Highway Bond Financing, 1962-1982: An Examination

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ABSTRACT

The current emphasis on rehabilitation of the nation's public works infrastructure suggests that state and local highway officials will be considering the use of additional debt financing. Coincidentally, there is a growing concern over the magnitude of outstanding public debt. This paper provides an examination of state and local highway debt financing from 1962 through 1982. For state highways, 10 eastern states accounted for nearly two-thirds of new debt assumed during the study period. Toll facility debt remained relatively constant over the period, falling from two-thirds to only one-third of total state highway debt. A significant trend at the state level has been the increased emphasis on issuance of general obligation bonds and the declining use of limited obligation and revenue bonds. The relative importance of bond funds as a source of state highway construction has changed only moderately. The proportion of road-user taxes used for debt service payments doubled during the study period. Municipal highway debt and local debt incurred for highway-related purposes grew at about twice the rate of state highway debt. On a per capita basis, total state and local highway debt increased at a much lower rate than total dollar debt. The study revealed that there was significant variation in the manner in which debt was used by individual states to finance highways. The growth in highway debt has generally been conservative when compared with other major categories of debt.

Financing through debt is a basic tenet of a capitalistic system. Debt financing not only allows industry and business to build and expand, but contributes largely to the development of the public infrastructure. Without debt financing, many major U.S. highways and bridges would not have been built.

The economic advantages of debt are not particularly complex. When practiced with prudence and intelligence, debt acquisition can provide similar benefits to an individual, a private firm, or a public entity. High on the list of justifications for debt financing are

1. The inability to finance projects or acquire goods with current revenues and cash flows;
2. The realization that the present value of money is greater than the future value of money to the borrower; and
3. The greater derived benefits of debt over the cost of debt.

However, there is growing concern among public officials and taxpayers over the magnitude of public debt. There is also an awareness of costly failures in the banking and nuclear plant construction industries that have resulted largely from poor debt management. Coincident with these concerns, there is a growing emphasis on the need to rehabilitate and maintain the highway infrastructure. Consequently, many highway officials will, at some point, have to address the issue of debt financing and their decisions that follow will attract the scrutiny of state legislators and the public. The purpose of this paper is to examine the trends and patterns of highway debt over the past 21 years. Included are an examination of

- State highway obligations,
- Sources of highway construction funds,
- Debt service requirements,
- Local government debt (highway related),
- Per capita highway debt, and
- Highway debt versus other debt.

Previous work in this area was done by Duzan et al. in 1952 (1) and McCallum in 1963 (2). This paper may be viewed as an extension of these previous efforts. [Note that short-term debt and refunding bonds (bonds sold to retire existing bonds) are not included in the study; and the term "highway" is used in this paper to refer to state highways, county roads, and city streets.]

HISTORY OF HIGHWAY BOND FINANCING

Bond financing has been an important factor in financing highway construction throughout this century. The 1920s saw the first significant use of bond proceeds relative to other revenue sources; nearly 40 percent of construction was financed with bond funds. Several states financed major highway programs almost exclusively with bond authorizations. The 1930s saw several major projects funded through bond issues (e.g., San Francisco Bay Bridge, Pennsylvania Turnpike). However, because of large infusions of federal aid, the relative amount of bond financing decreased to about 20 percent of total construction. The 1940s were characterized by two distinct periods of activity: (a) very limited construction levels, and thus bond sales, during the war years; and (b) rapid acceleration of highway building in postwar years with about $2.2 billion in new debt assumed at state and local levels.

Borrowing for highway purposes increased dramatically during the 1950s, with 39 states and the District of Columbia incurring almost $10 billion in new debt. Outstanding debt for all types of obligations increased from $1.5 billion to $9.4 billion. Ten states located in the northeast and north central regions issued more than $400 million in bonds and accounted for almost two-thirds of new highway

obligations between 1950 and 1960. The principal use of bond funds in these states was for the construction of major turnpikes.

STATE HIGHWAY OBLIGATIONS

State Bonding Practices

During the 21 years of this study, 41 states and the District of Columbia issued or assumed $24.8 billion in highway obligations. This assumed debt is approximately 50 percent greater than obligations issued during the previous 60 years. New issues for the 1962-1982 period are indicated in Figure 1 (3, Table SB-1), split between toll and free facilities.

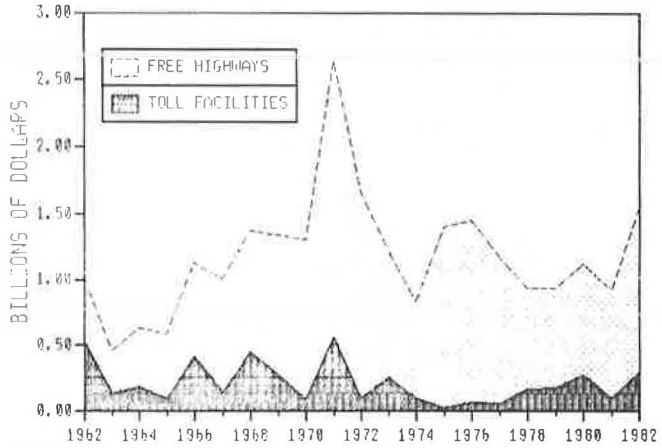

FIGURE 1 Annual state obligations, issued or assumed, for highways during year, 1962-1982.

Great variation exists among the states with respect to bonding practices. Nine states, all lying west of the Mississippi River, assumed no debt for either free highways or toll facilities during the 21-year period. These states were generally rural with relatively small populations. Nine additional states issued bonds during 5 or fewer years over the period; again, these were primarily western states with low population densities (Indiana and Michigan are exceptions). Ten states incurred highway debt exceeding $1.0 billion each during the 21 years; the total for these states ($15.4 billion) amounted to 62 percent of all state highway debt for the period. Two of these states, New Jersey and Pennsylvania, accounted for one-fifth of total obligations. The 10 states all lie east of the Mississippi River and are characterized as urban with relatively high population densities.

The bonding practices followed by these various groups of high- and low-debt states are consistent with trends in existence since World War II. Rural western states have generally managed to meet their lower construction needs with state funds and federal aid, whereas many eastern states with greater population pressures have required additional funds to provide needed facilities.

Toll Facility Bond Issues

During the study period, 23 states issued revenue bonds to finance toll roads, bridges, and ferry capital construction. For six states (California, Indiana, Iowa, Oklahoma, Texas, and Virginia), toll facility financing was the only purpose for which bonds were issued. Toll financing during the study period resulted in the issuance of $4.6 billion in bonds, or about one-fifth of all state highway bonds issued as shown in Figure 1. This is in contrast to the 1950s, when approximately the same absolute level of toll revenue bonds accounted for nearly one-half of new obligations.

The relative decline in the importance of bond financing for toll facilities is due partially to increased availability of federal funds. In many instances, debt service on general obligation bonds issued for toll facilities is actually paid from toll revenues. For the year 1982, general obligation bonds were sold to provide funding for toll roads in Florida and Virginia, but toll revenues from the projects will be used for debt service. In the same year, bonds issued for the San Francisco Bay Bridge, the Maine Turnpike, and the Dallas-North Tollway are supported only by tolls.

Outstanding Debt by Facility Type

Outstanding state government highway debt for all types of facilities increased from $10.5 billion to $19.3 billion between 1962 and 1982 [Figure 2 (3, Table SB-2)]. Total debt peaked in 1979 at $20.3 billion. Figure 2 shows that state debt for toll facilities and for state highways (i.e., toll-free facilities) have reversed positions of dominance during the study period. State highway debt grew from $3.6 billion in 1962, or one-third of the total debt, to $12.2 billion in 1982, nearly two-thirds of the total debt. Toll facility debt was relatively constant over the two decades, standing at $6.7 billion in 1962, peaking at $8.0 billion in 1972, and declining to $6.2 billion at the end of 1982. The relative share of toll facility debt declined from 64 percent to 32 percent during the period. By the end of the study period, 27 states had outstanding debt for toll facilities. Eight states in the East and the South had $300 million or more in outstanding toll facility debt, accounting for two-thirds of total state debt.

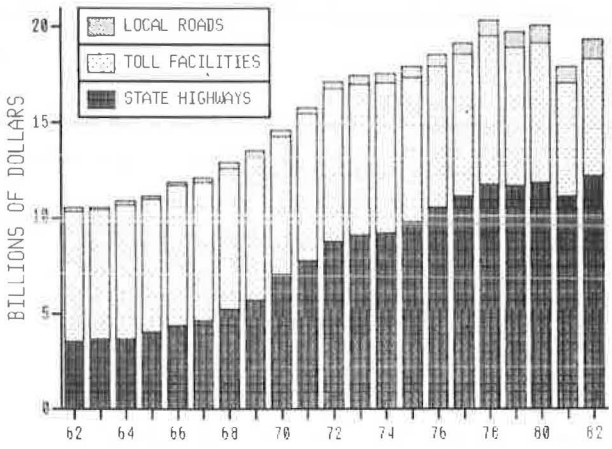

FIGURE 2 Outstanding end-of-year state obligations for highways, 1962-1982.

An interesting trend occurring over the study period was the growth of state government bond issues for local roads. By the end of the period, outstanding debt included only about $1.0 billion of this type of debt (5 percent of total debt), but the absolute amount of state-incurred debt for local roads grew by more than 500 percent ($163 million in

1962). About 75 percent of this type of debt was concentrated in two states and the District of Columbia. Of course, all outstanding debt in the District of Columbia ($178 million) was classified in this manner. Maryland ($351 million outstanding for county roads) and Washington ($200 million outstanding for city and county arterials) had regularly issued bonds in support of local roads. The other states with programs of this type were Alabama, Georgia, Massachusetts, Mississippi, and New Jersey.

State Bond Issues by Type of Security

The various types of bonds available for funding public capital projects are classified according to the security that underlies the debt. Three major types of bonds have historically been utilized to fund highway construction:

1. General obligation bonds--Principal and interest payments on these bonds are guaranteed by the full faith and credit of the governmental unit issuing the bonds. These bonds can generally be sold at a lower interest rate than other bond types because the full taxing power of the issuing authority is available to repay the bonds. For highway facilities, a specific road-user tax is normally pledged to provide principal and interest payments. General obligation bonds have been utilized to finance highway projects during most of this century.
2. Limited obligation bonds--These bonds are secured by a pledge of a specific tax or revenue of a specific fund. Revenues generated by the constructed facility may also be pledged, but such revenues cannot be the sole security. Limited obligation bonds thus have a broader security base than bonds backed only by project revenues, but are not as secure as general obligation bonds. Limited obligation bonds were first issued at the state level in 1929; their use peaked in the 1960s but continues today as an important method of securing highway construction funds.
3. Revenue bonds--Revenue bonds are obligations issued in support of specific projects, and are secured only by pledged earnings of the facility. Bondholders stipulate in some cases that tolls or other earnings of the facility must be adjusted if earnings prove insufficient. Revenue bonds have been in use in the highway field for the last half-century to fund bridges and tunnels, and have been used extensively since World War II to finance major turnpike systems.

Use of the three major types of security arrangements has changed markedly during the 21-year study period. Figure 3 (3, Table SB-2B) shows outstanding debt by security type for state highway facilities in 1962, 1972, and 1982. The most significant trend throughout this period has been the increased use of general obligation bonds. Bonds backed by the full faith and credit of state governments accounted for $11.1 billion in outstanding debt in 1982 compared with $2.8 billion 21 years earlier, an increase of nearly 300 percent. Total outstanding debt increased only 85 percent during this period. Although general obligation bonds accounted for about one-fourth of outstanding debt in 1962, they now account for well over one-half of outstanding debt. For 1982, about 65 percent of the $1.6 billion in new highway obligations was backed by the full taxing power of the states issuing the bonds.

As indicated in Figure 3, issuance of limited obligation bonds increased substantially through the 1960s in terms of absolute dollars. Outstanding debt for these types of bonds grew from $2.8 billion

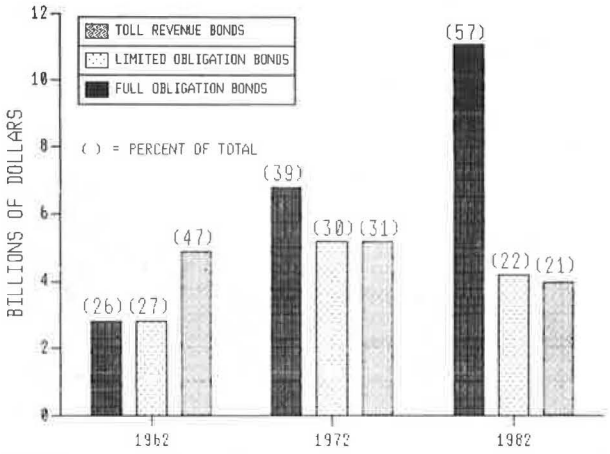

FIGURE 3 Outstanding state highway debt by type of security, 1962, 1972, and 1982.

to $5.2 billion between 1962 and 1982, an increase of 86 percent. Although the chart indicates a 30 percent share of all bond types for limited obligation bonds in 1972, they actually peaked at 32 percent from 1969 to 1970. During 1982, eight states issued $370 million in new limited obligation bonds, or 23 percent of total new highway debt.

Outstanding debt for toll facilities remained fairly constant through the 1960s and 1970s in terms of absolute dollars. However, the trend toward greater use of general obligation bonds for toll facility financing has reduced the relative percentage share of outstanding debt for toll facilities financed by revenue bonds to about one-fifth of the total debt, compared with nearly one-half in the early 1960s. In recent years, toll facility bonds have generally been concentrated in a few large issues. Table 1 (3, Table SB-1) lists 1978-1982 total bond issues for toll facilities including general obligation issues, issues backed only by tolls, and the largest single issue for each year.

TABLE 1 Toll Facility Bond Issues, 1978-1982

	Bond Category ($ millions)		
Year	Total Including General Obligation Bonds	Backed Only by Tolls	Single Largest
1978	174.2	174.2	Texas-Houston Ship Canal Bridge (102.0)
1979	190.9	17.3	Florida-Hillsborough County Expressway (117.5)
1980	283.1	283.1	Indiana-East-West Toll Road (259.5)
1981	99.0	25.0	California-San Francisco Bay Toll Bridge (25)
1982	297.5	200.6	Texas-Dallas-North Tollway (168.1)

Source of Highway Construction Funds

Analysis of the source of funds for state highway construction presents a somewhat different perspective of the role played by bond financing. As noted previously, significant growth has occurred over the last two decades in new bond authorizations for state highways. However, as shown in Figure 4 (3, Tables SF-3, SF-4), the relative importance of bond funds as a source of state highway construction changed only moderately during this period.

During the early 1960s bond sales for construction of state-administered highways averaged about

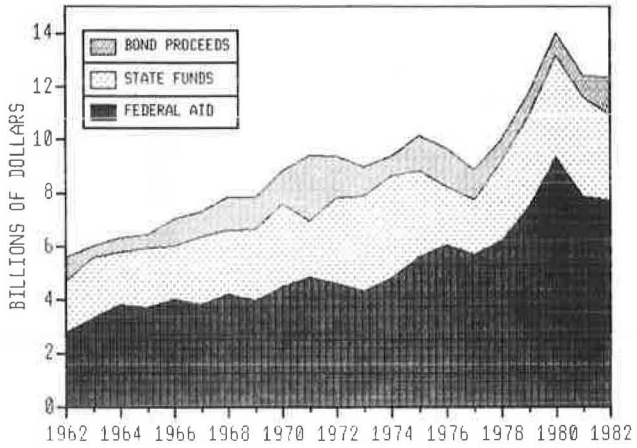

FIGURE 4 State highway construction by source of funds, 1962-1982.

$0.6 billion annually and provided about 8 percent of total construction funds. Beginning in the middle 1960s and continuing through the middle 1970s, bond sales averaged about $1.4 billion annually and 15 percent of funds available for highway construction. The year 1971 was atypical of this period, with 26 percent of construction funds provided by bond proceeds. In that year, six states (Florida, Illinois, Kentucky, New Jersey, New York, and Pennsylvania) had unusually large bond issues totalling $1.5 billion.

During the last 5 years of the study period, use of bond proceeds for highway construction declined, averaging about $1.0 billion and 8 percent of total construction funds (the year 1982 being an exception to this latest trend). Figure 4 shows that the use of state funds other than from bond sales has been consistent over the years, having averaged about 30 percent of construction funds. Federal aid funds accounted for 58 percent of construction dollars in the early 1960s, declined to about 50 percent during the late 1960s to middle 1970s, and increased rather dramatically from 1976 through 1982 to an average of 64 percent of total highway construction.

As an indicator of the variability among states in the use of bond funds, Table 2 (3, Tables SF-3, SF-4C) shows total construction funds, bond proceeds used for construction, and the percentage of the total made up of bond proceeds. The data shown are for the 32 states that issued bonds for use in construction of state-administered highways from 1978 through 1982. Four states utilized bond funds for more than 25 percent of their construction needs during this period, led by Delaware at nearly 50 percent. One of these four states, Arizona, has not historically depended upon bond issues, but had a very large issue in 1982. Six states issued bonds only once during the 5-year period. As noted previously, total bond proceeds over this period provided 8 percent of total construction funds, and this figure increases to only 11 percent when the 18 states with no bond sales are excluded from this calculation.

Debt Service Requirements

Another way of assessing the impact of state highway borrowing is to examine the level of debt service payments over time and among the states that have incurred long-term debt. Of particular interest is the use of road-user tax receipts (primarily motor fuel taxes and motor vehicle fees) to support in-

TABLE 2 Use of Bond Funds for State-Administered Highways, 1978-1982

State	Total State Highway Construction ($ thousands)	Bond Funds Used for Construction ($ thousands)	Bond Fund Percentage
Delaware	323,733	157,315	48.6
Massachusetts	1,012,693	307,300	30.3
Arizona	844,787	218,829	25.9
Connecticut	683,721	172,946	25.3
New Jersey	935,425	191,052	20.4
New Hampshire	304,380	60,500	19.9
Illinois	3,219,675	585,061	18.2
Kentucky	2,032,528	366,797	18.0
Louisiana	2,296,634	414,015	18.0
North Carolina	1,676,589	300,517	17.9
Maine	357,137	63,655	17.8
Hawaii	358,754	59,347	16.5
West Virginia	1,515,884	200,000	13.2
Indiana	857,751	104,020	12.1
New Mexico	603,725	65,825	10.9
Georgia	2,040,335	208,650	10.2
Minnesota	1,339,025	132,100	9.9
Ohio	1,647,725	150,000	9.1
Washington	1,564,693	135,000	8.6
Alaska	627,009	45,600	7.3
Alabama	1,321,751	79,000	6.0
Wisconsin	801,730	47,970	6.0
Vermont	190,401	10,803	5.7
Florida	3,014,334	169,646	5.6
Nevada	450,453	25,041	5.6
Mississippi	991,143	55,000	5.5
Pennsylvania	2,290,586	112,247	4.9
Kansas	851,006	40,000	4.7
Texas	5,164,612	175,951	3.4
Virginia	2,156,206	57,000	2.6
California	2,804,253	55,432	2.0
Oregon	845,774	15,000	1.8
Total, above states	45,124,452	4,781,619	10.6
Total, all states	61,084,771	4,781,619	7.8

debtedness. This is because the amount of such receipts remaining after debt service payments gives an indication of the state's ability to fund current and future construction needs, as well as to match federal aid receipts.

Figure 5 (3, Table DF) shows, for states with debt service payments, the change through the study period in state road-user tax receipts and the amount of these receipts used for debt service. In this chart, the top of each bar indicates the level of total tax receipts, and debt service payments are shown as a portion of tax receipts. The percentage of road-user tax receipts used for debt service is

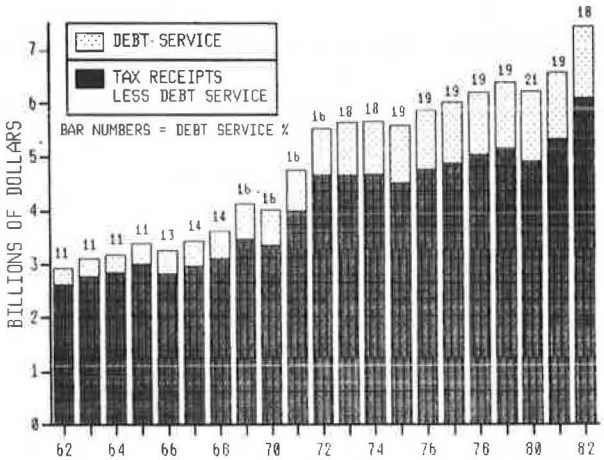

FIGURE 5 Total road-user tax receipts and portion used for bond debt service, 1962-1982.

indicated for each year. Total tax receipts approximately doubled over the 21-year study period, whereas debt service payments quadrupled. Thus, the percentage of tax receipts dedicated to the support of highway debt doubled during the study period, peaking at 21 percent in 1980, but declined during 1981 and 1982. It is clear from the trend shown in Figure 5 that servicing of highway bond debt has claimed a steadily increasing portion of state funds that would otherwise be available for current construction work. It should be noted that when this analysis is performed using total receipts available for highways (including federal aid) and debt service payments made from all sources of revenue, the ratio of debt service versus total receipts drops considerably. Using this computation method for 1982 shows that only 8 percent of total highway receipts was used for debt service payments, whereas (as shown in Figure 5) 18 percent of state road-user taxes was used for this purpose.

Table 3 (3, Table DF) provides further indication of the wide disparity among states in the assumption of highway debt. This information represents a state-by-state analysis of the data shown in Figure 5 for the year 1982. Three states, Connecticut, Delaware, and Hawaii, used more than one-half of their road-user taxes for debt service, and an additional eight states used at least one-fourth of available road-user tax receipts for this purpose. Connecticut and Delaware might be expected to appear near the top of this list because they were previously shown to be leaders in the use of bond funds for construction (Table 2). Hawaii heads the list in Table 3 partially because it is one of the few states that used only road-user taxes to make debt service payments. Arizona appeared high on the list of states using bonds for construction primarily because of a large bond issue in 1982, but it is one of the lowest states in terms of debt service payments. With the exceptions of Hawaii and Kansas, the states with the highest percentage of debt service lie east of the Mississippi River and are concentrated in the Northeast and the South.

TABLE 3 Use of State Road-User Tax Receipts for Bond Debt Service Payments, 1982

State	Road-User Tax Receipts ($ thousands)	Debt Service Payments ($ thousands)	Debt Service Percentage
Hawaii	26,763	16,966	63.4
Delaware	54,467	28,028	51.5
Connecticut	146,426	73,464	50.2
Georgia	156,199	64,471	41.3
West Virginia	199,568	81,592	40.9
Mississippi	114,688	44,858	39.1
Massachusetts	258,186	98,117	38.0
Kansas	138,322	46,479	33.6
Louisiana	250,068	78,959	31.6
New Jersey	163,603	49,860	30.5
Rhode Island	49,901	13,560	27.2
Illinois	369,857	91,100	24.6
Vermont	58,472	12,937	22.1
New York	501,086	113,822	22.7
Pennsylvania	914,901	196,113	21.4
Maine	70,536	10,490	14.9
Ohio	535,582	78,540	14.7
Alabama	132,533	19,374	14.6
Michigan	241,203	26,098	10.8
Tennessee	223,481	22,462	10.1
Wisconsin	218,366	21,045	9.6
Nevada	68,592	5,640	8.2
New Hampshire	79,674	6,147	7.7
Washington	234,563	17,205	7.3
North Carolina	462,858	32,565	7.0
South Carolina	237,544	13,251	5.6
Florida	411,711	22,272	5.4
Maryland	250,580	12,485	5.0
Oregon	136,194	5,802	4.3
Minnesota	243,963	8,724	3.6
Arizona	136,161	3,294	2.4
Nebraska	83,139	1,419	1.7
Kentucky	292,759	3,415	1.2
Total, above states	7,461,946	1,320,554	17.7
Total, all states	11,052,181	1,320,554	11.9

Local Government Bond Financing

From 1962 through 1981, local government agencies issued approximately $20 billion in long-term bonds for streets, roads, and indirect street functions. At the end of 1981, $10.7 billion in combined debt was outstanding for all local government entities. Growth of outstanding debt over the study period for the rural, municipal, and "other local" categories, is shown in Figure 6 (3, Tables UB-2, LB-2, UF-11, UF-12).

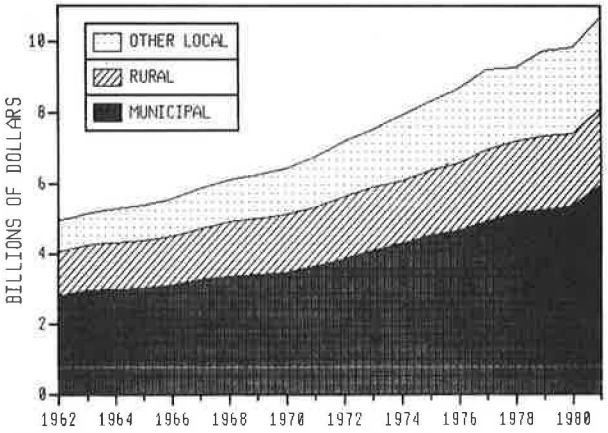

FIGURE 6 Local government outstanding highway debt: municipal, rural, and other local, 1962-1981.

Continuing a trend established in the 1950s, municipal highway debt grew between 1962 and 1981 at a significantly higher rate than highway debt in the counties, townships, and other rural governments. With total new issues of $10.6 billion during the period, municipal debt stood at $6.0 billion at the end of 1981, or 113 percent higher than in 1962. In the rural units, $4.1 billion in debt was assumed during the 20 years; outstanding debt grew 68 percent and stood at $2.2 billion in 1981. It may be assumed that the relatively large growth of municipal debt is a direct result of growth in urban areas as compared with rural areas during the 1960s and 1970s. Pressures to reduce traffic congestion and develop new services, as well as shortages of necessary construction funds, have resulted in a widespread requirement to obtain needed funds through bond issues.

The highest growth rate in local government debt has occurred in the "other local" category in Figure 6. This category includes bond debt for parking facilities and indirect street functions (street lighting and cleaning, sidewalks, and storm sewers) for both municipal and rural government agencies at the beginning of the study period; this type of debt accounted for less than one-fifth of total rural and municipal highway-related debt. Through 1981, outstanding debt for parking and indirect street functions nearly tripled, and at the end of that year constituted one-fourth of total local government debt. Again, the increase is largely due to growth of cities and the resultant need for streets and related facilities.

As was found to be the case with state highway debt, considerable variation exists among the states with respect to local government bonding practices. Rural authorities in 17 states had no outstanding debt at the end of 1981; for municipalities and the "other local" categories, the comparable numbers are 9 and 14 states, respectively. Only four states (Alaska, Nevada, Oklahoma, and Utah) had no outstanding local debt of any kind, whereas minimal local debt (less than one-half of 1 percent of the total) existed in 14 other states. These 18 states with little or no local highway debt are primarily western and northeastern states.

Local agencies in 17 states had assumed greater debt for highway and related purposes than had their counterpart agencies at the state level. For example, Texas possessed one-fourth of total municipal debt, one-fifth of total rural debt, and slightly less than one-fifth of total local outstanding debt. New York also had significant local debt with 12 percent of the total. The top 10 states in terms of total local debt are listed in Table 4 (3, Tables UB-2, LB-2, UF-11, UF-12).

TABLE 4 Outstanding Local Highway Debt, 1981

State	Debt Category ($ millions)			
	Rural	Municipal	Other Local	Total Local
Texas	446	1,499	67	2,012
New York	245	634	396	1,275
California	34	225	619	878
Minnesota	27	491	51	569
Pennsylvania	52	166	235	453
Ohio	9	262	170	441
Louisiana	179	184	23	386
Florida	277	98	0	375
Wisconsin	84	243	34	361
Maryland	184	54	109	347
Total, 10 states	1,537	3,856	1,704	7,097
All other states	627	2,107	857	3,591
Total, all states	2,164	5,963	2,561	10,688

COMBINED STATE AND LOCAL DEBT

Outstanding

Combined outstanding debt for state, municipal, and rural highway facilities is shown in Table 5 and Figure 7 (3, Tables SB-2, UB-2, LB-2, UF-11, UF-12). Total outstanding debt grew consistently at about 4 percent annually through 1978, but has since leveled off. State highway debt has generally accounted for at least two-thirds of total debt through the study period, although with the drop in the states' outstanding debt in 1981, this share was reduced to 62 percent of the total. A major factor in the 1981 decline in state highway debt was redemption of nearly $1.5 billion in bonds by Kentucky.

Only Utah had no state or local highway debt outstanding in 1981, although several other states (primarily north central and mountain states) have incurred limited highway debt. Illinois, New Jersey, New York, Pennsylvania, and Texas accounted for nearly one-third of the combined state and local highway debt. The most prominent states in terms of total amounts of state and local highway debt were generally southern and northeastern.

Per Capita Highway Debt

The absolute level of highway debt in the state does not necessarily give a true measure of the impact of the debt on the state's residents. Examination of the states with the largest outstanding highway debt shows that these are primarily the states with the greatest population. For example, of the top 10 states in terms of total highway debt, 7 are also among the nation's 10 most populous states. These 10 states accounted for 55 percent of state and local highway debt and 48 percent of the total U.S. population in 1981.

One method of giving perspective to the level of highway debt in the various states is to compute the debt on a per capita basis. Per capita state and local highway debt stood at $127 in 1981 compared with $84 in 1962. The 20-year growth rate of 51 percent in per capita debt is significantly lower than the growth rate of total debt (87 percent). Per capita debt peaked in 1978 at $134.

Individual state per capita debt varied in 1981 from $0 (in Utah) to $671 (in Delaware). Many of the states with relatively high per capita debt were also found to rank relatively high in terms of using road-user taxes for debt service and bond funds for state highway construction. About one-half of the states with greater than average per capita debt are

TABLE 5 Annual Outstanding Highway Debt for State and Local Authorities, 1962-1982

Year	Debt Category ($ millions)				
	State	Municipal	Rural	Other Local	Total
1962	10,454	2,803	1,285	875	15,417
1963	10,579	2,967	1,281	920	15,747
1964	10,913	3,019	1,317	983	16,232
1965	11,059	3,048	1,363	1,005	16,475
1966	11,814	3,144	1,394	1,056	17,408
1967	12,177	3,285	1,450	1,129	18,041
1968	12,903	3,384	1,555	1,178	19,020
1969	13,514	3,430	1,579	1,242	19,765
1970	14,020	3,501	1,632	1,313	20,466
1971	15,851	3,653	1,678	1,425	22,607
1972	17,171	3,868	1,770	1,552	24,361
1973	17,462	4,103	1,810	1,614	24,989
1974	17,631	4,323	1,775	1,855	25,584
1975	18,136	4,556	1,820	1,947	26,459
1976	18,657	4,686	1,875	2,131	27,349
1977	19,128	4,917	2,036	2,277	28,358
1978	20,282	5,190	2,003	2,123	29,598
1979	19,761	5,247	2,106	2,398	29,512
1980	20,091	5,383	2,023	2,465	29,962
1981	18,095	5,963	2,164	2,561	28,783
1982	19,312	-[a]	-[a]	-[a]	-[a]

[a]Data not available.

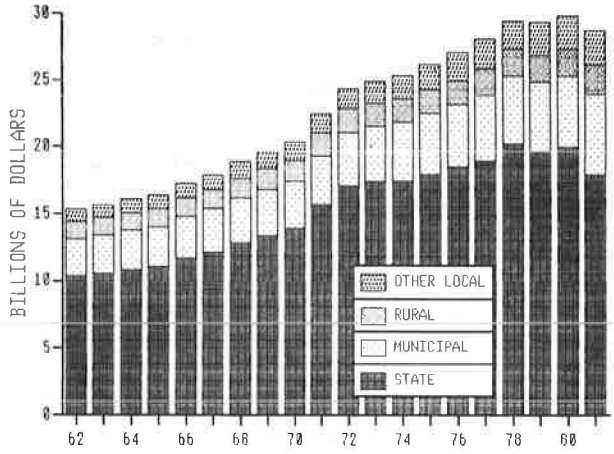

FIGURE 7 Annual outstanding highway debt by jurisdiction, 1962-1981.

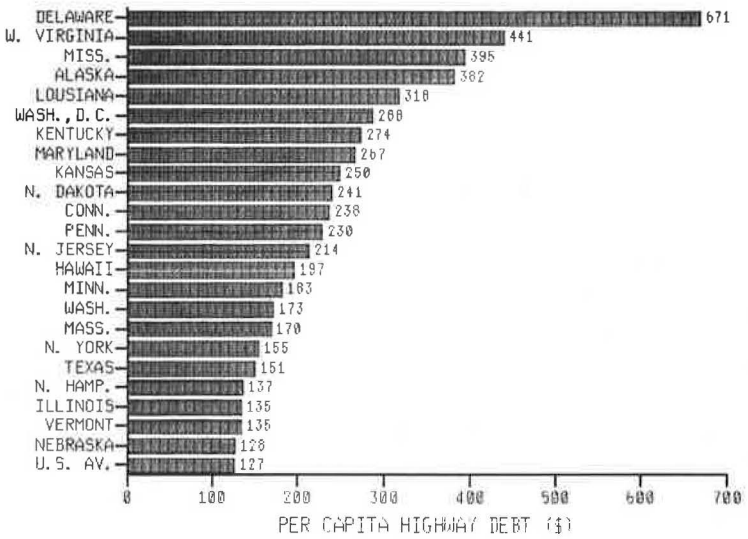

FIGURE 8 Per capita highway debt, state and local authorities, 1981.

located in the East, with the South, the Midwest, and the Pacific states also represented. Figure 8 (3, Tables SB-2, UB-2, LB-2, UF-11, UF-12; 4) shows 1981 per capita highway debt for the 23 states with values higher than the national average of $127.

Highway Debt Versus Other Debt

Assumption of debt for highway purposes is not a unique situation in our society. Public agencies issue bonds for many purposes in addition to highways. At the local level, schools and utilities are major recipients of bond proceeds. State governments incur debt for school and other public buildings, and a wide variety of facilities used for waste disposal, water supply, pollution control, recreational purposes, and so on. Federal government debt is not assumed for specific capital facilities, but it funds a broad spectrum of programs dealing with national defense, social services, and resource development. Of course, many other sectors in our economy assume debt as well, including corporations and consumers.

It has been noted that combined state and local highway debt has grown steadily, approximately doubling during the study period. Table 6 (5, Tables 448, 511, 857, 928, 1159; 6, Table 18), shows the 20-year growth of various categories of public and private debt and demonstrates that the increase in highway debt has been relatively conservative. It is particularly notable that state highway debt has increased less than 100 percent whereas total state government debt has increased more than 550 percent. Local government debt in total has grown at more than twice the rate of local highway debt. In 1962, state and local highway debt included 19 percent of total state and local government debt. By 1982, this share had dropped to only 8 percent.

TABLE 6 Comparison of Highway Debt with Other Public and Private Debt, 1962-1982

Debt Category	1962 ($ billions)	1982 ($ billions)	Percent Increase
Public			
Federal	298.2	1,142.0	283.0
State	22.0	143.7	553.2
Local	59.3	236.6	299.0
Private			
Mortgage	236.0	1,545.0	554.7
Farm	30.2	201.7	567.9
Consumer	46.0	370.6	705.7
Highway			
State	10.5	19.3	83.8
Local	5.0	10.7[a]	114.0

[a]1981 data.

CONCLUSION

Perhaps the most important finding of the study is that from a national perspective, state and local highway debt has not become an unmanageable burden. Although indebtedness for highways has shown steady growth through the past two decades, this growth has been extremely conservative when compared with other major categories of debt. The comparison to state and local nonhighway debt is especially relevant and shows that the other major governmental programs have utilized bond financing to a much greater degree than has the highway program. This is partially due to the widely accepted philosophy of dedicated funding for highways, resulting in assured sources of revenues and a reduction in the need to incur debt. The favorable indebtedness situation for highways is also a tribute to the major commitment at the federal level to provide an adequate national transportation system on a pay-as-you-go basis.

At the state level, a significant trend has been increased emphasis on issuance of general obligation bonds and the concurrent reduction in use of limited obligation and revenue bonds. This phenomenon has coincided with a general increase in interest rates, and reflects a prudent approach to debt management that minimizes total debt service costs. It should be noted, however, that even with the current prevalence of general obligation bond funding, highway user taxes and toll receipts continue to be the principal sources of revenue used for debt service purposes.

Use of highway bond financing by local rural authorities has not shown significant growth during the period of study. However, municipal highway debt and local debt incurred for highway-related purposes have grown at nearly twice the rate of state highway debt. This trend is one indicator of the exceptional infrastructure needs that have developed in the nation's urban areas and the inability of local au-

thorities to generate sufficient funds to finance capital programs from current revenues. These problems will inevitably affect both state and local government as the municipalities seek greater distributions of state highway user taxes as well as additional sources of local funds.

Analysis of highway debt at all jurisdictional levels has shown a remarkable variability among the states with respect to bonding practices. Several states (primarily western) have followed a pay-as-you-go philosophy and have avoided highway indebtedness completely, or nearly so. The philosophy has been adopted at the state level in a few states but not by the local government agencies. Many states (primarily eastern) appear to have transcended the acceleration principle of bond financing, that is, incurring debt only during short periods of relatively great construction needs and retiring debt as construction needs are reduced. These states tend to utilize bond funds on a regular basis and as a result must use a relatively high proportion of current revenues to retire debt. It must be noted in this discussion that although philosophical differences may account for some of the variation in state bonding practices, it is certainly easier to remain with a pay-as-you-go policy in a rural, low population state than in an urbanized, high population state. It is recognized in many cases that the immediate and long-term benefits of reduced traffic congestion and improved safety derived from a new highway facility will outweigh the costs of incurring new debt to build the facility.

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Development and Application of New Highway Cost-Allocation Procedures

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ABSTRACT

Previous attempts at resolving the highway cost-allocation problem of determining equitable changes for each vehicle class that shares transportation facilities such as highways and bridges can be reduced to two approaches: proportional allocation methods that determine costs in proportion to one or more measures of highway usage, and incremental methods that allocate costs on the basis of highway design differences necessary to accommodate heavier vehicle classes. Developed in this paper are two new highway cost-allocation methodologies that actually extend the basic concepts of the incremental and proportional allocation procedures. The new methods are referred to as the "modified incremental approach" and the "generalized method". Both methods fulfill the following conditions: (a) highway costs are completely financed by users (completeness condition); (b) vehicle classes reduce their cost responsibilities by sharing the facilities with other vehicle classes (rationality principle); and (c) vehicle classes are charged at least enough to cover their corresponding marginal costs (marginality principle). An example using Texas Pavement data illustrates the application of the proposed methods.