Research Report
KTC-05-17/TA504-2F

KENTUCKY TRANSPORTATION CENTER

College of Engineering

THE IMPACT OF STATE ROAD FUND DEBT LIMITS: AN EMPIRICAL ANALYSIS

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KENTUCKY TRANSPORTATION CENTER
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(859) 257-4513
(859) 257-1815 (FAX)
1-800-432-0719
www.ktc.uky.edu
ktc@engr.uky.edu

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The Impact of State Road Fund Debt Limits: An Empirical Analysis

By:

Michael Moody
Doctoral Candidate, Public Administration

and

Merl Hackbart
Professor of Finance and Public Administration

in cooperation with

Kentucky Transportation Cabinet

And

Federal Highway Administration
U.S. Department of Transportation

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16. Abstract

States have been gradually increasing their reliance on debt financing to meet their transportation funding needs. Increased reliance on debt financing has been driven by the slow growth of highway and Road Fund revenue sources, resistance to tax expenditures, and restrictions placed on the use of General Fund revenue, in many states, for transportation projects. In light of states' increasing reliance on debt financing for transportation, state officials and policy makers have shown greater interest debt management practices. One dominant practice across the states is the use of debt limitations. Debt limit policies vary widely from state to state. There are differences in the origin, scope, and coverage of state debt policies. The present study is an extension of the research originally done by the University of Kentucky Transportation Center exploring the debt limits and debt capacity using the Road Fund. The original study yielded an unexpected result related to the level of debt service to total revenue. States with debt limitation polices had, on average, higher ratios of debt service to total revenue than states without debt limitation policies. This study presents two statistical tests that confirm the previous graphical result from the original study. Using a simple t-test, the group of states with a Road Fund debt limit had a ratio of debt service to revenue that was, on average, 7.4% higher than the group of states without a Road Fund debt limit. Using multivariate regression analysis, states with a Road Fund debt limit had ratios of Road Fund debt service to Road Fund revenue that were 9.6% higher than states without Road Fund debt limits.

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Executive Summary

States have been increasing their reliance on debt financing to meet their transportation funding needs. Much of the increased reliance on debt financing can be attributed to three factors: first, slow growth of highway and Road Fund revenue sources; second, resistance to tax increases; and third, restrictions, in many states, placed on the use of General Fund revenue for transportation projects. In light of states' increasing reliance on debt financing for transportation, state officials and policy makers have shown greater interest debt management practices. One practice common to many states is the use of debt limitations.

Debt limit policies vary widely from state to state. There are differences in the origin, scope, and coverage of state debt policies. The present study is an extension of the research originally done by the University of Kentucky Transportation Center exploring the debt limits and debt capacity using the Road Fund. The original study arrived at a number of important conclusions. First, many states have established or are in the process of establishing debt limits for their Road Funds. Second, the origin and use of debt limitations varies widely. Third, states' levels of debt service as a portion of revenues seem to indicate that each type of fund (General or Road) has a different appropriate level of revenue that should be committed to debt service. The Road Fund typically has a higher ratio of debt service to total revenue than the General Fund.

The fourth result from the original study was that states with debt limitation polices had, on average, higher ratios of debt service to total revenue than states without debt limitation policies. The current study investigated this difference to test its statistical significance and determine whether these differences persist when we control for other factors. This study focuses on the impact of Road Fund debt limitations on the level of Road Fund debt. The question of what impact these debt limits have is critical to states now seeking to implement a viable debt policy.

This study presents two statistical tests that confirm the graphical result from the original study. A simple t-test, looking at the difference in the mean level of Road Fund debt service as a portion of Road Fund revenue between states with Road Fund Debt limits and those states without Road Fund debt limits found a significant difference. The group of states with a Road Fund debt limit had a ratio of debt service to revenue that was, on average, 7.4% higher than the group of states without a Road Fund debt limit. The second statistical test—multivariate regression analysis—controlled for other factors that are related to a state's ratio of Road Fund debt service to total Road Fund revenue. States with a Road Fund debt limit had 9.6% higher ratios of Road Fund debt service to Road Fund revenue than states without Road Fund debt limits.

The results of these statistical analyses leave open the question of why we observe this difference between states with a Road Fund debt limit and those without Road Fund debt limits. To answer this question we would need to look at the level of Road Fund debt service as a proportion of total Road Fund revenue across states for a number of years

before and after the adoption of Road Fund debt limit policies. Debt management studies are beginning to investigate the impact of debt limit policies on Road Fund debt levels.

Introduction

State governments are facing major transportation infrastructure financing challenges. Most states have a highway or Road fund that is solely used for transportation projects. These funds are primarily comprised of earmarked revenue sources that have been growing slowly relative to other state revenue sources. In addition to the slow growth of highway and Road funds—which are generally dedicated to transportation—many states have restricted the use of general revenue for transportation expenditures because of policymakers perception that having an earmarked revenue sources is sufficient for highway or Road Fund needs. These problems are compounded by the broad resistance to tax increases. As a result of these issues, state transportation officials have turned to new and innovative methods to meet highway construction and maintenance needs. Among the financing methods that state transportation officials have turned to is the use of bond or debt financing.

The attractiveness of debt financing is attributable to several factors including the theoretical justification of debt financing (the benefits received principle which suggests that it is appropriate policy to match the benefits of public expenditures to the cost of public programs and investments), the ability to undertake highway construction and maintenance projects without having all the necessary financial resources upfront and recent federal legislation (TEA 21) that permits the states to use future federal funds to meet debt service obligations. Increased reliance on debt financing has brought increased concern with debt management and limitations.

Discussions about appropriate debt limits include questions regarding Road Fund debt affordability or "debt capacity." Such questions focus on determining the "sustainable limits" to the use of Road Fund revenues to meet debt service obligations. By implication, a

sustainable debt limit is the level of debt or Road Fund debt service expenditures that can be incurred without negatively impacting the ability of a state to meet other high priority highway investments.

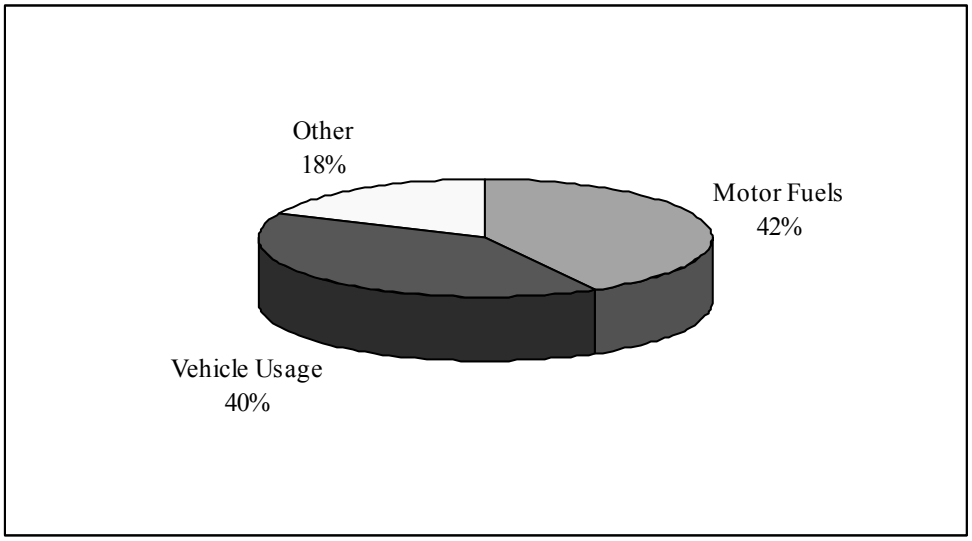
This study provides an empirical extension of a previous study that focused on "state transportation bond financing and debt limitation policies."[1] Two items of particular interest in the original study were 1) whether states established debt limits, in the Road and General Fund, as a part of their debt management policies, and 2) what type of debt limit policy was established by states for the different fund types. These state policies and practices are critical factors in the determination of bond ratings and the ultimate cost of debt financed capital. Moody's Investor Service (a credit rating agency) specifically lists among the management practices that tend to lead to strong results "debt affordability analysis to inform capital budgets and debt authorization decisions"[2] It is noted, in the same report by Moody's, that states with the highest credit rating (AAA) are distinguished by their "fiscal management and governance practices."[3] Debt management policies signal, to investors and credit rating agencies, the government's fiscal discipline and proper financial management.

Road Fund debt management policies have grown out of an increasingly complex environment of public finance. As noted, in the previous study[4], the current environment of slow Road Fund revenue growth and resistance to tax increases has led many transportation officials to search for innovative ways to finance their highway and road infrastructure needs.

[1] Hackbart, Merl, Suzanne Perkins, and Yongbeom Hur, Debt Capacity and Debt Limits: A State Road Fund Perspective, (Kentucky Transportation Center, University of Kentucky, 2004), 7.
[2] Moody's Investor Service, Moody's State Rating Methodology. (New York, New York, 2004), 16.
[3] Ibid, 2.
[4] Hackbart, Perkins, and Hur, 1.

In Kentucky, total Road Fund receipts decreased by 0.6 percent from Fiscal Year 2003 to Fiscal Year 2004[5]. Road Fund revenues have not been growing as rapidly as General Fund revenue[6], nor has Road Fund revenue growth kept pace with growth in the Consumer Price Index[7]. The composition of Kentucky's Road Fund revenues for FY 2004 appears in figure 1.

Figure 1: Kentucky's Road Fund Revenue Sources



Source: 2003-2004 Kentucky Department of Revenue Annual Report, pg. 8

Federal funds are an important component of Kentucky transportation funding, in fiscal year 2004 Kentucky received over $500 million from federal funds.[8] Most federal highway aid is distributed through the federal Highway Trust Fund Kentucky, like many states relies on aid from the Highway Trust Fund to pay for many transportation expenditures. The Highway Trust Fund was created to provide funding for the interstate highway system. Financing for the Highway Trust Fund is derived from a variety of federal

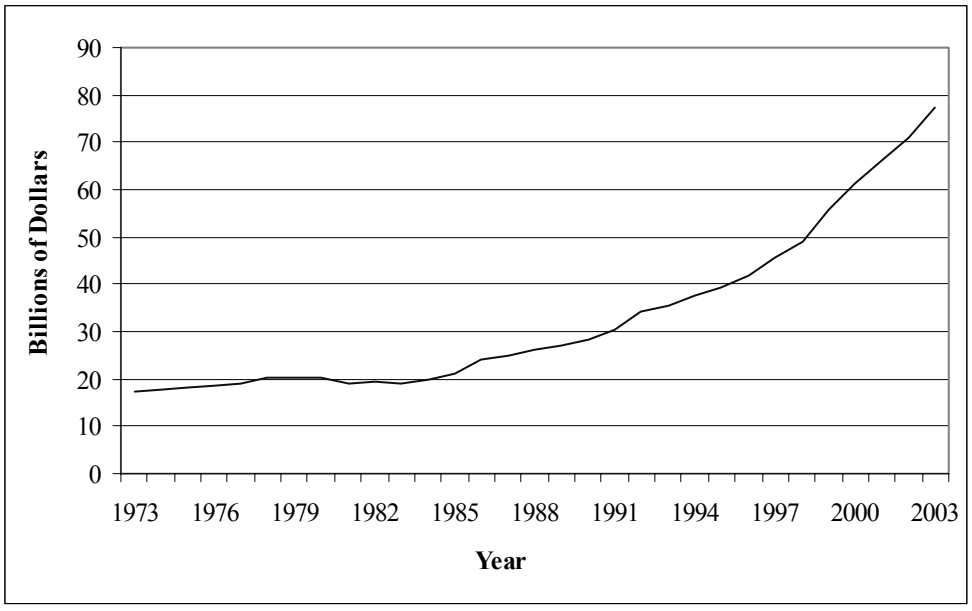
[5] 2003-2004 Kentucky Department of Revenue Annual Report (Commonwealth of Kentucky, Frankfort, Kentucky). 7.
[6] 26th Annual Kentucky Transportation Conference, presentation by Office of Budget and Fiscal Management (http://www.kytc.state.ky.us/policybud/Kbta2004.pdf accessed 5/23/2005).
[7] 27th Annual Kentucky Transportation Conference, presentation by Office of Budget and Fiscal Management (http://transportation.ky.gov/policybud/KBTA2005.pdf accessed 5/23/2005).
[8] Ibid.

highway user taxes including excise taxes on motor fuels (gasoline, gasohol, diesel and special fuels) and truck-related taxes on truck tires, sales of trucks and trailers, and the use of heavy vehicles.

Recent legislative changes (ISTEA, TEA21, and the NHS act) allow states to use federal funds with more flexibility. Now, states can pledge or "pre-obligate" federal funds to payment of highway debt service. Increasingly, states are relying on debt finance to meet their capital spending needs. This can be justified by the benefits principle of public finance.[9]

Figure 2 shows the increase in indebtedness for highway projects for state governments over 30 years. At the end of 1973, the total amount of outstanding highway obligations for all states and the District of Columbia was almost $17.5 billion; by the end of 2003 the amount of outstanding highway obligations was a little over $77 billion.

Figure 2: State government highway obligations outstanding, end of year, 1973-2003.

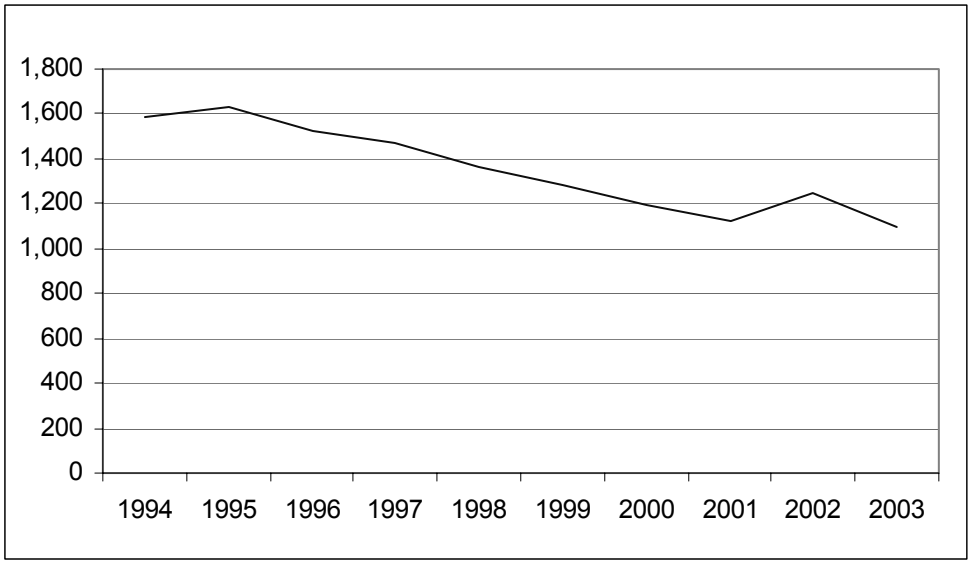


Source: Federal Highway Administration, Highway Statistics, Highway Finance 1995-2003

[9] The principle is that current expenditures should be financed from current revenues while capital expenditures can be financed by borrowing. This principle allows the stream of benefits from public services to be matched with a similar mechanism for payment. Oats, W.E., *Fiscal Federalism,* (Harcour Brace, Jovanovich: New York, 1972).

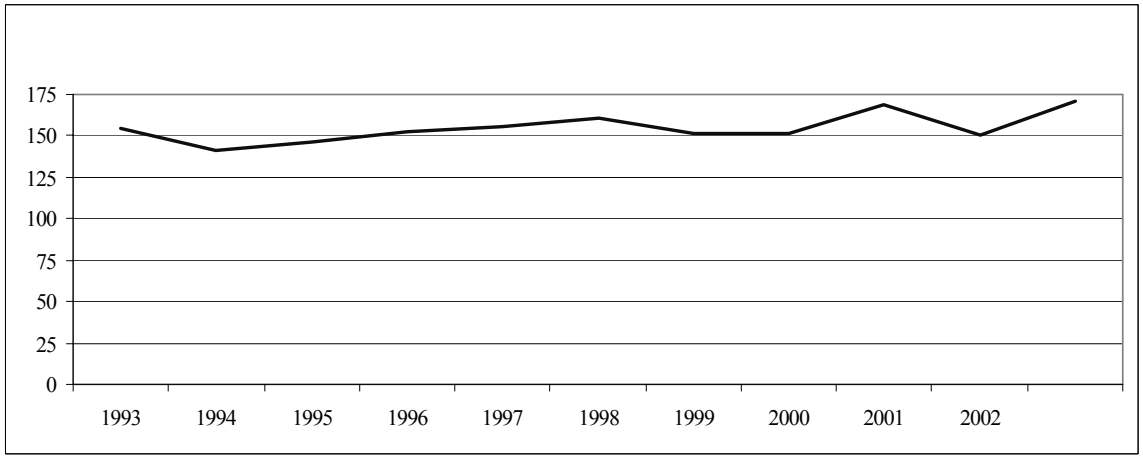
Kentucky's highway debt outstanding over the last decade looks much different than the national trend above. Kentucky's highway debt outstanding has decreased from 1994-2003, as shown in figure 3. By contrast, the requisite Road Fund debt service payments have increased slightly over, almost the same, time period (figure 4). Though there is less highway debt outstanding in Kentucky, the level of Road Fund debt service has been roughly constant. (An updated discussion of Kentucky's current status can be found in Appendix E)

Figure 3: Kentucky Highway Debt Outstanding, Millions of Dollars, 1994-2003



Source: Federal Highway Administration, Highway Statistics, Highway Finance 1994-2003

Figure 4: Kentucky Road Fund Debt Service, Millions of Dollars, 1993-2002



Source: University of Kentucky Transportation Center Survey—2003

Results from Original Study

The original study arrived at a number of important conclusions. First, many states have established or are in the process of establishing debt limits for their Road Funds. A struggle has ensued in many states as they have tried to establish appropriate limits on the use of Road Fund revenues to pay Road Fund debt service.

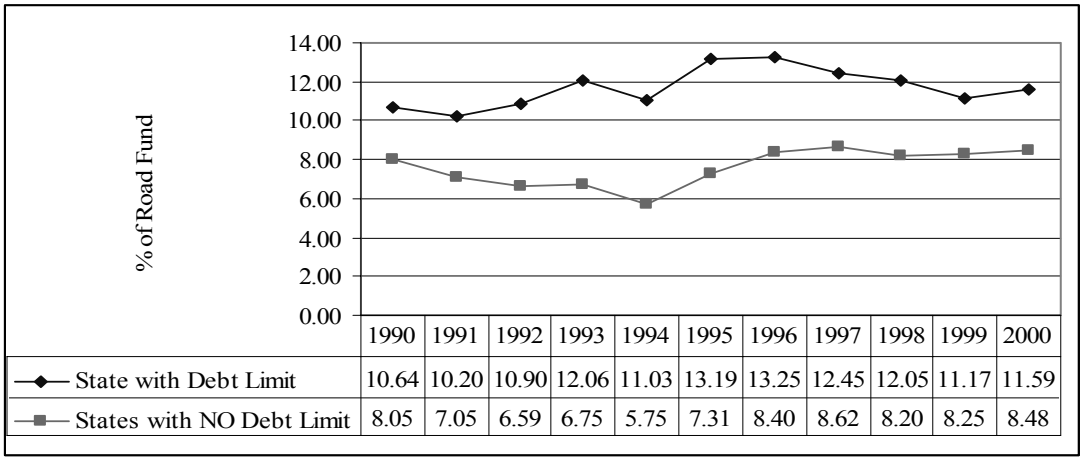
A second finding of the study is that the origin and use of debt limitations varies widely. Surveys were sent to each of the 50 states regarding debt limitation/management policies for both the General and Road Fund. The survey results "indicated that debt limits have multiple origins and that states can have duplicate debt limits."[10]

Third, the states' current levels of debt service as a portion of revenues is different for the Road and General Fund. This may indicate that each type of fund (General or Road) has a different appropriate level of revenue that should be committed to debt service. The Road Fund typically has a higher ratio of debt service to total revenue than the General Fund. This may stem from the capital intensive nature of Road Fund projects.

Finally, the original study yielded an unexpected result related to debt limits and the level of debt service to total revenue. States with debt limitation polices had, on average, higher ratios of debt service to total revenue than states without debt limitation policies. Figure 5, below, displays this unexpected result that debt limitations seem to have on the level of debt service to total revenue. One objective of the current study is to investigate this difference, test its statistical significance and determine whether these differences persist when we control for other factors.

[10] Hackbart, Perkins, and Hur, 35.

Figure 5: Comparison of Debt Service as a Percent of Road Fund Revenues for States With and Without Debt Limits: 1990-2000



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
State with Debt Limit	10.64	10.20	10.90	12.06	11.03	13.19	13.25	12.45	12.05	11.17	11.59
States with NO Debt Limit	8.05	7.05	6.59	6.75	5.75	7.31	8.40	8.62	8.20	8.25	8.48

*Source***:** *Calculated from 2003 University of Kentucky Transportation Center survey data. For this period, eight states with debt limits responded to the survey while fifteen states without debt limits responded.*

Study Focus

This study will focus on the impact of Road Fund debt limitations on the level of Road Fund debt. Many states have imposed debt limits to ensure compliance with bond rating agency expectations. The question of what impact these debt limits have is critical to states now seeking to implement a viable debt policy. Additionally, this study will search for other factors that might influence the level of Road Fund debt outstanding.

The next section of this study will briefly review relevant literature. Following the literature review, the data used for the analysis will be discussed. The data compiled from the original survey has been augmented with data from other national and state sources. The empirical models used for investigation, as well as the methods, are covered after the discussion of the data. The panel data are analyzed to shed insights into debt limits on the Road Fund. The final piece of study will present results of the statistical investigation and concluding observations.

Literature Review

States are issuing more debt now than they have in the past[11]. State debt levels are one of the primary factors considered by credit rating agencies in determining a state's credit rating. Credit ratings, and therefore debt levels, impact states in a number of ways. Bond ratings impact the state's cost of capital. A second important impact that some states face is a restriction on their ability to issue debt if their credit rating falls below investment grade. States with higher bond ratings can save millions of dollars in borrowing costs through the lower interest rates they are able to attain in the market. Johnson investigated the current condition of state credit quality by examining bond ratings from 1970-1995[12]. He found that state credit quality today is weaker than it has been in the past, but is still quite strong. He suggested that states take the lead in more active debt management to improve economic conditions and, as a result, bond ratings.

The academic focus on debt management is not new; public debt management has been approached in many ways and at many levels. States have been a dominant focus of research on debt policies and management[13]. Notably, some work has begun to examine state debt policy impacts on state road funds, public authorities, and special districts[14].

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[11]Regens, James L. and Thomas P Lauth. 1992. "Buy Now, Pay Later: Trends in State Indebtedness, 1950-1989." *Public Administration Review*, 52(2):157-161; Bahl, Roy and William Duncombe. 1993. "State and Local Debt Burdens in the 1980s: A Study in Contrast." *Public Administration Review*, 53(1):31-40; Johnson, Craig. 1999. "State Government Credit Quality: Down, But Not Out!" *Public Administration Review* 59(3): 243-249..

[12] Johnson, 248.

[13] Bahl and Duncombe, 32; Clingermayer, James C. and B. Dan Wood. 1995. "Disentangling Patterns of State Debt Financing." *American Political Science Review,* 89(1):108-120; Regens and Lauth, 157; Hackbart, Merl, and James Leigland. 1990. "State Debt Policy: A National Survey." *Public Budgeting and Finance* 10(2): 37-54; Hackbart, Merl and James Ramsey. 1993. "Debt Management and Debt Capacity" in *Handbook of Municipal Bonds and Public Finance*, edited by Lamb, Leigland and Rappaport. New York Institute of Public Finance, Simon and Schuster: New York.

[14] Hackbart, Perkins, and Hur; Trautman, Rhonda Riherd. 1995. "The Impact of State Debt Management on Debt Activity." *Public Budgeting and Finance*, Summer 1995: 33-51; Denison, Dwight V. and Merl Hackbart. "State Debt Capacity and Debt Limits: Theory and Practice" Forthcoming in *Handbook of Public Financial Management*, Howard Frank editor. Marcel-Decker: New York NY

The literature reviewed for this study falls into two broad categories: debt management/policy and transportation finance. Within the debt management literature one finds theoretical, descriptive, and empirical studies aimed at informing policy makers about the issues related to debt management. A better understanding of how the Road Fund is used, and how states choose their financing mix for transportation comes from the transportation finance literature. This study combines insights from both broad areas to frame the current question of the impact of debt limitations on Road Fund debt levels.

Debt Management Literature

Public debt management literature began to appear in the late 1980's and early 1990's. In 1990, Hackbart and Leigland presented the results of an in-depth, nation-wide survey on state debt management practices[15]. They looked closely at the differences in debt constraints, types of debt issued, entities authorized to issue debt, and many topics related to states overall debt management policies. Their reported differences across states, in terms of debt policy, were remarkable. For example, in Nebraska only public authorities issue debt; the state itself issues no debt. Other states, like Wisconsin, issue general obligation and revenue debt, while state authorities also issue revenue debt. A more recent study found that 10 states have no restriction on debt issuance and that among the 40 states with restrictions there is "substantial heterogeneity." [16]

Many researchers have built on the foundation established by Hackbart and Leigland to study the impacts of the various state debt policies on debt activity[17]. This research is only beginning to look at the impact of state debt limits on specific agencies, funds, or other

[15] Hackbart and Leigland, 39 et seq.
[16] Poterba, James M. and Kim S. Rueben. 2001. "Fiscal News, State Budget Rules, and Tax Exempt Bond Yields." *Journal of Urban Economics*, 50:537-562.
[17] Trautman; Bahl and Duncombe 36.

public entities that may be affected by a central debt limit. For example, Hackbart, Perkins and Hur have recently attempted to investigate state debt policies impact on state road funds[18].

The reasons for debt limits are numerous, but one of the most compelling reasons for states and localities to implement debt limits is a belief that debt limits will improve credit ratings and improved credit ratings will result in lower issuing costs[19]. Debt limits are usually part of a government's broader debt policy. These debt policies come in various forms including formal and informal debt policies, rules of thumb, and policy guidelines found in state statutes and constitutions.[20] States, localities, universities, public authorities and many types of governmental entities often use debt limits. There is a continuing debate about the impact of the debt limits.

Debt Limit Research Results

Some researchers have found that debt limits do indeed lead to lower debt burdens[21] while others have found the debt limits simply shift the composition of debt issued from general obligation bonds to non-guaranteed revenue bonds[22] or have no effect at all.[23]

Regens and Lauth look at the broad trend of state indebtedness in aggregate from 1950-1989. Over those four decades they identify the trend toward greater indebtedness in constant dollars, a shift toward the use of non-guaranteed debt compared to GO debt, and relatively constant total debt to revenue ratios. The shift toward non-guaranteed debt is

[18] Hackbart, Perkins, and Hur
[19] Hackbart and Ramsey 330.
[20] Robbins, Mark D. and Casey Dungan. 2001. "Debt Diligence: How states manage the borrowing function." *Public Budgeting and Finance*, 88-105.
[21] Bahl and Duncombe, 38.
[22] Regens and Lauth, 158.
[23] Clingermayer and Wood, 116.

attributed to state debt limits on general obligation bonds[24]. With more debt being issued as non-guaranteed, it was recognized that governments may be induced to cover these obligations despite the lack of a statutory or constitutional obligation[25]. This moral obligation may exist with public authorities, public universities and other entities related to the state.

Similar to Regens and Lauth, Bahl and Duncome put together a pooled cross-section of states to investigate the determinants of state and local government debt use. The independent variable in their model was total state (state + local) debt outstanding as a percent of personal income. They relied on four general categories of determinants: demand for public services, tendency for expansionary government, debt mix, and historic debt. They included a variable for debt limits on general obligation bonds, as well as for debt limitation of all state revenue bonds. Bahl and Duncombe reported that both debt limit variables dampened the total level of debt burden. States with a revenue bond debt limit has a "6 percentage point drop in total debt burdens"[26].

More recently, Clingermayer and Wood set out to determine which political factors affect state debt levels. Their analysis looks at 48 states from 1961-1989. They find that debt limits have no impact on states debt levels.[27] Ellis and Schansberg[28] also wanted to investigate the determinants of state government debt financing. They find that the fiscal restraints are "somewhat effective"[29].

[24] Regens and Lauth, 158.
[25] Hackbart and Leigland, 53.
[26] Bahl and Duncombe, 38.
[27] Clingermayer and Wood, 116.
[28] Ellis, Michael A. and D. Eric Schansberg. 1999. "The determinants of state government debt financing." *Public Finance Review* 27(6): 571-587.
[29] Ibid., 581.

To date there have not been studies that have focused exclusively on the impact of Road Fund debt limits on Road Fund debt levels. This study builds off of these empirical analyses, using many of the same variables, to investigate the Road Fund debt levels.

Road Fund Debt Management and Transportation Finance

Some recent scholarly work provides basic insights into Road Fund debt management. A research report by Hackbart, Perkins and Hur[30], in conjunction with the Kentucky Transportation Center, provides insights into debt management policies of both the General and Road Fund. Their results are based on the findings of two nationwide surveys: first, a survey on state debt management policies; and second, a survey on Road Fund debt management policies. The research report described the debt policies that govern state-wide borrowing, and compared them with those policies which govern borrowing by the Road Fund. Hackbart et al. report that the differences in debt management between the general fund and the Road Fund are likely due to the different functions that each fund plays.[31]

Hackbart and Denison[32], building off of the same surveys, consider theoretical and conceptual issues involved in setting debt limits. They give consideration to special Agency Funds that usually have different characteristics and uses compared to the general fund. They use the Road Fund as one example; this fund predominantly issues revenue bonds, primarily finances capital expenditures and has a dedicated source of revenue. Because of these characteristics it may be appropriate for these funds to have a separate debt limit policy.

While other studies on transportation finance have been undertaken, none have considered the effect of Road Fund debt policies on the state's choice of financing. A recent study by Tosun, Witt, Mann, and Salimi looked at differences in state and local highway

[30] Hackbart, Perkins, Hur.
[31] Ibid., 35.
[32] Hackbart and Denison.

finance.[33] They use a simultaneous equation model with various explanatory variables that control for population size and economic and demographic variables. Omitted from their study are any political or administrative variables that might impact the financing of state transportation. They find that per capita income and the unemployment rate are both positively related to a state's use of bond financing.

Data, Model, and Methods

The first item to address is the impact of a Road Fund debt limit on Road Fund debt levels. As mentioned in the introductory section, the initial study of Road Fund debt limitation policies produced a result that showed that states with a debt limit policy had, on average, a higher level of debt service as a proportion of revenues than states with no debt limitation policy.

The first step towards determining the statistical significance of this finding is to perform a statistical analysis of the mean levels of debt service as a portion of revenues. Two tables seem informative as we approach this question. The first table confirms what the graph presented in the introduction—on average a state with a road fund debt limit actually has a higher level of debt service as a portion of revenues than those without a debt limit policy. The difference in the means is statistically significant at the 0.01 level; a t-test generated a t-value of -5.84.

[33] Tosun, Michael, Tom S. Witt, Patrick C. Mann, and Jawad Salimi. 2003. *Changes in the Structure of State and Local Highway Financing: A Panel Data Analysis.* Working paper West Virginia University.

Table 1: Mean Levels of Debt Service as a portion of Revenues for the Road Fund, by Debt Limit Policy

Debt Limit Policy	Observations	Mean (Standard Deviation)
No	99	0.060 (0.052)
Yes	152	0.134 (0.118)

Data Source: Data for Fiscal Years 1992-2003 as reported in the University of Kentucky Transportation Center Road Fund Survey 2003

The table below looks at the same question using data from the Federal Highway Administration (FHA). The FHA data differs from the survey data in a number of respects. First, the survey data deals uniquely with Road Fund debt service while the FHA data records the debt service for highways regardless of which fund (General, Road, or other) provides the debt service. Some states do not issue bonds backed by Road Fund revenue, yet they provide highways for the public; in this case the survey results would show zero debt service from the Road Fund while the FHA data would show current highway debt service. Second, because it deals with highway finance universally, it contains data from all 50 states[34]. Using the FHA data confirms the above result; the difference in the mean between the states with *no debt limit* and the states with a debt limit is also statistically significant. (The difference in the means is statistically significant at the 0.05 level; a t-test generated a t-value of -2.93.)

[34] Though the FHA provides data for all 50 states, information on Road Fund debt policies was only received from 43 states. This accounts for the seven states that appear in the no response category. Another interesting observation is that those states that did not respond to the Road Fund survey appear to have the highest levels of debt service as a portion of total revenues, on average, when compared to the responding groups. The difference between the responding group and the non-responding group is statistically significant at the .01 level with a t-value of 4.3025.

Table 2: Mean Levels of Debt Service as a portion of Revenues for Highways, by Debt Limit Policy

Debt Limit Policy	Observations	Mean (Standard Deviation)
No	180	0.058 (0.073)
Yes	250	0.084 (0.106)
No Response	70	0.130 (0.139)

Data Source: Federal Highway Administration, Highway Statistics, 1994-2003

Simple statistical tests confirm that states with a Road Fund debt policy have different levels of Road Fund debt compared to states with no Road Fund debt policy. A multiple regression analysis allows us to control for other variables and see if the impacts of Road Fund debt policy remain important in determining the level of Road Fund debt outstanding. Below is a discussion of the data, methods and models used in the analysis.

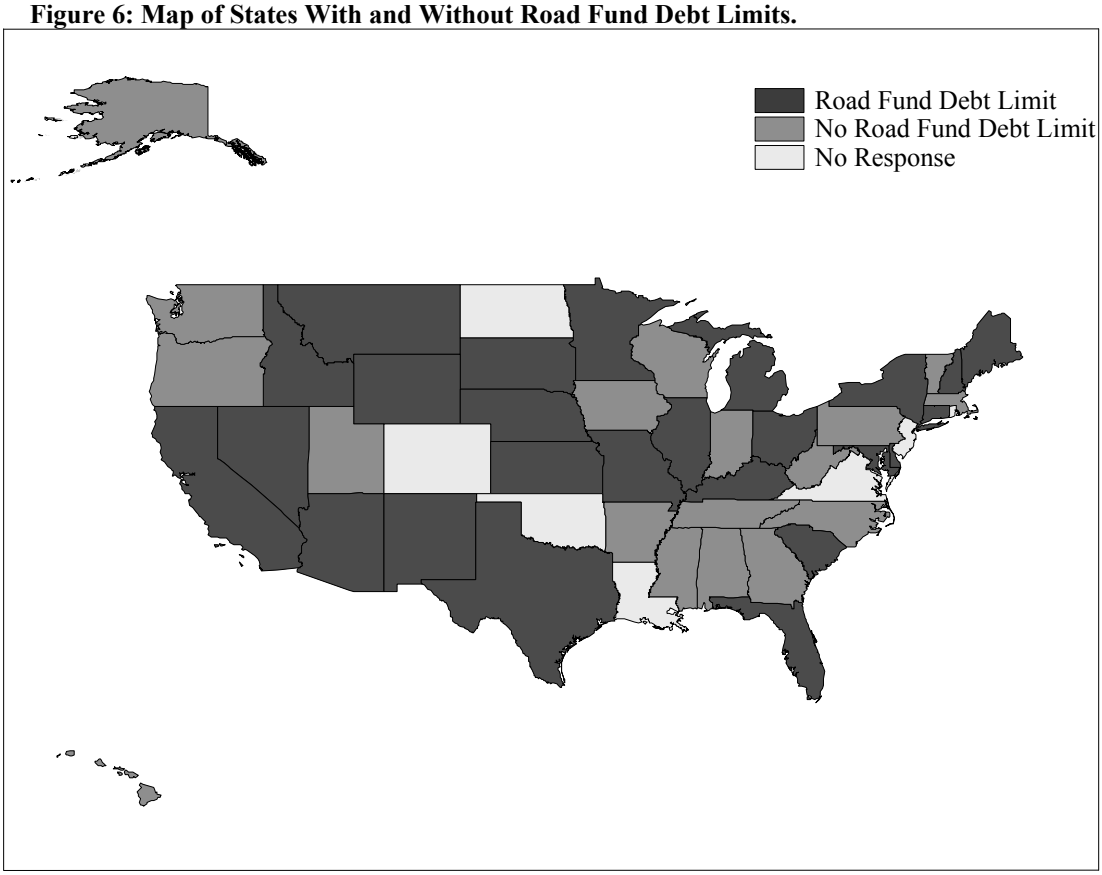
Data

The data for this analysis comes from a variety of sources. The data used in the previous study were collected from a survey designed specifically for this project. Other major data sources are the U.S. Census Bureau, U.S. Department of Transportation—Federal Highway Administration, Moody's Investors Services, and the National Council of State Legislatures (NCSL). The data contribution from each of these sources will be discussed below.

Survey Data

The primary data come from surveys concerning debt management practices; including the use, structure, and origin of debt limits, as well as information on debt capacity estimation. As mentioned previously, surveys were sent to each states' department of transportation (or other agency that deals with highway and road maintenance and construction); eighty-six percent of the states responded (43 of 50) to the survey.

Figure 6: Map of States With and Without Road Fund Debt Limits.



Source: University of Kentucky Transportation Center Road Fund Survey—2003

The last question of each survey asked for historical information on the debt service expenditures as a proportion of revenues (See Appendix C for a copy of the survey). This question was completely or partially answered by 29 states for the Road Fund.[35]

Census Data

Two types of data were collected from the U.S. Census Bureau: demographic and financial. Among the demographic variables are the percent of the state population over age 65, the population density, and state income per capita. The financial data includes various

[35] It should be noted that for some states there is no road fund, and many states do not issue debt supported by the road fund or this option only recently became available. The 29 states that responded to this question all had non-zero values for their road fund debt service in at least one year.

revenue sources related to highways and roads, such as toll fees and revenue, motor fuel taxes, and motor vehicle license fees.

Federal Highway Administration

The Federal Highway Administration publishes *Highway Statistics* annually. The variables taken from this source are revenue used by states for highways, and state obligations for highways—funding for debt service and change in indebtedness.

Other Data Sources

The NCSL annual publication *State Tax Actions,* provides information on tax changes in motor fuel and motor vehicle taxes from 1992-2003. The final data source, on state partisan balance, contains information on the majority party in legislative branches, the executive branch, as well as percentages of either major party.[36]

Each of the data sources, discussed above, is used in estimating the empirical models that are discussed in the next section.

Table 3 shows the descriptive statistics for these variables; there is great variation in these variables. (The descriptive statistics for a sample year, 2000, can be found in Appendix A.) Road Fund revenue used to pay debt service as a portion of total Road Fund revenue ranges from 0 to over 50 %. The average Road Fund debt service as a portion of Road Fund revenue is 10% according to the survey responses. The average disbursement of debt service related to highways as a portion of highway revenue is 8% according to

[36] Klarner, Carl, 2003. "State Partisan Balance" *State Politics and Policy Data Resource* (http://www.ku.edu/pri/SPPQ/journal_datasets.shtml accessed 5/23/2004).

Table 3: Descriptive Statistics, 1992-2002

Variable Description	Observations	Mean	Standard Deviation	Minimum	Maximum
Dependent Variables in at least one model					
Road Fund Revenue for DS/Road Fund Revenue	251	0.10	0.10	0	0.54
Disbursements on Highway DS/Revenue used for Highway	450	0.08	0.10	0	0.53
Key Independent Variable					
Road Fund Debt Limit	473	0.58	0.49	0 (198)	1 (275)
State Finance/Revenue					
Toll Highway Fees	550	72.58	134.63	0	762.70
Federal aid distributed from the Federal Highway Trust	550	414.63	402.20	0	3737.97
Motor Vehicle (MV) Fuel Tax, MV License & MV Operator's License Revenue	550	833.42	843.18	64.41	5187.68
Increased tax rate related to Motor Vehicles	550	0.12	0.32	0 (485)	1 (65)
Decreased tax rate related to Motor Vehicles	550	0.05	0.22	0 (523)	1(27)
State Demographics					
Per Capita Income (Thousands of Dollars)	550	24.96	4851.98	14.74	42.52
Population Density	550	175.00	239.78	1.00	1155.85
Percent of population over age 65	550	0.13	0.02	0.04	0.19
State Political/Organizational					
Political Competition--Senate & House	441	0.73	0.44	0 (118)	1 (323)
Political Competition--Executive & Legislative	441	1.07	0.87	0	2

Monetary variables in millions of dollars unless otherwise noted.

Parentheses in Minimum and Maximum: Used to indicate the number of occurrences for dichotomous variables

the Federal Highway Administration. On average, states receive about $414 million in aid from the Highway Trust Fund.

Model

In this section the empirical investigation into the impact of a Road Fund debt limit continues by controlling for other variables using multiple regression analysis. Using this type of analysis, we can better understand what variables might impact the Road Fund debt level and get an idea of the size of the impact. The general model is specified in equation 1 below:

(1) (RF Debt Service/ RF Total Revenues) = *f* (RF Finances, Demographics, State Politics, Debt Limit Policy)

As the equation notes, the level of Road Fund debt is a function of other Road Fund financing sources, state demographics, state political control and the imposition of any debt limit policy. The specific variables and their expected sign will be discussed below.

The primary independent or explanatory variable of interest is the Road Fund debt limit. The previous study found higher debt levels, on average, in those states with a debt limit policy. This was confirmed through a simple statistical test in the previous section. Hackbart et al.[37] suggest three possible reasons for this result. First, states with higher debt service to revenue ratios may see the implementation of debt limit policies as a signal to credit rating agencies that may help protect their credit rating. A second possibility, related to the first, is that states that rely heavily on debt may be more concerned with proper debt management. A third possibility is that states with lower debt service to revenue ratios see that they are in relatively good shape in relation to any peer groups making the establishment of debt limit policies less important to them. In

[37] Hackbart et al. 33-34.

keeping with the previous findings, the hypothesis is that the presence of a debt limit is positively related to the debt level.

In general, Road Fund financing sources can be classified as complements or substitutes to debt financing. If Road Fund own source revenue (i.e. revenue collected by the Road Fund itself such as motor fuel taxes, toll road revenue, or motor vehicle registration fees) are substitutes for debt financing, we should expect states with more own source revenue to have lower debt levels. If, on the other hand, own source revenue is complimentary, we should expect higher levels of own source revenue to be related to higher debt levels. Clingermayer and Wood[38] posit and find that own source revenues, when looking at all long-term state debt, are positively related to debt outstanding. This complimentary relationship can be explained as the state seeing its own capacity to make debt service payments increase as its own revenues are increased. Is it different for the Road Fund? The Road Fund is unique in that it is dominantly used to finance capital projects. When own source revenues increase a natural response may be to simply substitute away from debt financing.

An additional Road Fund revenue source is the federal aid from the Highway Trust Fund. This intergovernmental aid can be thought of in the same terms as the own source revenue: is it a compliment to debt financing or a substitute. As mentioned in the introduction, a recent change allows states more flexibility in using federal funds to pay debt service. The stability and reliability of this source of revenue may appeal to the states as being an ideal revenue source that could be committed to debt service. However, our data represent the time period prior to the change in federal policy. So it is uncertain how states viewed intergovernmental aid prior to this policy change.

[38] Clingermayer and Wood, 111.

Other studies looking at the debt levels have included various demographic variables. Bahl and Duncombe as well as Tosun et al. found population density positively related to the level of bond financing.[39] Population density may be a good indicator of the relative wear on public infrastructure. A densely populated area will have more motor vehicles on the roads with the increased congestion. This will create a need for more spending on maintenance as well as spending on projects to improve current road conditions (Adding lanes to the highway, creating alternate routes, etc.).

Additionally, Tosun et al. find that the portion of the population that is elderly is positively related to debt levels. The traditional theory is that elderly people are more willing to use debt financing because they are less likely to bear the burden of debt repayment than the younger generation. The older generation is able to shift the costs of construction to future generations. We expect that the percentage of the population over age 65 is positively related to the level of debt in the Road Fund.

Another relationship is that as a state's income increases its level of Road Fund debt will also increase. State income can be seen in a number of ways. One might see state income as a proxy for the overall wealth of a state, and as wealth increases the state's capacity to handle additional debt increases. An opposite argument is that increased wealth may reduce the state's need to rely on debt financing, a wealthy state can easily cover its costs through current taxation. We think that tate wealth as a proxy for debt capacity is a more compelling argument, therefore, the expected sign of the state income variable is positive.

The political climate of the states may also contribute to the level or Road Fund debt that is acceptable. Included in this model are variables that indicate the degree of

[39] Bahl and Duncombe, Tosun et al

political division within the state. In the early 1980's divided government led to large increases in national debt (republic president and a democratic House and Senate). Our hypothesis is that divided government will be positively related to the level of debt outstanding.

Methods

There are many possible models and methods that can be used in working with panel data sets. Greene (2003) lists a number of different cases to consider when working with panel data. The unique feature of each model is how the heterogeneity of each unit is included.

The pooled cross-section regression allows the inclusion of binary variables that do not change over time. The debt limit variables have this characteristic. The drawback to the simple pooled cross-section is that it does not allow for individual heterogeneity of the states. It assumes that all states are homogeneous rather than heterogeneous.

The random effects model allows for individual heterogeneity in a compound error term. For each group, there is a specific random element similar to the error term. This model allows inclusion of binary variables that do not change over time. In using the random effects model, one assumes that the random effect is uncorrelated with the remaining explanatory variables; this is rarely the case in empirical work and seems unlikely to hold in this model.

The fixed effect model (or the Least Squares Dummy Variable Model) models individual heterogeneity through the inclusion of a unique intercept for each unit. This model does not allow inclusion of variables that do not change over time because it would create perfect collinearity with the institutions' individual intercept term (the fixed

effect). Though this data does not allow us to use a traditional fixed effect model, we can use one component of the fixed effect model called the between estimator. The between estimator or group means estimator collapses the variables to their mean and regresses the independent variables on the dependent variable. Using between estimation focuses interpretation on the differences between observed units—in this case, the states.

The specific model, with Road Fund debt service as a portion of Road Fund revenue as the dependent variable is below:

Debt Service/Revenues = β_0 + β_1Road Fund debt limit + $\beta_2$toll revenue + β_3Highway Trust Fund Revenues + β_4Road/Highway related tax revenue + β_5MV tax increase + β_6MV tax decrease + $\beta_7$per capita income + $\beta_8$population density + β_9 population over age 65 (%) + β_{10} senate/house competition + β_{11}legislative/executive competition + ε

This model relies on the survey data that was collected and reported in the previous study by Hackbart, Perkins, and Hur.

The same model will be used to investigate the data from the Federal Highway Administration (FHA). The differences between these two sources of data are important and are reiterated here. First, the FHA data records the debt service for highways regardless of which fund (General or Road) provides the debt service. Some states do not issue bonds backed by Road Fund revenue, yet they provide highways for the public. The survey data deals uniquely with Road Fund debt service. Second, because it deals with highway finance universally, it contains data from all 50 states. The dependent variable in the second model is the disbursements for highway debt service as a portion of total revenue used on highways.

Because of the differences between the dependent variables we should expect differences in the significance of independent variables.

Results

The results of the first model, using survey data, are reported in Table 4. Almost 60% of the variation between states is explained by this model. A little over 30% of the overall variation is explained by this model. The F value generated by this model is 2.27, which is significant at the 0.10 level. The F-value indicates that at least some of the estimated coefficients are statistically different from zero.

Table 4: Regression Results: Dependent variable Road Fund Debt Service as a percent of Road Fund Revenue

Independent Variable	Coefficient	Standard Error	t-value
Constant	-0.45250	0.30763	-1.47
Road Fund Debt Limit	0.09649*	0.04210	2.29
Toll Road Revenue	-0.00033	0.00025	-1.29
Highway Trust Fund Revenue	0.00047*	0.00019	2.49
Road/Highway Related Tax Revenue	-0.00018*	0.00006	-2.78
Tax Increase (Motor Fuel or Motor Vehicle)	0.10056	0.15359	0.65
Tax Decrease (Motor Fuel or Motor Vehicle)	0.01669	0.19866	0.08
Per Capita Income	0.00001	0.00001	1.33
Population Density	-0.00004	0.00017	-0.24
Population Over Age 65 (%)	1.53520	1.64379	0.93
Political Competition House/Senate	-0.01469	0.06790	-0.22
Political Competition Executive/Legislative	0.02430	0.03088	0.79
R-sq (between) = 0.5948			
R-sq (overall) = 0.3165			

*Significant at the 0.05 percent level

As noted in the table above, there are three significant explanatory variables. The presence of a Road Fund debt limit is significant and positive. This indicates that states with a Road Fund debt limit have, on average and holding all else constant, ratios of Road Fund debt service to Road Fund revenue that is 9% higher than states without debt

limits. The effect, initially seen in the previous study, appears to hold even after controlling for other explanatory variables.

The other variables that are significant, in this model, are Highway Trust Fund Revenue and Road/Highway related tax revenue. Highway Trust Fund revenue appears to be complimentary to the ratio of debt outstanding to total revenue. An additional $100 million dollar increase in Highway Trust Fund revenue leads to an increase of debt service to revenue of 4.7%. On the opposite side, tax revenues appear to be substitutes for debt. A $100 million increase in road/highway related revenue leads to a decrease of the dependent variable ratio of 1.8%.

Table 5: Regression results, dependent variable--Highway debt service disbursements as portion of total highway revenue

Independent Variable	Coefficient	Standard Error	t-value
Constant	-0.19864	0.14400	-1.38
Road Fund Debt Limit	0.01241	0.01934	0.64
Toll Road Revenue	-0.00004	0.00011	-0.37
Highway Trust Fund Revenue	0.00001	0.00008	0.17
Road/Highway Related Tax Revenue	-0.00003	0.00003	-0.92
Tax Increase (Motor Fuel or Motor Vehicle)	-0.02489	0.05909	-0.42
Tax Decrease (Motor Fuel or Motor Vehicle)	0.11050	0.07647	1.44
Per Capita Income	0.00633	0.00446	1.42
Population Density	0.00021*	0.00009	2.35
Population Over Age 65 (%)	0.67824	0.50135	1.35
Political Competition House/Senate	-0.00930	0.02956	-0.31
Political Competition Executive/Legislative	0.01047	0.01353	0.77
R-sq (between) = 0.5948			
R-sq (overall) = 0.3165			

*Significant at the 0.05 percent level

Looking at the estimation of the second model, which uses FHA data, we see that only one variable is statistically significant at the 0.05 level. This model has similar results for the R-squared, 59% between and 31% overall. The F value is larger with this model at 5.81, this signifies there is greater surety that at least one estimated coefficient is non-zero.

The variable that is significant in this model is population density. As the population density of an area increases the more likely they are to rely on highway debt. It is not surprising that the road fund debt limit is not significant in this model. The differences in what the data, from the survey and FHA, report are substantial. All debt service related to highway bonds is quite different in some states from all debt service paid by the Road Fund.

Conclusion

Previous studies have shown that states with a Road Fund debt limit tend to have higher Road Fund debt service as a portion of total Road Fund revenue than states without Road Fund debt limits. This study presents two additional statistical tests that confirm the previous results. A simple test, looking at the difference in the mean level of Road Fund debt service as a portion of Road Fund revenue between states with Road Fund Debt limits and those states without Road Fund debt limits found a significant difference. The group of states with a Road Fund debt limit had a ratio of debt service to revenue that was, on average, 7.4% higher than the group of states without a Road Fund debt limit (Table 1, pg. 12).

The second statistical test—multivariate regression analysis—controlled for other factors that are related to a state's ratio of Road Fund debt service to total Road Fund

revenue. When we controlled for other variables, the difference between states with a Road Fund debt limit and those without was even larger. States with a Road Fund debt limit had 9.6% higher ratios of Road Fund debt service to Road Fund revenue than states without Road Fund debt limits. It appears that there is a systematic difference in the ratio of Road Fund debt service to Road Fund revenue for states with and without debt limitation policies. In many ways this difference appears counterintuitive, states with Road Fund debt limits have higher ratios of debt service to revenue than states without Road Fund debt limits. As noted earlier there are a number of possible hypotheses.

The results of these statistical analyses leave open the question of why we observe this difference between states with a Road Fund debt limit and those without Road Fund debt limits. To answer this question we would need to look at the level of Road Fund debt service as a proportion of total Road Fund revenue across states for a number of years before and after the adoption of Road Fund debt limit policies. This type of analysis would shed some light on whether the implementation of Road Fund debt limits constrained Road Fund debt issuance. We could see if the ratio of Road Fund debt service to Road Fund revenue was higher prior to the implementation of the debt limit. If there is no difference it may be the case that these limits were imposed as more of an outward signal to credit rating agencies.

Appendix A: Descriptive Statistics, 2000

Variable Description	Observations	Mean	Standard Deviation	Minimum	Maximum
Dependent Variables in at least one model					
Road Fund Revenue for DS/Road Fund Revenue	29	0.11	0.12	0	0.49
Disbursements on Highway DS/Revenue used for Highway	50	0.06	0.07	0	0.35
Key Independent Variable					
Road Fund Debt Limit, Dichotomous	43	0.58	0.50	0 (18)	1 (25)
State Finance/Revenue					
Toll Highway Fees	50	85.73	154.88	0	659.87
Federal aid distributed from the Federal Highway Trust	50	475.81	410.07	0	2008.73
Motor Vehicle (MV) Fuel Tax, MV License & Operator's License Revenue	50	928.26	928.38	77.71	4958.35
Increased tax rate related to Motor Vehicles	50	0.06	0.24	0 (47)	1 (3)
Decreased tax rate related to Motor Vehicles	50	0.18	0.39	0 (41)	1 (9)
State Demographics					
Per Capita Income (Thousands of Dollars)	50	28.40	4.43	21.03	41.56
Population Density	50	181.87	250.12	1.10	1134.15
Percent of population over age 65	50	0.13	0.02	0.06	0.18
State Political/Organizational					
Political Competition--Senate & House	49	0.73	0.45	0 (13)	1 (36)
Political Competition--Executive & Legislative	49	1.16	0.87	0	2

Monetary variables in millions of dollars unless otherwise noted.

Parentheses in Minimum and Maximum: Used to indicate the number of occurrences for dichotomous variables

Appendix B: Variable Descriptions and Sources

Variable	Variable Description	Source
Dependent Variables in at least one model		
Road Fund Revenue for DS/Road Fund Revenue	Road Fund revenue used for debt service divided by total Road Fund Revenue	UK Survey
Disbursements on Highway DS/Revenue used for Highway	Disbursements on highway debt service divdided by total revenue used for highways	Federal Highway Administration
Key Independent Variable		
Road Fund Debt Limit	Dichotomous variable, =1 if the state has a Road Fund debt limit, =0 if state does not have a Road Fund debt limit.	UK Survey
State Finance/Revenue		
Toll Highway Fees	Fees from turnpikes, toll roads, bridges, ferries, and tunnels; rents and other revenue from concessions (service stations, restaurants, etc.); and other charges for use of toll facilities.	U.S. Census Bureau
Federal aid distributed from the Federal Highway Trust Fund	Federal aid distributed from the Federal Highway Trust or other funds for approved projects and for highway safety.	U.S. Census Bureau
Own Source Tax Revenue--Road Related	The sum of a state's motor vehicle fuel tax revenue, motor vehicle license revenue, and motor vehicle operator's license revenue.	U.S. Census Bureau
Motor Vehicle Fuel Tax Revenue	Taxes on gasoline, diesel oil, aviation fuel, "gasohol", and any other fuels used in motor vehicles or aircraft.	U.S. Census Bureau
Motor Vehicle License Revenue	Licenses imposed on owners or operators of motor vehicles for the right to use public highways, such as fees for title registration, license plates, vehicle inspection, vehicle mileage and weight taxes on motor carriers, highway use taxes, and off-highway fees.	U.S. Census Bureau
Motor Vehicle Operator's License Revenue	Licenses for the privilege of driving motor vehicles, both commercial and private.	U.S. Census Bureau
Increased tax rate related to Motor Vehicles	Dichotomous variable, =1 if the state increased a tax rate related to motor vehicles, =0 otherwise.	NCSL
Decreased tax rate related to Motor Vehicles	Dichotomous variable, =1 if the state decreased a tax rate related to motor vehicles, =0 otherwise.	NCSL
State Demographics		
Per Capita Income (Thousands of Dollars)	State income divided by state population	U.S. Census Bureau
Population Density	State population divided by state land area, people per square mile.	U.S. Census Bureau
Percent of population over age 65	Number of state residents over age 65 divided by the total number of state residents.	U.S. Census Bureau
State Political/Organizational		
Political Competition--Senate & House	Dichotomous variable, =1 if the senate and house are controlled by different parties, =0 otherwise.	Carl Klarner
Political Competition--Executive & Legislative	Indicates the number of legislative chambers governed by the same party as the executive branch.	Carl Klarner

Appendix C: State Road Fund Debt Policy Survey

Responding State Information:

State: _____

Department or Cabinet Name: _____

Person Responding to Survey: _____

Position: _____

Telephone No.:_____

Email Address:_____

Address: _____

_____

_____

Survey Questions:

Q1. Does your state have a Road Fund debt limit policy or policies?

_____ Yes, we have a Road Fund debt limit policy or policies.
_____ No, we do not have a Road Fund debt limit policy. (If you check 'no', please proceed to **Q8**)

Note: If your state has a written Road Fund debt limit policy, please provide a copy of the policy statement. Thank you.

Q2. Please indicate the origin of your state's Road Fund debt limit for each of the following debt limit categories. (Check all applicable)

	ORIGIN OF ROAD FUND DEBT LIMIT			
DEBT LIMIT CATEGORY	**Constitutional**	**Statutory**	**Policy Based**	**Other***
Road Fund Non-Guaranteed/Revenue Debt Outstanding				
All State Non-Guaranteed/Revenue Debt Outstanding				
All State Debt Outstanding				
Road Fund Debt Payment Per Fiscal Year				
All State Debt Payment Per Fiscal Year				
Other**				

* If Other, Please explain here _____

_____

_____

** If Other, Please explain here _____

_____

_____

Q3. Please indicate your state's current Road Fund debt limits (for example, there could be a $3 billion debt limit on outstanding Road Fund supported bond, or a state might have a Road Fund debt service payment limit of 20% of Road Fund revenue per fiscal year) for applicable debt limit categories:

	CURRENT ROAD FUND DEBT LIMIT				
DEBT LIMIT CATEGORY	**Total Debt Outstanding**	**Debt Per Capita**	**Debt Service as % of Revenues**	**Debt Service Per Capita**	**Other***
Road Fund Non-Guaranteed/Revenue Debt Outstanding					
All State Non-Guaranteed/Revenue Debt Outstanding					
All State Debt Outstanding					
Road Fund Debt Payment Per Fiscal Year					
All State Debt Payment Per Fiscal Year					
*Other***					

*If other, please explain briefly: _____

_____

_____

** If other please explain briefly: _____

_____

_____

Q4. Are Road Fund debt limits periodically adjusted?

_____ No

_____ Yes (Please explain purpose and process)

_____

_____

Q5. Are Federal Funds included in Road Fund debt limitation calculation?

_____ Yes, they are.

_____ No, they are not.

If yes, please briefly describe how:

_____

_____

_____

Q6. Does your state estimate Road Fund debt capacity***?**

_____ Yes, we estimate debt capacity

_____ No, we do not estimate debt capacity.

*****Recall for this study, debt capacity is defined as the allowable level of debt or bonds outstanding according to current state policy (whether formal or informal). Refer to the attached Appendix for a more technical definition.

Q7. Please indicate the purpose of Road Fund debt capacity estimating process.

_____ Debt capacity analysis is a part of cabinet/department's long-term financial planning process (multi-year road construction and maintenance plan or capital improvement plan (CIP)).

_____ Debt capacity analysis is used to set debt issuing limits for use in the capital budgeting process (multi-year road construction and maintenance plan or capital improvement plan (CIP)).

_____ Other, please explain briefly:

_____

_____

_____

Q8. If you have historical data regarding your state's Road Fund revenue and Road Fund revenue utilized to meet debt service obligation, please provide this information on the table below or attach or e-mail the appropriate spreadsheet with such data.

Year	**Total Road Fund Revenue**	**Road Fund Revenue Used For Debt Service**
1980		
1981		
1982		
1983		
1984		
1985		
1986		
1987		
1988		
1989		
1990		
1991		
1992		
1993		
1994		
1995		
1996		
1997		
1998		
1999		
2000		

If there is another person or electronic source that we should contact for such information, please provide alternate contact here:

Name:_____

Telephone:_____

Email Address: _____

Data Source: _____

Appendix D: Brief Summary of Survey Results

This appendix summarizes the results of a Road Fund Survey originally administered in 2003. Thirty seven states responded to the initial survey and results from these states are reported in Kentucky Transportation Center Research Report KTC-04-16/TA5-03-1. The results reported here update the previous study with responses from six additional states.

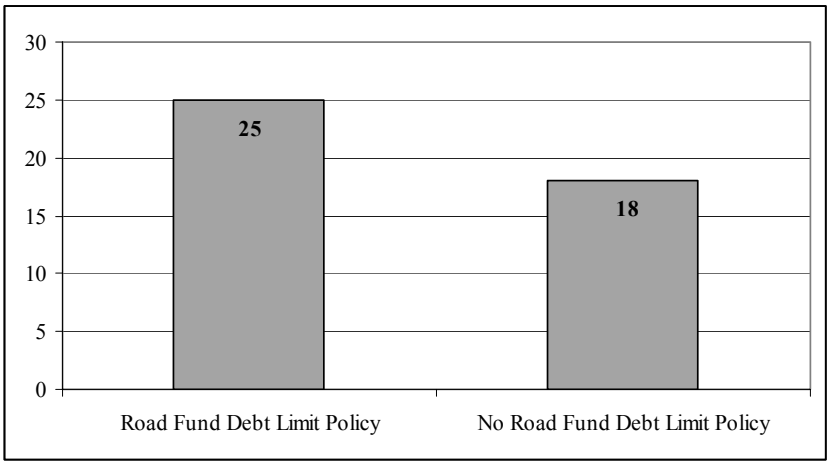
The Road Fund survey focused on determining whether states have established unique debt policies or debt limits for highway or Road Fund supported bond issues. The respondents for the first survey were State Highway Agency officials. Names and addresses of these officials (which tended to be the chief financial officer of a state's Transportation Cabinet or Department) were obtained from the Kentucky Transportation Cabinet or from state Transportation Cabinet or Department web sites. The initial surveys were mailed in August, 2003 with follow-up phone calls, e-mails, and faxes. At the time of this report, 43 states had responded to the survey[40].

Road Fund Debt Policy and Limits

Twenty-five of the forty-three reporting states (58%) indicated that their state had debt limit policies that guide their Road Fund supported debt issuance processes (Figure D.1). The remaining 18 states do not have Road Fund debt limit policies.

[40] The following states responded to the survey: Alabama, Alaska, Arizona, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Mexico, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Washington, West Virginia, Wisconsin, and Wyoming. The seven states that did not respond to the survey are Colorado, Louisiana, New Jersey, North Dakota, Oklahoma, Rhode Island, and Virginia.

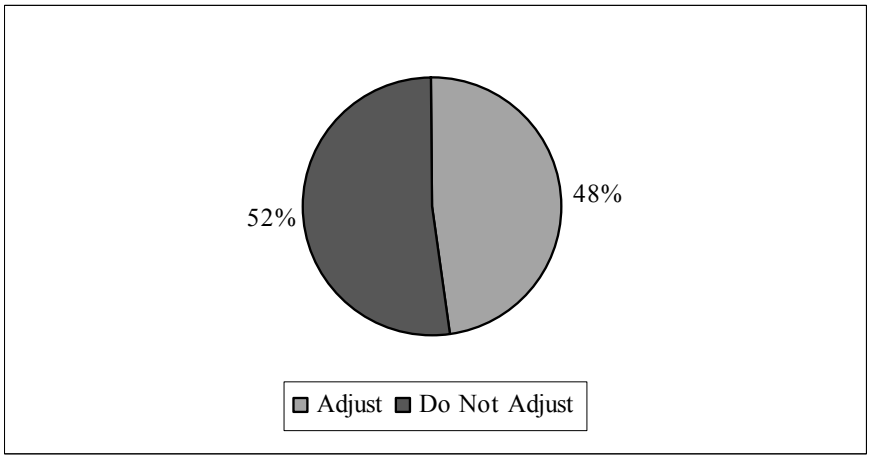
Figure D.1: States Reporting Road Fund Debt Limit Policies



Updated results from University of Kentucky Transportation Center Survey-2004

Although Road Fund debt limits are established in many states, they are not static metrics. Many states update or adjust their limits over time. As shown in Figure D.2, 48 % of the states that indicated that they had formal debt limits also indicated that they periodically adjust established limits.

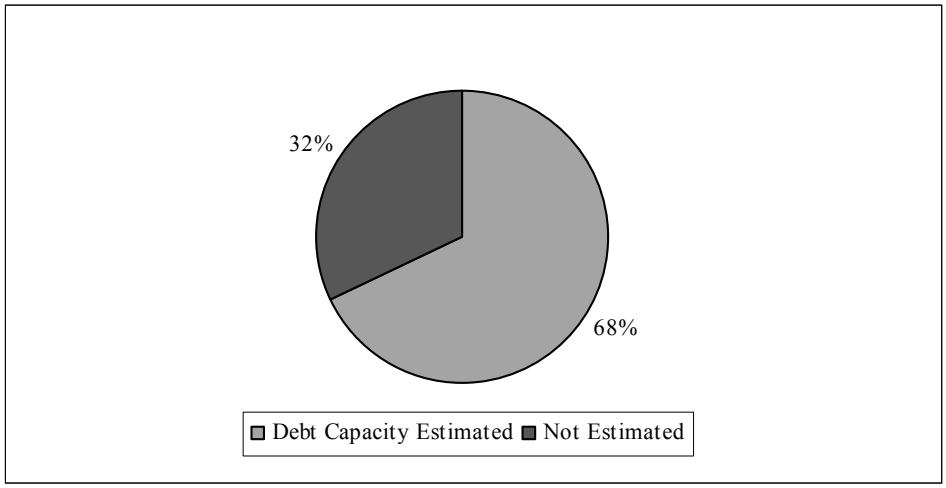
Figure D.2: Percent of States that Periodically Adjust Road Fund Debt Limits



Source: Updated results from University of Kentucky Transportation Center Survey-2004, 23 states responding

The estimation of debt capacity has emerged as an important component of Road Fund debt management policies. Sixty-eight percent of the states (15 of 22 responding states) that responded to the debt capacity section of the survey indicated that they estimate debt capacity (Figure D.3).

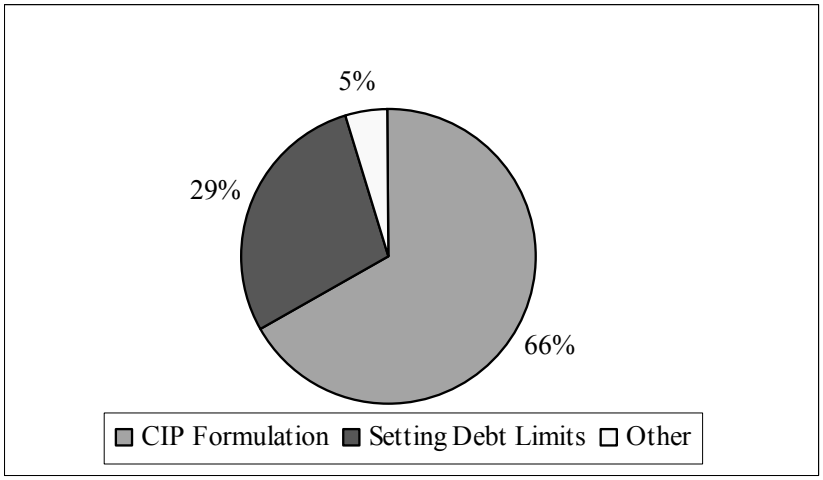
Figure D.3: Percent of States that Estimate Road Fund Debt Capacity



Source: Updated results from University of Kentucky Transportation Center Survey--2004, 22 states reporting

The responding states indicated that the major reason for estimating debt capacity was to provide information for the preparation of the Capital Improvement Plan (CIP), the other key reason for estimating debt capacity was for help in "setting debt limits."

Figure D.4: Purpose of Road Fund Debt Capacity Estimation

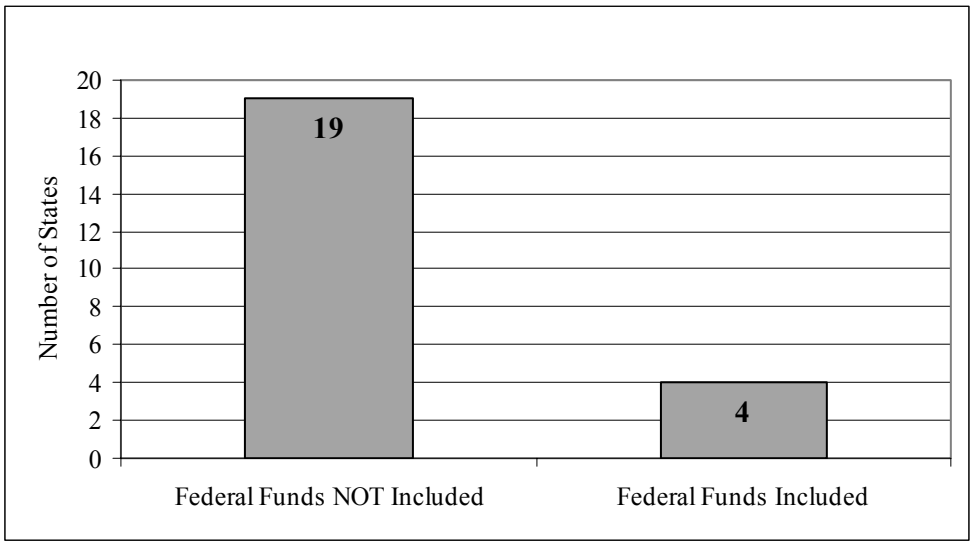


Source: Updated results from University of Kentucky Transportation Center Survey--2004, 17 states reporting.

As noted earlier, changes in federal legislation (particularly the National Highway System Act of 1995 and TEA-21 of 1998) removed restrictions regarding the use of federal funds as a bond issue debt service source. As states add federal funds to the revenue base that can be used for debt service support, federal funds are being included, by some states,

in the calculation of their debt limit policies. In this survey, 4 states or 19 % of the responding states indicated that they include their share (or anticipated share) of future federal funds in the calculation of their state's debt limit (Figure D.5).

Figure D.5: Inclusion of Federal Funds in Road Fund Debt Capacity Estimation



Source: Updated results from University of Kentucky Transportation Center Survey--2004, 23 states reporting

As revealed by the Road Fund debt survey results, state debt limits and related debt management policies and activities that impact state transportation financial planning are broad based and focus on a number of important debt financing issues. Interesting questions associated with the emergence of state debt limits include "what was the origin of state debt limits" and "what is actually limited by state debt limitation actions?" The origin of state Road Fund related debt limitation policies is quite diverse among the states. Actual debt limits include a variety of metrics such as the absolute level of debt outstanding, a relative limit of debt outstanding (for example, a limit on per capita debt) or by the percent of Road Fund revenues that can be committed to debt service payments. The survey included sections designed to determine the types of limits used by the states and their origins.

As shown in Table D.1, formal debt limits (constitutional or statutory) are the predominate source of Road Fund related debt limits. Fifteen states reported that Road Fund debt issues are limited by constitutional provisions (including specific references to Road Fund debt outstanding, all state debt outstanding and the like) while statutory debt limits of some form were reported by twenty-six states. Apparently, in some states, both constitutional and statutory limits may apply to bond issuance. Meanwhile, a smaller number of states (16) indicated that their states have "policy" based limitations. The survey results indicate a possible duplication of operative limits (for example, debt policy limits may be established even though "overriding" constitutional limits exist). Such duplicative limits may reflect conscious decisions to establish more rigorous limits for debt management reasons in some states.

Table D.1: Origin of Road Fund Debt Limitations

	ORIGIN OF ROAD FUND DEBT LIMITS				
DEBT LIMIT CATEGORY	**Constitutional**	**Statutory**	**Policy Based**	**Other**	**Total**
Road Fund Non-Guaranteed/Revenue Debt Outstanding	4	9	5	1	19
All State Non-Guaranteed/Revenue Debt Outstanding	2	3	0	0	5
All State Debt Outstanding	3	4	1	0	8
Road Fund Debt Payment Per Fiscal Year	2	4	8	3	17
All State Debt Payment **Per Fiscal Year**	4	6	2	0	12
Total	15	26	16	4	61

Source: Updated results from University of Kentucky Transportation Center Survey--2004

Also, as shown in Table D.1, nineteen states indicated that their limitations (regardless of the origin of the limit) are based on total Road Fund debt outstanding while five states responded that debt limitations were the result of state constitutions and statutes that limited all non-guaranteed revenue bond issuance. Meanwhile, eight states indicated that their states limited "all debt outstanding" by either constitutional, statutory or policy measures or provisions. Also, as shown, seventeen reporting states indicated their limits were based on Road Fund debt service payments per year and twelve states indicated that their states limited aggregate debt service payments per year (regardless of debt payment source). Again, in the latter set of debt limits, the source of the debt service payments were the result of constitutional, statutory or policy provisions and procedures.

The second part of the state Road Fund debt and debt policy survey focused on determining the ratio of debt service to total Road Fund revenues for the responding states for the period 1980 to 2000. Table D.2 indicates the number of states that supplied these data, the calculated mean debt service expenditures to total Road Fund revenue ratios per year for the responding states and the range of debt service expenditures relative to total Road Fund revenue provided by the reporting states for the period.

The number of states providing debt service and total Road Fund revenue data varied from 9 states (in 1980) to 23 states in the more recent period due to data availability. The mean "ratio" for the reporting states ranged from 6.89 percent in 1992 to 11.2 percent in 1983. The range of debt service to total Road Fund revenue ratios varied from zero for states that did not issue bonds to support the construction and maintenance of their roads and highways to more than 54 percent for one state in the late 1990s.

Table D.2: Debt Service as a percent of Road Fund Revenue from 1980-2000

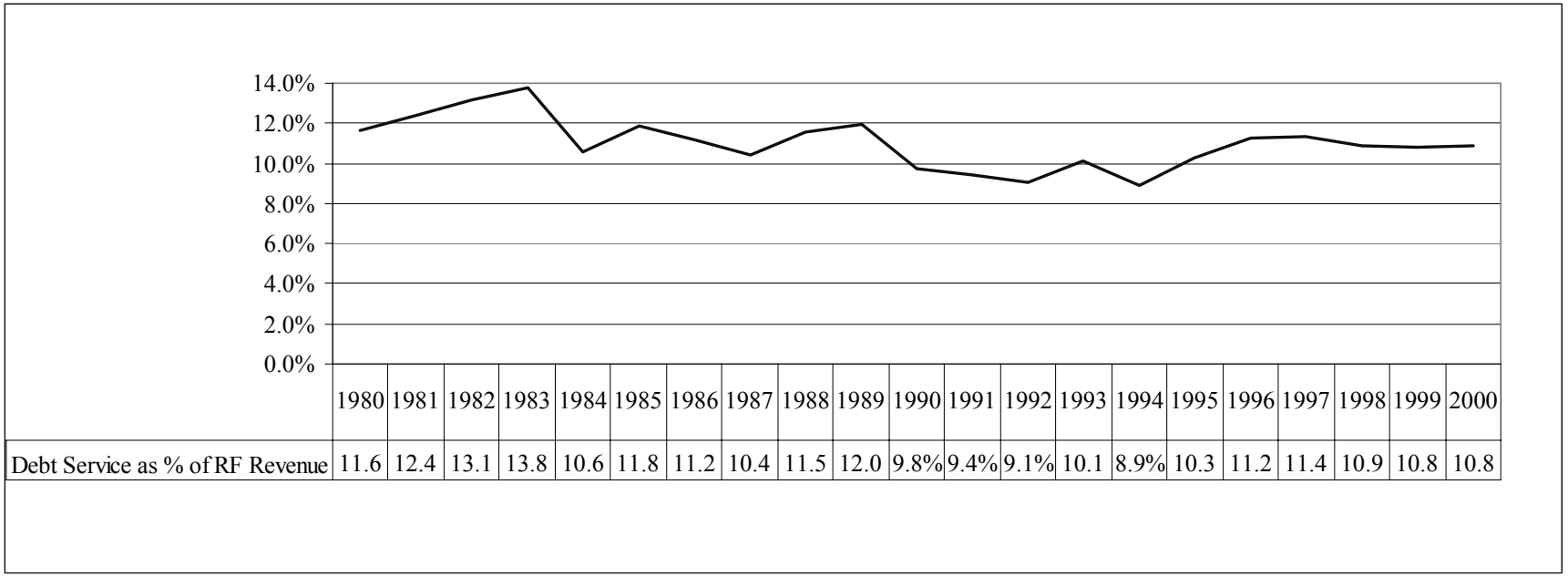
	Observations	Mean	Minimum	Maximum
1980	11	11.61	0.00	27.90
1981	13	12.38	0.00	27.40
1982	14	13.14	1.40	50.00
1983	15	13.79	3.10	36.60
1984	18	10.55	1.30	28.70
1985	19	11.85	1.40	44.50
1986	20	11.19	1.20	33.10
1987	20	10.39	0.50	33.20
1988	21	11.53	1.80	33.40
1989	22	11.96	1.40	39.00
1990	24	9.77	0.10	22.00
1991	25	9.44	0.20	27.70
1992	25	9.08	0.30	23.30
1993	25	10.13	0.60	35.30
1994	27	8.88	0.50	35.20
1995	27	10.30	0.00	34.90
1996	29	11.22	0.00	53.00
1997	29	11.36	0.00	54.00
1998	29	10.89	0.00	54.20
1999	29	10.83	0.00	39.30
2000	29	10.84	0.00	49.20

Source: Calculated from data provided by respondents to University of Kentucky Transportation Center updated 2004
Note:43 states responded to the Road Fund survey. However, the number of states providing debt service to total Road Fund expenditure ratios varied for the 20 year period as indicated in column 1 of this table.

Figure D.6 provides a graphical picture of the mean debt service to total Road Fund revenues for the reporting states for the various years in the study period. While the mean ratios of debt service as a percent of total Road revenues varied for the period, it is not clear why these ratios varied. While the economic downturn of the early 1980s might explain the tendency of states to increase their use of debt financing in that period, a similar pattern is not observed for the 1991-92 recession. Other possible explanations for the variations over time include a reduction in debt service costs in the early 1990s due to refinancing of bonds

issued in the high interest period of the early 1980s, a decline in the demand for infrastructure investment in the early 1990s due to the recession, and an increase in the demand for highway construction and maintenance expenditures in the last half of the 1990s due to the strong economy of that period. This current study was not designed to explore the reason for these observed trends.

Figure D.6: Mean Debt Service as a Percent of Road Fund Revenues: 1980-2000



	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Debt Service as % of RF Revenue	11.6	12.4	13.1	13.8	10.6	11.8	11.2	10.4	11.5	12.0	9.8%	9.4%	9.1%	10.1	8.9%	10.3	11.2	11.4	10.9	10.8	10.8

Kentucky Transportation Center updated 2004 survey
Note: As indicated in Table 2, the number of responses per year varied over the 20 year period and mean values should be considered in that light.

Appendix E: A Closer Look at Kentucky: Road Fund Debt Service

As noted in this report, debt limit policies vary across states in a number of ways. First, debt limitations are applied differently to different types of debt; second, debt limitation differ with respect to the source of funds (i.e. General Fund vs. Road Fund); and third, debt limitations vary dramatically in terms of the level of indebtedness allowed.

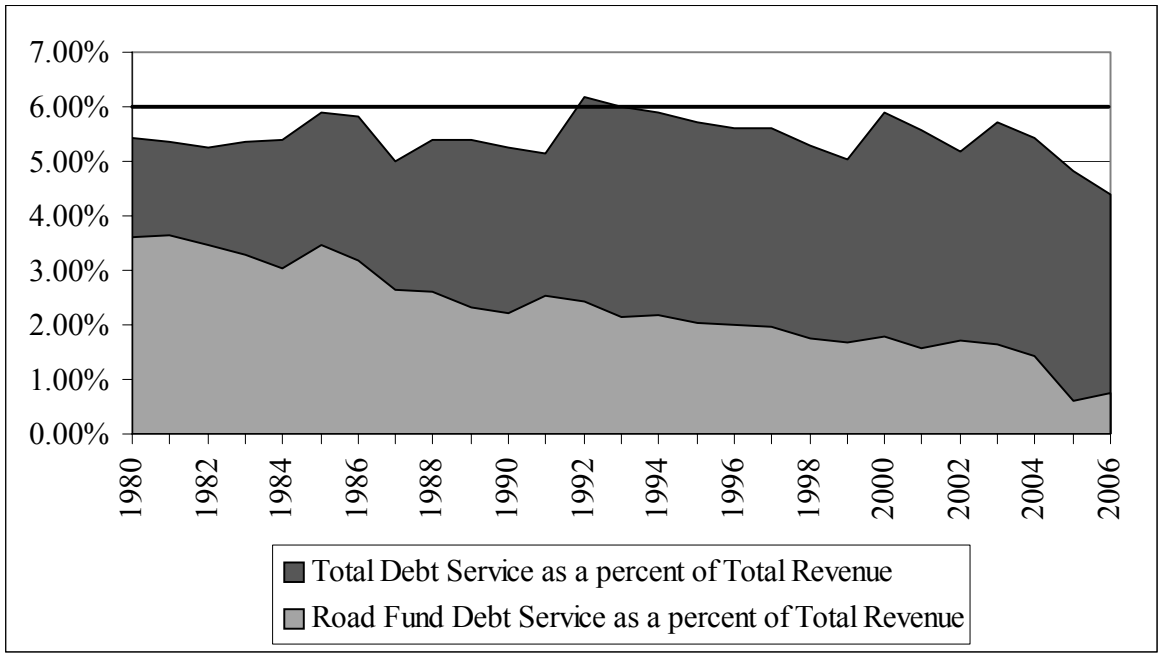
Kentucky's debt management policy was developed in the early 1980's and applies to all state debt issues. The policy limits Kentucky's annual debt service payments to 6% of Kentucky's annual total revenue (excluding intergovernmental transfers). The implementation of Kentucky's debt affordability policy includes a biannual analysis and forecast of Kentucky's future (next two fiscal years) debt capacity as part of its' capital budgeting process. The "future" debt capacity estimate is used as a guide when the Kentucky legislature authorizes new debt issues for the next two fiscal years.

Given the "all funds" nature of Kentucky's debt limit policy, there is competition between the departments and programs supported by the General Fund, the Road Fund, and Agency Funds for debt issuance authorizations. The bond issue authorization maximum for each biannual budget period will vary depending on anticipated interest rates given the 6% of anticipated total revenue debt service limit for the forthcoming biannual budget period.

On a practical level, Kentucky's debt limit policy implies that if departments whose bond issues are supported by one of the three major fund groups is authorized to increase its' bond issuance, the other departments (whose bond debt service is supported by one of the other funds or fund groups) may have to compensate by having their new desired debt authorizations reduced so the state can stay within the overall 6 % debt service limit.

Figure E.1 indicates these trade-offs by displaying debt service payment levels in Kentucky as a percent of total revenue from 1980 projected through 2006. The only year that Kentucky exceeded its 6% limit was in 1992, possibly a result of new debt authorization being greater that permitted by the debt limit policy as a result of biannual revenue being overestimated (due to the economic recession of the period). Also visible in Figure E.1 is the decline in Road Fund debt service as a percent of Kentucky's total revenue. This trend is principally the result of the maturing of toll road bond issues and the bond authorization re-allocations (the competition discussed above). Over the period, it appears that the Road Fund's share of debt capacity has declined. If the need for highway construction and maintenance funding follows previous trends, pay-as-you-go funding will have to increase to compensate for the loss of Road Fund debt capacity and issuing authority or under-funding of transportation capital projects may result.

Figure E.1: Total and Road Fund Debt Service as a Percent of Total Revenue

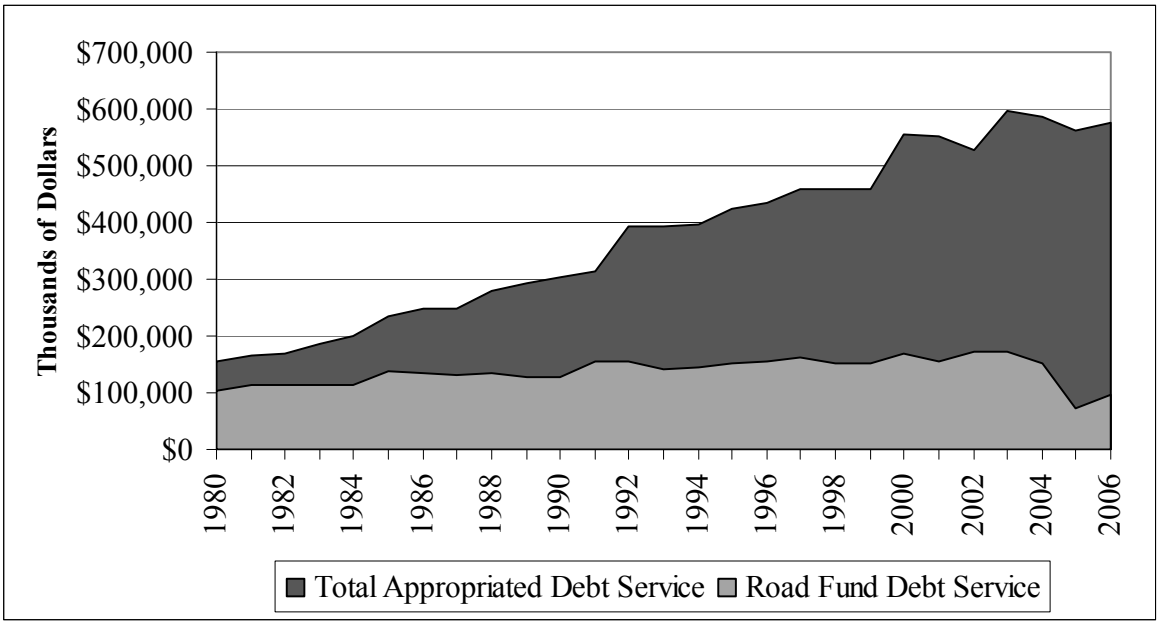


Source: Kentucky Office of Financial Management, Kentucky Transportation Budget Office, Consensus Forecast Estimates 2005 &2006. Total Revenue numbers do not include intergovernmental transfers.

In 1980, Road Fund debt service accounted for more than 66% of the commonwealth's annual debt service payments (and over 60% of available debt capacity). Since the early 1980's, Road Fund debt service has continually decreased relative to the state's overall level of debt service. The projection for 2006 indicates that Road Fund debt service will only account for slightly over 16% of all state debt service (and 12% of available debt capacity).

This trend is perhaps more easily seen in Figure E.2 which shows the level of debt service payments from the Road Fund compared to all state debt service payments. As can be seen, over this period of time, growth in the total appropriated debt service is impressive compared to the growth of the Road Fund appropriated debt service.

Figure E.2: Total Appropriated Debt Service and Appropriated Road Fund Debt Service



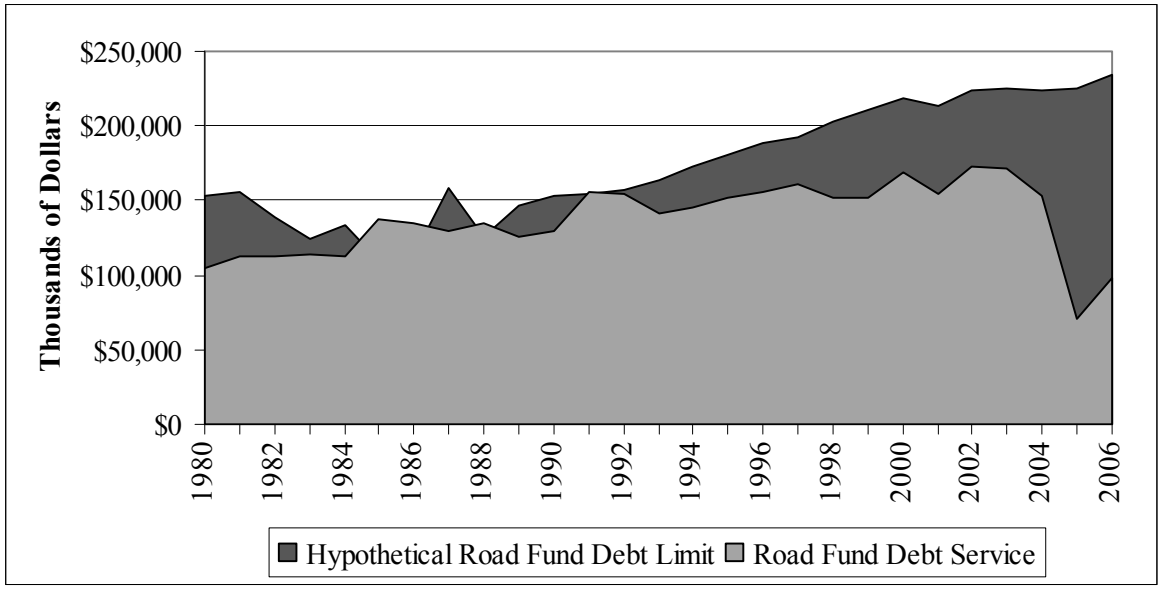
Source: Kentucky's Office of Financial Management

These two figures provide a clear picture of the impact of a single statewide debt limit on the issuance of Road Fund supported debt issues. For example, alternatively, consider what the Road Fund supported debt level might have looked like if each fund had

been allocated a share of available debt capacity based on its' share (of total defined capacity) in the early 80's (which for the Road Fund would roughly 20%).

Building on the assumption of a 20% limit of debt service to total revenue for the Road Fund, Figure E.3 illustrates the difference in actual Road Fund debt service relative to our hypothetical Road Fund debt limit. In this illustration we see that the Road Fund, if it operated under a separate debt limit policy, would have the ability to issue significant amounts of additional debt and still adhere to its debt policy.

Figure E.3: Hypothetical Road Fund Debt Limit Compared to Actual Road Fund Debt Service



Source: Kentucky's Office of Financial Management and Authors' Calculation

If separate debt limit polices were initially established (as suggested by the hypothetical situation above), the Transportation Cabinet would have many more funding options available to them. At the same time, if separate debt limits would have been established, the General Fund and Agency Fund based upon debt financing trends to that time, departments and agencies supported by those funds would have had much less debt capacity to use in meeting infrastructure and capital project needs over the years. It is

likely, based on Figure E.2 that many projects funded and backed by the General Fund would not have been possible if there were a separate limit for each of funds.