existing road system. This shortfall and future needs for new construction mandate consideration of new approaches in financing highway improvements. Involvement of the private sector in funding highway improvements has been successful in some cases and has significant potential for increasing the funds available.

The potential for obtaining private funds is closely related to the strength of the real estate development sector of the economy. Experience and common sense tell us that in an adverse market, the funds available for highway improvements are diminished. Figure 5 presents a simplified graphic representation of the economic context for the use of private funds for highway improvements. This graph shows that real government expenditures for this type of infrastructure tend to rise and fall in relatively gradual cycles. The real estate development market, however, is more volatile and can experience sharp increases and declines. Although the two areas are related, their peaks and valleys do not necessarily coincide. The result is a variation in the potential for private funding.

When the expenditures of government and the private sector are both at high levels, the potential for obtaining private funds is greatest. When government spending is reduced but the development market is strong (as is currently true in some areas of the country), there is potential for private funds to replace some portion of public spending. When the development market is depressed (as is currently the case in many other parts of the country), increased public expenditure may be needed to stimulate private investment.

Review of analyses of innovative financing mechanisms for other types of transportation improvement suggests that there are some techniques that hold considerable promise. These include incentive zoning regulations that offer a developer density increases in exchange for public improvements and dedicated property taxes or special benefit assessments that set aside all or a portion of a levy on a specified group to pay for needed improvements. The lease or sale of air rights may also provide a source of private funds.

The review of current practice and examples of the use of private funds indicates that there is substantial experience and current activity in this field. Preliminary investigations suggest that there may be no way to estimate how much activity of this type exists. Moreover, experience with techniques to obtain private funds is extremely varied. Further study and analysis are needed to document past experience and extend the knowledge of useful techniques to highway planners throughout the country.

REFERENCES

1. P. Choate and S. Walter. America in Ruins: Beyond the Public Works Pork Barrel. Council of State Planning Agencies, Washington, DC, 1981.
2. Report to the Congress: Deteriorating Highways and Lagging Revenues--A Need to Reassess the Federal Highway Program. GAO, Washington, DC, March 5, 1981.
3. Gladstone Associates. Innovative Financing Techniques: A Catalog and Annotated Bibliography. Urban Mass Transportation Administration, U.S. Department of Transportation, Jan. 1978.

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State Highway User Taxes: Comparative Tax Structures and Current Trends

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An attempt is made to interrelate and analyze the important state highway user taxes within their historical context. First are the registration fees for automobiles and light trucks. These are sometimes referred to as first-structure taxes. Second are the motor fuel, or second-structure, taxes. Third are the heavy-truck registration, weight, and mileage taxes, or third-structure taxes. Eighteen states increased and five states decreased their automobile registration fees in 1981. Some states have changed from flat fees to fees based on weight or horsepower to encourage the energy-saving potential of lighter vehicles. Five states base their fees on weight and age or value. This is one method of trading off the conflicting values of energy conservation and not unduly penalizing low-income households that own older, heavier vehicles. A motor fuel tax is relatively inexpensive to administer and is most closely related to use, so the taxes to cover costs of providing highway service can be related to the benefits received. As a result, 26 states increased their motor fuel taxes in 1981. In order to keep up with inflation, eight states have completely converted their motor fuel tax from a cents-per-gallon to an ad valorem tax (percentage of price). Ten states have changed to a combined cents-per-gallon and ad valorem tax. User taxes for heavy trucks include graduated registration fees and weight, mileage, and gross-receipts taxes. Generally, states attempt to relate taxes to benefits obtained from highway service and the costs occasioned to the system and seek to minimize administrative costs of collecting the taxes.

Beginning in the last quarter of the 18th century and extending to the railroad era in the middle of the 19th century, tolls were levied to support turnpikes in America. Aside from these early tolls, which were very grudgingly paid, the first user tax was a registration fee. The first registration fee was enacted by New York in 1901 as a regulatory mechanism; the practice soon spread and by 1921 every state required registration fees.

The next type of user tax was the fuel tax, first adopted by Oregon in 1919. This tax spread quickly throughout the country, and by 1929, all states had levied fuel taxes. One reason for the popularity of the fuel tax was that it was related to road use to some degree. Since heavier vehicles consumed more fuel than lighter ones, the fuel tax compensated for some of the additional wear by the heavy vehicles. Another reason for the popularity of the fuel tax was its low collection and administration costs. Typically, less than 1 percent of receipts was used for those purposes.

Although registration fees and fuel taxes were

Table 1. State highway revenue trends.

Revenue Source	Percentage of Total Highway Revenue					
	1921	1935	1950	1965	1975	1980
User fee						
Fuel tax[a]	1	38	39	31	30	25
Registration fee[a]	22	21	22	14	15	16
Toll	-	2	3	6	6	5
Subtotal	23	61	64	51	51	46
Federal aid	18	23	16	39	33	38
Other						
Property and general revenue	15	1	2	1	4	7
Bonds	35	12	15	6	8	4
Investments	1	1	1	2	3	4
Local aid	8	2	2	1	1	1
Subtotal	59	16	20	10	16	16

[a]Net revenue after distributions to local government.

related to the use of the system, many felt that these taxes did not adequately reflect the added costs associated with heavy vehicles. One way to redress this problem was to levy graduated registration fees based on vehicle weight. This method, however, discriminated against heavy vehicles that were not used extensively. To compensate for this discrimination, many states granted full or partial exemption to vehicles engaged predominantly in low-mileage functions, such as farm vehicles. Other states developed weight-mileage taxes, which were based on the weight of the vehicle and the distance it traveled. The latter form of tax was usually referred to as a "third-structure" tax, which, interpreted loosely, could refer to user fees levied against heavy vehicles.

Probably because they were the first user fees levied, registration fees conventionally are considered "first-structure" taxes. These fees, somewhat similar to an entrance fee or cover charge, finance a portion of fixed costs that do not vary with use. "Second-structure" taxes are fuel taxes, which measure the use of the system. Third-structure taxes account for the impact of vehicle weights. The growth of user taxes to finance roads resulted partly from expediency and also from the need to adopt general highway finance principles. These user taxes will be discussed in detail in the following sections.

HIGHWAY REVENUE TRENDS AND FUNDING APPROACHES

State highway finance has evolved considerably over time. Table 1 (1, Tables HF-211 and DF-201; 2, Tables HF-10 and SF-1) gives state revenue trends over a 60-year period; the first subtotal represents net revenue from state user fees after distribution to local governments. At the beginning of the period, states relied heavily on registration fees, general revenue, and bonding. As the traffic-carrying function began to predominate, more reliance was placed on fuel taxes and less on general revenues and bonds. Considerable change has occurred in intergovernmental payments; federal aid has grown to more than one-third of total revenue.

The following major trends can be observed:

1. State revenues from user fees grew dramatically during the period 1921-1935 and peaked at 64 percent in 1950.
2. State revenues from user fees, as percentages of total highway revenue, have been declining since 1950. For 1980, net state user fees represented 46 percent of total revenue.
3. Of the percentage drop in revenues from user fees, two-thirds has been in fuel taxes and one-third in registration fees.
4. Federal-aid revenue grew in parallel with state user revenue until 1935 and peaked at 39 percent in 1965. Federal aid provided 38 percent of state highway receipts during 1980. If federal aid is combined with the state user fee subtotal, the combined percentage peaked at 90 percent in 1965 and has declined since then.
5. The percentage contribution from property and general revenues was insignificant (1-2 percent) during the period 1935-1965 but recently has climbed to 7 percent.
6. In 1980, the use of bonds as a revenue source was at an historic low.

Some general observations may be drawn from these trends.

Federal aid has declined through 1982 from its previous peak in 1965. With the recent doubling of the federal highway user tax, federal aid will again immediately increase to a new peak. This will put additional pressure on states to provide new funds to match the higher levels of federal aid.

With the decline in state user fees, other sources have made up the difference. However, state budget constraints may make it difficult for property taxes and general revenue to rise above the 7 percent contribution in the future. Also, the peak may have been reached on investment income with an increasing number of states using cash-flow financial management. Finally, the decline in the use of bonds as a revenue source may be related to high interest rates. This situation has resulted in increased attention on user fees. Motor fuel taxes were increased by 26 states in 1981 and 12 states in 1982. These state increases, however, may not be adequate to overcome the complex problem of matching federal aid to address the backlog of needed improvements, accelerated deterioration of existing highways, increasing cost of highway improvements, and reduced user tax revenues from existing tax rates as a result of more fuel-efficient vehicles.

The data in Table 1 demonstrate the trends in net highway user revenues, that is, net revenues after distributions to local jurisdictions. A different picture emerges if comparisons are made among states for 1981. States vary in terms of proportion of the highway system under state responsibility and proportion of revenues returned to local jurisdictions; the next comparison is made by using state highway user revenues collected divided by total state vehicle miles of travel (VMT). Figure 1 (3) shows the state highway user revenues received by each state. For all states, the average is $11/1000 VMT, or 1.1 cents/VMT, with a range from 0.7 cent in Georgia to nearly 1.9 cents in West Virginia. The differences may be partly explained by additional revenues needed to compensate for bad weather and difficult terrain. Figure 2 may also show the relative success by states in obtaining adequate user taxes to maintain highway condition and service. Information of this nature may help support the reasonableness of a user tax increase.

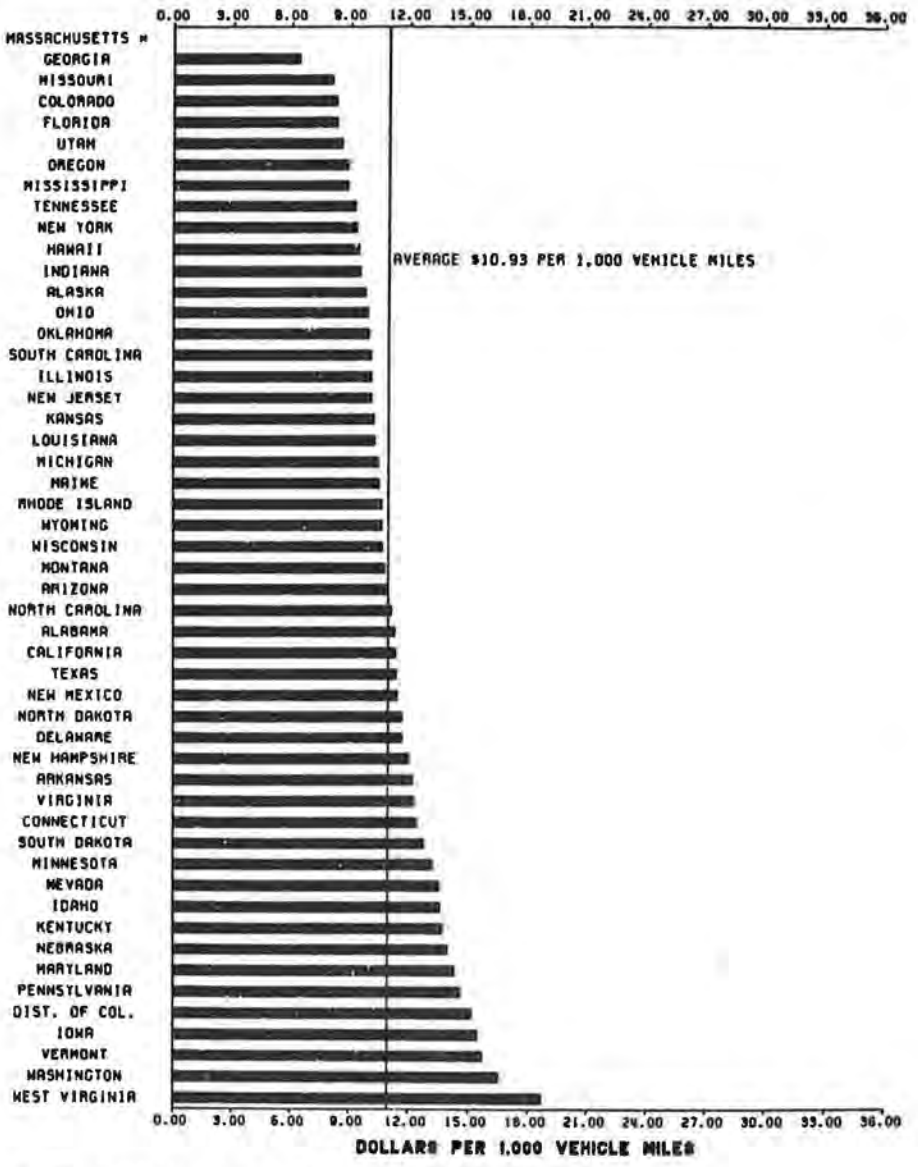
The next section examines specific state user fee structures and recent changes in registration fees, motor fuel taxes, and heavy-truck fees.

REGISTRATION FEES

Automobiles and Light Trucks

Registration fees are the earliest form of user taxes for highway purposes and are commonly referred to as first-structure taxes. They serve as an entrance fee for highway users. Vehicle registra-

Figure 1. State highway user revenue per VMT, 1981.



tions serve as both a regulatory function and a revenue source. Although the cost of administration is often large, this cost would be incurred in any event for the regulatory function. Therefore, the administrative cost from a tax viewpoint is negligible, and the incremental cost of increasing these fees is minor. However, registration fees are usually paid as a lump sum once a year. As such, it is a highly visible tax and substantial hikes are likely to be scrutinized closely by the public. First-structure taxes also include vehicle titling taxes and personal property taxes on vehicles; these will be discussed later. This section addresses automobile and light-truck registration fees. Heavy-truck registration fees are usually graduated based on weight. These fees will be discussed in the section following motor fuel taxes.

In the past, registration fees were typically a flat fee. However, as shown below (4, Table MV-103), automobile fees have changed to graduated fees; 25 states now use weight or horsepower as a basis:

Fee Basis	No. of States
Weight	16
Weight and age	4
Weight and flat fee	2
Weight and value	1
Horsepower	2
Flat fee	22
Age and value	3
Age	1
	51

Graduated registration fees have come about because of growing concerns about energy conservation and the desire to encourage the purchase of fuel-efficient vehicles. This practice, however, may not be equitable, because low-income households usually have to buy older and less-fuel-efficient vehicles. One method to trade off those conflicting values is to have a fee based on both weight or horsepower (plus) and value or age (negative) as is done by five states. A desirable attribute of including value in the basis for registration fees is that

newer vehicles usually have a higher value and travel more than older vehicles.

The average registration fee for a typical automobile in 1981 was $26.23, an increase of 21.38 percent as compared with that fee in 1980. The average registration fee for a typical single-unit truck was $89.30, an increase of 9.94 percent as compared with that in 1980. Twenty-three states have changed their registration fees from 1980 to 1981, as can be seen in Table 2 (4, Table MV-103). Eighteen of these states had increases; the average increase was $8.10. Arizona had the greatest increase, $46.59, perhaps because automobile registration fees increased by only $1.50 from 1973 to 1980 as compared with much larger increases in most states. Seventeen states changed their registration fee for single-unit trucks; in 14 states the increase averaged $31.88. Four of the five states that reduced their automobile registration fees did not change their fee for single-unit trucks. The remaining state, Ohio, reduced both of these fees.

Property Taxes

A personal property tax on motor vehicles is assessed by many governmental units. Personal property taxes are similar to registration fees in application and comprise a large portion of the total taxes paid on motor vehicles in some states. They are also similar to other property taxes because they are usually not available as highway revenue. Personal property taxes are usually collected and used by local jurisdictions. Before income taxes and the growth of a money economy, personal property taxes were an important element in state and local finance. Motor vehicles are especially easy to tax because the vehicle's value is readily available from independent sources and avoidance of the tax is difficult.

As found in a 1982 study (5), most states that have a high registration fee also have a low or no property tax. States that have a high property tax usually have a low registration fee. An example of this is New Jersey, which has a registration fee two and one-half times that of Massachusetts and South Carolina. However, the total motor vehicle taxes, including the property taxes, in Massachusetts and South Carolina far exceed those in New Jersey. In fact, as shown in Figure 2 (5, p. 41), 7 of the 10 states that have the lowest combined gasoline tax and registration fees have a property tax. Of the 10 states that have the highest combined gasoline tax and registration fee, only 2 have a personal property tax.

The relationship between registration fee and property taxes is illustrated by the data given in Tables 3 and 4 based on 1981 registration fees and property taxes for a 1980 four-door, medium-sized automobile (5, p. 24). [The registration fee in Table 2 may be different since the source (4, Table MV-103) contains additional fees and a different typical vehicle is used (1977 four-door sedan).] Five of the six states with the lowest registration fee also had a property tax, whereas the five states with the highest registration fee had no property tax. An exception is Louisiana, which has a registration fee of only $3/automobile and no property tax. This is a special case, since the state allocates to the highway program a substantial amount of revenue from severance taxes on oil. Connecticut, on the other hand, has a moderate registration fee of $20 but a personal property tax of $228, which is twice that of Arizona ($103).

Three out of four states examined had a substantial increase in property taxes between 1973 and 1981. Only Massachusetts showed a reduction, which may be a result of recent tax-law changes, e.g., Proposition 2 1/2. All of the states identified in Table 4 except Louisiana had an increase in registration fee since 1973.

Table 2. 1981 state motor vehicle registration fees and changes from 1980.

Item	1981 Registration Fee and Change from 1980			
	Automobile		Truck (single-unit, nonfarm)	
	Fee ($)	Change from 1980 ($)	Fee ($)	Change from 1980 ($)
State				
Alabama	13.75		45.50	
Alaska	30.00		80.00	
Arizona	54.59	+46.59	322.62	+245.62
Arkansas	30.00		91.00	
California	22.00	+11.00	147.00	+74.00
Colorado	10.10	-25.70	107.75	
Connecticut	20.00		91.00	+3.25
Delaware	20.00		66.80	
District of Columbia	42.50		163.50	
Florida	22.75	+0.75	83.75	+6.25
Georgia	8.00		8.00	
Hawaii	48.08		132.05	
Idaho	33.00	+5.00	30.60	+0.60
Illinois	30.00		130.00	
Indiana	60.25	+12.00	100.75	+0.50
Iowa	43.00	+3.00	110.00	
Kansas	19.50		75.00	
Kentucky	12.50		31.00	
Louisiana	6.00		100.00	
Maine	20.00		70.00	
Maryland	30.00		49.00	
Massachusetts	10.00	+3.00	98.00	+28.00
Michigan	23.00		243.00	
Minnesota	38.00	+11.00	62.00	
Mississippi	10.25		65.75	
Missouri	11.50	-9.00	50.50	
Montana	12.00		34.50	
Nebraska	16.50		86.50	
Nevada	16.00	+7.50	43.00	+8.00
New Hampshire	28.80	+4.80	88.80	+4.80
New Jersey	28.00	+4.00	126.50	+4.25
New Mexico	12.50		52.50	
New York	24.75	-0.86	70.00	
North Carolina	16.00	+3.00	144.40	+21.20
North Dakota	38.00	+5.00	47.00	+15.00
Ohio	21.00	-0.50	126.00	-0.50
Oklahoma	50.00		98.10	
Oregon	10.00		45.00	
Pennsylvania	24.00		132.00	
Rhode Island	17.00		62.00	
South Carolina	10.00		63.00	-15.00
South Dakota	21.00		60.00	
Tennessee	19.00	+0.50	62.50	+7.50
Texas	22.30		96.82	
Utah	7.00	-1.00	35.00	
Vermont	36.00	+4.00	172.20	
Virginia	15.00		32.40	
Washington	20.10	+9.60	65.00	+9.60
West Virginia	38.00	+8.00	58.00	-0.30
Wisconsing	25.00	+7.00	168.00	
Wyoming	15.00		60.00	
Avg	26.23	+4.73	89.50	+25.16
Last year's avg	21.61		81.41	
Percent change	21.38		9.94	

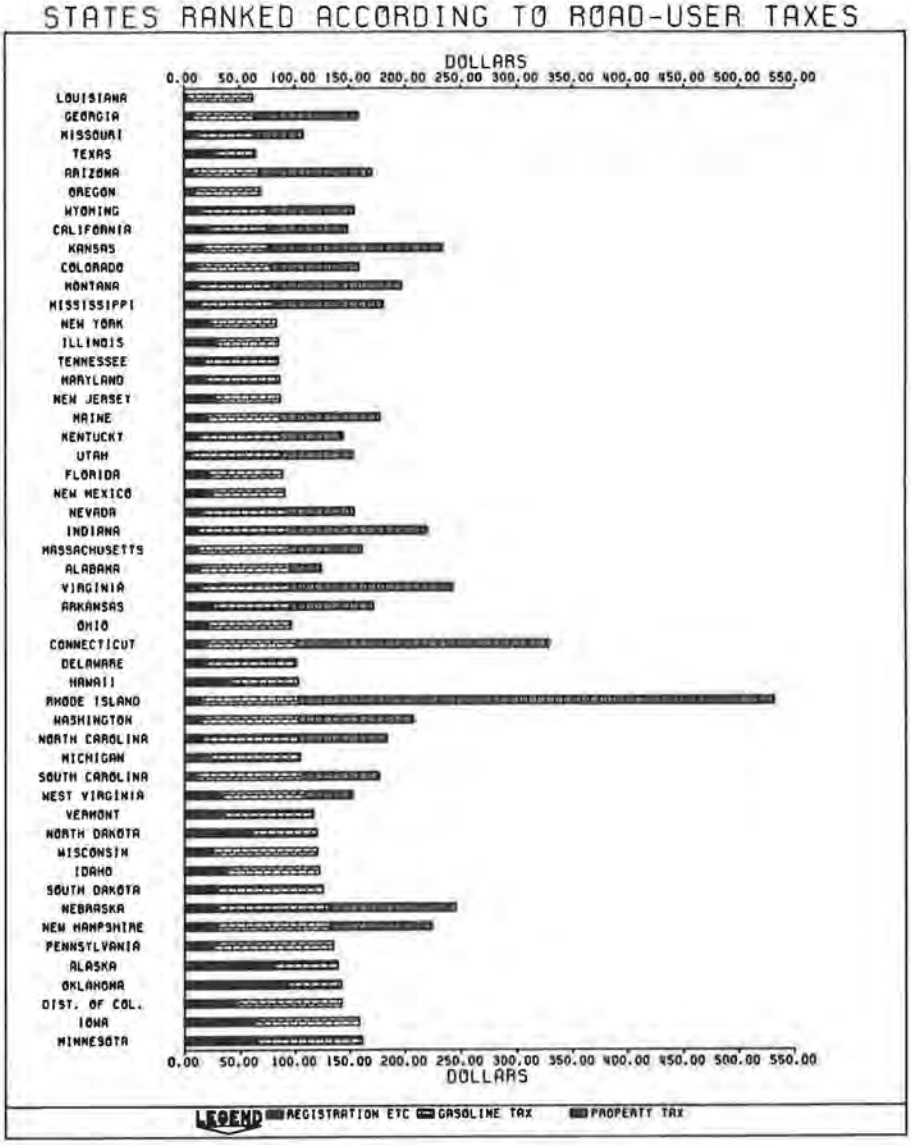


Figure 2. State road user and personal property taxes on a medium-weight passenger car.

The existence of a personal property tax on vehicles has obvious implications for the amount of highway revenue available to a state, because the opportunity to increase those revenues is hindered due to the high vehicle property taxes.

Property taxes, like registration fees, in some states are dependent on vehicle age, value, and other factors. The two fees are almost identical in their basis for taxation in states where registration fees are based on age or value.

Titling Taxes

First-structure taxes also include titling taxes on new and used vehicles. Titling taxes are similar to a state sales tax because they are based on a percentage of the vehicle purchase price. A titling tax is imposed when new, used, or transferred vehicles are first titled in a state, and titling taxes are predominantly dedicated to highways. The alternative sales tax is imposed on new and used vehicles when bought and the proceeds go to general state revenues, although some legislatures have appropriated portions of the revenues for transportation purposes.

Titling taxes were the only motor vehicle tax that kept pace with inflation and in fact exceeded it. In 1980, 10 states (Delaware, Idaho, Kentucky, Maryland, New Mexico, North Dakota, Texas, Vermont, Virginia, and West Virginia) and the District of Columbia imposed a titling tax in lieu of a sales tax on vehicles. However, in Delaware, District of Columbia, and Texas, the proceeds go into the general fund. Titling tax revenues increased by 269 percent during the 1970s in 9 of the 10 states and the District of Columbia. In the same period, registration fees increased by about 25 percent. Titling tax revenues from motor vehicle purchases accounted for one-third to two-thirds of all motor vehicle revenues in these states. Moreover, the receipts represent 13-34 percent of total road user revenues generated by these states, as can be seen in Table 5 (2, Tables DF and MV-2; 4, Table MV-106; 6). The importance of titling taxes as a source of revenue has been dis- cussed elsewhere (7).

MOTOR FUEL TAXES

A motor fuel tax has many advantages:

1. It measures use of the highway system,

Table 3. Registration fees and property taxes on medium-sized automobile in selected states ranked according to combined tax, 1981.

State	Registration Fee ($)	Property Tax ($)	Total ($)
Connecticut	20.00	228.00	248.00
Arizona[a]	8.00	103.12	111.12
Indiana[a]	12.25	126.00	138.25
Oklahoma	92.61	0	92.61
Colorado	11.10	80.88	91.98
South Carolina	10.00	70.50	80.50
Massachusetts	10.00	67.00	77.00
Utah	5.00	64.71	69.71
Iowa	63.00	0	63.00
District of Columbia	42.00	0	42.00
Vermont	36.00	0	36.00
New Jersey	25.00	0	25.00
Louisiana	3.00	0	3.00

[a]The property tax is an "in lieu" tax, which is paid with the registration fee. It has been included as part of the registration fee in previous tables.

Table 4. Registration fees and property taxes on medium-sized automobile in selected states ranked according to registration fee, 1981.

State	Registration Fee ($)	Property Tax ($)
Oklahoma	92.61	0
Iowa	63.00	0
District of Columbia	42.00	0
Vermont	36.00	0
New Jersey	25.00	0
Connecticut	20.00	228.00
Indiana[a]	12.25	126.00
Colorado	11.10	80.00
South Carolina	10.00	70.50
Massachusetts	10.00	77.00
Arizona[a]	8.00	103.12
Utah	5.00	64.71
Louisiana	3.00	0

[a]The property tax is an "in lieu" tax, which is paid with the registration fee. It has been included as part of the registration fee in previous tables.

2. It is inexpensive to administer,
3. It is relatively painless for the taxpayer because the tax is distributed over each refill, and
4. It can be collected from out-of-state vehicles.

Since almost all gasoline is consumed by motor vehicles, the tax is collected at the wholesale distribution level rather than at the retail level. This feature also serves to reduce administrative costs. Those who do not use highways also pay the tax, but they can generally claim a refund. Not all of them do, however, and some states set aside an estimated amount of unclaimed refunds to use for nonhighway transportation purposes such as airports, marinas, and snowmobile trails.

Diesel fuel has mixed uses. Because a substantial share of diesel fuel is used for nonhighway vehicles (e.g., farm tractors and construction equipment), this tax is frequently collected from retailers and not from distributors. However, comparisons of travel by diesel vehicles on the highway and expected miles per gallon against receipts from gallons of diesel fuel taxed indicate that a substantial amount of diesel fuel used for highway purposes may escape taxation.

Motor Fuel Tax Increases

Fuel taxes are an extremely productive source of revenue. Nationwide, each 1-cent tax increment produces about a billion dollars in revenue. The average weighted state fuel tax in 1979 was 8 cents. Motor fuel taxes were increased by 14 states in 1979, 12 states in 1980, 26 states in 1981, and 12 states in 1982. In four states that had an indexed motor fuel tax, the tax decreased in 1982 [Table 6 (4, Table MP-121, modified to show portion of sales tax dedicated to highways)].

Although fuel taxes have been a mainstay of highway finance, generally they have not kept up with inflation. As can been seen in Table 1, motor fuel taxes provided 30 percent of highway revenue in 1975 but only 25 percent in 1980. When fuel consumption was increasing steadily, fuel tax receipts increased automatically. Recent years have seen a leveling and even a decline in fuel consumption. With mandated fuel-efficiency standards and increasing fuel prices, an increase in future fuel consumption is unlikely despite possible increases in travel.

In order to keep up with inflation, an increasing number of states have converted completely or partly to an ad valorem (indexed) tax on motor fuel. The tabulation below indicates that eight states have motor fuel taxes that are completely indexed at 1- to 12-month intervals.

State	Type of Tax
District of Columbia	Indexed to consumer price index (effective Jan. 1982)
Indiana	Retail
Kentucky	Wholesale (9 percent)
Maryland	Wholesale (10 percent, effective July 1, 1984)
Massachusetts	Wholesale (10 percent)
New Mexico	Indexed to wholesale; maximum rise, 1 cent/year
Rhode Island	Wholesale (10 percent)
Washington	Retail (10 percent)

Indiana has an ad valorem tax of 10 percent of $1.00 and 8 percent of the next $0.50 of the retail fuel price before taxes that is used for highways. In addition, Indiana has a 4 percent sales tax on the retail fuel price before taxes that is used for mass transportation and general revenue purposes. Maryland increased its motor fuel tax to 11 cents in 1982. A future increase to 13.5 cents will be effective June 1, 1983, and 13.5 cents per gallon will be the floor or minimum tax when it is converted to an ad valorem tax of 10 percent of wholesale price effective July 1, 1984.

Table 5. Selected motor vehicle revenues, 1980.

Item	Titling Tax ($)	Total Motor Vehicle Revenue: Amount ($)	Total Motor Vehicle Revenue: Titling Tax (%)	Total Highway User Revenue: Amount ($)	Total Highway User Revenue: Titling Tax (%)
State					
Delaware	8 112[a]	24 864	32.6	53 090	15.3
District of Columbia	10 441[a]	29 620	35.2	46 707	22.4
Idaho	829	41 504	2.0	90 298	0.9
Kentucky	89 065	153 164	58.2	342 708	26.0
Maryland	122 265	221 123	55.3	407 598	30.0
New Mexico	16 719	59 371	28.2	129 873	12.9
North Dakota	2 004	31 824	6.3	62 263	3.2
Texas	423 622[a]	804 613	52.6	1 282 057	33.0
Vermont	10 761	33 206	32.4	54 886	19.6
Virginia	62 798	183 252	34.3	467 006	13.4
West Virginia	49 001	99 854	49.1	200 925	24.4
Weighted avg			47.3		25.4

[a]Considered to be a highway user tax; however, it is not dedicated and may not necessarily be appropriated to the highway fund.

Several states have retained a flat (unit) gallonage tax and added a small ad valorem tax, as shown below:

State	Type of Tax
California	7 cents plus 4.75 percent retail
Georgia	7.5 cents plus 3.0 percent retail less state tax
Hawaii	8.5 cents plus 4.0 percent retail
Illinois	7.5 cents plus 4.0 percent retail
Michigan	11 cents plus 4.0 percent retail less state tax
Mississippi	9 cents plus 5.0 percent retail
Nebraska	11.5 cents plus 2.0 percent (variable) retail
New York	8 cents plus 4.0 percent retail less state tax
Ohio	7 cents plus 3.3 cents indexed to fuel consumption and maintenance cost
Pennsylvania	11 cents plus 3.5 percent wholesale less taxes
Virginia	11 cents plus 3.0 percent wholesale less taxes

In some cases, the legislature has been more receptive to indexing part of the tax increase than to indexing the total tax. In other cases, state legislatures have gradually dedicated an increasing proportion of the existing sales tax on motor fuel to highways. Georgia, Illinois, and Nebraska dedicate the sales tax revenue to highways. Ohio has an additional 3.3 cents/gal that is indexed to the maintenance cost index and inversely to motor fuel consumption. Pennsylvania has a 3.5 percent fran-

Table 6. Gasoline and diesel fuel tax and changes by year.

	Fuel Tax (cents/gal)									
	1979		1980		1981		1982		1983	
Item	Gasoline	Diesel	Gasoline	Diesel	Gasoline	Diesel	Gasoline	Diesel	Gasoline	Diesel
State										
Alabama	7	8	11	12						
Alaska	8									
Arizona	8						10		12	
Arkansas	9.5	10.5								
California	7								9	
Colorado	7				9					
Connecticut	11									
Delaware	9				11					
District of Columbia	10		11		13		14			
Florida	8									
Georgia	7.5[a]									
Hawaii	8.5									
Idaho	9.5				11.5		12.5			
Illinois	7.5[b]									
Indiana	8		8.5		10.5		11.1			
Iowa	10	11.5			13	13.5	13	15.5		
Kansas	8	10								
Kentucky	9				10.4		10.0			
Louisiana	8									
Maine	9									
Maryland	9						11		13.5	
Massachusetts	8.5		9.8	10	11.4		10.4			
Michigan	11	9	11							
Minnesota	9		11		13					
Mississippi	9	10			9	10[c]				
Missouri	7									
Montana	9	11								
Nebraska	10.5		13.6		13.9		14			
Nevada	6				10.5		12			
New Hampshire	11				14					
New Jersey	8									
New Mexico	7		8		9		10			
New York	8									
North Carolina	9				12					
North Dakota	8									
Ohio	7				10.3		11.7			
Oklahoma	6.58									
Oregon	7				7		8			
Pennsylvania	11				11[d]					
Rhode Island	10				12		11			
South Carolina	10		11		13					
South Dakota	9		12		13					
Tennessee	7	8			9	12				
Texas	5	6.5								
Utah	9				11					
Vermont	9				11					
Virginia	9		11				11[e]			
Washington	12				13.5		12			
West Virginia	10.5									
Wisconsin	7		9		13					
Wyoming	8									
No. of increases	14		12		26		12			

[a] Plus 3 percent of sales tax.
[b] Plus 4 percent of sales tax.
[c] Plus 5 percent of sales tax; Mississippi's highway-revenue proceeds from sales tax are limited to $42 000, $50 000, and $60 000 for FY1981, 1982, and 1983, respectively.
[d] Plus 3.5 percent of sales tax.
[e] Plus 3 percent of sales tax.

chise tax on gross receipts, which is at the point of first sale of motor fuel in Pennsylvania (wholesale level). The franchise tax revenue is dedicated to highways. Beginning in 1981, Mississippi gradually increased the proportion of its motor fuel sales tax dedicated to highways. California's sales tax was instituted in the early 1970s and generally funded mass transportation, but it was changed in 1981 so that by 1986 it will be split fifty-fifty between highway purposes and mass transportation. Hawaii's sales tax on motor fuel has been going to general revenues, but for 1981-1984, the revenues will be used for highway purposes. Part of Michigan's sales tax on motor fuel is used for mass transportation.

Exemptions and Special Vehicles

When highway revenues are evaluated, the impacts of exemptions and special vehicles such as those that use gasohol and electricity should be considered. The use of these fuels conserves the U.S. supply of oil. However, motor fuel use and tax revenues are reduced, despite the continued use of the highways.

Electric vehicles do not pay a gasoline tax but receive the benefits of a highway system without adequately paying the costs of maintaining and improving the system. Several possibilities to rectify this situation are a graduated registration fee based on mileage similar to that for heavy trucks, an additional property tax, or a tax on vehicle parts. For example, a state may choose not to impose a high tax the first year (e.g., sales tax, titling tax) so as not to discourage the purchase of electric vehicles but to impose a large registration fee or property tax to compensate for highway system use.

The other item to consider is gasohol. To encourage production and use of alcohol as a means of reducing U.S. dependence on foreign oil, the federal government and many states have exempted gasohol from some or all taxes. The loss in revenue has been significant in some states. Iowa estimates a loss of $35.6 million for FY 1982 and 1983 because of gasohol use. At the national level, the tax exemption on gasohol is expected to result in a loss of $115 million to the Highway Trust Fund for 1985.

HEAVY-TRUCK TAXES

Studies have shown that the fuel tax does not impose charges commensurate with cost responsibilities for very heavy trucks. For this reason, most states levy graduated registration fees based on vehicle weight; others impose weighted axle-mile or ton-mile charges; some impose gross receipts taxes on certain motor carriers; and a few states use a combination of these.

The basis in 1981 for determining graduated registration fees for heavy trucks is summarized below (4, Table MV-103). Thirty-eight states based the fees on weight, usually defined as the maximum allowable gross vehicle weight for that truck. Since some carriers handle light cargo loads in which the space capacity is filled before the vehicle load capacity is reached, provisions are frequently made to allow an operator to declare the gross vehicle weight to be the weight at which the vehicle will operate.

Fee Basis	No. of States	
	Tractor	Semitrailer
Flat fee	-	32
Weight	38	10
Flat fee and weight	8	4
Flat fee or weight	-	2
Weight and age	5	1
No registration fee	-	2
	51	51

Graduated registration fees usually discriminate against low-mileage operators. To correct for this, many states have also varied the fee by vehicle classification or use. Low-mileage users such as farmers and lumber haulers might pay lower fees, whereas high-mileage users such as common carriers would pay higher fees. Consideration for low-mileage operators may have helped keep these fees lower then they should be.

Registration Fees

Registration fees for heavy trucks have changed to a degree similar to that for automobiles and single-unit trucks. The graduated fee structure has shown the greatest changes. Twenty-five states changed heavy-truck registration fees from 1980 to 1981, as shown in Table 7 (4, Table MV-103). Twenty of these states increased their registration fees. The average increase was $202.28, whereas the average reduction of the four remaining states was $38.50, which gives a net change of $163.75. When all the states are considered, the average change was 11.88 percent and the average registration fee was $701.23. The average registration fee in 1980 was $626.77.

In comparing registration fees for heavy trucks with those for light single-unit trucks, the average ratio is 9.08:1; the largest ratio is 24.9:1 and the smallest is 1.4:1. Colorado is the only state to have a lower registration fee for heavy trucks than for single-unit trucks. The reason is that Colorado has a ton-mile tax on heavy trucks, which more directly measures the use of the system. The range of registration fees nationwide for heavy trucks was from $33.00 to $2159.55 as compared with $8.00 to $322.02 for single-unit trucks. If the wide range in the ratio of heavy-truck registration fees to automobile and single-unit registration fees is noted, some states may wish to evaluate their fee structure.

Weight and Mileage Taxes

A few states have gone beyond simply levying graduated weight fees. To compensate more fully for the cost imposed by heavy trucks, a weight-mileage fee has been applied. The basis for this tax also varies: Two states (Colorado and Wyoming) use ton miles and six states (Idaho, Nevada, New Mexico, New York, Ohio, and Oregon) use weight miles.

Some of these states give operators the option of substituting mileage fees for the graduated registration fee. This allows low-mileage operators the opportunity to reduce their overall payments.

Two states--Virginia and Kentucky--require trucks with three or more axles to pay a motor fuel surtax of 2 cents/gal of fuel.

Finally, a few states (Arizona, California, Pennsylvania, and Washington) levy a gross receipts tax on certain operators, usually common carriers. The principle of this mechanism is to tax operators for the differential benefits they receive from highways. The underlying theory behind all these taxes is that heavy trucks either cause greater costs for highway improvements and maintenance or receive special benefits from the highway system. Exactly how these costs or benefits are determined is the objective of cost-allocation studies.

The cost to collect weight and mileage taxes and the burden imposed on operators can be high. The

trucking industry has been particularly vociferous in their opposition to the weight-mileage fees. Claiming that this tax imposed an extraordinary paperwork burden, the industry mounted a campaign during the 1950s to prevent the spread of this form of tax. A study conducted by the University of Mississippi concluded that although the paperwork involved is extensive, much of the required data are also needed for the reciprocal agreement reports. The weighing stations likewise serve a dual function. They help prevent excessive loads from damaging the highways as well as provide proper taxing reports. The cost of collecting the weight-mileage taxes is much higher than that for other user taxes. This cost varies from 3 to 10 percent of the total revenue levied. Overall, the states collected about $1.9 billion in truck registration fees and about $205 million in mileage taxes during 1979.

Due to the variety of methods as well as the particular rates used, the costs of operating similar trucks in different states vary widely. Also, the ratio of payments for a heavy truck to those for a medium-weight truck could vary from as low as 1.4:1 in New Mexico to a high of 24.9:1 in Kentucky and Missouri. If Interstate operators were allowed to register their trucks wherever they desired, they would obviously select the states that had the lowest taxes. To prevent this from happening, most states require operators to file extensive reports detailing the extent of their operations within that state.

Regional Compacts Relating to Heavy-Truck Fees

Three agreements or compacts have been enacted among regional groupings of states that specify how trucks registered in one state will be treated when they are operated in another. Such agreements may waive any additional taxes being imposed by the nonhost state provided that reciprocal treatment is accorded.

The three regional compacts are the Multi-State Reciprocal Agreement, the Uniform Vehicle Registration Proration and Reciprocity Agreement (UPRA), and the Internationl Registration Plan (IRP). IRP has the largest membership; 26 states are now participating. There are three states under UPRA that are not members of IRP. IRP and UPRA operate on a proration basis. The operator pays a portion of a state registration fee based on the expected fleet mileage to be traveled there. This is done by the following calculation:

(In-state fleet miles)/(total fleet miles) x total state registration fee.

Under IRP, the carrier files with the base state and receives one plate and cab card. This allows travel in member jurisdictions where fees have been apportioned. Under UPRA, the carrier must file individually with each member state in which travel is to occur and receives a base plate plus identifying stickers that must be attached to a second plate. The Multi-State Reciprocal Agreement has a membership of 16 states, some of whom are also members of IRP.

OTHER STATE FUNDING SOURCES

In addition to highway user revenue, some states receive revenue from nonuser sources. In fact, nonuser sources of state highway revenues have increased substantially in the last 15 years; they rose from 10 percent in 1965 to 16 percent in 1980. As shown in Table 8 (2, Table SF-1; 8) there are several nonuser taxes that are allocated to highways. In Massachusetts and Mississippi, a portion of the cigarette tax is allocated to the highway fund. This makes up 4.4 percent of the total highway revenue in Massachusetts and 1.6 percent in Mississippi. In Maryland, 3.75 percent of the 7.0 percent corporate tax goes to the state's Transportation Trust Fund; the dedicated portion pays for

Table 7. State motor vehicle heavy-truck registration fees.

State	Heavy-Truck Registration Fee 1981		Ratio Heavy-Truck Fee to Single-Unit Truck Fee[a]
	Fee ($)	Change from 1980 ($)	
Alabama	346.00		7.6
Alaska	230.00		2.9
Arizona	2159.55	+1569.55	6.7[b]
Arkansas	1044.00		11.5
California	1081.00	+451.00	7.4[b]
Colorado	33.00		0.3[b]
Connecticut	740.00	-72.00	8.1
Delaware	362.40		5.4
District of Columbia	700.00	-71.00	4.3
Florida	474.50	+2.50	5.7
Georgia	108.00		13.5
Hawaii	536.60		4.1
Idaho	135.00	+33.00	4.4[b]
Illinois	1492.00		11.5
Indiana	625.50	+110.00	6.2
Iowa	1520.00		13.8
Kansas	1200.00		16.0
Kentucky	771.50		24.9
Louisiana	490.00		4.9
Maine	700.00		10.0
Maryland	555.00		11.3
Massachusetts	534.00	+144.00	5.4
Michigan	798.00		3.3
Minnesota	1330.50	+270.00	21.5
Mississippi	608.50		9.3
Missouri	1259.00	+250.00	24.9
Montana	774.00		15.3
Nebraska	814.00	+1.00	9.4
Nevada	167.00	+30.00	3.9[b]
New Hampshire	532.80	+100.80	6.6
New Jersey	637.50	+17.00	5.0
New Mexico	75.50		1.4[b]
New York	519.00		7.4[b]
North Carolina	841.00	+117.00	5.8
North Dakota	1016.00	+221.00	21.6
Ohio	663.00	-1.00	5.3[b]
Oklahoma	655.25		6.7
Oregon	185.00		4.1[b]
Pennsylvania	369.00		2.8[b]
Rhode Island	410.00		6.6
South Carolina	586.00	+73.00	9.3
South Dakota	415.00	+20.00	6.9
Tennessee	1010.00	+125.00	16.2
Texas	735.60		7.6
Utah	510.00	+305.00	14.6
Vermont	1869.10	+209.80	12.2
Virginia	680.00		21.0
Washington	540.64	+148.20	8.3[b]
West Virginia	628.50	-10.00	10.8
Wisconsing	1176.00	+50.00	7.0
Wyoming	120.00		2.0[b]

[a]See Table 2 for single-unit truck fees. [b]States with additional gross receipts or weight-mileage tax.

debt service, highway costs, and other transportation costs, including the state's share of costs for mass transportation systems. This amounted to $5 366 270 in 1980 or 1.4 percent of the revenue allocated to the trust fund. In South Dakota, 10 percent of the game and fish license fee ($221 525 in 1980) is allocated to the counties for highway purposes. Severance taxes and mineral lease revenues are allocated to highway programs in 10 other states.

Severance Taxes

Ten states collect a severance tax and/or mineral lease revenue (e.g., for oil or coal) that is partly allocated to the highway program. The procedures used to collect this revenue and the allocation of the revenue to the highway programs vary between states. Revenue allocated to the highway programs from severance taxes and mineral leases ranges from $445 710, which is 0.2 percent of Kansas' total highway revenue, to $55 964 000, which is 58.6 percent of Wyoming's total highway revenue. In New Mexico, severance taxes comprise nearly 14 percent of highway program revenue. Excluding Kansas, Wyoming, and New Mexico, severance taxes for the remaining seven states comprise about 7 percent of total highway revenues.

Alaska and Louisiana allocate all severance taxes and mineral lease revenue to the state general fund; these states are discussed below. Several states collect a severance tax that is not directly allocated to the state's highway program. Often bonds are issued based on the severance tax revenue or some other revenue source. A portion of the revenue generated from the bonds may then be allocated to the highway program. These other fees can make a significant contribution to the state's highway programs.

Table 8. Other taxes dedicated to highways, 1980.

State	Special Type of Tax	Amount ($)	Percentage of Total State Highway Revenue
Arizona	Mineral lease	854 192	0.4
Arkansas	Severance tax	2 476 182	
	Mineral lease	83 820	1.1
Kansas	Mineral lease	445 710	0.2
Kentucky	Coal severance tax	33 194 680	6.5
Maryland	Corporate income tax	5 366 270	1.4
Massachusetts	Cigarette tax	17 600 000	4.4
Mississippi	Cigarette tax	5 005 540	1.6
Montana	Mineral lease	3 580 444	
	Coal tax	1 786 708	7.0
New Mexico	Severance tax	20 314 705	13.7
North Dakota	Gas and coal production tax	4 580 022	6.7
Oklahoma	Oil severance tax	28 988 239	6.7
South Dakota	Game and fish license	221 525	0.3
Wyoming	Coal severance tax	16 361 000	
	Mineral royalties (federal)	39 603 000	58.6

General-Fund Appropriations

There are eight general-fund states. This means that all revenue received by the state goes into the state's general fund. Then, through legislative appropriations, a certain amount is allocated for highway purposes. Highway appropriations for four states were greater than highway-user receipts. Alaska and Louisiana receive substantial revenues from severance taxes and mineral leases. This allows the states to keep highway user taxes low and to appropriate amounts substantially above highway-user receipts for highway purposes. Delaware is a general-fund state without significant severance taxes; however, appropriations for highway purposes for 1981 were 20 percent greater than highway-user receipts. In New York, 1981 appropriations for highway purposes were 4 percent greater than user receipts. Although New York substantially funds its highway program, the average appropriation from general funds for the 43 states with dedicated highway trust funds equals an amount 7 percent greater than user receipts. Table 9 (9, Tables DF and SF-1) contains these recent trends.

Four general-fund states appropriated less money for highway purposes than was received from highway-user revenues. In the case of Connecticut and District of Columbia, the remainder of highway-user receipts generally matched that appropriated to mass transportation. However, in the case of New Jersey, only $234 476 000, or 45 percent, was appropriated for highway purposes and $253 197 000 was used for state general purposes out of the $519 592 000 received in highway-user revenues.

CONCLUDING OBSERVATIONS

Efficiency and equity are important concerns. Some observers of the current decline of the public works infrastructure in the large cities believe that it reflects inadequate investment versus consumption and the need for increased application of user charges. Investment in water systems is an example outside the realm of highways. Cities that have investments in water systems tied directly to dedicated user charges have water systems in far better shape than those that do not (10).

Table 9. Appropriations for highway purposes by general-fund states, 1981.

State	Highway-User Revenue ($000 000s)	Appropriations ($000 000s)			Percentage of Highway-User Revenue Used	
		From User Revenue	From General Funds	Total	1980	1981
A:						
Alaska	28.509	28.509	130.885	159.394	549	559
Louisiana	256.147	256.147	315.149	571.296	174	223
Delaware	52.072	52.072	10.356	62.428	116	120
New York[a]	738.120	738.120	30.045	768.165	103	104
B:						
Connecticut	239.681	208.014	0	208.014	88	87
Rhode Island	59.313	37.269	0	37.269	70	63
District of Columbia	50.094	32.676	0	32.676	42	65
New Jersey	519.592	234.476	0	234.476	40	45

Notes: A = states that appropriated more funds than they received in highway-user revenue. B = states that appropriated less funds than they received in highway-user revenue.

[a]Funds are partly dedicated.

There are a number of highway user and nonuser taxes and combinations thereof in use. The objective of a state highway agency in structuring its taxes should be to follow good highway-finance principles. Also, the objectives should be the same as those contained in a highway cost-allocation study. For example, the objectives of the 1978-1981 National Highway Cost-Allocation Study were to develop equitable and efficient highway user charges. "Equitable" means the fair allocation of costs among vehicle classes where the revenue obtained should correspond to costs caused or occasioned by such vehicle classes. Economic efficient charges are achieved when the price of a trip equals the extra (marginal) costs caused by that trip, but this is very difficult to put into practice. Economic efficiency, however, underlies the whole concept of using highway user charges to finance highway improvements and operations. Over the long run, motor fuel taxes for all vehicles and weight and mileage taxes for heavy vehicles appear to best correspond to use and to long-run marginal costs.

For example, problems develop when part of the highway user charges rises with inflation and part does not. As pointed out previously, there are 10 states with titling taxes. The increase in highway revenue from the titling tax has on the average exceeded the rate of inflation, whereas motor fuel tax revenues have risen slowly and in some cases decreased. Logically, other states may focus on the titling tax as a good means of increasing their highway revenues. However, considerations of equity in tax burden and good highway-finance principles suggest that increased revenue from a titling tax should be considered only after an increased motor fuel tax has been considered.

Personel property taxes on vehicles, which generally accrue to local general revenues and not to the highway fund, provide another example that shows how some taxes are indexed to inflation and others are not. Based on highway cost-allocation principles, there are at least five problems with placing major reliance on the vehicle property tax, the titling tax, or the vehicle sales tax. First, they are not related to use of the highway system vis-à-vis the motor fuel tax. Therefore, they act contrary to the concept of economic efficiency stated above. Second, it appears that generally owners of automobiles and light trucks overpay their share of highway costs. Third, highway tax increases due to inflation that affect such owners would make such user charges even more inequitable. Fourth, economists point out that adverse impacts from deviating from economic efficiency are complex and affect the national, state, and local economies in other ways. Fifth, they make it much more difficult to raise nonindexed taxes such as most motor fuel taxes.

As a practical matter, the state highway agency is primarily concerned with whether or not vehicle property and sales taxes adversely affect proposals to raise highway user taxes. One possible solution may include seeking a lower vehicle property tax rate so that increased or ad valorem highway user taxes may be enacted.

In conclusion, states are urged to first seek increases in motor fuel taxes and weight and mileage taxes, since these are most closely related to use. If such use-related taxes are insufficient to fund the highway program, then states may look to first-structure taxes such as registration fees and titling taxes to fund the program. In developing the amount of the tax increase, the objectives of equity and balance should be kept in mind, so that the amount of the tax imposed corresponds to the costs caused by each vehicle class. Some states may be able to use a financing package that combines bonds for capital improvements with increased user fees for debt service and expected maintenance.

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REFERENCES

1. Highway Statistics Summary to 1975. FHWA, 1977.
2. Highway Statistics 1980. FHWA, 1982.
3. Selected Highway Statistics and Charts--1981. FHWA, 1982.
4. Highway Taxes and Fees. FHWA, Jan. 1, 1982 (published annually).
5. Road User and Property Taxes on Selected Motor Vehicles. FHWA, 1982.
6. State Motor Vehicle Registration, Registration Fees, and Miscellaneous Receipts. FHWA, Form 561 (by state), 1980.
7. T.W. Cooper. State Highway Finance Trends. TRNews, No. 98, Jan.-Feb. 1982, p. 1.
8. State Highway Finance Analysis Schedule. FHWA, Form PR-533, Sept. 1981 (annual).
9. Highway Statistics 1981. FHWA, 1982.
10. P. Choate and S. Walter. America in Ruins--Beyond the Public Works Pork Barrel. Council of State Planning Agencies, Washington, DC, 1981.

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Financing County Roads: An Evolution in Progress

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As new methods of raising and allocating revenues to maintain local roads and bridges are debated in the political arena, the condition of those facilities continues to worsen. Cities and counties are faced with increasing competition for funds that have not kept up with rising construction costs. The problem of programming county road and bridge funds in Indiana is described. The state's local-option highway user tax is presented as an innovative revenue-generation method available to county governments. The financial constraints on a county's ability to fund all legitimate projects are illustrated by two distinctly different cases in Indiana. The resolution of these two cases gives clues to a set of measures that must be considered as we move through an evolutionary period in highway financing and programming.