REPORT OF THE

REVENUE RESOURCES AND ECONOMIC COMMISSION

ON

TRANSPORTATION TAXATION IN VIRGINIA

TO

THE GOVERNOR

AND

THE GENERAL ASSEMBLY OF VIRGINIA

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Foreward

This study utilizes the best sources available to the authors given the time constraint for the work. A listing of the sources used is found at the end of the report. The results reflect staff work and are not a result of Commission delibration. Nor is the study to be interpreted as representing the Commission's views or opinions. The report is made in hopes that it will be of benefit to others in their examination of this issue. Since the Commission did not have sufficient time to review this report prior to publication, no legislative recommendations are made.

The following division of labor was used in the report. Dr. George E. Hoffer did primary research on automobile and motor carrier revenues and cost allocations. Dr. James T. Lindley was primary researcher for issues dealing with 80,000 pound vehicles and implications for policy. He also performed the computor work that was necessary. Dr. Charles J. Gallagher was involved in literature review and methodolgy. The comparison of costs and revenues was done jointly by James T. Lindley and George E. Hoffer.

The authors wish to thank the following for assistance: Haywood Moore and his staff of the State Corporation Commission, Lloyd Towers and his staff of the Division of Motor Vehicles, Gary Allen of the Virginia Highway and Transportation Research Council, and the Virginia Department of Highways and Transportation.

Executive Summary

The Revenue Resources and Economic Commission (RREC) study updates and extends a 1976 RREC study which examined the equity of the Virginia taxation structure with regard to several transportation modes. [1/] The issues examined in this report are limited to (1) the equity between classes of highway users in terms of costs to the system and revenue paid to the system, and (2) the adequacy of the present level of highway financing given the marginal highway replacement and maintenance costs.

With regard to automobiles, it was estimated that automobiles together with passenger carrying vans and light trucks (less than 7,500 pounds GVW) paid federal and Virginia highway user taxes in 1976 and 1978 of 1.33 cents per mile. However, the estimated federal and Virginia allocated costs per mile in 1976 and 1978 for these lightest vehicles were 2.17 and 3.57 cents per mile, respectively. Thus, it is estimated that in 1976, automobiles and light trucks covered approximately 61 percent of their allocated highway cost responsibility under the incremental cost allocation method. Because of rapidly increasing construction and maintenance costs, passenger carrying vehicles covered only 37 percent of their highway cost responsibility in 1978. The 1976 RREC study did not estimate automobile user taxes or costs.

1/ George E. Hoffer and Charles J. Gallagher, Transportation Taxation in Virginia: An Interstate-Intermodal Analysis, Revenue Resources and Economic Commission, Richmond, Virginia, 1976.

As a basis of comparison, in 1964 the allocated costs of automobiles were estimated to be 1.10 cents per mile and the estimated revenues were 1.53 cents per mile. Automobiles covered 130 percent of their allocated costs in 1964 as opposed to 37 percent in 1978.

Estimates of motor carrier allocated costs and highway user tax payments were also made. Because the Division of Motor Vehicles was unable to supply 1978 registration and Sales and Use Tax data in time for this study, only 1976 results were available at the time of printing. Data for 1978 will be supplied to interested parties by the authors upon request, when available.

Table 10 summarizes the results. Like the previous RREC study, it was found that Virginia-domiciled, ICC certificated common carriers came close to covering their allocated costs in 1976. Their total allocated costs were estimated to be 8.33 cents per mile, while their Virginia and federal user payments were estimated to be 7.47 cents per mile. Despite increased weights, it was found that 1976 Virginia-based motor carrier user tax payments per mile actually declined from 1970 and 1973 due to increased fuel efficiency and Virginia IRP membership. When Federal user taxes are excluded, the decrease in Virginia user tax payments by Virginia carriers becomes more pronounced. It is estimated that per mile payments to Virginia decreased from 5.43 cents per mile in 1973 to 4.76 cents per mile in 1976.

One finding of the 1976 RREC study was the disparity between taxes paid by motor carriers domiciled in Virginia and those domiciled out of state.

Virginia's participation in the International Registration Plan was predicated on narrowing this disparity.

An examination of Table 4 leads one to conclude that the disparity has somewhat narrowed. Whereas, foreign-domiciled carriers were found to have paid 2.06 cents per mile and 2.42 cents per mile to the Commonwealth in 1970 and 1973, respectively, foreign-domiciled carriers from IRP states were found to have paid 3.10 cents per mile in 1976 to the Commonwealth. Thus, the disparity between IRP foreign and non IRP foreign and Virginia-domiciled trucks found in 1973 narrowed from 124 percent to 54 percent in 1976. The narrowing is the result of both increased payments per mile by non-resident, IRP state based carriers and decreased payments by Virginia carriers.

When 1976 Virginia and federal user payments per mile are totaled, IRP-state based, ICC certificated carriers paid 5.72 cents per mile, while their non-IRP state counterparts paid 5.46 cents per mile. Their estimated allocated costs per mile were 8.66 cents. Thus, these carriers covered 66 and 63 percent, respectively, of their estimated allocated costs per mile.

Road tax payments in 1976 for the sampled carriers were also estimated for all states and states other than Virginia. In general, as would be expected, non-resident carriers paid higher user payments per mile to other states than they did to Virginia.

Allocated costs for motor carriers were also estimated assuming the use of 80,000 pound units on Virginia highways. Using a linear

extrapolation method, the authors estimated that the total allocated construction and maintenance cost per mile in 1978 for a 3-S2 diesel powered, for-hire vehicle increases from 17.05 cents per mile at 66,000 pounds to 20.46 cents per mile at 80,000 pounds. If 25 percent of the 3-S2 fleet mileage is done with vehicles weighing 80,000 pounds, then the foreign-domiciled, ICC certificated carrier allocated costs in 1978 increase from 14.56 cents per mile to 15.1 cents per mile.

While 1978 revenue estimates for motor carriers are not available at the time of printing, it is anticipated that they will differ little from the 1976 estimates. Estimated automobile payments per mile remained unchanged at 1.33 cents per mile between 1976 and 1978. However, as shown in Table 10, estimated allocated costs in 1978 are significantly higher for each class of highway user because of increased construction and maintenance costs. For instance, the Virginia Highway Construction Index increased from 182.6 in 1976 to 311.9 in 1978 (1967 = 100.0). Thus, a major gap has developed between highway trust fund payments and allocated costs, with the difference made up through disinvestment in highways. If revenues for Virginia-domiciled ICC certificated carriers are assumed unchanged in 1978 from the 1976 estimates, then whereas the carriers were estimated to cover 90 percent of their allocated costs in 1976, by 1978, they would have covered only 53 percent of their allocated costs. Nonetheless, this coverage would still be higher than that of automobiles in Virginia.

TRANSPORTATION TAXATION IN VIRGINIA

Introduction

Recent years have seen vast changes in factors affecting all forms of transportation, and Virginia has not been exempt. Rapidly increasing fuel prices, accelerating construction and maintenance costs, changing transportation patterns, and declining real revenues from transportation taxation have all contributed to the problem. The collection of revenues constitute only a part of the problem. One additional factor must also be considered.

It should be recognized that highways constitute capital investment of long life, financed and constructed over long periods of time. In this sense, highways are similar to railroads. Both are subject to consumption of embedded capital (disinvestment). Consumption of embedded capital takes place when the "system" is being used up faster than it is being replaced and maintained. Because of the length of time involved and the nature of the investment, disinvestment can occur for a period of time before it becomes evident. For instance, it has been argued that railroad disinvestment in the United States can be traced prior to 1920, when the Interstate Commerce Commission denied a rate increase. 1/ There is literature which asserts that the 1970's have seen a disinvestment in highways that it is accelerating. 2/ The results of the present study support that theory.

1/ United States Railway Association, "Preliminary System Plan Summary", Washington, D.C., February 26, 1975, pp. 1-9.

2/ Congress of the United States, Office of Technology Assessment, Technology Assessment of Changes in the Future Use and Characteristics of the Automobile Transportation System, Summary, 1978.

The present study by the Revenue Resources and Economic Commission is an attempt to highlight the important issues regarding transportation taxation in Virginia. The issues that are examined include:

1. The equity between classes of highway users in terms of costs to the system and revenues paid to the system.
2. The adequacy of the present level of transportation financing, given costs of construction and maintenance.
3. The form of taxes.

Costs and Revenues --- Automobiles and Motor Carriers of Property

Previous Studies

In 1975, the Revenue Resources and Economic Commission, for the General Assembly of Virginia, commissioned a study of the equity of the Virginia taxation structure with regard to several transportation modes. The study was completed for the 1976 session of the General Assembly by Dr. Charles J. Gallagher and George E. Hoffer, both of the Economics Department, Virginia Commonwealth University. [1/] With regard to motor freight carriers, it was found that the user taxes paid by Virginia-domiciled interstate and intrastate common freight carriers were slightly below the allocated costs of providing the highways to these carriers. However, it was found that the total Federal and Virginia user fees paid by foreign-domiciled, interstate common freight carriers in 1973 were less than one-half their allocated costs

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1/ George E. Hoffer and Charles J. Gallagher, Transportation Taxation in Virginia: An Interstate-Intermodal Analysis, Revenue Resources and Economic Commission, Richmond, Virginia, 1976.

on irginia highways. These carriers were calculated to have paid 4.7 cents per mile in user fees, while their allocated costs on an incremental cost basis were estimated to be 9.7 cents per mile.[1/]

The user fees paid per mile by type of motor carrier are shown in Table 1. Virginia-domiciled interstate common carriers paid over twice as much in user charges per mile to the Commonwealth than foreign-domiciled carriers with the same certificates. Table 1 shows user fee payments by carrier type in 1970 and 1973. The increase in user fees to the Commonwealth between 1970 and 1973 represents the 2 cents per gallon increase in the motor fuels tax enacted by the 1972 General Assembly.

It was concluded in the 1976 study that the Virginia shortfall stemmed from foreign-domiciled carriers registering only a nominal portion of their fleets in the Commonwealth because of irginia's high registration fees and personal property taxes. While Virginia had the highest nominal user fee tax structure in the region in 1973, its per mile collections that year ranked with the lowest states.[2/] The conclusions of the Hoffer-Gallagher study are consistent with the findings of previous studies done for the General Assembly, for ot er state legislatures, for other

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1/ bid., p. 23.

2/ George E. Hoffer and Charles J. Gallagher, "The Effects of Registration Reciprocity on Road User Tax Rates", Southern Economics Journal, April, 1978, pp. 913-921.

TABLE 1

User Charges Per Mile by Type of Motor Carrier

Carrier	Federal User Charge Per Mile	All State User Charge Per Mile	Virginia User Charge Per Mile	Federal and State User Charge Per Mile	Federal and Virginia User Charge Per Mile
1970					
Interstate Common, Virginia	.0244	.0373	.0515	.0621	.0759
Interstate Common, Foreign	.0227	.0315	.0206	.0542	.0433
1973					
Interstate Common, Virginia	.0241	.0375	.0543	.0616	.0784
Interstate Common, Foreign	.0228	.0325	.0242	.0553	.0470

Source: George E. Hoffer and Charles J. Gallagher, Transportation Taxation in Virginia: An Interstate-Intermodal Analysis, Revenue Resources and Economic Commission, Richmond, Virginia, 1976, p. 35.

state highway authorities, and for federal highway authorities. [1/]

Criticisms of these various studies have been voiced as to methodology and as to the conclusions generated from the studies. Although some criticisms of the various studies have merit, each study reached a similar conclusion: the largest trucks proportionately underpay their allocated incremental costs for highways.

In the period since the previous studies, conditions have changed; inflation has increased to a double digit rate, fuel costs have increased, motor carrier weights have increased, automobiles are lighter and more fuel efficient, Virginia has joined the International Registration Plan (IRP), the Department of Highways and Transportation is faced with declining real revenues, and the Metro (mass transit) of Northern Virginia is asking for State assistance.

This combination of events has changed previous relationships. A per gallon motor fuel tax, increasingly fuel efficient automobiles and trucks, coupled with double digit inflation indicate that some tax increase is necessary if the highway system is to be maintained. To unilaterally raise taxes, however, without considering changes other than declining revenues, is to misevaluate the situation.

[1/] See the Stone Commission Report to the Virginia General Assembly (1964), the Humphrey-Karp Study done for the Revenue Resources and Economic Commission (1973), the Federal Highway Administration, Department of Transportation Study (1970), Secretary of Transportation, William Coleman's Statement of National Transportation Policy (1976), and the Report to the Congress by the United States General Accounting Office (July, 1979).

It is to evaluate the impact of the above changes that previous work by the Revenue Resources and Economic Commission is reexamined and extended. The analysis will be in the areas of (1) motor carrier user tax payments, (2) automobile user tax payments, (3) allocated highway costs for motor carriers, and (4) allocated user costs for automobiles.

Revenues

Road tax authorities have traditionally classified road user taxes into three broad classes. These classifications include:

1. Motor fuel taxes and miscellaneous fees incidental to fuel taxation constitute the first structure taxes.

2. Motor vehicle registration, license, and other related fees make up second structure taxes. Some of these minor taxes, such as title fees and drivers' license fees, may not be paid on an annual basis.

3. Miscellaneous major taxes such as gross receipts, ton-mile, or axle-mile taxes are known as third structure taxes. These taxes generally apply only to motor carriers and for-hire passenger carriers. Presently, approximately 20 percent of the states have such a tax on property motor carriers.

Federal Revenues

The Highway Revenue Act of 1956 established the Federal Highway Trust Fund as the source of Federal funds for highway aid. Presently, the sources of revenue for the Trust Fund are:

1. Receipts from the 4 cents per gallon tax on motor fuels used in highway vehicles.

2. The unrefunded portion of the tax on gasoline used for non-highway purposes. 1/

1/ Full 4 cents per gallon refunds are made to farmers on fuel used in farming; other non-highway users of gasoline are refunded 2 cents per gallon with all receipts from motor boat users going to the Land and Water Conservation Fund administered by the Department of the Interior.

3. The 2 cents per gallon tax on special and diesel fuels used in non-highway vehicles.

4. The 2 cents per gallon tax on fuel used by certain transit systems.

5. Total receipts from the 10 cents per pound tax on highway tires and inner tubes and the 5 cents per pound tax on non-highway tires and all tread rubber.

6. Total receipts from the 10 percent excise tax on new trucks, buses, and trailers over 10,000 pounds gross weight.

7. Total receipts from the 8 percent tax on truck parts and accessories.

8. The 6 cents per gallon tax on lubricating oil used in highway vehicles.

9. Total receipts from the Federal Highway Use Tax on highway vehicles. [1/]

Of the sources listed above, automobile owners incur the fuel tax, the tax on rubber, and the tax on lubricating oil, while motor carriers incur each of the above taxes associated with highway use.

Virginia Revenues

The Commonwealth of Virginia generates over 95 percent of highway user revenues from licenses, fuel taxes, and a vehicle sales and use tax. The generated revenues are placed in the highway trust fund. Table 2 shows the dollar amount of these revenues by source for fiscal year 1977-78.

Of the revenues generated, fuel taxes account for 60 percent of the total, sales and use taxes account for 15 percent, and 20 percent of the revenues were from various licenses and fees. The remaining 5 percent is from various miscellaneous sources. For automobiles, the motor fuel

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[1/] United States Department of Transportation, Highway Statistics 1977, United States Government Printing Office, Washington, D.C., 1978, p. 104.

TABLE 2

Revenues on Motor Vehicles from Virginia Taxes (1977-78)
(in thousands)

RECEIPTS	REVENUE
Motor Vehicle Fuel Tax	$274,953
Motor Vehicle Licenses	70,658
Motor Vehicle Title Registration	7,889
Motor Vehicle Chauffeurs' & Operators' Licenses	6,147
Motor Vehicles Interstate Registration Plan	11,404
Motor Vehicle Carrier Passenger Gross Receipts Tax	792
Motor Vehicle Receipts from Reportable Violations	2,990
Motor Vehicle Recording, Copying, Certifying Public Records	3,107
Motor Vehicle Sales and Use Tax	68,896
Motor Vehicle Liquidated Damages-Weight Limit Violations	1,268
Other Motor Vehicle Licenses and Permits	4,922
State Corporation Commission	1,669
State Police Sale of Surplus Property	4
Outdoor Advertising	68
State-Owned Ferry Tolls	290
Highway-Miscellaneous Permits and Fees	806
Central Garage-Miscellaneous Receipts	
Receipts from Cities, Towns, Counties, etc.	12,511
Total from Local Sources	$468,374

Source: Virginia Highway and Transportation Commission Seventy-first Annual Report, Financial Report, 1978, Table B.

tax per gallon is 9 cents, while most ten wheel trucks and all tractors pay an additional 2 cents per gallon, for a total of 11 cents per gallon. Both per gallon fuel taxes and license taxes are unresponsive to inflation and both have declined in real terms over the past few years. The last motor fuel tax increase was 2 cents per gallon in 1972. The heavy vehicle surcharge has not increased since it was adopted in 1956. Accordingly, the surcharge has declined from 33 percent in 1956 to 22 percent presently. Sales and use taxes are responsive to price changes and therefore have generally kept pace with inflation. Table 11 shows the real revenues generated from these three taxes over the past ten years.

Taxation Among Vehicles

In Virginia, passenger vehicles pay roughly 80 percent of the total revenues to the highway trust fund, while heavy trucks pay 20 percent. This proportion varies widely among the states. This issue is discussed in further detail in a later section. While the taxation of passenger vehicles is relatively straightforward, motor carrier taxes are more complicated and bear further examination before proceeding.

Motor Carriers

Every state has an excise tax on gasoline, with rates ranging between 5 and 11 cents per gallon. Motor fuels other than gasoline are commonly called "special fuels", with diesel fuel the most widely used of the special fuels. Two states, Vermont and Wyoming do not levy a tax on special fuels, instead, levying "in lieu" taxes. Vermont

levies additional registration fees on vehicles using special fuels, while Wyoming imposes an additional ton mile tax on such users. The increase in the use of diesel fuels has increased the significance of the special fuel tax. The diesel engine is much more fuel efficient than a comparable gasoline engine. For instance, it is estimated that a 55,000 pound, four-axle combination that is diesel-powered obtains over 37 percent more miles to the gallon than its gasoline-powered counterpart. 1/

Consequently, a number of states impose a higher tax on diesel fuel than on gasoline. Currently, nine states have higher diesel fuel rates with the differences ranging between one and two cents per gallon. While these taxes have been initiated to bring the relationship of automobile taxes and truck taxes back to its original ratio, some trucking interests have charged that these levies are a "tax on efficiency".

Virginia is one of two states, Kentucky being the other, which has a motor fuel surcharge on heavy vehicles, regardless of the manner in which they are powered. Trucks or combinations with more than two axles pay a 2 cents per gallon surcharge over the basic 9 cents per gallon tax in both states. All carriers remit the difference in quarterly filed motor fuel reports, the proceeds of which go to the state highway trust fund.

1/ United States Department of Transportation, Road User and Property Taxes on Selected Motor Vehicles, 1973, United States Government Printing Office, Washington, D.C., 1975, p. 5.

Since the vehicles of both private and for-hire carriers operating regularly in interstate commerce have the range to go through states without purchasing motor fuel -- thus, avoid contributing to state highway trust funds -- the vast majority of states, including Virginia, have enacted motor fuel requirements. Under the motor fuel statutes, carriers must show evidence that they have purchased in the state as much fuel as they have used therein. Any tax deficiency is adjusted in monthly or quarterly reports filed with the appropriate authorities. Both Virginia and Kentucky also use the quarterly reports to collect their motor fuel surcharge. In 1975, only six states had no motor fuel registration requirements: California, Florida, Illinois, Louisiana, Rhode Island, and Wisconsin.

Those states having motor fuel requirements keep track of foreign and home domiciled vehicles and their motor fuel tax liability by requiring an additional registration for motor fuel tax collections. These fees are nominal with Virginia's being $3 per vehicle. Most states seize non-registered vehicles found operating within their states.

Unlike fuel taxes, registration fees vary significantly from state to state. On a privately used, five-axle, diesel-powered tractor-trailer combination of 72,000 pounds, annual registration fees vary from a low of $33 in Colorado to a high of $1,659 in Vermont. Virginia would charge $662. In general, states with low registration fees have other taxes such as a third structure tax, while high registration fee states have registration as their principal or only tax.

Third structure taxes are neither as widely used nor as homogeneous as first and second structure taxes. Presently, only Arizona has a gross receipts tax on carriers. [1] Virginia repealed its gross receipts tax in 1956 in favor of the surcharge on fuel. Because it levies taxes only on the for-hire carriers, it is recognized that the gross receipts tax is not a good third structure tax.

Other third structure taxes have mileage as a common denominator. These taxes, which are based on vehicles and their use, make little, if any, distinction between private and for-hire operations. There are two points to be made in regard to weight distance taxes. First, they have the potential to raise significant revenues. Second, they should theoretically be imposed at rates which take into account the value of the service received and the cost of providing highway services. [2]

There may be also an equity benefit from third structure taxes. The tax can be adjusted to fit the weight of the vehicle, thus more closely matching the cost of the vehicle to the system. Presently, most studies show that smaller trucks pay higher per mile taxes than larger trucks. [3] From Table 5, it can be seen that this also is true in Virginia. The states of New York, Ohio, and Oregon have weight-distance taxes that yield over $25,000,000 annually.

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[1] United States Department of Transportation, [illegible] Statistics, [illegible]73, United States Government Printing Office, Washington, D.C., 1977, p. 86.

[2] United States Department of Transportation, Road User and Property Taxes on Selected Motor Vehicles, 1973, United States Government Printing Office, Washington, D.C., 1975, p. 13.

[3] Congressional Budget Office, Who Pays for Highways: Is A New Study of Highway Cost Allocation Needed?, September, 1978, p. 16.

Estimating Automobile User Payments

Like motor truck operators, automobile owners and operators pay user taxes at both the federal and Virginia levels. Since the removal of the federal excise tax on new automobiles in 1971, the major federal user tax on automobiles has been the federal excise tax on motor fuel. This four cents per gallon levy has been unchanged since its 1956 inception. The other federal excise taxes on automobile use are minor, and include a six cents per gallon tax on lubricating oil and a 10 cents per pound tax on rubber used in automobile tires and tubes. In 1978, these taxes are estimated to total .336 cents per mile for automobiles.

While there are a number of Virginia user taxes that automobile owners and operators pay, most are minor such as dealer license fees, rental taxes and title registration fees. Three user taxes (motor vehicle license fees, motor vehicle fuel taxes and the motor vehicle sales and use taxes) account for over 95 percent of Virginia highway user fee collections.

As shown in Table 3, passenger vehicle user tax payments were estimated for the years ending June 30, 1977 and June 30, 1979. Automobile vehicle license fees were estimated by subtracting the license fees paid by appropriate property carrying vehicles as reported by the Division of Motor Vehicles to the General Assembly. [2/]

1/ In this section, automobiles are defined as to include vans and pickup trucks used predominately as passenger vehicles. This definition is consistent with that used by the Virginia Division of Motor Vehicles.

2/ Senate Document 3, 1980, Exhibit A, Schedules 1-6.

TABLE 3

Automobile and Light Truck User Tax Payments
To Virginia Highway Trust Fund, 1976-77 and 1978-79

Source	Revenue	
	1976-77	1978-79
Vehicle license fees	$ 49.7 million	$ 53.7 million
Motor fuel tax	223.8	236.4
Sales and use tax	56.1	68.9
Total	$329.6 million	$359.0 million
Virginia user tax per mile	.99 cents	.99 cents
Federal user tax per mile	.34	.34
Total user tax per mile	1.33	1.33

Motor vehicle sales and use taxes paid for automobiles were estimated by subtracting the sales and use taxes estimated to have been paid by property carrying vehicles and buses from the total. These estimates were derived from the federal excise taxes reportedly paid from Virginia on new trucks, buses and trailers. [1/] Motor fuel user tax payments to Virginia were estimated by subtracting motor fuel tax payments made by trucks other than light trucks (Gross Vehicle Weight less than 7,500 pounds) from the net motor fuel tax collections reported by the DMV. [2/]

Motor fuel taxes paid by tractors and trucks with 10 wheels or more that report to the State Corporation Commission (SCC) were calculated from the SCC's report to the General Assembly. [3/] Motor fuel taxes paid

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1/ Highway Statistics, 1977, p. 108, and Highway Statistics, 1976, p. 38. Public Law 92-178 repealed the excise tax on light trucks (December 12, 1971).

2/ Biennial Report, 1977-79, Virginia Division of Motor Vehicles, p. 26.

3/ "Motor Fuel Road Tax Statistics, Carrier of Property", years ending June 30, 1977, June 30, 1978, and June 30, 1979, State Corporation Commission.

by trucks with Gross Vehicle Weight (GVW) greater than 7,500 pounds, but not reporting to the SCC (less than 10 wheels or exempt), were estimated from DMV and Motor Vehicle Manufacturers' Association data. [1/]

As shown in Table 3, it is estimated that passenger carrying vehicles paid user taxes in 1976 and 1978 to the Commonwealth 329.6 million dollars, and 359.0 million dollars, respectively. If these total taxes are divided by the vehicle miles of travel estimated to have been done by these vehicles in each year [2/], Virginia user fee collections per mile were .99 cents per mile in 1976 and .99 cents per mile in 1978. If these estimated State collections are added to the estimated per mile federal collections of .34 cents per mile, total State and federal user payments per mile in Virginia for passenger carrying vehicles in both 1976 and 1978 are estimated to be 1.33 cents per mile.

These estimates approximate those computed by two alternative methods. From a "hypothetical" car method, it was estimated that user charges per mile would have been 1.33 cents. If 1976 Motor Vehicle Manufacturers' Association data are used, the estimated payments total 1.20 cents per mile. Thus, the 1.33 cents per mile estimated in 1976 and 1978 derived from MV and SCC data seems reasonable and accurate.

In Table 9, it was estimated that the total 1976 and 1978 allocated construction and maintenance cost responsibility for automobiles was 2.17

1/ Senate Document 3, Schedule A; Motor Vehicle Manufacturers' Association, Facts and Figures, 1975, pp. 68-70, 90-99.

2/ Highway Statistics, 1977, p. 101, and Highway Statistics, 1976, p. 31. Passenger vehicle miles were derived by subtracting truck miles (GVW is less than 7,500 pounds) from total miles.

and 3.57 cents per mile, respectively. If this cost responsibility is compared with the total payments per mile, it is estimated that in 1978, automobiles and passenger carrying light trucks covered one-third of their allocated costs ($\frac{\$.0133}{\$.0357}$) = .372. This percentage is significantly less than the .61 ($\frac{\$.0133}{\$.0217}$) coverage in 1976.

It should be noted that the automobile user tax payments of 1.33 cents per mile represent payments on all categories of highways (federal and non-federal aid), while the 1976 and 1978 allocated cost responsibility estimates represent federal aid highways only.

Estimating Truck User Taxes

One finding of the 1976 Revenue Resources and Economic Commission study was the disparity between taxes paid by Virginia-domiciled trucks and foreign-domiciled trucks. 1/ Since Virginia's membership in the International Registration Plan (IRP) post dates the previous study, an attempt is made to ascertain if Virginia's membership in the IRP has narrowed the previous disparities found in 1960, 1966, 1970, and 1973.

Virginia is one of twelve states and one Canadian province that were charter members of the IRP, which is sponsored by the American Association of Motor Vehicle Administrators. With the exception of Kentucky, Tennessee, and Virginia, the other charter members were west of or along the Mississippi River. Over the past five years, IRP membership has increased to its present 23, with Alabama, the latest signee, to become a member in October, 1980. While most recent signees

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1/ George E. Hoffer and Charles J. Gallagher, Transportation Taxation in Virginia: An Interstate-Intermodal Analysis, Revenue Resources and Economic Commission, Richmond, Virginia, 1976, p. 35.

still are clustered around and west of the Mississippi, the 1977 joining of North Carolina is of particular significance to Virginia.

Under the IRP, heavy vehicles used in the carriage of passengers or property within two or more IRP states pay registration fees to each participant state in proportion to the mileage done by the carrier in the previous year or that expected to be done during the present registration period for that state. Estimating the fleet mileage in each jurisdiction, the carrier computes its tax liability in each member jurisdiction by writing a separate check to each jurisdiction, but sending all of the checks to the carrier's home base (state). The base state then distributes the apportioned checks to the proper jurisdiction.

IRP registered vehicles display license plates of their base state that are marked "apportioned", and are considered registered in each state for which the apportioned fee has been paid. As such, the IRP supercedes registration reciprocity among the member states. The reciprocity agreements previously negotiated between IRP and non-member states govern vehicle registration between non-member states and between non-member IRP states. Thus, while Virginia is an IRP member, heavy vehicle travel between Virginia and Maryland, a non-member, is governed by the previously negotiated bilateral registration reciprocity agreement between the two states. Under registration reciprocity, the state in which the motor vehicle is registered would recieve all of the registration fees for that vehicle, regardless of the proportion of total vehicle mileage done within that state. But if the states were IRP members, the registration fees would be paid proportionately to each state on the basis of mileage.

Theoretically, the disparity between the user charges paid to Virginia by resident and non-resident carriers should narrow significantly for carriers from IRP states. Virginia carriers, which previously registered

proportionately more vehicles in Virginia, would now be apportioning their vehicles among the member jurisdictions, lowering the Commonwealth's revenues. Conversely, carriers from other IRP states who previously paid registration fees in their home states, would now be apportioning the fees among the member states in which their vehicles operate, including Virginia.

To estimate the user taxes paid by the several classes of motor carriers to Virginia and other states, a sample of 98 motor carriers operating through Virginia during the calendar years 1976 through 1978 was taken from the files of the SCC. The sample carriers accounted for approximately 25 percent of the total miles operated in Virginia during the period. The carriers were chosen on the basis of miles operated in Virginia.

The sampled carriers were then placed in one of six categories, based on whether they were for-hire or private and the state of domicile. Carriers were categorized as Virginia-domiciled, domiciled in an IRP state other than Virginia, or domiciled in a non-IRP state. During the 1976-78 period, the number of IRP states increased from 12 to 22. Thus, a state in 1976, such as North Carolina, may have been classified as a non-IRP state, but by 1978 was classified as an IRP state.

From quarterly reports filed with the SCC, carrier mileage and motor fuel consumption data were obtained for 1976, 1977, and 1978. Registration fees and Motor Vehicle Sales taxes paid the Commonwealth by the carriers were obtained from DMV for 1978 only. DMV's information

system would not permit retrieval of fees prior to 1978. Supplemental data on for-hire carriers were obtained from carrier M-1 Reports filed with the Interstate Commerce Commission.

From these data, user charge payments to Virginia, to every other state and to the Federal government were calculated by carrier type on a per mile basis for 1976. The 1977 data would permit only a computation of total state and federal user charges per mile, but not payments to Virginia specifically. The latter was not calculable because of a format change in the carrier's M-1 report. From the SCC, DMV, and ICC data, Virginia payments as well as total state and federal payments on a per mile basis were calculated.

Table 4 shows the user charges paid by several types of carriers to the Federal government, to all states in which the carriers travel, to Virginia, and to all states in which they travel other than Virginia. These results can be compared with those obtained for 1970 and 1973 in the previous Revenue Resources and Economic Commission study (Table 1). In Table 4, it can be seen that the Virginia-domiciled ICC certificated common carriers paid 7.47 cents per mile in Federal and Virginia highway user taxes. These payments include all user taxes reportedly paid by the carriers and an estimate of capitalized federal user taxes such as the 10 percent excise tax on new trucks. This estimate of 7.47 cents per mile for Virginia-domiciled, class I, ICC certificated common carriers is lower than the 7.59 cents per mile estimated in 1970 and 7.84 cents per mile estimated in 1973.

TABLE 4

Common Carrier Revenues Per Mile
1976 and 1978 [1]

Total Federal and All State Common Carrier Revenues [1]

Domicile	1976 per mile	1978 per mile [4]
Virginia Resident	.0576	
Non-Resident, IRP	.0648	
Non-Resident, non-IRP	.0596	
All Carriers	.0601	

Total Common Carrier Revenues for States Other than Virginia [2], [3]

Virginia Resident	.0490
Non-Resident, IRP	.0628
Non-Resident, non-IRP	.0583
All Carriers	.0581

Common Carrier Revenues for Virginia

Virginia Resident	.0476
Non-Resident, IRP	.0310
Non-Resident, non-IRP	.0292
All Carriers	.0334

Federal Common Carrier Revenues

Virginia Resident	.0257
Non-Resident, IRP	.0262
Non-Resident, non-IRP	.0254
All Carriers	.0262

Total Federal and Virginia Common Carrier Revenues

Virginia Resident	.0747
Non-Resident, IRP	.0572
Non-Resident, non-IRP	.0546
All Carriers	.0596

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[1] Domicile is determined by the State Corporation Commission and is based on where the firm's records are kept.

[2] Includes Federal Excise taxes and other capitalized taxes, see page of the Appendix for details.

[3] Calculated by subtracting Virginia taxes from total taxes and Virginia miles from total miles.

[4] DMV could not supply the required data in time for printing. For these data, contact Dr. James T. Lindley, Old Dominion University (804-440-3567), or Dr. George E. Hoffer, Virginia Commonwealth University, (804-257-1717).

This decrease is even more pronounced when payments made only to Virginia are examined. Whereas, Virginia-domiciled, ICC certificated carriers paid 5.15 and 5.43 cents per mile to the Commonwealth in 1970 and 1973, respectively, in 1976, payments declined to 4.76 cents per mile.

The decrease can be attributed to several factors. First, the fuel efficiency of the motor carriers has increased since the last study, despite higher weights. This reflects the increased attention paid to fuel economy by motor truck manufacturers and motor carriers which became manifested after the 1976 Revenue Resources and Economic Commission study (which used 1973 data). Secondly, since the 1976 Revenue Resources and Economic Commission study, Virginia has joined the IRP. Accordingly, Virginia carriers which previously paid 100 percent of the registration fees for a tractor that only did 50 percent of its mileage in Virginia would, under the IRP, distribute revenues proportionately to other IRP states. Hence, the lower Virginia revenues from Virginia-domiciled vehicles.

It should be recalled that the last Revenue Resources and Economic Commission study, [2/] found a significant disparity between user payments made to Virginia by domiciled and non-domiciled carriers. One of the purposes of this stury is to see if the IRP has narrowed this disparity. An examination of Table 4 leads one to conclude that the disparity has narrowed, somewhat. Where, foreign-domiciled carriers were found to have paid 2.06 cents per mile and 2.42 cents per mile to the Commonwealth in 1970 and 1973, respectively, foreign-domiciled carriers from IRP states were found to

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1/ The increase from 1970 to 1973 reflects the 2 cents per gallon motor fuel tax increase enacted in 1972.

2/ George E. Hoffer and Charles J. Gallagher, Transportation Taxation in Virginia: An Interstate-Intermodal Analysis, Revenue Resources and Economic Commission, Richmond, Virginia, 1976, p. 35.

have paid 3.10 cents per mile in 1976 to the Commonwealth. Thus, the disparity between IRP foreign and Virginia-domiciled trucks found in 1973 narrowed from 124 percent to 54 percent in 1976. It should be pointed out that this narrowing is the result of both increased payments per mile by non-resident, IRP state based carriers and decreased payments by Virginia carriers.

As expected, highway user payments to Virginia from IRP state carriers exceeded those from non-IRP state carriers in 1976. The difference was approximately .2 cents per mile for the sampled carriers. As seen in Tables 1 and 4, non-resident, non-IRP state motor carrier payments to Virginia increased by .5 cents per mile to 2.92 cents per mile from 1973.

Table 4 shows that each of three groups of common carriers paid approximately 2.6 cents per mile to the Federal Highway Trust Fund. This payment is slightly higher than the average 2.3 cents per mile found in 1970 and 1973 in the previous Revenue Resources and Economic Commission study and reflects for the most part the rapidly increasing prices of rolling stock. The fact that carriers in each group sampled were found to pay federal taxes within .1 cents per mile (.08) of each other would be expected if the samples were properly drawn and data processed correctly.

If federal and Virginia user tax payments to the Commonwealth are summed, on average all carriers paid 5.96 cents per mile in 1976. Of the three groups, Virginia carriers paid 7.47, IRP foreign-domiciled

paid 5.72, and non-IRP foreign-domiciled paid 5.46 cents per mile in 1976. he latter group was fo nd to pay over .7 cents per mile in 1976 more than was found in 1973 (4.70 cents per mile).

Table 4 also details what the several motor carrier groups pay in Federal and state user charges in all states in which they travel and in all states in which they travel exclusive of Virginia. irginia-domiciled carriers pay slightly less (5.76 cents per mile) than the other two groups (6.48 cents per mile for non-resident IRP, and 5.96 cents per mile for non-resident, non-IRP). If payments to Virginia are excluded, Table 4 shows that Virginia carriers paid 4.90 cents per mile in total user taxes while non-resident IRP carriers paid 6.28 cents per mile and non-resident non-IRP carriers paid 5.83 cents per mile.

Operations of all carriers were broken down into the pickup-delivery category or the line haul category. As of 1977, ICC data are collected in this manner: using 1977 and 1978 data, an estimate was made on the 1976 data to determine the revenue payments by all carriers in these two categories. As in other studies, it was found that line haul trucks pay significantly less per mile than the pickup and delivery trucks. 1/ Table 5 shows that line haul trucks pay 5.6 cents per mile while pickup and delivery trucks pay 8 cents per mile. The difference can be explained by line haul ope ations spreading the fixed cost of licenses and registration over many more miles. See page 204 for a further discussion in regard to third structure taxes.

1/ Congressional Budget Office, Who Pays for Highways: Is A New Study of Highway Cost Allocation eeded?, Septe ber, 1978, p. 16.

TABLE 5

Total User Charges Contract Carriers
by Line Haul and Pickup and Delivery

	1976	1978 [1/]
Line Haul Mileage Tax	.05603	
Pickup and Delivery Mileage Tax	.08076	

One comparison that is being made in other states is that between the percent of total revenues that are paid by passenger vehicles and heavy trucks. There is a wide diversity between states. Using the calculated amount for passenger vehicles from page 160, of $359.0 million we can compare that to the total revenues raised through license fees and sales and use taxes and the motor fuel tax ($440.7 million). Passenger vehicles are paying approximately 80 percent of those revenues while heavy vehicles, the remaining 20 percent. Table 6 shows ratios for selected other states.

As can be seen, there is a large degree of diversity between states in this matter. The three states with percentages in the thirties are unique in that they have a third structure tax.

DMV could not supply the required data in time for printing. For these data, contact Dr. James T. Lindley, Old Dominion University (804-440-3567) or Dr. George E. Hoffer, Virginia Commonwealth University (804-257-1717).

TABLE 6

Ratio of Heavy Truck Revenues to Total Revenues

State	% of Total, State Only	% of Total, Federal and State
Oregon [1]	39.00%	
Georgia [2]	15.59	20.54%
Florida [3]	10.90	14.66
Ohio*	39.00	
Wisconsin*	36.00	
Virginia*	20.00	22.00 [4]
Arkansas	25.00 [5]	
Tennessee*		22.0

[1] Motor Vehicles Cost Responsibility Study, 1979 Final Report, Oregon Department of Transportation.

[2] Georgia Highway Cost Allocation Study, Department of Transportation, State of Georgia, 1979, Table 4.

[3] Florida Highway Cost Allocation Study, Department of Transportation, State of Florida, September, 1979, Table 8.

[4] Heavy trucks were calculated to be 47.8 percent for Federal Excise and Motor Fuel Tax.

[5] Truck Size and Weight Study, A. K. Cooper, Arkansas State Highway and Transportation Department.

* Acquired by telephone conversations with Gary Allen of the Virginia Department of Highways and Transportation Research Council.

Costs

Allocation of highway costs among the various vehicle types was based on the last major study of the type done by the American Association of State Highway Officials (AASHO) and submitted to Congress. Virginia, along with other states, shared the financial responsibility for this study, which was required as part of the Highway Revenue Act of 1956 (70 Stat. 387). A discussion of the purposes, objectives amd methodology of this cost allocating study can be found elsewhere. 1/

Two points need elaboration. First, there is some controversy over the use of the AASHO study data because of its age. Second, there is the question of whether occasional costs (incremental costs), or benefits derived, is the better cost method to use.

AASHO Study

The AASHO Study was commissioned in 1956 and results were available in 1961. The 1964 Cost Allocation Study on which the present work draws was dependent upon the AASHO data. In recognition of the need for new data, Congress passed the Surface Transportaion Assistance Act of 1978, part of which calls for a new allocation study. 2/ In setting up the guidelines for the new study, previous studies were critiqued and new methods were suggested.

1/ For instance, see the Supplementary Report, 1965, Highway Research Board, The AASHO Road Test: Special Report, 1973, National Academy of Sciences - National Research Council, Washington, D.C., 1962; Final Report of the Highway Cost Allocation Study, 1961. These are summarized in the Hoffer-Gallagher Study done for the Revenue Resources and Economic Commission, 1976.

2/ Guidelines for a Study of Highway Cost Allocation, Congressional Budget Office, February, 1979.

Some comments regarding the new study are reproduced below:

Previous studies of cost allocation have generated considerable background on how pavement is worn out by vehicles of different types. They have shown that, as a general rule, heavy vehicles cause many times more road wear than do light ones. The guidelines presented here call for the allocation of pavement costs on the basis of this relative wear.

This approach differs from that followed in the past in one important respect: the fact that increases in the thickness of pavement add disproportionately to the strength of the pavement, while adding relatively little to total costs, has been recognized, and this economy of scale has been allocated evenly to all classes of vehicles. With the methodology applied in past studies of cost allocation, all the benefits of economies of scale were generally bestowed on the heaviest classes of vehicles. 1/

Pavement costs are to be allocated in proportion to the amount of pavement consumed by different classes of vehicles. Highway engineers have developed mathematical relationships between the wear to which a pavement has been subjected and the weight carried by the axles that pass over it. Direct use of these relationships was not made in earlier studies, and pavement costs were allocated according to incremental construction costs, an approach that appears to favor heavy vehicles. The result was an allocation of pavement costs based largely upon the amount of use made of roads, while the approach set forth here is based upon the amount by which roads have been worn out. Also, the common portions of pavement costs are recognized explicitly in the approach taken here. These common portions are primarily the cost of repairing the damage done to pavement by weather and environmental conditions and to the cost of that part of the pavement which is not worn out but remains usable indefinitely.

In earlier studies, the costs of acquiring rights-of-way were assumed to be common to all vehicles. In the proposed guidelines, it is recognized that, as the volume of traffic expected during peak periods increases, so does the need for a wider right-of-way -- beyond that required for a lightly traveled road -- are to be allocated in proportion to the amount of road space consumed by different types of vehicles.

It was also assumed in earlier studies that virtually all grading costs were common to all vehicles. In these guidelines, it is proposed that since some grading, particularly in rolling or mountainous terrain, is done to reduce grades and make it easier for certain vehicles to maintain speed, a portion of the costs of grading should be considered to be occasioned by these vehicles. 2/

1/ Guidelines for a Study of Highway Cost Allocation, Congressional Budget Office, February, 1979, p. xii.

2/ Ibid., pp. 16-17.

It is difficult to a priori determine what the relative costs of various classes of vehicles will be based on a new study, but it would appear that heavier vehicles will be charged with a greater percentage of overall costs than in previous studies.

Given all the criticisms, however, the 1964 cost allocation study is the state of the art at present and the 1982 projected completion of the new study is still tentative. In addition, all state studies reviewed have relied upon the AASHO study. Until further data are available the AASHO study based data is the best that can be done.

Cost Occasional Versus Benefits Derived

Two methods have been relied on in the allocation of highway cost responsibility; the cost occasional method and the benefits derived method. The principle on which the cost occasional or incremental method is based is that the cost of constructing and maintaining highways increases as the size of the vehicles and the frequency of the trips increase. Therefore, the cost of providing facilities for the lightest vehicles is apportioned to all vehicles on an equal basis. The successive increments of costs required by the special highway features occasioned by or necessitated by heavier vehicles is allocated to those vehicles. The benefits derived method involves a subjective evaluation of the benefits accruing to the various user classes. The version of the benefits method that has been used is the differential benefits method. This method would allocate highway

cost responsibility among highway users in proportion to the estimated benefits derived from the use of the highway by each c ass of users.

n G 'delines For ~ Study of Highway Cost ~llocation, Congressio.al Budget Office, February, 1979, it was concluded that:

> Taxes based upon benefits derived would require a considerable degree of tax differentiation among users. The fineness of differentiation and the nu ber of tax classes used would be very difficult to establish. For example, auto travelers might be differentiated by income class, by family status, or even by recreational habits. It is likely that nonessential travel. such as sightseeing trips and recreational journeys, which tends to be price-sensitive, would subject the user to very little in taxes, whereas essential travel, such as trips to work or school would be taxed heavily. Such an outcome might conflict with other governmental objectives.
>
> Benefit-based taxes might also be difficult to administer with respect to freight vehicles. Because of large variations in the value of truckloads and in the value of truck services, benefit-based truck taxes would have to be specified separately for each commodity and for each destination. The complexity of such a scheme is an obvious drawback.
>
> In short, the imposition of charges or taxes on the basis of benefits received by each class of users seems fraught with practical problems and contains a number of conceptual difficulties as well. Because of the problems of estimating benefits received by each class of users, benefits have been excluded from recent federal studies of cost allocation. 1/
>
> The cost occasional method has probably gained the greatest public and legislative acceptance as the technique that can best operationalize the princip e of equity--that is, *he principle that any roadway users that require special public expenditures on their behalf should pay for those expenditures. Just as the user-pays principle has become a cornerstone of the nation's policy on highway finance, so too has the occasioned-cost method become the conventional way of extending this principle so that each user pays an appropriate share. For example, heavy trucks should pay for the costs of the thick pavement, extra-wide lanes or the high

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1/ Congressional Budget Office, United States Congress, Guidelines For A Study of Highway Cost Allocation, February, 1979, p. 81.

bridge clearances that they require, while cars should pay most of the costs of the extra lanes needed to carry predominately automobile traffic during the rush hours in congested urban areas.

The incremental cost method that was used in previous federal cost allocation studies comes fairly close to assigning costs to the roadway users that occasion them. The chief problem with this method, however, is that it departs from the principle of occasioned costs in two ways. First, it does not account for costs occasioned by any factor other than increased size and weight. For example, the cost of the extra freeway lanes needed to carry rush hour vehicles -- mostly automobiles -- are not proportionately assigned to automobiles.

Second, and more significant, the incremental method takes far too narrow a view of occasioned costs, relying exclusively on engineering estimates of the additional construction costs associated with different facilities and ignoring the functional reasons for undertaking construction projects. For example, in allocating the costs of building a bridge, the incremental method assigns to heavy trucks the costs of the additional structure, width, clearance, and pavement thickness that are required to design and build the bridge for trucks, over and above those needed to design and build the bridge for cars. But if a bridge now exists where a new one is contemplated, and if that existing bridge could adequately carry automotive traffic indefinitely, then the entire cost of replacing that bridge is occasioned by heavy vehicles. Similarly, if a road must be resurfaced with at least three quarters of an inch of pavement because a lesser amount would not bind the original surface, and if that minimal thickness is sufficient to serve heavy vehicles as well as cars, the incremental method assigns no costs exclusively to heavy vehicles. But if a heavy truck does several thousand times as much damage per load application as a car, then each truck mile occasions as much cost as several thousand automobile miles over the life of the facility. In brief, as these examples illustrate, the reliance of the incremental method on an engineering-based method of assigning costs tends to ignore some relationships that become apparent only when allocations are based on the function or actual use of the highway improvement. 1/

1/ Congressional Budget Office, United States Congress, Who Pays for Highways: Is A Study of Highway Cost Allocation Needed?, Washington, D.C., 1979, pp. 50-51.

Thus, an evaluation of the allocation methods demonstrates the objectiveness of the incremental cost method and the highly subjective nature of the differential-benefits method. It is for this reason that more reliance has been placed on the cost occasional method. "The incremental cost technique is the best known of all occasional cost methods, and it has been the chief approach relied upon in federal cost allocation studies and in numerous state studies, [1/] and is the one relied on in the present work.

As in the previous report made to the Revenue Resources and Economic Commission, federal cost data were used to generate Virginia cost data and indices were used to bring the results into current dollars.[2/]

Column A of Tables 7 and 8 shows the federal cost per mile in 1964 dollars using the incremental method of construction cost allocation on federal aid highways by vehicle type. Column A represents the federal portion of construction cost only, in 1964 dollars. For automobiles, this represents .514 cents per mile. Since Column A is in 1964 dollars, it was first adjusted to reflect 1976 and 1978 dollars. Construction price indices were obtained from the Virginia Department of Highways and Transportation. The 1976 price index (182.6; 1967=100.0) was divided by the 1964 construction index. The 1978 construction price index (311.9) was also divided by the corresponding index.

Since the cost allocation by vehicle type in Column A represents the federal government's portion only on federally aided highways, the data

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1/ Congressional Budget Office, United States Congress, Who Pays for Highways: Is A Study of Highway Cost Allocation Needed?, Washington, D.C., 1979, p. 49.

2/ George E. Hoffer and Charles J. Gallaher, Transportation Taxation in Virginia: An Interstate-Intermodal Analysis, Revenue Resources and Economic Commission, 1976, pp. 6-9.

TABLE 7

Allocated Federal and Virginia Cost Responsibility by Incremental Method
For Each Vehicle Type by Class of Operation and Type of Fuel, in Cents Per Mile, 1976

Type of Vehicle, Class of Operation, and Type of Fuel	A Allocated Construction Cost Responsibility, Federal Portion Only, Federal Aid Highways, 1964 Dollars	B Allocated Total Construction Cost Responsibility in 1976 Dollars	C Allocated Total Maintenance 1/ Cost Responsibility in 1976 Dollars	D Total Allocated Construction and Maintenance Cost Responsibility in 1976 Dollars
Automobiles	.514	1.79	.38	2.17
Buses: Transit	1.856	6.47	.46	6.93
Intercity	1.685	5.87	.58	6.45
School and Misc.	.717	2.50	1.26	3.76
Single-Unit Trucks:				
2 axle, 4 tire				
Private:				
gasoline	.436	1.52	.50	2.02
diesel	.426	1.48	.47	1.95
For Hire:				
gasoline	.544	1.90	.53	2.43
diesel	.422	1.47	.96	2.43
2 axle, 6 tire				
Private:				
gasoline	.773	2.70	.69	3.39
diesel	1.026	3.58	.73	4.31
For Hire				
gasoline	.886	3.09	.74	3.83
diesel	.948	3.30	.75	4.05
3 axle				
Private:				
gasoline	1.262	4.40	.79	5.19
diesel	1.684	5.87	.80	6.67
For Hire:				
gasoline	1.190	4.15	.74	4.89
diesel	1.121	3.91	.72	4.63

1/ Total includes Federal and Virginia in 1976 dollars.

TABLE 7
(continued)

Type of Vehicle, Class of Operation, and Type of Fuel	A Allocated Construction Cost Responsibility, Federal Portion Only, Federal Aid Highways, 1964 Dollars	B Allocated Total Construction Cost Responsibility in 1976 Dollars	C Allocated Total Maintenance Cost Responsibility in 1976 Dollars	D Total Allocated Construction and Maintenance Cost Responsibility in 1976 Dollars
Combinations:				
With Semi-trailers:				
3 axle (2-S1)				
Private:				
gasoline	1.618	5.61	.79	6.40
diesel	2.034	7.09	.93	8.02
For Hire:				
gasoline	1.784	6.22	.75	6.97
diesel	2.189	7.63	.90	8.53
4 axle (2-S2)				
Private:				
gasoline	1.951	6.80	.73	7.53
diesel	2.280	7.95	.83	8.78
For Hire:				
gasoline	2.122	7.40	.73	8.13
diesel	1.123	7.40	.77	8.17
5 axle (3-S2)				
Private:				
gasoline	2.288	7.98	.72	8.70
diesel	2.382	8.30	.91	9.21
For Hire:				
gasoline	2.502	8.72	.72	9.44
diesel	2.651	9.24	.72	9.96

Source: United States Secretary of Commerce, Supplementary Report of the Highway Cost Allocation Study, U.S. Government Printing Office, Washington, D.C., 1965, pp. 10-14.

TABLE 8

Allocated Federal and Virginia Cost Responsibility by Incremental Method
For Each Vehicle Type by Class of Operation and Type of Fuel, in Cents Per Mile, 1978

Type of Vehicle, Class of Operation, and Type of Fuel	A Allocated Construction Cost Responsibility, Federal Portion Only, Federal Aid Highways, 1904 Dollars	B Allocated total construction Cost Responsibility in 1978 Dollars	C Allocated Total Maintenance 1/ Cost Responsibility in 1978 Dollars	D Total Allocated Construction and Maintenance Cost Responsibility in 1978 Dollars
Automobiles	.514	3.11	.46	3.57
Buses: Transit	1.856	11.23	.54	11.77
Intercity	1.685	10.20	.69	10.89
School and Misc.	.717	4.34	1.49	5.83
Single-Unit Trucks:				
2 axle, 4 tire				
Private:				
gasoline	.436	2.64	.59	3.23
diesel	.426	2.58	.56	3.14
For Hire:				
gasoline	.544	3.29	.63	3.92
diesel	.422	2.55	1.14	3.69
2 axle, 6 tire				
Private:				
gasoline	.773	4.68	.82	5.50
diesel	1.026	6.21	.87	7.08
For Hire:				
gasoline	.886	5.36	.88	6.24
diesel	.948	5.74	.89	6.63
3 axle				
Private:				
gasoline	1.262	7.64	.81	8.45
diesel	1.684	10.19	.95	11.14
For Hire:				
gasoline	1.190	7.20	.87	8.07
diesel	1.121	6.78	.85	7.63

1/ Total includes Federal and Virginia in 1978 dollars.

TABLE 8
(continued)

	A	B	C	D
[illegible] Source, Type of Operation, and Type of Fuel	Allocated Construction Cost Responsibility, Federal Portion Only, Federal Aid Highways, 1964 Dollars	Allocated Total Construction Cost Responsibility in 1978 Dollars	Allocated Total Maintenance Cost Responsibility in 1978 Dollars	[illegible] and Maintenance [illegible] in 1978 [illegible]
Combinations:				
With Semi-trailers:				
3 axle (2-S1)				
Private:				
gasoline	1.610	9.74	.94	10.68
diesel	2.034	12.31	1.10	13.41
For Hire:				
gasoline	1.784	10.80	.89	11.69
diesel	2.189	13.25	1.07	14.32
4 axle (2-S2)				
Private:				
gasoline	1.951	11.81	.87	12.68
diesel	2.280	13.80	.98	14.78
For Hire:				
gasoline	2.122	12.84	.86	13.70
diesel	2.123	12.85	.91	13.76
5 axle (3-S2)				
Private:				
gasoline	2.288	13.85	.85	14.70
diesel	2.382	14.41	1.08	15.49
For Hire:				
gasoline	2.502	15.14	.85	15.99
diesel	2.651	16.04	1.01	17.05

Source: United States Secretary of Commerce, Supplementary Report of the Highway Cost Allocation Study, U.S. Government Printing Office, Washington, D.C., 1965, pp. 10-14.

were adjusted to reflect Virginia's portion of construction costs. State and federal construction expenditures on Virginia federally aided highways were totalled and averaged for the 1974-76 period and the 1976-78 period. This was done to average irregular federal payments to Virginia. For both the 1976 and 1978 periods, the federal construction contribution represented approximately 56 percent of total construction expenditures on federal aided highways. Thus, Column B in Tables 7 and 8 represent construction cost responsibility for both the State and federal governments adjusted for inflation. Column B was calculated from the following formula:

1976(8) total construction cost per mile by vehicle type	= Column A x	Federal % of construction cost of federally aided highways	x	inflation factor 1976(8)	

As can be seen in Table 8, the 1964 allocated cost responsibility for automobiles increases from .514 to 3.11 cents per mile in 1978 when adjustments are made for Virginia's portion of construction costs and inflation.

Allocated maintenance cost responsibility per vehicle type was also obtained from the Supplementary Report [1/], and totalled separately. Since during thie period, the State was responsible for the most part, for maintenance on federally aided highways, the entire maintenance cost responsibility was attributed to the State. However, the 1964 AASHO allocated maintenance cost estimates were adjusted to reflect changes in maintenance costs. The Virginia Highway Maintenance index was 198.4 in 1976 and 234.9 in 1978

1/ National Research Council, Supplementary Report, 1965, pp. 204-209.

(1967=100.0). Allocated maintenance cost responsibility be vehicle type in 1975 and 1978 dollars is shown in Co umn C, Tables 7 and 8. In Table 8, automobile maintenance cost responsibility is estimated to be .46 cents per mile for 1978.

Total allocated construction and maintenance costs by vehicle type in 1976 and 1978 dollars respectively were calculated by totalling Columns B and C to obtain Column D in Tab es 7 and 8. For automobiles in 1978, total cost responsibility was estimated to be 3.57 cents per mile.

It should be noted that this method of cost allocation responsibility differs somewhat from that used in the Hoffer-Gallagher study. [1/] The previous study, in adjusting for inflation and the Virginia portion of expenditures, combined construction and maintenance outlays. The cost allocation estimates derived here follow the methodology suggested by Professor Charles Phillips, representing the Virginia Highway Users Association, before the Revenue Resources and Economic Commission. [2/]

Allocated cost responsibility by vehicle type was derived for 1976 and 1978 as outlined above. In order to estimate cost responsibility per mile by type of motor carrier, estimates were made of the mix of vehicle types used by the several classes of motor carriers. The mix was estimated using DMV, SCC, and ICC data, as well as information supplied by motor carriers. The allocated cost per mile by carrier type shown in Table 9 represents the weighted average of the mix of vehicles and the cost per mile by vehicle type in Tables 7 and 8. As would be expected a priori,

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1/ George E. Hoffer and Charles J. Gallagher, Transportation Taxation in Virginia: An Interstate-Intermodal Analysis, Revenue Resources and Economic Commission, Richmond, Virginia, 1976, pp. 7-8.

2/ Statement of Charles F. Phillips before the Revenue Resources and Economic Commission, November 17, 1975.

the highest cost responsibility is attributed to foreign-domiciled ICC certificated common carriers, reflecting their proportionately higher mix of larger tractor-semitrailer combinations. The allocated cost by carrier type for the respective classes analyzed are limited to the periods for which user tax payment data were available.

TABLE 9

Allocated Cost Per Mile by Incremental Method
by Class of Motor Carrier, 1976 and 1978

Class of Motor Carrier	Cost in Cents Per Mile	
	1976	1978
Virginia domiciled ICC Certificated - Class I	8.33	14.05
Foreign domiciled, ICC Certificated - Class I	8.66	14.56
Virginia domiciled, Private carriers		*
Foreign domiciled, Private carriers		*

* DMV could not supply the required data in time for printing. For these data, contact Dr. James T. Lindley, Old Dominion University, (804-440-3567), or Dr. George E. Hoffer, Virginia Commonwealth University, (804-257-1717).

Comparing Allocated Costs and User Payments

Year 1976

Allocated costs and road user payments in 1976 for the several classes of automobiles and ICC certificated motor carriers are compared in Table 10. The costs and revenues include Federal and Virginia figures. The estimated allocated costs for automobiles in 1976 of 2.17 cents per mile can be compared with revenues of 1.33 cents per mile. Thus, automobiles covered 61 percent of their allocated costs in 1976. This underpayment is consistent with the findings of the Congressional Budget Office (CBO) study, which, in comparing Federal costs and revenues only, estimated that automobile user revenue convered 90 percent of their costs. 1/

The allocated costs for Virginia-domiciled, ICC certified carriers were 8.33 cents per mile, while the same carrier was estimated to pay 7.47 cents per mile in user charges. Thus, this class of carrier paid approximately 90 percent of its allocated costs in 1976. Virginia carriers came closer, both in percentage terms and in absolute terms, to covering allocated costs than did automobiles. The same cannot be said of foreign-domiciled common carriers, both from IRP states and non IRP states. Allocated costs for these foreign-domiciled carriers were 8.66 cents per mile while their payments were 5.72 cents per mile for IRP state carriers and 5.46 cents per mile for non IRP state carriers. These payments represent

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1/ Congressional Budget Office, Who Pays For Highways: Is A New Study of Highway Cost Allocation Needed?, September, 1978, p. 16.

TABLE 10

Comparison of Allocated Costs and Revenues
by Vehicle Class, 1976 and 1978

Vehicles	1976 Revenues Cents Per Mile	1976 Costs Cents Per Mile	1976 % of Costs Covered by Revenue	1978 Revenues Cents Per Mile	1978 Costs Cents Per Mile	1978 % of Costs Covered by Revenue
Automobiles	1.33	2.17	61 %	1.33	3.57	37*
All Common Carriers	5.96	8.57	70			
Virginia Resident	7.47	8.33	90		14.05	53*
Non-Resident, IRP	5.72	8.66	66		14.56	39*
Non-Resident, Non IRP	5.46	8.66	63		14.56	38*
Line Haul	5.60	8.17 [1/]	69		13.76 [1/]	41*
		9.96 [2/]	56		17.05 [2/]	33*
Pickup and Delivery	8.08	4.63 [3/]	175			
		8.53 [4/]	95			
80,000 pounds	5.60				18.56 [5/]	30*
					20.46	27*

* Calculated as a percentage of 1976 revenue. Revenue figures were unavailable when this report was printed. See page 35 for details. There is every reason to believe that 1978 revenues will be no more and perhaps less per mile than for 1976.

[1/] 4 axle (s-S2) for-hire, diesel.

[2/] 5 axle (3-S2) for-hire, diesel.

[3/] 3 axle for-hire, diesel.

[4/] 3 axle (2-S1) for-hire, diesel, semi.

[5/] 5 axle (3-S2) for-hire (20.16) private (18.56), both diesel.

66 percent of the allocated costs for IRP based carriers and 63 percent for non IRP based carriers.

For 1976, line haul revenues fall significantly short of the costs for four and five axle, semi-combinations. Line haul revenues were 5.60 cents per mile, while costs for these vehicles (2-S2 and 3-S2), for-hire, diesel) were 8.17 and 9.96 cents per mile. These vehicles covered 69 and 56 percent of their costs respectively. However, pickup and delivery vehicles more than covered their costs. Revenues from this group were estimated to be 8.08 cents per mile, while allocated costs ranged from 4.63 to 8.53 cents per mile. These payments represented from 95 percent to 175 percent of estimated allocated costs. The comparison of these results with those of the CBO report, which is based on an unpublished Federal Highway Administration study, is less clear than in the case of automobiles. The CBO report estimated that "Single-Unit Trucks" paid 136 percent of their costs, and "Combination Trucks" paid 102 percent of their costs. [1/] At least part of the difference can be explained by differences in vehicle classification and base year. Pickup and delivery includes some semi-combination trucks as well as single-unit trucks. While the magnitude of the results differ for the Federal when compared to the Federal and Virginia, the direction is the same. Smaller trucks pay much more of their allocated costs than larger property carrying vehicles.

[1/] Ibid., p. 16.

Year 1978

When this study was undertaken in late summer, 1979, it was anticipated that 1978 revenue data would be included. Because of changes in the ICC M-1 reporting format, it was necessary to utilize DMV more heavily. The Division agreed to supply the data, but was unable to supply it by early December. Because of the time constraint in publishing this report (the Revenue Resources and Economic Commission's budget expires December 31, 1979), the report had to be published without 1978 revenue data for trucks. When the new data become available, the authors will distribute the results to interested parties.

Given the nature of the taxes, however, and the past trends, there is every reason to believe that per mile revenues for carriers will either slightly decline or remain steady as they did for automobiles. Motor carrier fuel efficiency has continued to increase. In the judgement of the authors, using 1976 revenues in place of 1978 revenues will not do an injustice to motor carriers.

As can be seen in Table 10, costs have increased rapidly in the period from 1976 to 1978. The highway construction index rose from 182.6 in 1976 to 311.9 in 1978. Two points should be made regarding the rapid increase in the index. One, the index may level off or even fall if it reacts as it did in the last recession. The index, which was 235.0 in 1974, fell to 182.6 in 1976. The second point is that even if it levels off or declines, the costs in 1979, 1980, or 1982 will not be significantly lower than those shown in Table 10 and perhaps greater.

Thus, it is not only trucks which are underpaying on highways; automobiles were underpaying in 1976 and the underpayment is greater in 1978. The magnitude between costs and revenues strongly suggests that Virginia is rapidly disinvesting in highways. With the traditional highway users all underpaying, it is even more crucial to carefully consider additional demands that are being made on highways. One such demand is the increase of truck weights to 80,000 pounds from the original 73,280 pounds for which the interstates were designed. In Table 10, the underpayment can be seen. Revenues are assumed to be the same as for general line haul vehicles since there is no additional fee for registering trucks capable of legally carrying 79,800 pounds in Virginia. It is possible that heavier weights could result in lower miles per gallon and thus, higher revenues. Even so, however, the gap between revenues and allocated costs is so large that any understatement of revenue would be academic. It is estimated that 80,000 pound vehicles would be paying approximately 30 percent of their costs. Allocated costs are only one part of the issue. For a discussion of the impact of 80,000 pound vehicles, see Cost Allocation and Heavier Truck Weights, page 55 of this report.

Cost Allocation and Heavier Truck Weights

One of the deficiences of cost allocation studies of the past is that costs were based on a given life expectancy of the highways under consideration. Deterioration of highways at a rate faster than that used in the studies results in an understatement of costs.

Deterioration is a function of weather, use, original design and construction. Weather is obviously not a variable that can be controlled. Design and construction and use are legislatively and administratively determined.

Heavier loads are a use that is a function of administrative actions. Since the 1973 base period for the 1976 RREC transportation study, Virginia's maximum weight limits have been increased from 73,280 pounds to 76,000 pounds with a 5 percent average allowance resulting in 79,800 pounds legal weights. In 1979, by executive order, the limit was raised to 80,000 pounds. In addition, the ICC has liberalized its back haul regulations. Relaxation of back haul rules allow private and for-hire carriers to legally carry revenue producing loads on return trips. While this increases carrier efficiency and lowers cost per mile, it increases the average weight per mile, an important function in cost allocation studies.

More important to allocating cost responsibility is the fact that present and proposed truck weights are outside the information boundaries

of previous cost allocation studies. Allocated costs for 80,000 pound trucks are estimated in Table 11 through interpolation.

TABLE 11

Estimate of Allocated Costs for Carriers Using 80,000 Pound Trucks

	Allocated Construction Cost Responsibility Federal Portion Only, Federal Aid Highways 1964 Dollars	Allocated Total Construction Cost Responsibility in 1978 Dollars	Allocated Total Maintenance Cost Responsibility in 1978 Dollars	Total Allocated Construction and Maintenance Cost Responsibility in 1978 Dollars
5-axle (3-S2)				
Private:				
gasoline	2.773	16.78	.852	17.63
diesel	2.887	17.48	1.077	18.56
For-Hire:				
gasoline	3.033	18.36	.847	19.21
diesel	3.213	19.45	1.009	20.46

TABLE 12

Allocated Cost Per Mile by Incremental Method
by Class of Carrier, 80,000 pounds
1978

Class of Carrier	Costs in Cents Per Mile
Virginia-domiciled, ICC certificated Class I	14.53
Foreign-domiciled, ICC certificated Class I	15.16

Allocated costs for 80,000 pound vehicles are calculated by dividing the 1964 cost figures by 66,000 pounds (the maximum pounds used in the tests) and multiplying this by 80,000 pounds. A linear projection is used for an exponential relationship, thus, underestimating the true costs. Maintenance costs were assumed to be the same, resulting in even more conservative estimates.

Costs for 80,000 pound trucks vary from 17.63 to 20.46 cents per mile. Revenues, (Table 4) are 7.5 cents per mile for Virginia-domiciled and 5.5 cents per mile foreign-domiciled vehicles. In Table 12 the fleet mix was adjusted to include 80,000 pound vehicles by answering that 25 percent of 3-S2 diesel powered miles would be at 80,000 pounds. The 1978 average allocated costs for carriers increased from 14.05 to 14.53 15.16 cents per mile for foreign-domiciled carriers.

Other attempts have also been made to measure the impact of heavier loads on highways. Most of the work done, though, is in the terms of what heavier weights will do to existing highways and not what the incremental costs are for constructing new highways built to the heavier weight requirements.[1/]

One such study on existing highways was prepared by the Arkansas State Highway and Transportation Department. Using engineering data from the Asphalt Institute and AASHO, the Department estimated the reduction in pavement service life due to the increase in truck weights from 73,280 pounds to 80,000 pounds. [2/]

1/ General Accounting Office, Comptroller General, Excessive Truck Weights: An Expensive Burden We Can No Longer Support, July 16, 1979, p. ii.

2/ Arkansas State Highway and Transportation Department, "A Study of the Effects of Proposed Weight Limit Increases on Arkansas Highways", July, 1979.

The loss of remaining service life of a primary highway was estimated to be 35 percent, while that of a secondary highway was 53 percent. The Department found that the loss of remaining service life of concrete pavement was 8 percent.

The Department projected a 40 percent increase in budgeted expenditures over a ten year period if Arkansas highways were subjected to heavier truck weights. The GAO estimated an increase in traffic related pavement damage by 35 percent. [1/] Whatever the rate of increased deterioration, there is little doubt that heavier weights reduce existing pavement life. Highways designed for 73,280 pounds will have reduced service life under 80,000 pounds.

Previous cost studies as well as this one cannot adequately address the impact of higher weights using present data. Because previous engineering tests were for weights of 66,000 pounds or less, 80,000 pound weights are outside the range of data. The Ottawa road tests from which the basic data for the present study were gathered, assumed costs for a highway that would last for a specific time for the measured weights. If 80,000 pounds had been in the test, the cost for vehicles carrying 80,000 pounds would have reflected the increased costs of constructing a road sufficient for that weight. The estimate in Table 11 is a conservative estimate of the added costs of 80,000 pounds. Even if it were

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1/ General Accounting Office, Comptroller General, Excessive Truck Weights: An Expensive Burden We Can No Longer Support, July 16, 1979, p. ii.

the actual amount, however, it is not the only consideration. Having accurate cost allocation data on 80,000 pound trucks would not address the problem that highway departments face - the monetary impact on existing roads of 80,000 pounds.

Indeed, much of the concern over increased weights has been over the impact on existing roads. Conceptually, it is possible to estimate the magnitude of the problem by using a standard depreciation concept of the highway system.

A current dollar value of the highway system can be calculated by bringing lane-mile construction costs to current dollars and then depreciating this gross value over the expected life of the system. The value of primary and interstate highways in Virginia is estimated to be 10.6 million in 1977 dollars. With a life expectancy of 25 years, the depreciated value for each year would be 410.4 million dollars (.04 x 10.26 billion). This seems reasonable since 1978 expenditures were 700 million dollars. If, however, increased truck weights decrease the life expectancy of highways, such must be taken into account. Decreased life means a faster rate of depreciation and higher depreciation amounts. The higher depreciation amounts are totally attributable to those vehicles carrying the increased weights. In Table 13, various percentage decreases in life expectancy are calculated in terms of increased depreciation amounts. A 20 percent decrease in life expectancy would amount to an increase in depreciation of 102.6 million dollars. In Virginia, this translates to 7 cents per mile for all trucks, but 18 cents per mile for trucks capable of carrying 80,000 pounds. A one percent decrease would translate into

TABLE 13

Theoretical Relationship Between the Decrease in Highway Life Due to Increased Weight Limits, and the Rate of Depreciation

% Decrease in Life	Years of Remaining Life	Depreciation Rate	Depreciation Amount	Amount Charged to Vehicles of Increased Weight
			(in millions)	(in millions)
0	25.00	4.00	410.100	0
5	23.75	4.21	431.946	21.546
10	22.50	4.44	455.544	45.144
15	21.25	4.71	483.246	72.846
20	20.00	5.00	513.000	102.600
25	18.75	5.33	546.858	136.458
30	17.50	5.71	585.846	175.446
35	16.25	6.15	630.990	220.590
40	15.00	6.67	684.342	273.942
45	13.75	7.27	745.902	335.502
50	12.50	8.00	820.800	409.600

1.5 cents per mile for all trucks and 4 cents per mile for heavy trucks.

These changes would be in addition to the allocated costs in Table 11. In essence, trucks carrying weights above 73,280 pounds would pay allocated costs for construction and maintenance plus the additional depreciation amounts. At the end of the 25 years, all of the system would have been replaced and trucks over 73,280 pounds will be charged only their allocated construction and maintenance costs.

The paucity of data on 80,000 pound trucks and the lack of more in-depth analysis on the value of the present highway system leads the authors to make the following caveats. The use of interpolation to calculate allocated costs for 80,000 pound trucks involves assumptions about the reliability of the data to predict outside the sample bounds. Since a linear interpretation was used for a curvilinear relationship, the error is to understate allocated costs for 80,000 pound trucks. While the depreciation approach to putting a value on damage caused by heavier loads is theoretically sound, there are practical problems. The calculations based on real lane mile construction values can vary with the period covered and the index used. Also, the depreciation should only be charged against reconstruction costs. The right of way would not have to be repurchased. The expected life will also change the value of the system. Not withstanding the above problems, it is evident that 80,000 pound trucks are an issue that involves potentially large costs and large related revenues.

VIRGINIA'S TRA SPORTATIO TAXATION RE ENUE PICTURE

Since Virginia relies heavily upon a fuel tax that is applied on a per gallon basis and upon flat rate license, it is not suprising that inflation has reduced Virginia's transportation tax revenues. A gap has developed between revenues and projected expenses for highway needs. Gary Allen of the Virginia Highway Research Council has forecasted that this gap will rapidly widen. [1/] It should be noted that this gap is not the result of rapidly expanding services, but of decreasing revenues. The highway fuel tax has historically been a per gallon tax. Through 1973, gallons consumed increased at a rate sufficient to offset inflation. However, since 1974, the amount of dollars received from fuel taxes has declined in real terms. To view it another way, fuel taxes have consistenly purchased fewer miles of highways since 1974.

Tables analyzing Highway Department data begin on page 63. In able 14, the motor fuel tax and license tax revenues are deflated into 1972 dollars. n this manner, we are able to compare one year's revenues to another without the distortion of inflation. Except for fiscal year 1973, when an increase in the tax rate was legislated, [2/] the real revenue (1972 dollars) from fuel taxes has declined (Column 1). If motor fuel tax revenues are projected and deflated with a 6 percent inflation rate, the picture darkens. Added to this is the fact that fuel taxes presently

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1/ Allen, Gary, R., The Desirability and Feasibility of Alternative Means of Financing Transportation in Virginia, November, 1978.

2/ Code of Virginia, Section 58-711.

TABLE 14

Major Highway Department Revenues Deflated to 1972 Dollars [1/]
(in thousands of dollars)

Year	Deflated Fuel Taxes	Deflated Registration and Licenses	Deflated Sales and Use Taxes
1968	$174,907	$60,304	$25,538
1969	180,392	62,148	28,768
1970	179,382	60,008	30,849
1971	186,443	61,097	31,882
1972	190,968	65,691	38,054
1973	235,434	65,954	43,073
1974	234,620	57,313	37,119
1975	196,017	55,654	32,127
1976	189,196	56,543	36,971
1977	186,307	56,216	41,224
1978	180,783	51,645	45,299
1979	168,595	50,616	43,544
1980	160,405	51,381	46,289
1981	156,034	51,342	49,078
1982	149,242	51,351	52,133
1983	142,092	51,343	55,325
1984	133,670	51,311	58,728
1985	129,640	51,338	62,358

1/ Deflated with Gross National Product implicit price deflator, Survey of Current Business, October issue of the respective years. 1972 is the base year. Years 1979-85 were deflated at 6 percent per year. Years 1968-78 are from the Financial Supplement to Virginia Highway and Transportation Annual Reports. Years 1979-85 are from Gary Allen, The Desirability and Feasibility of Alternative Means of Financing Transportation in Virginia, November, 1978.

constitute 60 percent of the State revenue and are used to finance the Highway Department. Licenses, which constitute 20 percent of State revenues, show similar movement downward (Column 3). Some of the declining aspects are from the Sales and Use Tax on motor vehicles which constitutes 15 percent of State revenue to the Department of Highways (Column 9).

In Table 15, Virginia highway user tax revenues are compared with State personal income data. Thus, Table 15 represents a measure of the relative burden of highway user taxes to Virginians. Both total State highway revenues and fuel taxes (Columns 1 and 2) show secular declines, indicating a decreasing burden for Virginians. Revenues have also declined on a per capita basis (Columns 3 and 4).

Table 16 shows deflated maintenance expenditures. Noteworthy is the increase in interstate maintenance expenditures (a 96 percent increase from 1968-1978) as the interstate system ages.

Table 17 shows deflated revenue per lane mile. The pattern is clearly one of decline in fuel tax, license fees, and total revenues since 1973.

Fixed fee licenses and a per unit motor fuel tax coupled with inflation has led to a rapid decline in real highway revenues. Information gleaned from examining highway revenues is consistent with the results from comparing per mile costs of automobiles and trucks with their respective per mile revenues. Revenues have not kept pace with costs and a disinvestment in highways exists at this time.

TABLE 15

Revenues of the Highway Department as a Percentage of Income and Per Capita

Year	Total Highway Revenue From Virginia as a % of Income	Fuel Taxes as a % of Income	Deflated State Revenues Per Capita	Deflated Fuel Revenues Per Capita
1968	2.52	1.02	59.87	38.38
1969	2.48	1.01	61.47	39.10
1970	2.33	0.97	60.99	38.59
1971	2.25	0.97	62.11	39.50
1972	2.12	0.91	65.09	40.08
1973*	2.28	1.06	73.93	48.60
1974	2.12	1.04	69.65	47.79
1975	2.10	0.87	60.34	39.36
1976	1.95	0.79	59.76	37.60
1977	1.91	0.75	58.93	36.28

1/ Deflated to 1972 dollars by GNP implicit price deflator, Survey of Current Business, U.S. Department of Commerce. Income figures from Survey of Current Business, October issue of the respective years. Income figure is an average of the four quarters.

* A Fuel Tax increase of 2 cents per gallon was levied for the 1972-73 fiscal year.

TABLE 16

Deflated Highway Maintenance Expenditures
Per Respective Lane Mile [1/]
(1972 Dollars)

Year	Primary Maintenance Per Lane Mile	% Change	Total Secondary Expenditures Per Lane Mile	% Change	Interstate Mainentance Per Lane Mile of Interstate	% Change
1968	1355.9		973.0		1833.6	
1969	1408.3	3.9	889.9	-8.5	1851.1	1.0
1970	1454.3	3.3	973.7	9.4	2389.2	29.1
1971	1278.3	-12.1	946.4	-2.8	2374.9	-.6
1972	1329.5	4.0	936.9	-1.0	2046.4	-13.8
1973*	1269.3	-4.5	1070.0	14.2	2267.0	10.8
1974	1236.9	-2.6	1112.0	3.9	2473.3	9.1
1975	1221.7	-1.2	1026.7	-7.7	2678.6	8.3
1976	1098.7	-10.1	909.4	-11.4	2298.8	-14.2
1977	1852.1	68.6	917.9	.9	3524.7	53.0
1978	1710.8	-7.6	1074.7	17.1	3585.0	1.7
Percentage change from 1978		26.0		10.5		96.0

[1/] Deflated with State and Local Government Price Index, Survey of Current Business, October issue of the respective years.

* A Fuel Tax increase of 2 cents per gallon was levied for the 1972-73 fiscal year.

TABLE 17

Deflated Revenues (1972 Dollars) per Lane Mile 1/

Year	Deflated Fuel Tax Per Lane Mile	Deflated License Fees Per Lane Mile	Deflated Revenues Per Total Lane Mile
1968	1673.8	634.2	2610.7
1969	1700.6	677.4	2674.3
1970	1681.3	642.4	2657.2
1971	1740.0	658.1	2735.9
1972	1774.1	706.5	2881.3
1973 *	2175.5	687.2	3309.5
1974	2155.5	595.6	3141.4
1975	1789.6	621.6	2743.8
1976	1722.4	644.3	2737.7
1977	1688.6	644.4	2742.2
1978	1636.0	561.7	2709.0

1/ Deflated with GNP Implicit Price Deflator, Survey of Current Business, U.S. Department of Commerce.

* A Fuel Tax increase of 2 cents per gallon was levied for the 1972-73 fiscal year.

Implications for Policy

If one translates the underpayment of allocated costs into revenues for automobiles and common carriers, the projected tax increases would be quite large. For example: the allocated costs for automobiles in 1978 is 3.57 cents per mile while revenues are 1.33 cents per mile, leaving a shortfall of 2.24 cents per mile.

Assuming a conservative 2 cents per mile underpayment, it would require an additional 28 cents per gallon on fuel to make up the difference. Although most would consider such an increase appalling, some comparative analysis may help. It should be noted that this automobile underpayment is a relatively recent phenomenon. For instance, 1964 construction and maintenance costs for automobiles were estimated to be 1.10 cents per mile, while 1964 automobile user payments per mile were estimated to be 1.53 cents per mile. Thus, in 1964, it is estimated that automobiles covered 130 percent of their allocated costs.

Another way to look at the situation is that if highway user taxes had only kept pace with the consumer price index (1967 base) the general fuel tax would be 16 cents per gallon. If it had kept pace with the construction price index, it would be 22 cents per gallon. Similarly, if license and registration fees had increased with the Consumer Price Index since 1967, the registration costs for automobiles under 4000 pounds would be $30.00 and for greater than 4000 pounds, $40.00. If inflated by the construction index, the costs would be $45.00, and $60.00, respectively.

Although high by U.S. standards, even with such an increase, it would leave the fuel tax a small fraction of that levied in other industrialized countries.

For common carriers, the cost increases would be in the same relative magnitude. For a Virginia based common carrier, the 1978 costs were 14.05 cents per mile and estimated revenues, 7.47 cents per mile. This leaves a difference of 6.58 cents per mile. Assuming a fuel tax increase of 28 cents, as calculated for automobiles, trucks would be paying an additional 5 cents per mile if the fleet average were 5.5 miles per gallon. It would require roughly an additional one cent per mile to fill the gap. This translates into an additional 6 cents a gallon surcharge. The ratio of an additional 6 cents surcharge to an additional 28 cents per gallon tax is .21, very close to the .22, as it is presently, but less than it was in 1972 (.29) and 1964 (.33). It should be kept in mind that the truck figures do not include trucks weighing more than the 66,000 pounds used in the 1964 study.

Heavier weights are an issue which cannot be ignored because of the exponential relationship between weight and highway deterioration. This study has attempted to deal with the issue using the limited data available. The authors would urge more study into heavier weights before decisions are made. Some states have attempted to tax according to weight by adopting a third structure tax.

Examples of third structure taxes are gross receipts taxes, ton-mile taxes, and weight mile taxes. (At one time, Virginia had a gross receipts tax). The states that collect third structure taxes are receiving a larger percentage of their revenues from trucks. (Table 6).

The ability to differentiate users and charge them their allocated costs has been one of the strengths of the taxation system used to finance highways. The rather large differences between line haul and pickup and delivery trucks, and Virginia-domiciled and foreign-domiciled trucks shows an inequity between truck owners. A weight mile tax can address these inequities better than license taxes or fuel taxes.

A ton mile tax is a tax based on the miles travelled and the tons hauled. This credits trucks for those times that trucks are empty or lightly loaded and consequently do less damage. A problem with the tax is that it requires detailed bookkeeping on the part of the industry as well as on the part of the government.

The weight mile tax is much easier to administer and Virginia currently has the bureaucracy to administer it. A weight mile tax is charged by weight category based on registration applied on a per mile basis. This tax does not take into account empty or less than full load situation. At the same time, it does assess load situations more adequately than the second structure taxes.

Legislation has been proposed in Maryland that would address this issue. Concerned about the damage done by increased weights, Maryland has proposed a "Relative Road Damage Factor" based on weight. The factor is multiplied by the fuel tax. The proposed amendment which follows would result in a 73,000 pound truck paying 42 cents per mile (.09 x 4.7 damage factor). The amendment is reproduced here because of its uniqueness but no attempt is made to confirm the validity of the factors used. What such a tax does is to allow trucks to tailor the taxes to their particular

business. Under the Maryland proposal, if their gross loads do not exceed 50,000 pounds, they would not be subjected to greater taxes.

Amending the road tax on Maryland motor carriers to reflect the differences in damage to pavement surfaces by vehicles of various weights.

ARTICLE: REVENUE AND TAXES

AMENDING SECTIONS 413 and 414

Sec. 413. Calculation of the road tax.

[(a) Every motor carrier shall pay a road tax calculated on the amount of motor fuel consumed in its operations on highways within this State. The tax shall be at the same rate as the tax applicable to the purchase of the same motor fuel within this State and shall be paid pursuant to rules and regulations promulgated by the Comptroller of the State of Maryland.]

(a) EVERY MOTOR CARRIER OF FIVE (5) OR MORE AXLES SHALL PAY A ROAD TAX CALCULATED TO REFLECT THE DIFFERENCES IN ROAD DAMAGE OCCASSIONED BY VEHICLES OF DIFFERENT WEIGHTS. THE TAX SHALL BE BASED ON THE TAX APPLICABLE TO THE PURCHASE OF MOTOR FUEL WITHIN THIS STATE MULTIPLIED BY THE AMOUNT OF MOTOR FUEL USED FOR OPERATIONS ON HIGHWAYS WITHIN THIS STATE MULTIPLIED BY THE RELATIVE ROAD DAMAGE FACTOR FOR THE REGISTERED WEIGHT OF THE VEHICLE AS ESTABLISHED IN THE SCHEDULES BELOW:

Weight - Pounds	Relative Road Damage Factor
50,000	1.0
51,000	1.1
52,000	1.2
53,000	1.3
54,000	1.4
55,000	1.6
56,000	1.6
57,000	1.7
58,000	1.8
59,000	2.1
60,000	2.1
61,000	2.2
62,000	2.4

63,000	2.6
64,000	2.7
65,000	2.9
66,000	3.0
67,000	3.3
68,000	3.4
69,000	3.7
70,000	3.9
71,000	4.1
72,000	4.4
73,000	4.7

(b) The amount of motor fuel consumed in the operations of any motor carrier on highways within this State shall be needed to such proportion of the total amount of such motor fuel consumed in its entire operations within and without this State as the total number of miles travelled within and without this State. (1975, ch. 842, Section 1; 1967; ch. 539, Section 1.)

Section 414 (d) CONDITION ON CREDITS AND REFU DS -- THE A OUNTS OF CREDITS AND REFUNDS FOR VEHICLES REGISTERED FOR GROSS WEIGHTS OF 66,000 POUNDS OR MORE SHALL BE CALCULATED IN A MA!NER WHICH ACCOUNTS FOR THE ROAD DAMAGE LIABILITY ESTABLISHED BY SECTION 413 OF THIS SUBTITLE.

Another approach is one used by Arkansas which has truck license fees graduated by weight in thousand pound increments. Trucks are classified in eight different classes with eight different rates per thousand. For example: trucks from 40,000 to 55,000 pounds have a rate of $11.05 per thousand, making a 55,000 pound truck pay $608. Trucks from 68,000 to 73,000 pounds have a rate of $14.30 a thousand, with a 73,000 pound truck paying $1,044. [1/]

[1/] B. K. Cooper, "Truck Size and Weight Study Public Meeting", Greensboro, North Carolina, Arkansas State Highway and Transportation Department, July, 1979.

Other Transportation Issues

Although the purpose of this report is to focus on the monetary aspects of transportation costs and revenues, other considerations are important. Issues of equity, land-use, safety, and economic growth concern many of the Commonwealth's citizens. Included among the issues are intermodal equity between competing modes of transportation, the trade-offs between private automobile use and mass transit, and the social and environmental trade-offs that exist with various transportation decisions.

Other work exists that deal with these issues singularly and collectively, and no attempts are made here to significantly address them. The following points, however, should be kept in mind when making decisions regarding transportation taxation.

Competing modes of transportation are treated unequally if one mode is not paying its full cost of operation because of differential tax treatment.

There are disturbing preliminary indications that increased truck weights combined with smaller automobiles have resulted in a higher fatality rate for truck-automobile accidents.

If energy efficiency is to be considered, it is logical to consider it in terms of energy efficiency between modes as well as for one mode. For example, while a truck carrying heavier loads is more energy efficient than one lightly loaded, if the heavier load is directed from rail to truck because of the ability of a truck to carry higher weights, there has been a decrease in energy efficiency.

Mass transit supporters are proposing to direct fuel and license tax revenues from highway use to mass transit. Such a move will change the user charge aspect of these taxes that currently exists. In support of mass transit, it should be pointed out that commuters will more likely choose the private automobile over mass transit, if the automobile is not paying its allocated costs.

SOURCES

TRANSPORTATION TAXATION IN VIRGINIA

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