracketing the tax increases. In nearly every instance the highway gasoline sales of the state with a tax rate increase appeared to decrease or show only a slight increase during the month of change, even though the traffic in that state for that month still showed a normal increase. The month preceding the month of change customarily shows an unusual increase in the highway gasoline sales, although traffic has not reflected these changes. In the month following the month of the change in the tax rate, highway gasoline sales again show a normal or a slightly higher than normal increase over the same month of the preceding year, and compare favorably with the traffic increases shown.

There are some special situations that require additional comment. The highway gasoline sales entries for the "second following month" in the Indiana "change" group are all minus as are the entries for the "preceding month" in the Massachusetts and South Dakota change groups. Also, all of the entries for the "month of change" for the Pennsylvania group are minus when they would be expected to be plus, since the Pennsylvania tax was reduced. All of the foregoing situations compare certain months of 1957 with those for 1956. The months compared also include June and July 1956, which show the

TABLE 3

PERCENTAGE CHANGES IN HIGHWAY GASOLINE SALES AND TRAFFIC IN YEAR OF TAX INCREASE FROM SAME MONTHS OF PRIOR YEAR

Month in which tax was increased	State 1/	Second preceding month		Preceding month		Month of change		Following month		Second following month		Total, 5 months	
		Highway gasoline sales	Traffic	Highway gasoline sales	Traffic	Highway gasoline sales	Traffic	Highway gasoline sales	Traffic	Highway gasoline sales	Traffic	Highway gasoline sales	Traffic
March 1957 2/	INDIANA	1.5	4.9	7.5	3.8	-11.9	3.2	3.4	2.3	-4.4	3.2	-1.0	3.4
	Illinois	6.3	5.2	-1.4	2.0	0.9	2.7	6.8	-0.2	-6.7	2.1	0.8	2.3
	Kentucky	9.2	7.0	-3.8	5.3	6.0	5.7	9.0	3.7	-3.1	2.8	3.2	4.7
	Ohio	6.9	5.6	-0.8	2.6	-2.7	2.9	11.0	5.4	-5.5	2.1	1.7	3.7
	Group Total	5.9	5.5	0.4	2.9	-2.7	3.2	7.8	2.8	-5.4	2.4	1.0	3.3
	U. S. Total	1.0	6.0	---	4.9	4.2	4.9	4.7	3.1	-4.1	2.9	1.1	4.3
	OKLAHOMA	2.0	-6.9	11.4	-7.6	-19.0	-2.3	11.1	5.1	5.3	7.2	1.6	-0.9
	Arkansas	-5.7	2.2	1.5	0.8	5.0	1.4	8.5	2.7	5.4	-0.1	3.0	1.4
	Kansas	-5.3	-0.9	5.3	-3.2	-12.6	4.1	40.8	2.4	-2.8	-2.5	3.6	-1.8
	Texas	4.7	2.1	-1.4	2.9	-3.3	2.0	15.7	4.4	6.2	2.4	4.1	2.8
	Group Total	1.7	0.1	1.7	-0.2	-6.5	0.2	17.3	4.0	5.5	2.1	3.6	1.3
	U. S. Total	4.2	4.9	4.7	3.1	-4.1	2.9	12.8	3.6	3.4	4.5	4.0	3.8
May 1957 2/	UTAH	7.9	6.9	7.2	3.4	-6.7	-1.9	14.9	0.5	4.8	1.3	5.2	2.5
	Arizona	8.1	0.4	11.4	-6.2	0.1	-10.9	17.6	---	8.0	-6.1	8.8	-4.8
	Colorado	-3.1	3.3	7.9	0.3	-0.2	1.6	14.8	1.3	5.3	2.4	5.1	1.8
	Nevada	9.1	2.9	-13.2	6.2	16.1	5.4	9.8	7.7	14.6	9.9	7.9	6.6
	Group Total	3.6	3.2	6.6	-0.5	---	-1.3	14.9	1.5	6.8	0.5	6.4	0.6
	U. S. Total	4.2	4.9	4.7	3.1	-4.1	2.9	12.8	3.6	3.4	4.5	4.0	3.8
Decrease June 1957	PENNSYLVANIA	8.7	9.5	0.7	---	-3.9	8.1	16.2	7.7	7.2	14.6	5.5	7.9
	Maryland	8.2	2.2	4.4	4.3	-3.9	11.8	8.7	9.7	1.4	7.7	3.6	7.2
	New Jersey	1.1	16.3	6.1	16.7	-7.5	11.6	7.2	11.4	-2.8	9.1	0.6	12.9
	New York	9.9	15.4	2.3	14.6	-3.4	10.2	16.0	9.6	4.1	9.3	5.5	11.7
	Group Total	7.5	12.4	2.7	8.9	-4.4	9.9	13.7	9.3	3.5	10.9	5.4	10.2
	U. S. Total	4.2	4.9	4.7	3.1	-4.1	2.9	12.8	3.6	3.4	4.5	4.0	3.8
July 1957	MASSACHUSETTS	7.8	7.0	0.2	5.8	2.5	6.9	9.1	4.2	-1.1	2.7	3.8	5.4
	Connecticut	3.8	5.4	-2.4	7.5	8.8	8.6	8.4	7.9	4.4	3.6	4.6	6.6
	New York	2.3	14.6	-3.4	10.2	16.0	9.6	4.1	9.3	1.0	5.4	3.9	9.8
	Rhode Island	-1.2	3.5	-7.2	6.4	2.5	-0.1	16.0	4.0	4.1	-1.4	2.7	2.6
	Group Total	3.6	11.2	-2.7	8.7	11.5	8.5	6.2	7.8	1.1	4.4	3.9	8.1
	U. S. Total	4.7	3.1	-4.1	2.9	12.8	3.6	3.4	4.5	2.1	2.8	3.6	3.4
July 1957	SOUTH DAKOTA	-12.3	3.8	-1.5	2.8	11.2	1.3	54.4	2.9	17.5	1.4	11.6	2.4
	Minnesota	-5.5	0.6	-7.6	0.4	19.2	-0.6	5.5	3.7	-2.0	1.7	4.0	1.2
	North Dakota	34.8	0.9	-9.1	8.5	21.6	-1.8	-4.3	4.5	-3.5	4.7	7.3	3.3
	Wyoming	5.0	2.6	-0.5	2.9	8.9	0.4	1.2	7.0	1.8	-1.1	3.3	2.4
	Group Total	7.5	1.3	-6.3	2.1	17.2	-0.3	9.1	4.1	1.2	1.7	5.7	1.8
	U. S. Total	4.7	3.1	-4.1	2.9	12.8	3.6	3.4	4.5	2.1	2.8	3.6	3.4
August 1957	VERMONT	-8.8	1.4	10.3	-2.1	2.6	-1.8	-0.4	1.4	-2.3	-6.5	0.4	-1.5
	Connecticut	-2.4	7.5	8.8	8.6	8.4	7.9	4.4	3.6	1.0	3.0	4.0	6.2
	Maine	-5.4	-0.4	15.0	6.0	7.2	6.2	1.4	4.3	-2.7	-1.9	3.5	1.5
	New York	-3.4	10.2	16.0	9.6	4.1	9.3	1.0	5.4	-1.3	5.2	3.2	8.0
	Group Total	3.6	8.8	14.7	8.8	4.9	8.5	1.5	4.3	-1.1	4.1	3.3	7.0
	U. S. Total	-4.1	2.9	12.8	3.6	3.4	4.5	2.1	2.8	1.3	0.5	2.9	2.9

1/ The States shown first in each group of States and printed in capital letters are the ones in which rate changes occurred.
2/ Since the rate change occurred late in the month, the effect on sales was not felt until the following month. Therefore, the "month of change" columns shown for Indiana are actually for April, and those for Oklahoma and Utah are for June.

(TABLE 3—Continued)

Month in which tax was increased	State 1/	Second preceding month		Preceding month		Month of change		Following month		Second following month		Total, 5 months	
		Highway gasoline sales	Traffic	Highway gasoline sales	Traffic	Highway gasoline sales	Traffic	Highway gasoline sales	Traffic	Highway gasoline sales	Traffic	Highway gasoline sales	Traffic
September 1957	NEW HAMPSHIRE	17.2	4.0	6.9	7.9	-5.4	2.5	-4.9	-2.8	-1.5	-1.6	3.3	2.6
	Connecticut	8.8	8.6	8.4	7.9	4.4	3.6	1.0	3.0	1.3	2.1	4.9	5.1
	Maine	15.0	6.0	7.2	6.2	1.4	-4.3	-2.7	-1.9	-5.1	1.8	3.9	1.9
	Rhode Island	2.5	-0.1	16.0	4.0	1.4	-1.4	2.0	5.3	4.5	3.5	6.0	2.3
	Group Total	10.3	6.0	9.1	6.9	2.5	0.9	-0.4	1.5	0.2	1.8	4.6	3.6
	U. S. Total	12.8	3.6	3.4	4.5	2.1	2.8	1.3	0.5	0.2	2.6	4.0	2.8
October 1957	NEBRASKA	17.7	7.0	3.3	0.3	-19.6	-3.6	20.4	-0.3	14.7	1.4	5.8	1.1
	Colorado	5.3	2.4	5.3	-0.4	3.9	-1.6	10.1	6.2	3.1	11.9	5.4	3.4
	Kansas	2.6	-2.5	4.3	3.0	-0.8	-1.5	7.3	-0.1	12.0	7.9	4.9	1.2
	Group Total	7.7	1.4	4.4	1.3	-5.1	-2.0	11.4	1.8	10.0	7.4	5.3	1.8
	U. S. Total	3.4	4.5	2.1	2.8	1.3	0.5	0.2	2.6	3.9	4.7	2.2	3.0
Decrease January 1958	OKLAHOMA	-2.8	--	4.3	1.6	2.3	7.9	0.3	16.6	-2.1	1.8	0.4	4.9
	Arkansas	-2.5	2.0	-0.8	2.7	10.5	2.8	-1.7	-0.2	0.6	0.8	1.1	1.7
	Kansas	7.3	-0.1	12.0	7.9	4.2	4.9	-13.2	-5.2	-3.7	-4.8	-0.3	0.6
	Texas	0.3	0.2	3.7	3.9	2.5	6.3	4.0	0.9	0.8	3.8	2.3	3.1
	Group Total	0.4	0.3	4.7	4.0	2.5	6.0	0.6	2.1	-0.3	1.9	1.6	2.9
	U. S. Total	0.2	2.6	3.9	4.7	1.5	3.9	2.5	-2.2	-1.5	-0.1	1.3	1.8
Decrease February 1958	MONTANA	-14.0	9.5	-11.2	17.4	26.7	1.5	22.3	-3.5	18.8	0.1	7.2	4.4
	Idaho	-21.2	1.0	14.1	7.8	12.9	5.5	13.4	9.3	5.9	4.6	4.8	5.5
	North Dakota	--	2.8	--	18.5	--	1.2	32.4	2.5	14.4	8.0	11.9	6.3
	Wyoming	8.8	0.7	2.0	5.4	1.3	-8.9	15.8	-6.0	-2.2	2.8	0.6	-1.4
	Group Total	0.4	3.5	-20.2	11.9	43.4	0.3	15.6	1.3	11.0	3.9	10.4	4.0
	U. S. Total	3.9	4.7	1.5	3.9	2.5	-2.2	-1.5	-0.1	3.7	2.1	2.2	1.7
June 1958	RHODE ISLAND	-1.3	-1.4	20.7	-0.2	-17.3	1.0	-1.1	4.0	-1.1	6.6	-2.5	1.9
	Connecticut	-1.7	--	2.2	1.1	-0.1	0.2	1.9	0.3	-1.6	2.7	0.2	0.9
	New Hampshire	-8.8	2.9	-0.4	4.3	-6.5	1.7	2.5	2.0	-4.3	5.7	-3.2	3.4
	New York	-0.3	3.3	3.7	2.3	1.2	-0.9	-0.2	-10.6	0.3	-0.4	0.9	-1.4
	Group Total	-0.9	2.5	4.1	2.1	-0.3	-0.5	0.2	-7.6	-0.8	0.7	0.4	-0.6
	U. S. Total	3.7	2.1	1.8	3.2	3.0	2.6	0.8	2.2	0.4	3.0	1.0	2.6
July 1958	NEW JERSEY	0.8	4.5	-2.7	4.1	12.4	8.3	6.4	5.8	10.8	7.6	5.5	6.1
	Delaware	2.8	2.4	4.6	4.5	-0.6	-0.6	-2.4	6.2	7.3	2.8	2.6	3.0
	Maryland	--	2.6	3.1	3.1	5.9	2.2	1.3	3.8	12.2	4.3	4.3	3.2
	New York	3.7	2.3	1.2	-0.9	-0.2	-10.6	0.3	-0.4	4.7	-0.1	1.8	-2.0
	Group Total	2.3	3.0	0.4	1.3	4.1	-2.9	2.0	2.1	7.4	2.8	3.2	1.2
	U. S. Total	1.8	3.2	3.0	2.6	0.8	2.2	0.4	3.0	7.1	3.2	2.5	2.8

1/ The States shown first in each group of States and printed in capital letters are the ones in which rate changes occurred.

TABLE 4

PERCENTAGE CHANGES FROM SAME MONTHS OF PRECEDING YEAR IN U.S. HIGHWAY GASOLINE
SALES AND TRAFFIC IN EACH OF TWO FIVE-MONTH PERIODS ENCOMPASSING THE JULY 1956
AND OCTOBER 1959 FEDERAL TAX RATE CHANGES

Period	1956 Tax Rate Change		1959 Tax Rate Change	
	Highway Gasoline Sales	Traffic	Highway Gasoline Sales	Traffic
Second preceding month	7.0	3.0	2.0	5.3
Preceding month...........................	10.4	6.6	12.9	6.4
Month of change...........................	0.2	3.7	−4.3	3.4
Following month...........................	5.2	4.2	4.2	3.8
Second following month....................	−0.4	2.8	1.8	6.1
Total, 5 months...........................	4.5	4.1	1.0	5.0

effects of a much publicized Federal tax increase of 1 cent per gallon. Motor-fuel purchases in June 1956 were abnormally high, and July purchases were low, so comparison with 1957 data shows an unusual pattern.

Since tax decreases are not given the same publicity as tax increases, there is no notable difference in the 1957 motor-fuel purchase pattern of either Oklahoma or Pennsylvania, compared with 1956, after adjustment for the effect of the Federal tax increase. This is not always the case, however. Foreknowledge of the Montana tax decrease was sufficient to affect motor-fuel sales. Although there were increases in traffic for all of the months considered, there were decreases in highway gasoline sales in both of the months prior to the month of change, and substantial highway gasoline sales increases after the tax rate decreased.

The "fuel purchased—traffic pattern" relationships, similar to those that were experienced with publicized state tax increases, also reflected the Federal tax changes, one in July 1956 and the other in October 1959. Table 4 demonstrates that the "loading up" in the month prior to the increase, and the apparent highway sales decreases in the "month of change" are merely time-of-purchase variances. During October 1959 when the Federal rate increased one cent the highway gasoline sales appeared to decrease by 4.3 percent. Vehicle-miles of travel for the month increased 3.4 percent, however. In the preceding month the loading up could be readily observed since sales showed a 12.9 percent increase while traffic was only up 6.4 percent.

The immediate effect of this loading up is to give the appearance, in the month of the tax increase and immediately following while inventories are being reduced to normal, that gasoline consumption has suffered substantially as a result of the impact of the tax increase. A close analysis of gasoline consumption, however, reveals that the five-month totals for the states in which the increases occurred are very similar to those of the adjoining states in which there were no increases. As inventories in the supply channels are brought back to normal, it frequently appears, to those not thoroughly familiar with the distribution and taxation of gasoline, that the demand for gasoline has been decreased by the increase in tax. This misinterpretation has frequently accounted for articles appearing in newspapers and trade journals to the effect that gasoline demand has been sharply cut by tax increases. Recent instances of such misinterpretations occurred

with respect to Nebraska and Oklahoma gasoline consumption. In both cases, abnormally large amounts of gasoline had been purchased prior to the imposition of the tax increase, but the total amounts sold in the five-month period bracketing the increases showed no marked deviation between the sales pattern of those states and those of adjoining states.

The gasoline tax is imposed on the "first sale" in most states. The gasoline sales data used in this study are based primarily on state, rather than Federal, records. Consequently, the taxed sales given in Tables 3 and 4 reflect any changes in distributor's, retailer's, and consumer's inventories and do not necessarily reflect the month of use of gasoline on the highways by the ultimate consumer. The dates of tax increases are known in advance, and there appears to be a strong tendency to utilize all storage capacity immediately prior to the tax increases. Although tax increases are frequently accompanied by "floor taxes," imposing the additional tax on inventories, these increased inventories reveal, to a degree, the hope of somehow avoiding the tax. Undoubtedly, this loading up takes place throughout the supply channels, including retail outlets, and probably includes a considerable amount of gasoline sold to consumers who purchase in bulk.

NATURE OF THE GASOLINE TAX

The impost on gasoline is unique. More than any other major levy, it is applied in almost direct proportion to the use of the facility supplied and supported by the levy.

The gasoline tax could more appropriately be called a toll for highway use. It is an almost perfect example of a user tax. It is not a tax on the product itself, since it applies only when the product is used (with minor exceptions) for moving motor vehicles on public highways. As a consequence, it seems much more appropriate to associate this use tax with the total cost of owning and operating a vehicle than with the cost of fuel alone. Those who benefit from the use of roads pay in almost direct proportion to their use of highways, and those who do not benefit do not pay.

The average state gasoline tax rate in 1959 was about 5.9 cents per gallon, and amounted to the equivalent of a toll of 0.42 cent per mile for a passenger car with an over-all urban-rural operating average of 14 miles to the gallon. The Federal tax is 4.0 cents per gallon, which amounts to 0.28 cent per mile. The total of state and Federal gasoline taxes on an average automobile is therefore about 0.7 cent per mile. This is less than half the toll rate on any major toll road.

The need and desire for highways is such that in several instances, where conventional public financing of major routes through user taxes has not been feasible, the routes have been financed through tolls. Most of these major toll routes are listed in Table 5. Some were omitted because they include segments constructed with road-user tax revenues, and therefore are not comparable. In such instances what may appear to travelers to be continuous toll roads are actually intermingled toll and free sections of a through route; and it is possible to enter, travel a free section, and leave the road without paying a toll.

Table 5 gives the lengths of the toll roads, the full-length toll for automobiles, for three types of trucks, and for two combinations types. The toll rate per mile and the computed fuel tax rate equivalents are also given. Even though the computed equivalent fuel tax rates vary considerably between routes, and between vehicles on the same route, all are substantially greater than the

TABLE 5

TOLL CHARGES FOR SELECTED VEHICLES ON MAJOR CLOSED-ACCESS TOLL ROADS COMPARED TO EQUIVALENT CHARGES IN TERMS OF GALLONAGE

FACILITY	LENGTH	PASSENGER CAR — Full Length Toll	— Approx. Toll per Mile	— Equiv. Gas Tax per Gallon 1/	TRUCK, 2-AXLE, 4-TIRE (6,000 lbs. G.V.W.) — Full Length Toll	— Approx. Toll per Mile	— Equiv. Gas Tax per Gallon 2/	TRUCK, 2-AXLE, 6-TIRE (12,000 lbs. G.V.W.) — Full Length Toll	— Approx. Toll per Mile	— Equiv. Gas Tax per Gallon 3/	TRUCK, 2-AXLE, 6-TIRE (20,000 lbs. G.V.W.) — Full Length Toll	— Approx. Toll per Mile	— Equiv. Gas Tax per Gallon 4/	TRACTOR-SEMI-TRAILER, 3-AXLE (40,000 lbs. G.V.W.) — Full Length Toll	— Approx. Toll per Mile	— Equiv. Fuel Tax per Gallon 5/	TRACTOR-SEMI-TRAILER, 4-AXLE (55,000 lbs. G.V.W.) — Full Length Toll	— Approx. Toll per Mile	— Equiv. Fuel Tax per Gallon 6/
	(Miles)	(Dollars)	(Cents)	(Cents)	(Dollars)	(Cents)	(Cents)	(Dollars)	(Cents)	(Cents)	(Dollars)	(Cents)	(Cents)	(Dollars)	(Cents)	(Cents)	(Dollars)	(Cents)	(Cents)
Colorado Turnpike	17.3	.25	1.45	21.7	.50	2.89	32.9	.50	2.89	22.8	.50	2.89	17.3	.65	3.76	20.7	.80	4.62	22.7
Florida Turnpike (Day rates)	109.6	2.40	2.19	32.8	2.40	2.19	25.0	3.75	3.42	27.0	3.75	3.42	20.5	4.30	3.92	21.6	5.00	4.56	22.4
Florida Turnpike (Night rates) 7/	109.6	1.75	1.60	23.9	1.75	1.60	18.2	2.40	2.19	17.3	2.40	2.19	13.1	2.60	2.37	13.0	3.00	2.74	13.4
Illinois-Northwest Tollway	76.3	1.35	1.76	26.5	1.35	1.76	20.2	1.75	2.29	18.1	1.75	2.29	13.8	2.10	2.75	15.1	2.85	3.74	18.3
Tri-State Tollway	81.7	1.80	2.20	33.0	1.80	2.20	25.1	2.40	2.94	23.2	2.40	2.94	17.6	3.00	3.67	20.2	3.00	3.67	18.0
East-West Tollway	26.4	.40	1.52	22.7	.40	1.52	17.3	.55	2.08	16.5	.55	2.08	12.5	.75	2.84	15.6	.75	2.84	13.9
Indiana Turnpike	156.9	2.00	1.27	19.1	2.80	1.78	20.3	2.80	1.78	14.1	2.80	1.78	10.7	5.60	3.57	19.6	8.40	5.35	26.2
Kansas Turnpike	236.7	3.90	1.61	24.1	3.90	1.61	18.3	5.40	2.28	18.0	5.40	2.26	13.7	7.20	3.04	16.7	8.00	3.38	16.6
Kentucky Turnpike	40.0	.60	1.50	22.5	.60	1.50	17.1	.90	2.25	17.8	.90	2.25	13.5	1.35	3.37	18.6	1.80	4.50	22.0
Maine Turnpike	113.9	2.15	1.89	28.3	2.15	1.89	21.5	2.85	2.50	19.6	3.50	3.07	18.4	5.00	4.39	24.1	5.00	4.39	21.5
Massachusetts Turnpike	124.6	2.45	1.97	29.5	2.45	1.97	22.4	4.35	3.49	27.6	4.35	3.49	20.9	5.55	4.45	24.5	6.85	5.50	25.9
New Hampshire Turnpike (Seabrook-Portsmouth)	14.5	.20	1.38	20.7	.20	1.38	15.7	.40	2.76	21.8	.40	2.76	16.5	.60	4.14	22.8	.60	4.14	27.0
New Jersey Turnpike	132.3	1.75	1.32	19.8	1.75	1.32	15.1	3.30	2.49	19.7	3.30	2.49	15.0	4.45	3.36	18.5	5.00	3.78	18.5
Garden State Parkway 8/	173.0	2.75	1.59	23.8															
New York Thruway	395.0	6.40	1.62	24.3	6.40	1.62	18.5	9.10	2.30	18.2	9.10	2.30	13.8	17.95	4.54	25.0	19.90	5.04	24.7
Ohio Turnpike	241.0	3.40	1.40	21.1	3.00	1.45	16.6	6.50	2.70	16.4	6.50	2.70	13.0	9.50	3.94	21.7	12.75	5.29	25.9
Oklahoma-Turner Turnpike	87.3	1.40	1.60	23.9	3.00	3.44	26.1	3.00	3.44	26.1	3.00	3.44	20.6	4.00	4.58	25.1	4.00	4.58	22.4
Rogers Turnpike	88.5	1.45	1.64	24.6	1.95	2.20	25.1	3.00	3.39	26.8	3.00	3.39	20.3	4.00	4.52	24.9	4.00	4.52	22.1
Pennsylvania-East-West Turnpike	359.0	3.90	1.09	16.3	3.90	1.09	12.4	7.35	2.05	16.2	11.95	3.33	20.0	18.25	5.08	28.0	23.80	6.63	32.5
Northeastern Extension	110.3	1.40	1.27	19.0	1.40	1.27	14.5	2.20	1.99	15.8	3.60	3.26	19.6	5.40	4.90	26.9	7.20	6.53	32.0
Texas Turnpike	30.0	.50	1.67	25.0	.50	1.67	19.0	.60	2.00	15.8	.75	2.50	15.0	1.00	3.31	18.3	1.25	4.17	20.4
Virginia Turnpike	34.7	.70	2.02	30.3	.70	2.02	23.0	.80	2.31	18.3	.80	2.31	13.8	1.20	3.46	19.2	1.40	4.03	19.8
West Virginia Turnpike	86.8	1.95	2.25	33.7	2.00	2.30	26.3	3.00	3.46	27.3	3.00	3.46	20.7	6.50	7.49	41.2	6.50	7.49	36.7

1/ Computed on the basis of 15.0 miles per gallon.
2/ Computed on the basis of 11.4 miles per gallon.
3/ Computed on the basis of 7.9 miles per gallon.
4/ Computed on the basis of 6.0 miles per gallon.
5/ Computed on the basis of 5.5 miles per gallon.
6/ Computed on the basis of 4.9 miles per gallon.
7/ Toll rates effective between 10:00 p.m. and 8:00 a.m. only.
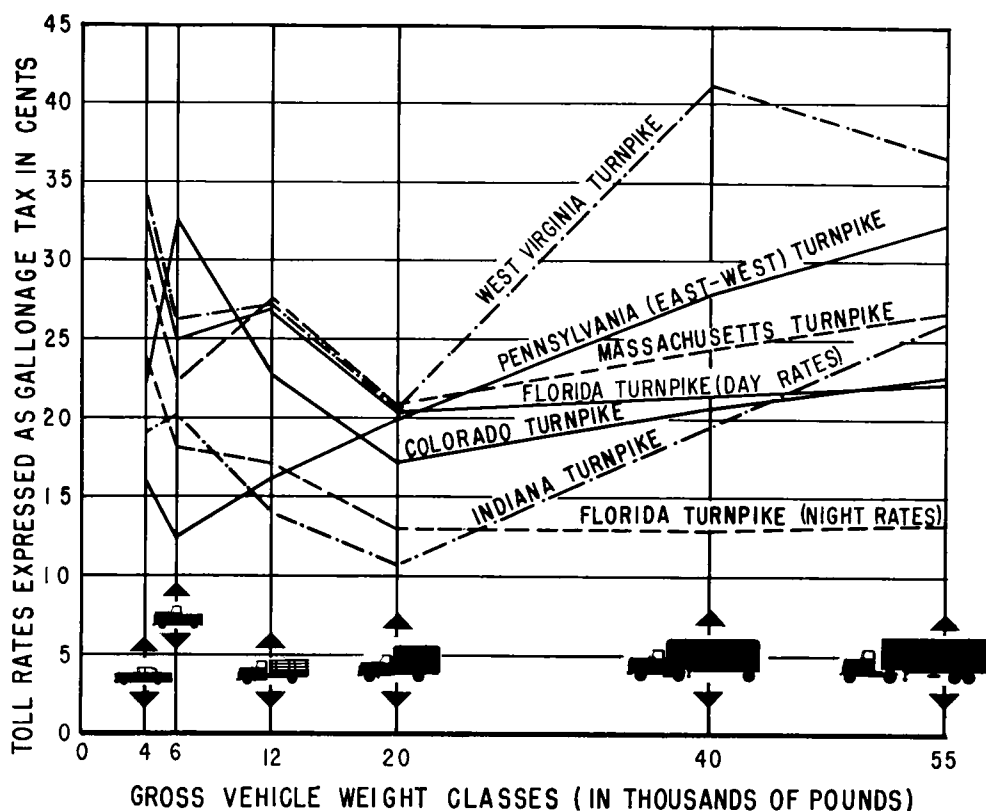8/ Trucks are permitted only south of Interchange No. 90 near Lakewood.

Figure 1. Gallonage tax rates required for specific vehicles to yield amounts equivalent to tolls on selected toll roads.

combined total of the Federal gasoline tax plus the highest state motor-fuel tax rate. The lowest toll rate-per-mile on any major road financed without tax funds is the $3.90 charge to travel the 359-mile long East-West Pennsylvania Turnpike. For a car traveling 15 miles on a gallon of gasoline (which is good at turnpike speeds), this toll cost is equal to a gasoline tax of 16.3 cents per gallon. The rate (for automobiles) on the Northeastern Extension of the Pennsylvania Turnpike is equal to a gasoline tax of 18.9 cents per gallon; and that for the Indiana Turnpike is equivalent to a tax of 19.1 cents per

gallon. Rates for automobiles on all except four of the other major toll roads are equivalent to gasoline tax rates of between 20 and 30 cents per gallon. These four, with rates for automobiles equivalent to more than 30 cents per gallon, are the Florida Sunshine State Parkway, the Illinois Tri-State Tollway, and the Virginia and West Virginia Turnpikes.

Although a generally similar pattern of relationship exists between toll road charges for trucks and the equivalent fuel tax rates, the relationships vary somewhat. When the tolls for all vehicles are computed in terms of probable equivalent fuel tax
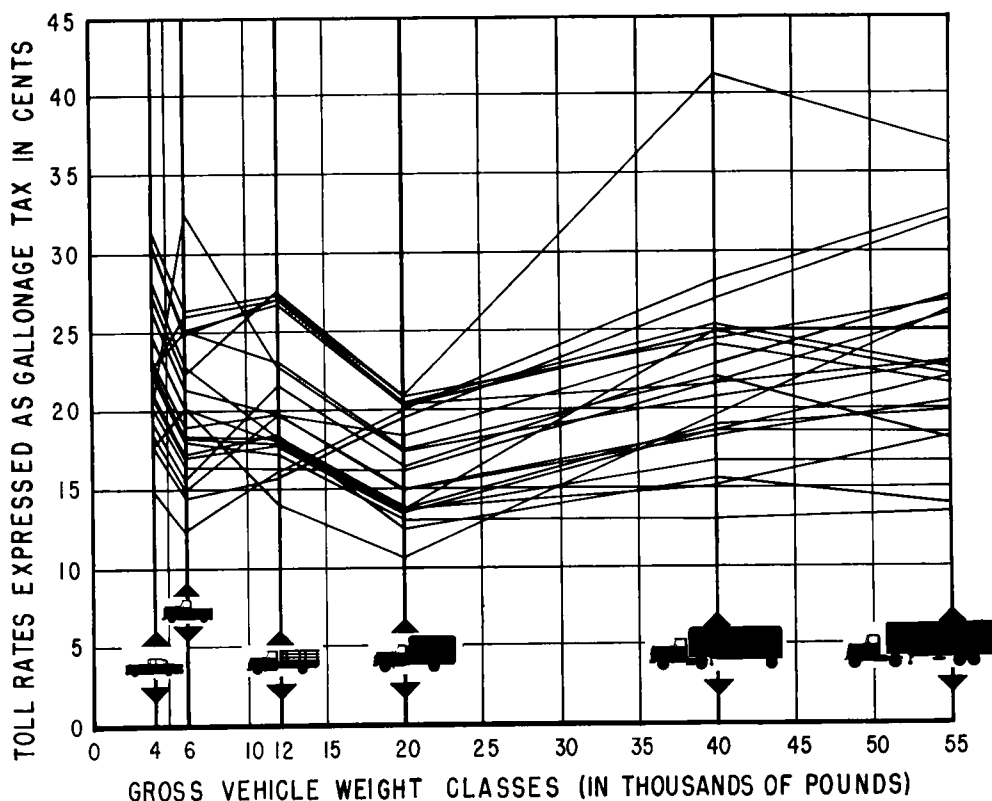
Figure 2. Gallonage tax rates required to yield amounts equivalent to tolls for selected vehicles on major controlled-access toll roads.

rates, some appear to favor automobiles over trucks; others favor trucks over automobiles. Similarly, when computed on "equivalent fuel tax" basis, the toll schedules of some roads show considerable favoritism toward heavier trucks and combinations (as compared to lighter trucks), while for other roads the reverse is true.

The Florida Sunshine State Parkway has introduced an additional variable in the form of a reduced night rate to encourage use between 10 P.M. and 6 A.M., and other roads allow discounts to frequent or large volume users. Massachusetts, under some conditions, refunds the tax

paid on motor fuel used on its turnpike.

The points in Figures 1 and 2 were plotted from Table 5 and are useful for the assistance they give in visualizing the relative distribution of toll rates when converted to fuel tax rate equivalents. Figure 1 includes and identifies only those roads for which the rate equivalent was highest or lowest for any of the vehicles listed in Table 5. Since space limitations made it impractical to show and identify in one figure the fuel tax rate equivalents of all of the toll roads shown, the distribution of all the equivalents is given in Figure 2,

TABLE 6
INDEX OF COSTS OF SELECTED ITEMS, 1935 TO 1960 (1940 = 100)

Year	Motor Fuel			Cost of Highway Construction (composite mile)	Retail Price of New Automobiles	Consumer Price (cost of living)
	Total Tax	Total Price	Price Excluding Tax			
1935	93.5	102.3	106.3	112.6	94.7	98.0
1936	94.5	105.6	110.6	115.8	95.6	99.0
1937	95.4	108.6	114.4	110.9	97.4	102.5
1938	96.1	106.0	110.4	101.7	102.1	100.7
1939	96.1	101.8	104.4	101.4	99.8	99.2
1940	100.0	100.0	100.0	100.0	100.0	100.0
1941	104.8	104.5	104.3	113.7	107.5	105.0

WAR YEARS

Year	Total Tax	Total Price	Price Excluding Tax	Cost of Highway Construction	Retail Price of New Automobiles	Consumer Price
1947	109.2	125.5	132.8	188.5	159.7	159.4
1948	112.0	140.6	153.3	211.1	174.6	171.6
1949	115.2	145.5	159.0	203.6	191.1	169.9
1950	118.0	145.4	157.5	192.3	192.6	171.6
1951	120.8	147.5	159.3	214.7	201.8	185.3
1952	129.3	149.7	158.7	227.0	219.1	189.5
1953	130.9	155.8	166.9	223.7	221.2	191.0
1954	132.2	157.7	169.1	211.2	217.7	191.7
1955	135.2	157.9	168.0	213.4	210.0	191.2
1956	147.7	162.6	169.2	228.1	215.8	194.0
1957	156.4	168.2	173.4	237.4	227.1	200.7
1958	157.4	165.0	168.4	233.9	234.5	206.2
1959	164.5	165.6	166.1	229.9	244.5	207.8
1960	178.8	166.2	160.5	222.8	241.7	210.2

without identification of the individual roads. It is purposeful, however, in that it shows the general pattern of toll rates.

The traffic on the toll roads has been phenomenal. The demonstrated willingness to select and use an optional (and superior) route on which the user charge is much greater than the toll paid in the form of fuel taxes must be accepted as evidence that fuel taxes have not reached the point where they may be considered to exercise a genuine restraint on the use of highways.

RELATION OF GASOLINE TAXES TO
GENERAL PRICE LEVELS

There have been many instances of publicity apparently aimed at persuading the public that the gasoline tax has grown to be a disproportionate burden on the automobile user. Perhaps as fair a way as any to weigh the validity of this type of statement is to compare the present rate of gasoline tax with the rates of earlier years and to see how they have fared in proportion to other prices and costs that affect the motorist (Table 6). Although selection of a base, or index year, for the comparison can affect the relative positions of the items or costs compared, a 20-year period, based on 1940 levels, seems adequate and fair—1940 was the last of 22 consecutive peacetime years, the great depression had ended, and prices had been relatively stable for a considerable period.

Using 1940 as the index year, and comparing price and tax levels of 1960 with the 1940 index year levels, the Department of Labor cost-of-living index had risen to 210.2. The retail price of new automobiles had gone up to 241.7. The average cost of gasoline, excluding tax, had risen to 160.5. The index cost of highway construction (composite mile) had risen to 222.8, and the weighted average gasoline tax index had increased to
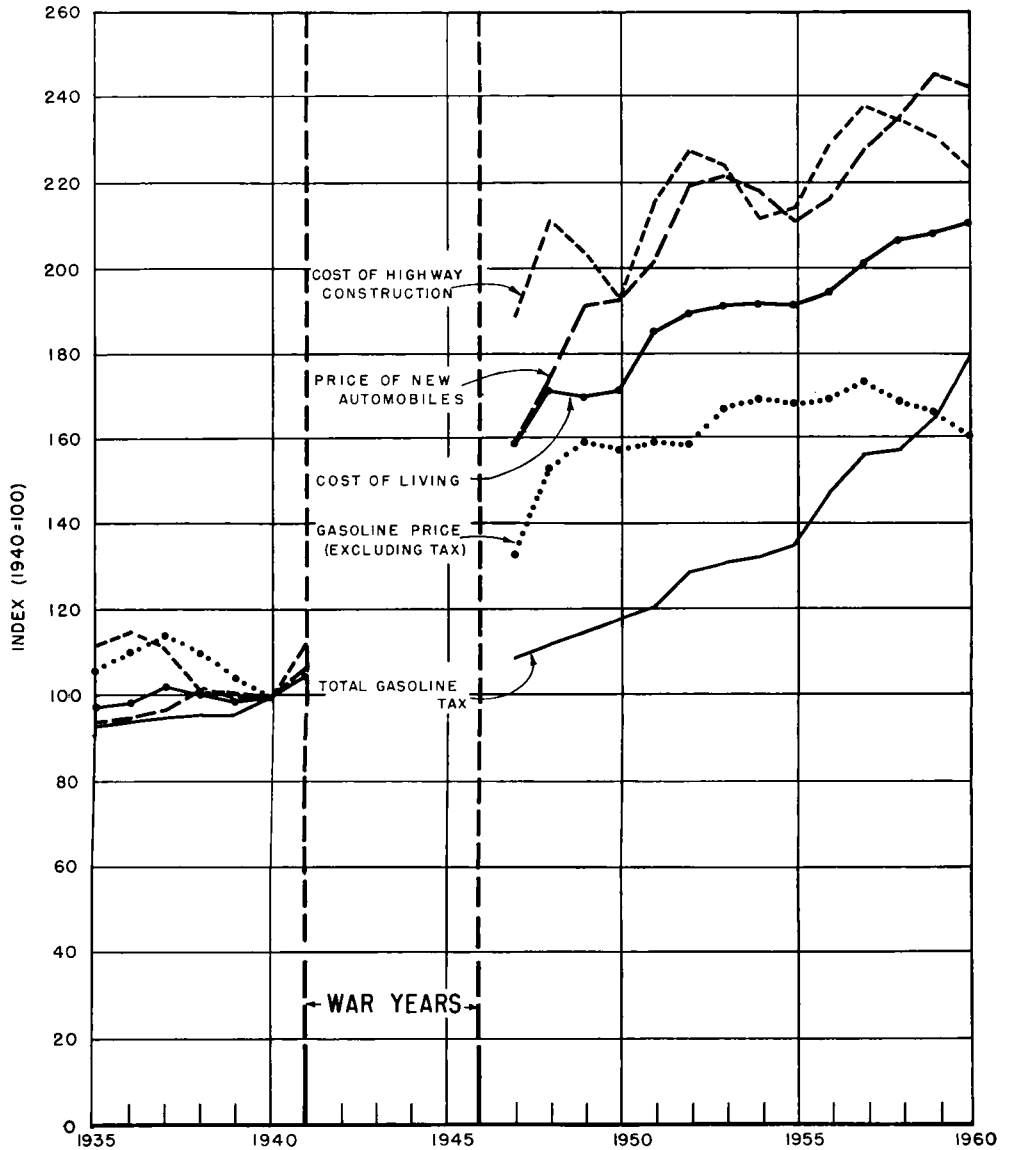
Figure 3. Relative changes in price levels of automobiles, motor fuels, and highway construction, and the cost of living, 1935-1960.

178.8. Thus the relative increase in gasoline taxes, while somewhat greater than the relative increase in the price of gasoline, was much less than the increases in the general cost of living and the cost of automobiles. Of particular importance, the increase in the gasoline tax was far less than that encountered in highway construction costs for which the gasoline tax is the principal source of support.

The gap between rising highway costs and the gasoline tax (Fig. 3) appears to be the chief reason why highway funds did not keep pace with highway needs. Although the slope of the two curves is roughly parallel from 1946 on, the gasoline tax resumed in 1946 at the same level it had reached in 1941, while all of the other costs reflected in Figure 2 started the postwar period at much higher levels than in 1941.

It is evident that gasoline prices have not been increased at a rate greater than vehicle costs or those of other commodities encountered by the motorist in his daily life. From an over-all standpoint, the gasoline tax rate has not kept up with increasing costs. Although the average gasoline tax in 1960 showed a greater increase percentagewise since 1940 than gasoline price, this was not true on a cents-per-gallon basis. Since 1940 the Federal and states taxes have increased a total of 4.5 cents per gallon, while the price exclusive of tax is up 8 cents per gallon. The cumulative price increases of gasoline had been proportionately greater than the cumulative tax increases for 19 years out of the 20-year period (Table 6). In any case, it must be concluded that if the gasoline tax was not oppressive in 1940, it is even less likely to be so now. It is now a smaller part of the total cost of owning and operating an automobile than it was in 1940, and has actually declined since then in its relation to highway costs, the cost of vehicles, and the cost of living.

AUTOMOBILE OPERATING COSTS

The total of state and Federal gasoline taxes, the principal source of revenue for highways, costs the average automobile user a little less than 20 cents a day. This fact is of limited significance until it is related to total costs of vehicle operation. To establish the relationship, an estimate of the cost of owning and operating an automobile is presented in Table 7. It is not based on actual records for any particular vehicle or group of vehicles, but the figures are believed representative at mid-1960 prices of the typical costs encountered by the owner of a typical automobile.

This estimate of 9.76 cents per mile is based on a medium-priced 1960-model four-door sedan built by a leading manufacturer, and covers an assumed 100,000 miles of travel

TABLE 7

ESTIMATED COST OF OPERATING
AN AUTOMOBILE [1]

Item			Cost Per Mile (¢)
Costs Excluding Taxes:			
Depreciation			2.54
Repairs and maintenance			1.72
Replacement tires and tubes			0.18
Accessories			0.14
Gasoline			1.45
Oil			0.19
Insurance			1.29
Garaging, parking, tolls, etc			1.08
Total			8.59
Taxes and fees:	*State*	*Federal*	
Gasoline	0.42	0.28	0.70
Registration	0.10	—	0.10
Titling	0.05	—	0.05
Property	0.05	—	0.05
Oil	—	0.01	0.01
Auto, tires, parts, etc	—	0.26	0.26
Total	0.62	0.55	1.17
Total cost			9.76

[1] Estimated average cost per mile, excluding interest, of owning and operating a medium priced 4-door sedan, with a "life span" of 100,000 miles, over a 10-year period.
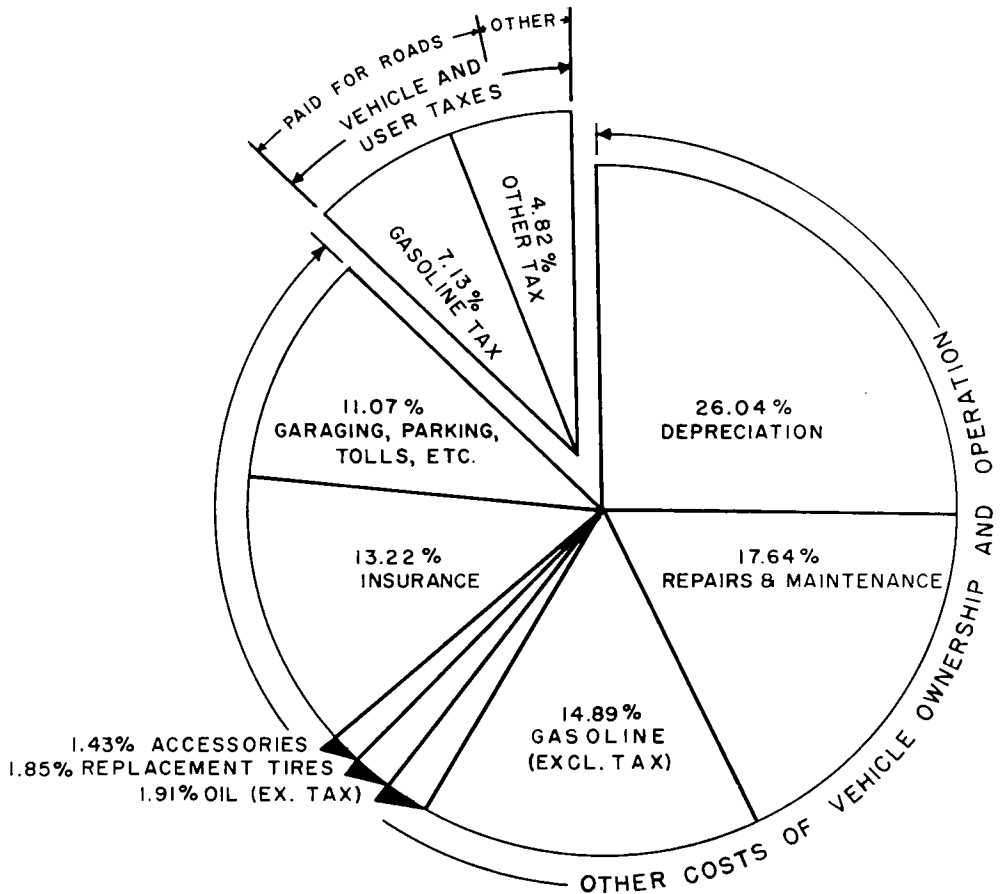
Figure 4. Distribution of the motor-vehicle dollar.

during a 10-year life. The automobile is assumed to be registered in Baltimore, Md., and subject to normal costs and taxes in that area. Although the mileages, operating costs, and other factors in the estimate are believed to be reasonable, they are not purported to be averages or for an average vehicle. Data for such purposes are not available in sufficient coverage.

Vehicle service data from trade journals were used in estimating expenditures for repairs and maintenance. A sample group of maintenance and repair jobs done by car dealers and independent repair shops was chosen as representative of the work that would be done on the automobile during the 10-year period. These items range from major repairs, such as a complete engine overhaul, to minor maintenance items such as washing and lubrication. The frequency of the jobs as observed in the service data publications, and the experience of men familiar with automotive maintenance and service, were used as guides to the number of times each job would be required

TABLE 8

COMPARISON OF SELECTED 1961 AMERICAN CARS WITH 1950 AMERICAN CARS

1950 PRODUCTION YEAR						AMERICAN "ECONOMY COMPACT" CARS, 1961 PRODUCTION YEAR 1/					
MAKE	OVERALL LENGTH	SHIPPING WEIGHT	WHEELBASE	GROSS BRAKE HORSEPOWER	CYLINDERS	MAKE	OVERALL LENGTH	SHIPPING WEIGHT	WHEELBASE	GROSS BRAKE HORSEPOWER 2/	CYLINDERS
	(inches)	(lbs.)	(inches)				(inches)	(lbs.)	(inches)		
Chevrolet	197.5	3,120	115.0	92	6	Corvair	180.0	2,440	108.0	* 80	6
Ford	196.7	2,990	114.0	95	6	Comet	194.8	2,539	114.0	* 85	6
Ford	196.7	3,030	114.0	100	8	Falcon	181.2	2,422	109.5	* 85	6
						Rambler Am.	173.1	2,650	100.0	* 90	6
Nash 600	201	2,965	112.0	85	6	Rambler Classic	189.8	2,960	108.0	* 127	6
Plymouth	186.5	2,946	111.0	97	6	Valiant	183.7	2,665	106.5	101	6
Stud. Champ.	197.3	2,750	113.0	85	6	Lark	175.0	2,605	108.5	* 112	6
						Lancer (Dodge)	188.8	2,665	106.5	* 101	6
						Tempest (Pont.)	189.3	2,910	112.0	* 110	4

1/ Specifications given in this table are for "volume production" models of 4-door sedans with engines not exceeding 130 gross brake horsepower, and without optional equipment.

2/ An asterisk (*) indicates that other engine options are available.

during the life of the car. Labor and parts costs were then obtained from the most recent rate and parts manuals, and the prices of parts as listed in the manuals were checked locally to determine any necessary adjustments for the Baltimore area. The fixed costs in Table 7 (excluding taxes) include depreciation of the original cost, accessories, insurance, and garaging. These items account for about 3.98 cents per mile, or more than 40 percent of all costs. Insurance coverage, of course, varies with the age of the automobile, but the major portion of even this cost is essentially of a "fixed" nature. The "variable" costs (excluding taxes), those that are dependent on the amount the vehicle is used, include gasoline, oil, replacement tires and tubes, repairs and maintenance, parking and tolls, etc. These costs amount to 4.61 cents per mile, or over 47 percent of total costs. Taxes, registrations, and other fees amounting to 1.17 cents per mile account for the remaining 12 percent of total costs. The gasoline tax, which is the principal variable portion of the tax cost, is the major source of funds for highways, and accounts for three-fifths of all the taxes on the vehicle. The gasoline tax costs the owner less than one-third as much as depreciation, and less than half as much as either repairs and maintenance or the gasoline used.

No costs for car financing, for fines and forfeitures, or for automobile club membership are included in the 9.76 cents per mile estimate, nor does it include any interest on the investment. Although these items may add substantially to some owner's costs of owning and operating an automobile, the wide variations in their applicability among motorists makes it impractical to include them.

The relative magnitudes of automobile costs, derived from Table 7, are shown in Figure 4. Only 12 percent of the automotive dollar goes for highway-user taxes, and the price being paid for roads is indeed small.

Because the combined state and Federal gasoline taxes, averaging 10 cents per gallon, account for only 7 percent of the total costs of owning and operating an automobile, each

one-cent increment of gasoline tax accounts for about two-thirds of 1 percent. In view of this, it is difficult to conceive of economic or statistical tests that could yield a conclusive measurement of possible variations in fuel use brought about by changes in the tax rates.

GASOLINE TAX AND THE COMPACT CAR

Within the past year, there has been a marked tendency for the public to turn away from the so-called standard automobiles and to favor instead a number of smaller cars loosely grouped under the category of "compact." The group of vehicles being manufactured under the general classification of compact are remarkably similar to vehicles being manufactured 10 years ago. Table 8 gives major specifications of several of the vehicles that were sold in volume in 1950, and similar specifications for the 1961 model compacts and "near compacts" being manufactured in the fall of 1960. The 1961 model vehicles are remarkably similar to those of 1950, except that the 1961 models tend to have greater horsepower and somewhat less weight. The lighter weight may be attributed to the use of lighter metals or the substitution of non-metallic materials. Although it is true that many of the vehicles now offered by American manufacturers are substantially smaller than their current standard vehicles, the differences are emphasized by the fact that the standard vehicles manufactured in recent years have been increasing rapidly in size and horsepower. (The six 1950 production run cars listed in Table 8 had engines with an unweighted average of 92.33 horsepower. Their 1961 model compact counterparts had engines that average 93.83 horsepower.)

To study the possible effect of compact cars on tax revenues, a definition of "compact-economy" cars was developed by the Bureau of Public Roads. The factors in this definition are wheelbase, weight, brake horsepower, and over-all length. Examination of specifications for vehicles now being manufactured or in prospect indicates that a wheelbase of 112 in., empty weight of 3,000 lb., over-all length of 200 in., and 130 horsepower are satisfactory "breaks" for use in the definition, with horsepower and over-all length being the most important.

Using the following values, any vehicle whose "points" add to 1.0 or more would not be considered a compact.

Criterion[1]	*Points*
Wheelbase, more than 112 in.	0.5
Empty weight, more than 3,000 lb.	0.5
Gross brake horsepower, more than 130	1.0
Over-all length, more than 200 in.	1.0

[1] To be applied only to vehicles produced for the 1955 or later model years. Earlier models would not be included in the compact-economy car classification. The "empty weight" item is considered to be shipping weight, for 4-door sedan or nearest comparable model, with conventional transmission and standard equipment.

A vehicle would not be excluded from the compact-economy group solely because of weight in excess of 3,000 lb., or solely because of a wheelbase of more than 112 in. However, any vehicle exceeding both of those limits or exceeding either 130 horsepower or 200 in. in over-all length, would be excluded. There are research areas, of course, in which this compact-economy classification is not adequate, such as visual classification

of vehicles in moving traffic, studies involving vehicle performance, visibility, accident costs; and possibly other areas might require subgroupings for sports cars or very small cars.

The change in public tastes probably can be attributed to many factors, some of which concern convenience, and some of which concern cost. Tastes in appearance, and perhaps the novelty of the smaller cars may have also contributed to the relative decline of the standard cars in the public's favor. Any reduction in the size or use of vehicles would tend to reduce fuel consumption, and gasoline tax revenue would be reduced in direct proportion to any reduction in fuel consumption. However, records of vehicle purchases for the past several years show that motorists have been willing, in increasing numbers, to purchase vehicles that have additional equipment that is costly in itself and results in higher fuel consumption as well. For example, the automatic transmission costs the owner 2.2 to 3 miles per gallon, or about 5 cents per gallon in fuel consumption. At the present time, automobiles with automatic transmissions comprise more than one-half of the total in operation, and more than 70 percent of automobile purchasers during the past 4 years chose vehicles with automatic transmissions.

CONCLUSIONS

The science of economics is not yet sufficiently precise to permit the mathematical measurement of the effects of the imposition or removal of increments of gasoline tax, in practical application. Nevertheless, in the absence of mathematical measurement, four tests of logic have been applied and it was found that in each of the four cases the result is clear and consistent with the other three.

1. It is demonstrated that while an increase in the gasoline tax is anticipated and does have a temporary effect on fuel sales, these are only fluctuations in time-of-purchase, rather than in the total amounts purchased. There appears to be no discernible long-range effect.

2. It is demonstrated in this study that gasoline taxes when considered as a form of toll, are far lower than rates that the public has for some time willingly accepted for the use of toll roads.

3. It is demonstrable that the gasoline tax is a smaller portion of owning and operating a vehicle than was the case 20 years ago, and that this has been true for 19 of the past 20 years. In relative terms, the tax has been reduced.

4. It is demonstrated that the total of state and Federal gasoline taxes accounts for a small portion, 7 percent, of the total cost of owning and operating a vehicle and that each increment of one cent of gasoline tax accounts for only about two-thirds of 1 percent of that cost. These charges are so low that it seems unreasonable to attribute great economic impact to them.

It has also been shown that there is good reason to feel that the so-called compact cars are nearer, in power and size, to the type of automobile to which the American public had previously been accustomed, and that much of the smallness of the compacts is simply the result of comparing them to the large, powerful vehicles of the late 1950's. No substantial part of a trend to compacts could logically be attributed to gasoline taxes.

The weight of evidence from the application of these tests of logic leads inevitably to the conclusion that the gasoline tax at any rates as yet encountered or in reasonable prospect cannot have a measurable effect on the amount of gasoline used on highways.

It is impossible to refrain from observing that any reduction in the gasoline tax as a source of revenue for highways could, in the long run, restrict highway capacity to the point that the potential use of highways could not be realized, thus starting a vicious circle of increased highway congestion, reduced highway funds available, and a resulting increase in vehicle operating costs despite any reduction in the gasoline tax.

REFERENCE

1. COPE, E. M., and LISTON, L. L., "The Effects of Tax Increases on Gasoline Consumption." *Public Roads* (Mar. 1949).