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UNIVERSITY OF CALIFORNIA

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**FAIRNESS OR FAVORITISM?
GEOGRAPHIC REDISTRIBUTION AND FISCAL EQUALIZATION
RESULTING FROM TRANSPORTATION FUNDING FORMULAS**

A Dissertation submitted in partial satisfaction of the
requirements for the degree Doctor of Philosophy
in Urban Planning

by

Lewison Lee Lem

1996

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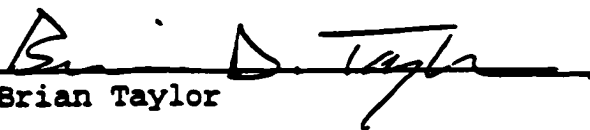
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To My Parents

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ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ACIR	Advisory Commission on Intergovernmental Relations
CDOF	California State Department of Finance
CDOT	California State Department of Transportation
CQ	<u>Congressional Quarterly Weekly Report</u>
CSBE	California State Board of Equalization
CTC	California Transportation Commission
FHWA	Federal Highways Administration
FY	Fiscal Year
GST	General Sales Tax
ISTEA	Intermodal Surface Transportation Efficiency Act
LTF	Local Transportation Fund
MFST	Motor Fuels Sales Tax
MVOLT	Motor Vehicle Operators License Tax
MVRT	Motor Vehicle Registrations Tax
NHS	National Highway System
PCI	Per Capita Income
RTS	Representative Tax System
TDA	Transportation Development Act
USDOC	United States Department of Commerce
USDOT	United States Department of Transportation
USGAO	United States General Accounting Office
VMT	Vehicle Miles Traveled

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ABSTRACT OF THE DISSERTATION

Fairness or Favoritism?

Geographic Redistribution and Fiscal Equalization
Resulting from Transportation Funding Formulas

by

Lewison Lee Lem

Doctor of Philosophy in Urban Planning

University of California, Los Angeles, 1996

Professor Martin Wachs, Chair

Federal and state governments use funding formulas to apportion, or geographically distribute, billions of dollars of expenditures for transportation programs every year. Past studies suggest that successful targeting of such funding results in fairness towards all areas while lack of targeting results in favoritism towards some areas over others.

By examining the two issues of geographic redistribution and fiscal equalization, this study assesses the fairness of three examples of transportation funding formulas. Descriptive and inferential statistical methods (including location quotients, indices of dissimilarity, and simple regressions) are used to measure the amount of funding that is geographically redistributed, and to measure how consistent the distributions of funds are with the principle of fiscal

equalization.

Analyses of the patterns of geographic redistribution show that federal transportation funds are redistributed from the most populous states to the least populous states, that California state highway funds are redistributed from the most densely populated counties to the least densely populated counties, and that California transit funds are not geographic redistributed.

Numerous needs targeting studies have measured the need for funding in terms of fiscal capacity, or the ability of governments to raise revenues, and asked whether or not intergovernmental aid is apportioned in a manner which equalizes fiscal capacities. While the overall pattern of intergovernmental aid has been scrutinized, the distributive impact of transportation grants in particular has not been conclusively determined. This study finds that California highway funding apportionments result in fiscal equalization, while federal transportation funding and California transit apportionments do not act to equalize fiscal capacities.

Based upon these empirical findings, the study concludes that the federal funding apportionments results in favoritism, because tax revenues are being redistributed from the less wealthy states to the more wealthy states. In contrast, the California state highway apportionments result in fairness, since tax revenues are being redistributed in a fiscally

equalizing fashion from the more wealthy counties to the less
wealthy counties.

Justice is the first virtue of social institutions, as truth is of systems of thought. A theory however elegant and economical must be rejected or revised if it is untrue; likewise laws and institutions no matter how efficient and well-arranged must be reformed or abolished if they are unjust.

John Rawls, A Theory of Justice

PREFACE

This study is primarily an examination of a single empirical question: Does the funding of government transportation programs result in fiscal equalization? A single hypothesis--the "equalization hypothesis"--is at the center of the analysis. This hypothesis suggests that an equalization of fiscal capacities occurs, and the study seeks to determine empirically whether this is in fact that case. Once the appropriate terms have been defined and the methods of analysis determined, the question at first glance appears relatively straightforward.

The equalization hypothesis has been advanced frequently enough in the study of public finance that it is familiar to many public economists, although it is usually associated with the study of public school finance. This study of transportation finance, like previous studies involving school finance, suggests that the equalization hypothesis is important primarily because of equity concerns. As a result, the question of fairness of funding distributions is the motivation for the study, rather than the question of efficiency.

While the question of fiscal capacity equalization at first appears straightforward, the in-depth analysis which this study attempts to present shows how complicated it is to

answer the question. This complexity may be a result of the relative scarcity of prior examinations of the equalization hypothesis regarding transportation finance. Accordingly, much of the study is devoted to defining the appropriate terms and determining the appropriate method of analysis. It is not until the penultimate chapter that the original question of fiscal equalization is directly addressed.

The first two chapters fall into the general category of defining the appropriate terms. First, it is important to understand how most funding for government transportation programs is distributed. Chapter 1 of the study seeks to introduce the reader to transportation funding formulas, the predominant method of funding apportionment. Second, it is important to introduce and demonstrate the concept of fiscal capacity. Chapter 2 seeks to define the concept and illustrate existing patterns of fiscal capacities in order to show what it is that may or may not be equalized.

The next two chapters describe and justify the methods of analysis for the study. Chapter 3 provides two theoretically-oriented frameworks for looking at the relationship between fairness and fiscal equalization. This chapter seeks to explain why the question is significant and how the study goes about determining fairness and favoritism in funding distributions. Chapter 4 provides an overview of the three case studies that the study uses to examine the question of

fiscal equalization in transportation finance.

Chapter 5 examines the question of geographic redistribution, and in doing so provides the empirical foundation for examining the equalization hypothesis. As explained more fully in Chapter 3, one cannot reach a positive conclusion about whether or not fiscal equalization occurs without first determining whether or not geographic redistribution occurs.

Following the initial five chapters of preparation, then, Chapter 6 directly examines the question at the core of the study: Do transportation funding formulas result in equalization of fiscal capacities? Finally, Chapter 7 provides some concluding discussion of findings and implications for public policy and future research.

It may be helpful to keep in mind that the question of fiscal equalization tells us something about the result of funding distributions, but does not tell us in detail the process by which we came to that result. In other words, this study describes one aspect of the destination, but does not tell us the path that brought us to the destination.

CHAPTER 1.

AN INTRODUCTION TO TRANSPORTATION FUNDING FORMULAS

When legislation reauthorizing federal programs for surface transportation reached the floor of the United States Senate during the summer of 1991, some predicted another "War between the States".¹ Disagreements over how best to distribute the federal funding among the states threatened to block approval of the legislation.² "This is an issue that will create a donnybrook on the floor of the Senate if we don't get it resolved in an amicable manner," said Howard M. Metzenbaum, a Democratic Senator from Ohio. "There is no reason to continue this disproportion any longer."³ Metzenbaum and other Senate critics of the funding distribution represented "donor" states, which had historically contributed more in federal transportation-related taxes than they received in federal transportation funding. The opponents of the proposed legislation included members from both the Democratic and the Republican parties

¹Congressional Quarterly Weekly Report (hereafter abbreviated as CQ) (1991) pp. 1487-1489. The phrase was probably first used in reference to funding distribution in Business Week (1976).

² CQ (1991) pp. 1367-1368, 1487-1489, 1575-1576, 1653-1655

³ CQ (1991) p. 1368

who questioned the fairness of the funding formula proposed in the legislation.

The 1991 surface transportation legislation, commonly referred to as ISTEA⁴, had been crafted by a Senate subcommittee chaired by Daniel Patrick Moynihan, the Democratic Senator from New York. As the Senate prepared for floor debate on the issue of funding formulas, Moynihan defended ISTEA's funding apportionment with a rhetorical question. "Any federal activity, by definition, is unequal in its impact," he said. "Is life fair?"⁵

1.1 Apportionment by Funding Formula

In the American federal system, the national⁶ and state governments apportion,⁷ or geographically distribute, billions of dollars of funding every year. All of these funds must be apportioned among recipient governments, much as cake must be

⁴ Intermodal Surface Transportation Efficiency Act of 1991, P.L. 102-240 (December 18, 1991)

⁵ CQ (1991) p. 1368

⁶ The terms "national government" and "federal government" will be used interchangeably in this study.

⁷ While the term "allocate" and "apportion" are sometimes used interchangeably, this study will use the verb "apportion" to describe the distribution of funding among different geographic areas, and reserve the verb "allocate" to describe the commitment of funding for particular programs or projects.

cut and portions distributed among celebrants at a party.

Like the cake, government funding may be apportioned according to many possible principles. For example, federal funding could be divided into fifty equally-sized shares, so that each of the fifty states receives an equal amount. Alternatively, funding could be divided according to appetite, whereby the states that are hungrier for more of the federal government cake receive larger shares. An important distinction between the apportionment of cake and the apportionment of federal funding, however, is that there is often extra cake left over after all the celebrants have eaten, while there is rarely enough funding to satisfy all the states.

Each year, Congress faces the problem of apportioning limited amounts of federal funding among the states, and state legislatures face the equivalent problem of determining apportionments of state funds for counties and other local areas. The basic problem of funding apportionment is one of distributive equity. What principle or principles should be used in apportioning funding in a manner which is fair to all recipients?

Many government spending programs deal with the problem of apportionment by using formulas to determine how much funding each recipient area should receive. Funding formulas attempt to resolve the problem of apportionment by providing

predictable, explicit rules that all parties agree will govern the distribution of funds.

This study defines funding formulas as mathematical equations that calculate the dollar amount or proportion of funding each recipient geographic area will receive, based upon one or more numerical variables that describe some characteristic of the geographic area. The funding formulas act as mathematical functions, where the descriptive characteristics--the inputs--are the independent variables and the dollar amount or proportion of funding--the output--is the dependent variable.⁸

A simple example of a funding formula⁹ follows:

$$\text{Funding for Area "x"} = \frac{\text{Total Amount of Funding} * \text{Population of Area "x"}}{\text{Total Population of all areas}}$$

The illustrative funding formula above uses one factor,

⁸ In Public Law 98-169 (31 U.S.C. 6101), Congress defined a funding formula as: "...any prescribed method employing objective data or statistical estimates for making individual determinations among recipients of Federal funds, either in terms of eligibility or actual funding allocations, that can be written in the form of either (A) a closed mathematical statement; or (B) an iterative procedure or algorithm which can be written as a computer program; and from which the results can be objectively replicated..."

⁹ In mathematical terms, this formula describes the function:

$$F(x) = F_T * \frac{P_x}{P_T}$$

where F_T = Total Amount of Funding
 P_x = Population of Area "x"
 P_T = Total Population of all areas

or inputted variable, describing a characteristic of area "x". The single factor used is population, and the formula may be described as a one-factor funding formula, or more specifically as a population-based funding formula.

This simple example illustrates the elegance and appeal of funding formulas. Funding formulas seem to provide the promise of a fair apportionment to all recipients. With their seeming mathematical objectivity, funding formulas appear at first glance to be without favoritism.

While many would view a desirable apportionment of funds as one which would result in a "fair share" to all areas, in practice it is extremely difficult to define what constitutes a fair share. In the process of establishing funding formulas, debate often arises over how many factors to include, what factors to include, and how much weight each factor should be given in the formulas. Any funding formula may be criticized for exhibiting favoritism toward some recipients over others. The question of fairness and favoritism in the formula apportionment of government funding for transportation is the central concern of the research that follows.

1.2 The Scope and Prevalence of Funding Formulas

The total amount of government funding that is

apportioned by formula is very difficult to determine. While numerous governmental units at the federal, state, and local levels distribute funds by formula, no single report or organization collects data on the method of distributing funding for all governmental units at all levels of government. Both the United States Department of Commerce (USDOC) and the Advisory Commission on Intergovernmental Relations (ACIR) collect and publish data on intergovernmental grants-in-aid, though both data sources suffer from two limitations.¹⁰

First, available data are limited to intergovernmental apportionment of funds. In addition to using formulas to apportion intergovernmental grants-in-aid, however, governmental units may use formulas to apportion funds for internal administrative purposes, without transferring the funds to another governmental unit. As a result, the available data underestimates the prevalence and impact of formula funding.

Second, both intergovernmental and intragovernmental funding may be distributed on a project-by-project basis rather than by funding formulas.¹¹ Determining which method

¹⁰ ACIR (1994b) and USDOC (1990)

¹¹ Break (1980), pp. 123-186, Project grants may be distributed by legislative "earmarking" or by administrative discretion. Project based funding is sometimes referred to as discretionary funding.

of apportioning funding is used for all government programs would require an exhaustive review of legislation and administrative rules. As a result the available data overestimate to some extent the prevalence of formula funding. At least one author has noted, however, that the historical pattern has been one of increasing reliance upon formula funding and decreasing use of project-based funding.¹²

For the fiscal year ending 1984,¹³ two federal government agencies reported on the number of federal grant-in-aid programs using funding formulas. The Advisory Commission on Intergovernmental Relations (ACIR) counted 125 grant programs apportioning funds by formula for categorical, or federally-specified, purposes.¹⁴ This figure constituted 32 percent of the 392 total categorical grant programs existing in that year.¹⁵ The United States General Accounting Office (USGAO) calculated that there were 142 total grant programs using

¹² Dilger (1982), p. 26

¹³ Consistent with the general practice, FY 1984 refers to the 1983-1984 fiscal year.

¹⁴ Categorical grants are usually distinguished from "block" grants and general purpose grants. Block grants may be used by recipient areas for any program within broad functional areas, such as transportation or public safety. The spending of funds from general purpose grants is not limited to any particular or functional area of government activity. In general, block grants and general purpose grants are distributed by formula.

¹⁵ ACIR (1994c) p. 7

formula apportionment,¹⁶ distributing about \$85 billion. The USGAO found that 87 percent of all federal grant-in-aid funds was distributed by formula.¹⁷

More recently, the ACIR estimated that three-fourths of all grant aid is distributed by formula.¹⁸ Other researchers also have found that the great majority of federal grants-in-aid funds are apportioned by formula.¹⁹

In FY 1992, federal grants-in-aid totalled about \$178.1 billion. This total represented approximately 21 percent of the total state and local outlays, 13 percent of total federal outlays, and 3 percent of the gross domestic product.²⁰ If we conservatively estimate that 70 percent of all grants-in-aid in 1992 were apportioned by formula, the total amount of federal intergovernmental grants-in-aid apportioned by formula funding was approximately \$124.7 billion.

State intergovernmental expenditures to local governments totalled \$201.3 billion in 1992.²¹ It is not known whether state governments are more or less likely than the federal

¹⁶ The USGAO did not differentiate between categorical, block, and general purpose grants in its calculation.

¹⁷ USGAO (1987), p. 10

¹⁸ ACIR (1995), p. 1

¹⁹ Hale and Palley (1981), p. 76

²⁰ ACIR (1994b), p. 30

²¹ ACIR (1994b), p. 10

government to use formulas to apportion their intergovernmental grants. If we estimate that the states, like the federal government, uses formulas to apportion 70 percent of all grants-in-aid, the estimated amount of state intergovernmental aid distributed by formula is \$140.9 billion.²²

Combining our estimates of federal intergovernmental grants and state intergovernmental grants using funding formulas, we find that roughly \$265.6 billion dollars in intergovernmental aid is apportioned by formula in 1992. This total is equal to 4.5 percent of the national gross domestic product for the year.²³

1.3 Government Funding of Transportation

This study analyzes the impact of funding formulas used in government funded transportation programs. Government

²² Again, this figure underestimates the prevalence of formula funding to the extent that intragovernmental apportionment is not included, and overestimates the prevalence of formula funding to the extent that funding is distributed on a project-by-project basis.

²³ ACIR (1994b), pp. 10, 110. The total figure does not "double-count" federal funds which are passed through the states to local governments. The ACIR reports that in 1992 local government general revenues included \$196.1 billion in state intergovernmental aid and \$20.1 billion in federal intergovernmental aid. The former figure is roughly equivalent to the \$201.3 billion which the ACIR reported in state intergovernmental aid to localities.

spending for transportation is large in absolute terms, and makes up a significant percentage of all government expenditures. A great deal of government funding for transportation undergoes a process of intergovernmental and intragovernmental distribution. Large proportions of the federal government funding for transportation are apportioned by formula to the states, and much state spending on transportation is distributed by formula to counties and other local governments.

Transportation spending makes up a relatively small percentage of the total federal budget, but constitutes a significant proportion of total federal intergovernmental grants-in-aid. Considered from either perspective, the amount of money being spent by the federal government on transportation is large in absolute terms.

In FY 1992, federal budget outlays totalled \$1,382 billion. The United States Department of Transportation (USDOT) was budgeted \$33.33 billion in outlays, approximately 2.4 percent of the total federal budget. Within the USDOT, \$20.35 billion was budgeted for surface (ground) transportation, \$9.31 billion for air transportation, \$3.43 billion for water transportation, and \$.24 billion for other forms of transportation.²⁴

Most of the USDOT's spending is dedicated to

²⁴ USDOC (1993), p. 330, pp. 332-333, p. 611

intergovernmental grants. In FY 1992, the USDOT distributed \$20.6 billion in transportation grants-in-aid, approximately 61.8 percent of its total budget. This \$20.6 billion in grants is equal to 11.6 percent of total federal grants, 1.5 percent of total federal outlays, and 2.5 percent of total state and local outlays.²⁵

Table 1 below shows that while the total amount of current-year federal grant dollars for transportation has been increasing in recent years, transportation grants have been declining as a percentage of total federal grants. Grants for federal-aid highways have likewise been increasing in current

Fiscal Year	Transportation Grants	Percentage of Total Grants	Total for Federal-Aid Highways	% of Total Grants
1989	\$18,225	14.9%	\$13,196	10.8%
1991	\$19,878	13.1%	\$14,124	9.3%
1993	\$22,343	11.5%	\$15,895	8.2%
1995 (est.)	\$24,823	10.9%	\$18,642	8.2%

Sources: ACIR (1994c), p. 15; ACIR (1995), p. 12

year dollar terms, and decreasing as a percentage of total

²⁵ ACIR (1994b), p. 31

federal grants-in-aid.

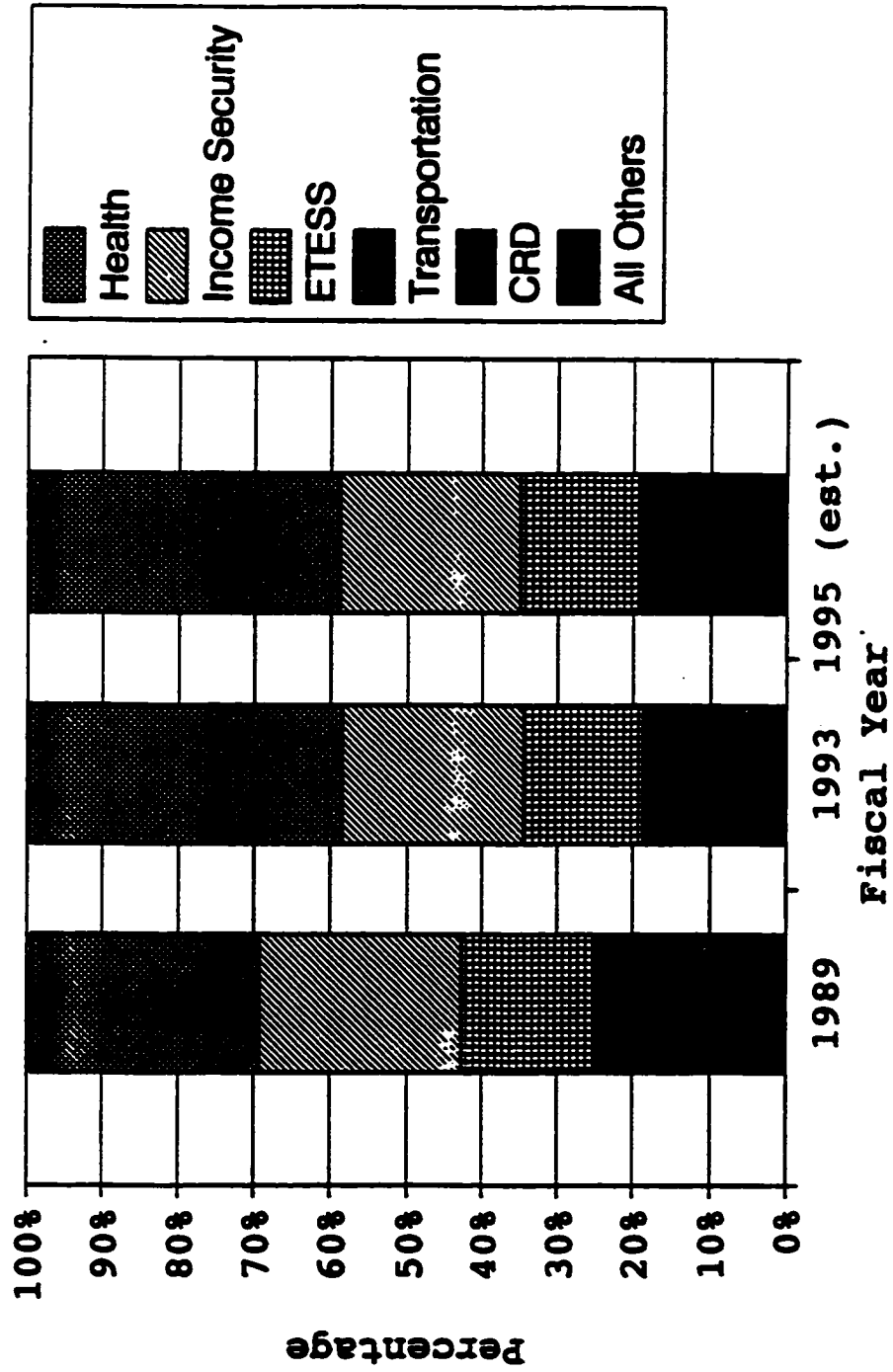
Transportation grants make up a significant share of total federal grants, though not the largest share. As Figure 1 shows, transportation as a general category of federal grants in recent years has received the fourth largest amount of funds. In FY 1993, for example, grants for health-related programs received \$79,665 million, making up 41 percent of total grants. Grants for income security made up \$46,991 million, constituting 24 percent of the total. A total amount of \$30,160 million in federal grants, or 16 percent of the total, were dedicated to the general category including education, training, employment, and social services.²⁶

Moving from general categories to specific programs, Highway Planning and Construction in recent years has been the federal grant program receiving the second highest amount of funding. In FY 1992, \$17 billion was devoted to Highway Planning and Construction grants, second only to the Medical Assistance Program, commonly known as Medicaid, which received \$69 billion.²⁷

²⁶ ACIR (1995), p. 12

²⁷ ACIR (1993a), p. A-2

**Figure 1. Federal Outlays for Grants
Percentage Distribution by Function**



If the amount of money the federal government spends reflects the relative priorities of the national government, then it is perhaps significant that Highway Planning and Construction program receive more federal grant funds than many other well known federal grant programs. In FY 1992, the federal Highway Planning and Construction program received one and one-half times more funding than the Lower Income ("Section 8") Housing Assistance Program (\$12 billion), more than four times more funding than the National School Lunch Program (\$4 billion), and more than six times more funding than the Unemployment Insurance Program (\$3 billion).²⁸

Like the federal government, state governments expend a significant share of total outlays on transportation, and state transportation spending represents a large amount of money in total dollar terms. In FY 1992, state governments spent \$41 billion, or 10 percent of total direct spending, on highway programs. This category represents the fourth highest funded category of state expenditures, following public welfare, higher education, and health.²⁹

Previous researchers have noted that intergovernmental funding may be distributed for specific projects or through

²⁸ ACIR (1993a), p. A-2

²⁹ ACIR (1994b), pp. 76. This figure does not include intergovernmental aid from the federal government used for transportation purposes.

formula grants.³⁰ Although recent popular accounts have directed much public attention toward the distribution of project grants, commonly referred to as "pork-barrel projects" or simply "pork,"³¹ examination of federal authorizations for transportation expenditures shows that in recent years most funding for ground transportation have been distributed by formula.³²

Everyday accounts from the popular media sometimes give the impression that the process of funding distribution has no rational basis. The 'pork-barrel' thesis often claims that public works funding is primarily distributed by politically powerful congressmen to their own districts. While the practice of including specifically earmarked transportation improvements projects has risen in recent legislation,³³ the total impact of such projects is often exaggerated by popular accounts. In the 1991 ISTEA legislation, for example, the total amount of federal highway funds earmarked for specific projects was \$6.2 billion over a six-year period, making up approximately five percent of the total authorization included

³⁰ Break (1980), pp. 123-186

³¹ Anderson and Binstein (1994), Del Valle (1995), Kelly (1992), Pound and Pasternak (1994)

³² Most often, "pork-barrel" funding is used as a term to describe funding for specific projects. One might argue that formula-based funding may be described as another, more sophisticated, form of "pork".

³³ CQ (1991), pp. 1884-1888

in the legislation.³⁴

In fact, the great majority of federal transportation funds have been distributed among the states through apportionment formulas. These transportation funding formulas distribute funds to all fifty states based upon factors such as population and lane-miles of highways, and are decided by political negotiations during the legislative process. These apportionment formulas have played the most important role in determining how much federal funding each state receives under various programs since the first major legislation providing federal aid for transportation improvements passed the Congress in 1916.

³⁴ FHWA (1992), pp. 35-37

CHAPTER 2.

MEASURES AND PATTERNS OF FISCAL CAPACITY

Perhaps the most common measure of need for funding examined in previous studies of funding apportionments is fiscal capacity.³⁵ Fiscal capacity of governments may be defined as the ability of governmental units to raise revenues to pay for public services.³⁶

Fiscal capacity of governmental units is analogous to the income-earning capacity of individual persons. Fiscal capacity and income-earning capacity reflect the potential ability of governments and individuals to raise revenues, but do not show the degree to which governments and individuals make full use of such potential. A different concept, fiscal effort, describes the degree to which governmental units make use of their ability to raise revenues.³⁷

The central question of this study is whether or not transportation funding formulas result in an equalization of fiscal capacities. In other words, do less wealthy governments--those with lower fiscal capacity--receive more net transportation funding per capita from central governments

³⁵ Dye (1990), Peterson (1995), Haskell (1962), Moynihan (1992)

³⁶ ACIR (1993b), p. 3. See Barro (1986) for a critical examination of the concept of fiscal capacity.

³⁷ ACIR (1993b), p. 3

than more wealthy governments, which have higher fiscal capacity?

Before attempting to answering the central question of the study, it is necessary to better understand two aspects of government fiscal capacity. First, how are the fiscal capacities of state and local governments measured? Second, what are the patterns of fiscal capacity disparities of governments that results from the use of these measures? The following sections of this chapter attempt to answer these two questions.

This study uses several measures of the fiscal capacities of state and county governments. Five measures of state fiscal capacity are used for the first case study, relating to federal highway apportionments, and three measures of county fiscal capacity are used for the second and third case studies, relating to California state's apportionments for highways and transit.

The various measures of fiscal capacity are described as broad-based measures when they reflect the revenue-raising ability of governments from broad-based taxes, and they are described as benefit-based measures when they reflect the ability of states and counties to raise revenues from specific transportation-related tax sources.³⁸

One gap in our understanding of the impact of funding

³⁸ Shick (1995), pp. 106

apportionments upon fiscal capacity disparities is highlighted by the lack of consensus in the literature about what measure of fiscal capacity is most appropriate to use.³⁹ While previous research has often considered the impact of governmental apportionments upon per capita income and other broad-based fiscal capacity measures, none to date have considered their impact upon benefit-based measures of transportation-related fiscal capacity.

In the transportation sector, specific sources of revenue are often dedicated to, or limited to, spending on transportation programs that are meant to provide direct benefits to the persons who pay the taxes. These transportation-related taxes are often justified as "user fees" and held in trust funds separate from the general fund, out of which most other government programs are funded.

It is important to know whether broad-based or benefit-based measures of fiscal capacity are being used in any analysis because the type of measure used may result in a different outcome regarding the impact of funding apportionments upon fiscal capacity. It is possible, for example, that areas with relatively low broad-based fiscal capacity have relatively high fiscal capacity from the

³⁹ There is some dispute in the literature about the most appropriate measure of fiscal capacity to use. See Gold (1986), Barro (1986), and Aten (1986). For a more recent discussion, see Ladd (1994) and Downes and Pogue (1994).

benefit-based revenue sources which usually fund transportation programs.⁴⁰ In this case, these areas would be classified as more wealthy areas by one measure and less wealthy areas by another measure. If these areas receive disproportionately more in central government apportionments, then findings regarding the impact of the apportionments on fiscal capacity disparities may depend upon whether broad-based fiscal capacity or benefit-based fiscal capacity is used.

2.1 Measures of State Fiscal Capacity

Two broad-based measures of state fiscal capacity are used in the study. The two measures are described below, and the actual fiscal capacities of the fifty states using the two measures are listed in Appendix 1.

The first measure used, per capita income (PCI), provides a measure of the average personal income of individuals residing in the state.⁴¹ PCI is calculated as the total annual personal income of residents divided by the total resident population of the state. PCI is perhaps the most commonly

⁴⁰ This may be true, for example, of the larger, more sparsely populated, Western area states where there are higher levels of per capita motor fuel consumption than in the more densely populated states of the Northeast.

⁴¹ USDOC (1993), p. 451

used measure of fiscal capacity. The rationale for using this measure is that the ability of state governments to raise revenue depends predominantly upon the personal incomes of the residents of the states.⁴²

The second measure used, the representative tax system (RTS), provides a measure of the potential revenue state governments could raise if they applied a representative rate of taxation to twenty-seven commonly taxed revenue sources.⁴³ The representative rates of taxation are calculated as the nation-wide weighted average of tax rates for each of the twenty-seven revenue sources. RTS is calculated according to relatively complex procedure by the Advisory Commission on Intergovernmental Relations (ACIR).⁴⁴ The ACIR promotes RTS as an alternative measure to PCI, arguing that RTS provides a more realistic measure of tax-raising ability than does per capita income.⁴⁵

In addition to these two broad-based measures, three benefit-based measures of state fiscal capacity are used in the study. The research that follows is particularly concerned with the ability of governments to raise revenues for transportation spending. Since transportation programs

⁴² Gold (1986), p. 29

⁴³ ACIR (1993b), p. 76

⁴⁴ ACIR (1993b), pp. 4-9.

⁴⁵ Cohen, Lucke, and Shannon (1986), pp. 11-28

are commonly paid for out of dedicated revenue sources, the benefit-based fiscal capacity of states is measured relative to three specific transportation-related revenue sources. These three benefit-based revenue sources are the motor fuels sales tax (MFST), the motor vehicle operator's license tax (MVOLT), and the motor vehicle registration tax (MVRT). The fiscal capacities of the fifty states based upon these three measures are listed in Appendix 2.

The first benefit-based measure of state fiscal capacity to be used is motor fuels sales tax (MFST) fiscal capacity.⁴⁶ Many states have trust funds holding revenues from motor fuels sales taxes and dedicated toward transportation spending programs. These trust funds also hold revenues from other transportation-related excise taxes, but motor fuels sales taxes usually represent the predominant source of revenues.⁴⁷ MFST fiscal capacity may be calculated in a similar manner as RTS fiscal capacity, in that each state's tax base from motor fuels sales is multiplied by the representative nation-wide rate of taxation to find the potential revenue raising ability of individual states.⁴⁸

The second benefit-based measure of state fiscal capacity is motor vehicle operators' license tax (MVOLT) fiscal

⁴⁶ ACIR (1993b), p. 81

⁴⁷ Larson (1990), pp. 74, 78

⁴⁸ ACIR (1993b), p. 81

capacity.⁴⁹ Commonly known as driver's license fees, the MVOLT provides a commonly used source of transportation-related revenue in many states. MVOLT fiscal capacity may be calculated in the same manner as MFST fiscal capacity, by multiplying each state's tax base by the representative level of fees.⁵⁰

The third benefit-based measure of state fiscal capacity used in the study is motor vehicle registration tax (MVRT) fiscal capacity.⁵¹ Commonly known as automobile registration fees, MVRT is also commonly used by states as a source of revenues for transportation related spending. Like MFST and MVOLT, MVRT is calculated by multiplying the appropriate tax base by the representative rate of taxation.⁵²

2.2 Measures of County Fiscal Capacity

Just as state governments' fiscal capacities may be measured, so too may the revenue raising ability of county and other local governments be measured. While the data on county fiscal capacity are not as readily available as that of state

⁴⁹ ACIR (1993b), p. 91

⁵⁰ ACIR (1993b), p. 91

⁵¹ ACIR (1993b), p. 95

⁵² ACIR (1993b), p. 95

fiscal capacity⁵³, both broad-based and benefit-based measures may be calculated or estimated.

This study uses two broad-based measures and one benefit-based measure of county fiscal capacity. Appendices 3-5 show the fiscal capacities of the fifty-eight counties using these three measures.

First, per capita income (PCI) of counties is used as a measure of the broad-based fiscal capacity of counties.⁵⁴ While at least two state governments have calculated representative tax system (RTS) measures of county fiscal capacities,⁵⁵ the state government of California has not done so. Thus it is not currently possible to measure county fiscal capacity for California using an RTS measure.⁵⁶

Second, since the general sales tax (GST)--a broad-based tax--has been the predominant source of revenues dedicated to state funding of public transportation,⁵⁷ the analyses of transit apportionments uses GST as a second measure of broad-

⁵³ Agencies analogous to the ACIR do not exist in most states.

⁵⁴ CDOF (1991), p. 52

⁵⁵ ACIR (1993b), p. 5; Department of Fiscal Services (1995) and Commonwealth of Virginia Commission on Local Government (1995)

⁵⁶ For future analyses, it may be possible to calculate RTS fiscal capacities for the counties in California as has been done in other states.

⁵⁷ CDOF (1991), p. 141

based fiscal capacity.

While two broad-based measures of county fiscal capacity are used, only one measure of benefit-based fiscal capacity of California's counties is used. In California (as in many other states), the motor fuels sales tax (MFST) has been the predominant source of revenues for highway programs. As a result, the study uses MFST fiscal capacity as a benefit-based measure of county fiscal capacity.⁵⁸

Nobody knows exactly what percentage of total statewide gasoline taxes are paid in each county in California, since gasoline taxes are not directly paid to the state government at the retail level by the customer. Instead, the state government collects taxes from motor fuels distributors before the gasoline is provided to wholesale and retail sellers throughout the state. According to standard microeconomic theory, some portion of the gasoline tax is ultimately passed on to the consumer in the form of higher gasoline prices.

This study uses two methods of estimating the proportion

⁵⁸ In theory, one could estimate a benefit-based, transit-related tax capacity analogous to motor fuels sales tax capacity. Such a specific measure of transit financing capacity would be farebox capacity, or the revenue raising ability of local governments from farebox revenues. Farebox capacity might be measured as the total consumption of transit--the "tax base"--divided by the total population.

However, doing so would require a conception of fares as being analogous to a benefit-based tax. Many analysts of transit finance would probably not agree with this conception, particularly because transit is disproportionately used by the members of society who are least able to "pay their own way" for transportation.

of gasoline taxes that are attributable to each county. While both estimation methods have their own shortcomings, the results derived from the two methods are very close to one another, suggesting that the estimates are reasonably close to the actual proportions of gasoline taxes paid in each county.⁵⁹

The first method, which produces the "sales-based estimate," calculates the approximate proportion of gasoline taxes paid in each county on the basis of total taxable sales reported by service stations in each county. Since gasoline is not the only item sold at service stations, an average statewide percentage (92.7%) of total service station sales is estimated to be that portion of sales which can be attributed to gasoline sales.⁶⁰

The second method produces the "consumption-based estimate". This estimate of how much gasoline tax is attributable to each county is calculated from approximations of how much gasoline is consumed in each county, using data provided by the California Department of Transportation.⁶¹ While not all of the gasoline sold in each county is consumed in the same county, the second estimation technique presumes

⁵⁹ The dissimilarity index between the two estimates is 4.48 percent, indicating that less than 5.00 percent of the taxes would need to be shifted from one estimate's distribution to produce the other estimate's distribution.

⁶⁰ CSBE (1991), p. 3

⁶¹ CDOT (1994), Figure 19

that the county of purchase and the county of consumption is the same for the vast majority of the gasoline sold.

In summary, this study uses multiple measures of fiscal capacity, both of the broad-based type and of the benefit-based type. One might ask whether there is a single measure that is most appropriate to use. There is no clear consensus on this issue. One study has argued that fiscal capacity is best measured by the tax base(s) that are actually used in the financing of government programs.⁶² For this study, such a principle would suggest that benefit-based measures are more appropriate, since transportation programs are often financed out of dedicated benefit-based revenue sources.

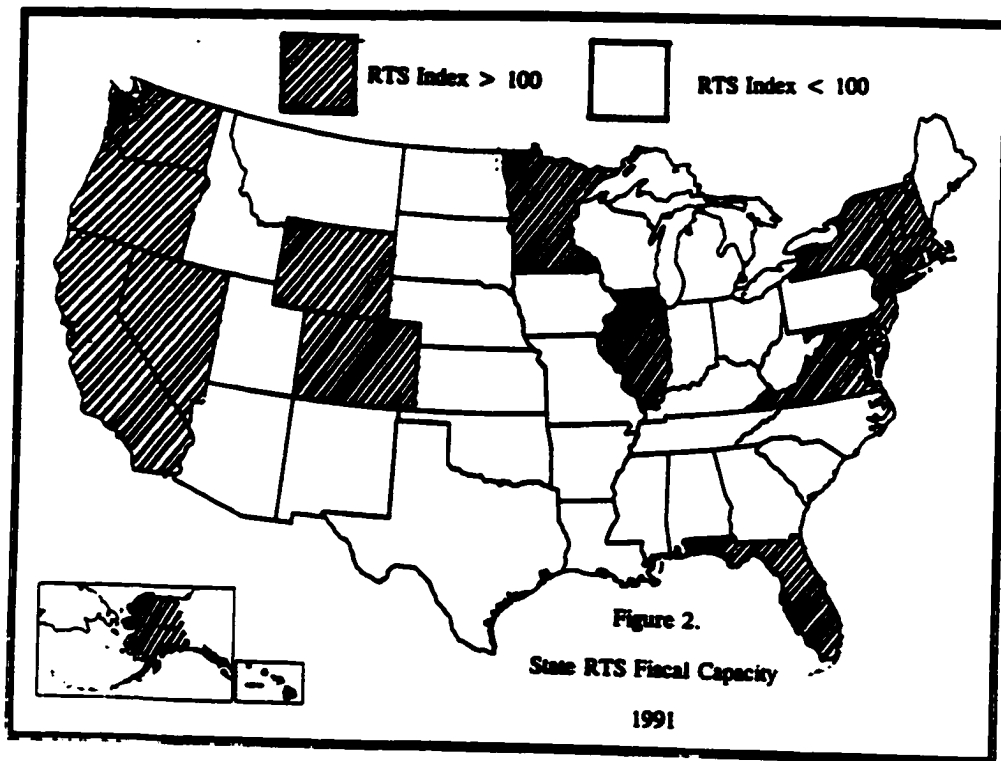
However, it seems that a larger understanding of what impact funding apportionments have upon fiscal capacity would result from analyses which include both broad-based and benefit-based measures. Such is the effort which this study seeks to pursue in the use of multiple measures of both types.

2.3 Patterns of State Fiscal Capacities

As a previous section of this chapter described, this study uses two broad-based measures of state fiscal capacity and three benefit-based measures of state fiscal capacity. In addition, the study uses two measures of broad-based county

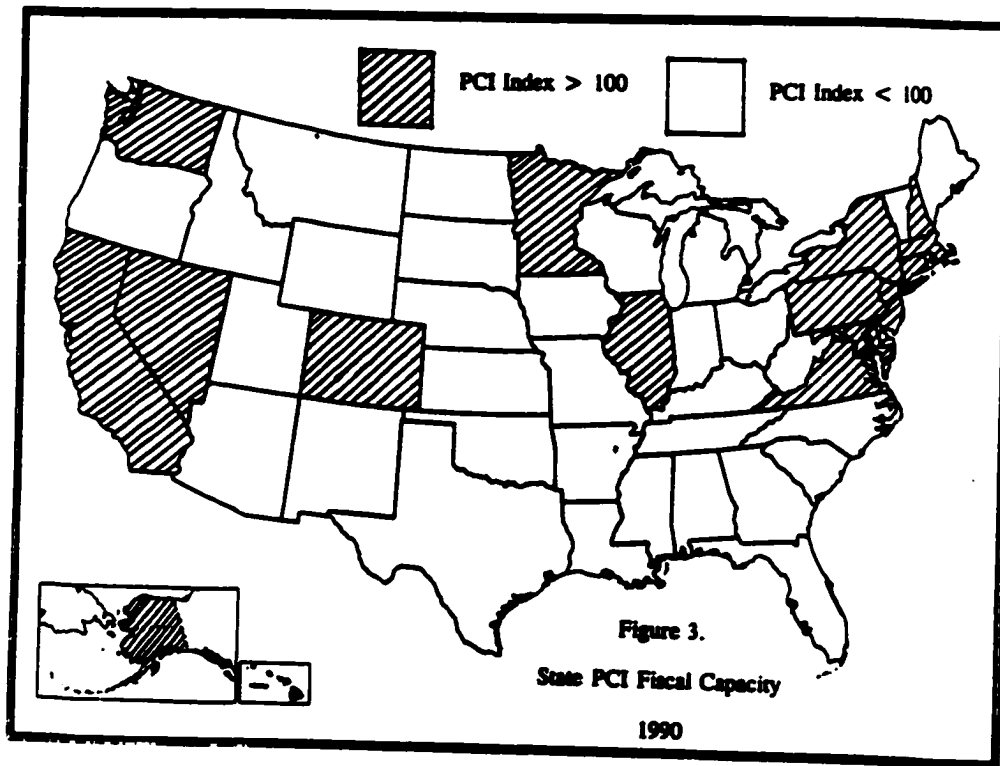
⁶² Downes and Pogue (1994), p. 65

fiscal capacity and one measure of benefit-based county fiscal capacity. In order to determine whether the choice of the measure makes a difference (or whether these measures are in fact interchangeable with one another), one must consider whether the different possible measures of fiscal capacity describe similarly patterned phenomena.

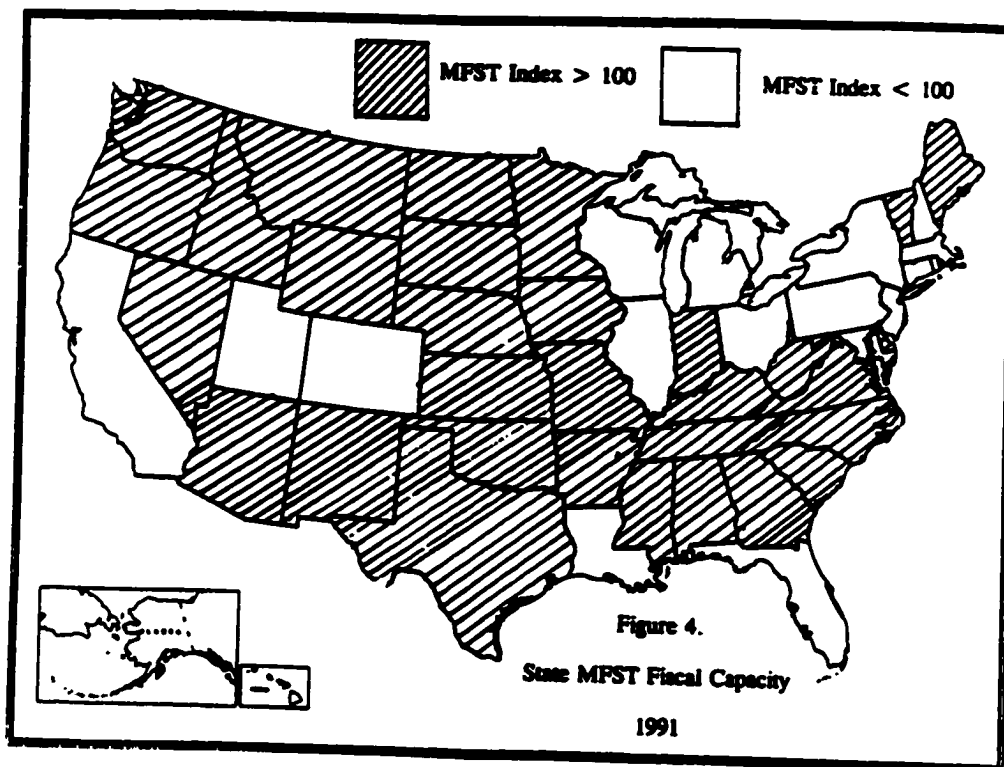


Figures 2 and 3 show the geographic pattern of higher capacity states and lower capacity states using the broad-based fiscal capacity measures of the representative tax system (RTS) and per capita income (PCI), respectively. These two maps illustrate similar patterns, in which the higher capacity states tend to be concentrated in the Northeast and

the Pacific regions of the country.



While the two broad-based measures result in similar geographical patterns, benefit-based measures result in a different pattern. For example, Figure 4 shows the geographic pattern of state fiscal capacity using the benefit-based measure of motor fuels sales tax (MFST) fiscal capacity. In Figure 4, the high capacity states are not concentrated in the Northeast and the Pacific regions, but instead spread throughout the interior of the country. The pattern illustrated by Figure 4 appears quite different from, and may even be described as the opposite of, the pattern shown in Figures 2 and 3.

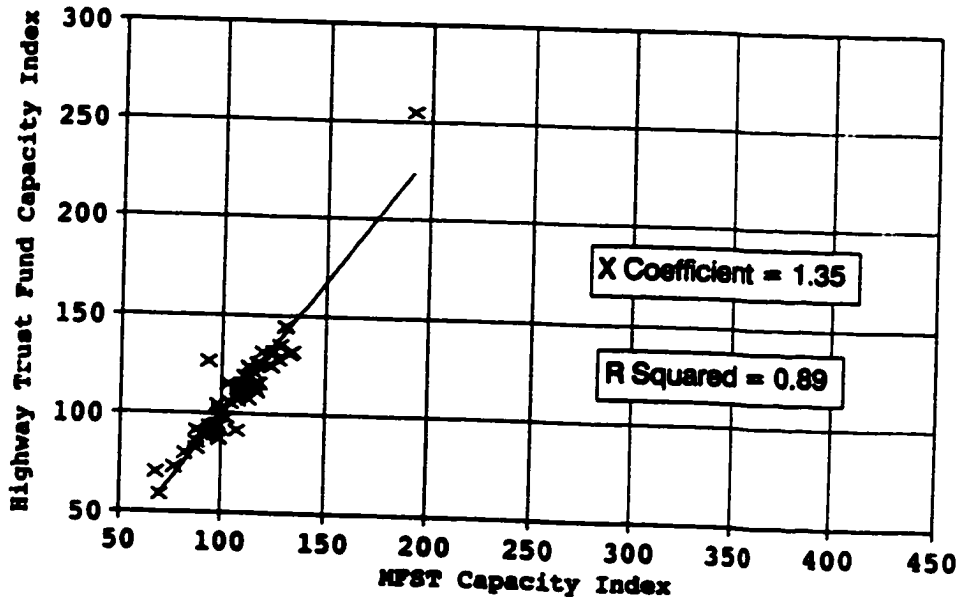


Linear regression analysis shows that the broad-based measures and the benefit-based measures of fiscal capacity do not describe similarly patterned phenomena. The individual broad-based measures of fiscal capacity do correlate positively with one another, and the individual benefit-based measures of fiscal capacity likewise correlate positively with one another. However, broad-based measures and benefit-based measures of state fiscal capacity do not correlate positively with one another.

As Table 2 indicates, the two broad-based measures have positive values for the x-coefficients when compared with each other, and the three benefit-based measures have positive x-

coefficient values when compared with one another. However, when comparing the two fiscal capacity measures of different types, the sign of the x-coefficient is negative, indicating a negative correlation.

**Figure 5. MFST and Trust Fund Capacity
Two Benefit-Based Measures, FY 1991**



The federal highway trust fund is financed by a group of transportation-related, benefit-based taxes. In a sense, it represents an aggregate of several benefit-based measures. The ability of states to raise revenues for the federal trust fund is a reflection of aggregate benefit-based fiscal capacity. Figure 5 shows that the capacity of states to raise revenues for contributions to the federal highway trust fund has a high positive correlation with the motor fuels tax

(MFST) capacity. Based upon a linear regression, 89 percent of the variation in trust fund tax capacity is explained by variation in motor fuels capacity.⁶³ This high correlation is to be expected since the largest proportion of trust fund

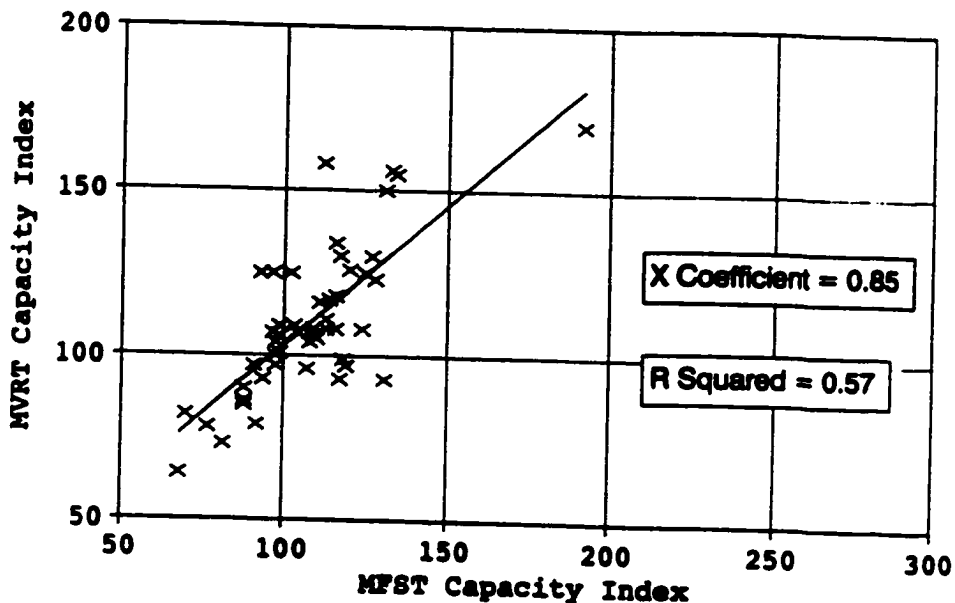
Table 2. X-Coefficients for Correlations between Fiscal Capacity Measures for Fifty States					
x\y	PCI	RTS	MFST	MVOLT	MVRT
PCI	+1.00	+0.92	-0.77	-0.65	-0.80
RTS	+0.53	+1.00	-0.23	-0.08	-0.14
MFST	-0.43	-0.22	+1.00	+0.16	+0.85
MVOLT	-0.24	-0.54	+1.09	+1.00	+0.58
MVRT	-0.35	-0.11	+0.67	+0.07	+1.00

revenues come from motor fuels taxes.⁶⁴ Every increase of one unit in motor fuels tax capacity is correlated with a 1.3 unit increase in trust fund tax capacity.

⁶³ $R^2 = 0.89$, X Coefficient = 1.3

⁶⁴ Larson (1991), p. 48

**Figure 6. MFST and MVRT Capacity
Two Benefit-Based Measures, FY 1991**

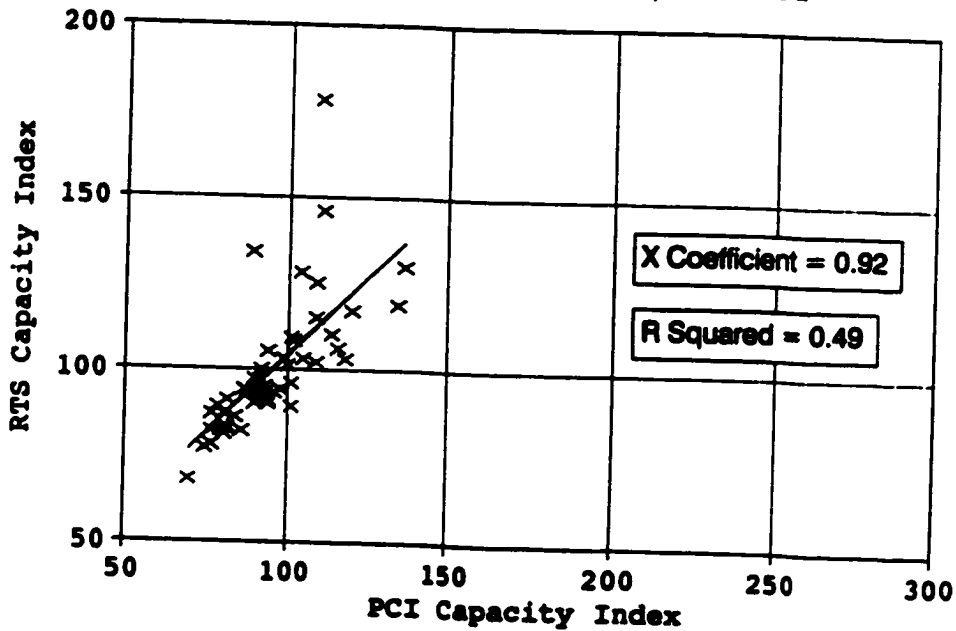


Similarly, Figure 6 shows that motor fuels (MFST) fiscal capacity is positively correlated⁶⁵ with motor vehicle registrations (MVRT) fiscal capacity. Fifty-seven percent of the variation in the y-axis variable is explained by variation in the x-axis variable. In addition, every one unit increase in motor fuels (MFST) capacity is correlated with a 0.85 increase in motor vehicles registration (MVRT) capacity.⁶⁶

⁶⁵ $R^2 = 0.57$, X Coefficient = 0.85

⁶⁶ While motor fuels (MFST) fiscal capacity and motor vehicle registration (MVRT) fiscal capacity are positively correlated with one another, motor vehicle operators' license (MVOLT) fiscal capacity is not strongly correlated with the other two benefit-based measures. This appears to suggest that the rate of drivers' licensing is a phenomenon with a different geographic pattern than that of motor

**Figure 7. PCI and RTS Capacity
Two Broad-Based Measures, FY 1991**



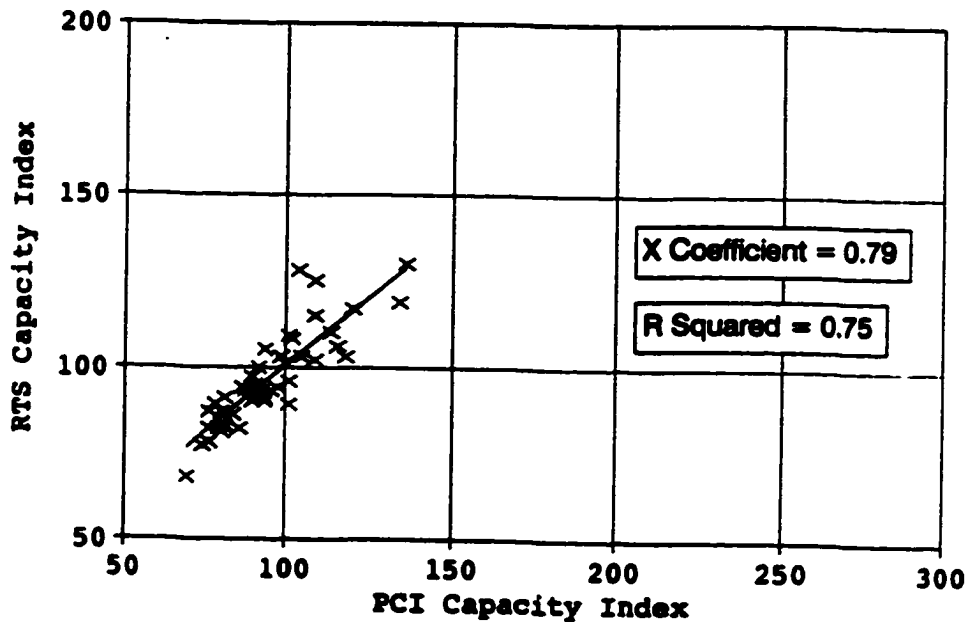
Just as some benefit-based measures of fiscal capacity correlate positively with one another, Figures 7 and 8 show that the two broad-based measures of fiscal capacity considered in this study also correlate positively with one another, as the two maps in Figures 2 and 3 suggested. Figure 7 illustrates the relationship using the data from all fifty states and Figure 8 shows a stronger relationship which appears when three data outliers are removed.⁶⁷ Figure 8 shows

vehicle registration and motor fuels consumption.

⁶⁷ The three data outliers are Alaska, Hawaii, and Wyoming. Again, the effort of this study is to show and understand the general pattern, rather than to explain the existence of outliers.

that 75 percent of variation in the RTS index is accounted for by variation in the PCI index.⁶⁸ There is a good correspondence (approximately 8:10) between PCI and RTS measures.

**Figure 8. PCI and RTS Capacity
Two Broad-Based Measures, 47 States**

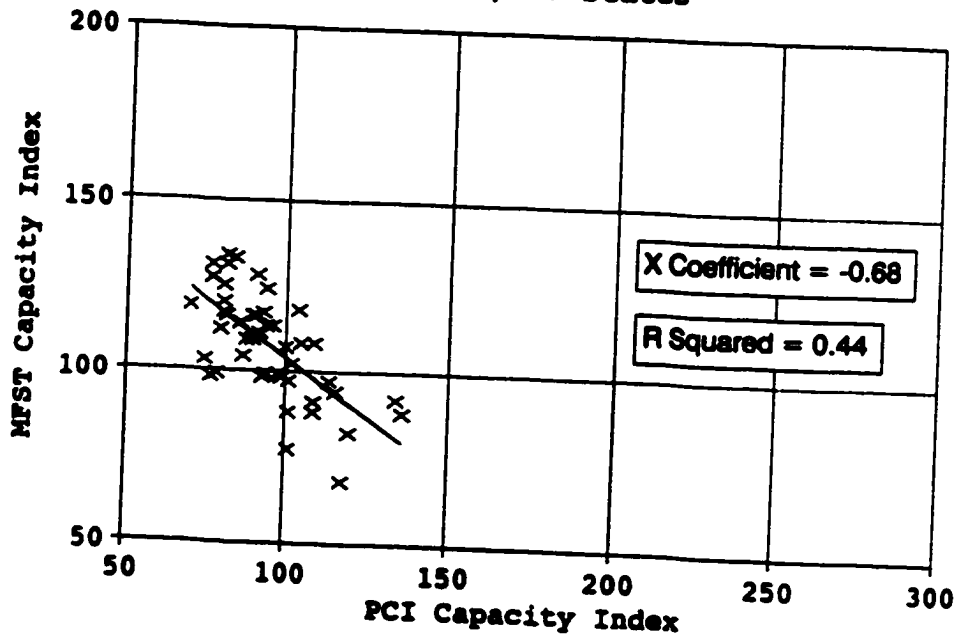


Significantly, however, broad-based and benefit-based measures of fiscal capacity are not positively correlated. In fact, motor fuels fiscal capacity is negatively correlated with both the PCI and RTS measures of fiscal capacity, as Figures 9 and 10 indicate. As shown in Figure 9, the PCI capacity index and the MFST capacity index are negatively

⁶⁸ $R^2 = 0.75$, X Coefficient = 0.79

correlated.⁶⁹ Almost half of the variation in one variable is accounted for by the variation in the other, with an increase of one unit of PCI index associated with a decrease of 0.68 of motor fuels capacity index.

**Figure 9. PCI and MFST Capacity
FY 1991, 47 States**



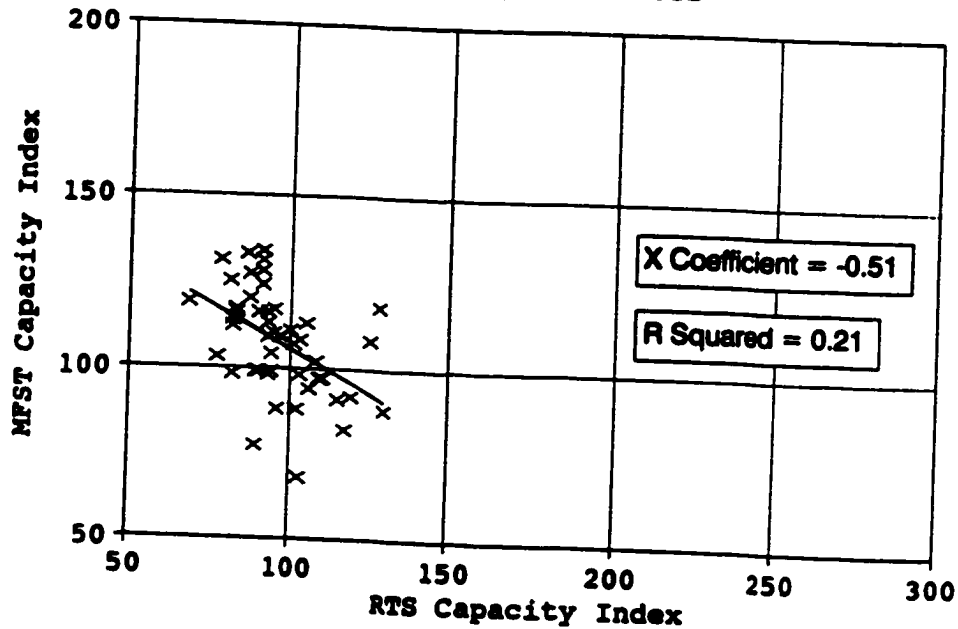
Similarly, Figure 10 shows that the RTS capacity index and the motor fuels capacity index are also negatively correlated.⁷⁰ This relationship is not very strong, with only 21 percent of the variation in one variable is accounted for by the variation in the other. An increase of one unit of RTS index is associated with a decrease of half a unit of motor

⁶⁹ $R^2 = 0.44$, X Coefficient = -0.68

⁷⁰ $R^2 = 0.21$, X Coefficient = -0.51

fuels capacity index.

**Figure 10. RTS and MFST Capacity
FY 1991, 47 States**



The negative correlation between broad-based and benefit-based measures of fiscal capacity is important because it suggests that conclusions about the impact of funding apportionments upon fiscal capacity disparities depend upon which measures of fiscal capacity are used. While broad-based measures have similar geographic patterns with one another, and benefit-based measures have similar geographic patterns with one another, a given apportionment will not necessarily have the same impact upon the pattern of broad-based fiscal capacity as it will upon the pattern of benefit-based fiscal capacity.

In fact, an apportionment which results in an increase in PCI capacity disparities might result in a decrease in motor fuels capacity disparities. Similarly, an apportionment which results in a decrease in PCI capacity disparities may result in an increase in motor fuels capacity disparities.

2.4 Patterns of County Fiscal Capacity

Just as it is essential to establish the patterns of state fiscal capacity disparities in laying the groundwork for the first case study on federal apportionments, it is equally important to determine the patterns of county fiscal capacity disparities in preparation for the second and third case studies on California's apportionments.

In the process of assessing the impact of funding apportionments upon the fiscal capacities of California's counties, this study groups the state's fifty-eight counties into quintiles--five groups of a roughly equal number of counties.⁷¹ The counties are grouped according to population density,⁷² so that the first quintile includes the twelve

⁷¹ Quintiles 1, 3, and 5 include twelve counties, and quintiles 2 and 4 include eleven counties, accounting for a total of fifty-eight counties.

⁷² Population Density =
$$\frac{\text{Resident Population}}{\text{Square Miles of Land Area}}$$

counties with the highest population density,⁷³ and the last quintile includes the twelve counties with lowest population density.⁷⁴ Table 3 provides a summary description of the five quintiles.

Figure 11 and the first column of Table 3 show that while

Table 3. Summary Description of Five Quintiles			
Quintile of Counties	Population Density	Population (Persons)	Land Area (Sq.Mi.)
1st	1,359	20,567,279	15,130
2nd	174	4,722,672	27,160
3rd	73	3,483,659	47,455
4th	30	759,932	25,525
5th	6	226,479	41,088

Source: USDOC (1992)

the population densities for all five quintiles varies, the first quintile has a population density more than seven times that of all the other four quintiles. The highly urbanized counties in the first quintile have a population density many times greater than the less developed counties in the other four quintiles.

⁷³ The twelve counties with the highest population density are (in descending order) San Francisco, Orange, Los Angeles, Alameda, San Mateo, Santa Clara, Contra Costa, Sacramento, San Diego, Santa Cruz, Marin, and Solano.

⁷⁴ The twelve counties with the smallest population density are (in ascending order) Alpine, Inyo, Modoc, Mono, Sierra, Trinity, Lassen, Siskiyou, Plumas, Mariposa, Colusa, and Tehama. See Appendix 6 for a complete list of the counties in each quintile and each county's population density.

Figure 11. Population Density of Quintiles for California Counties

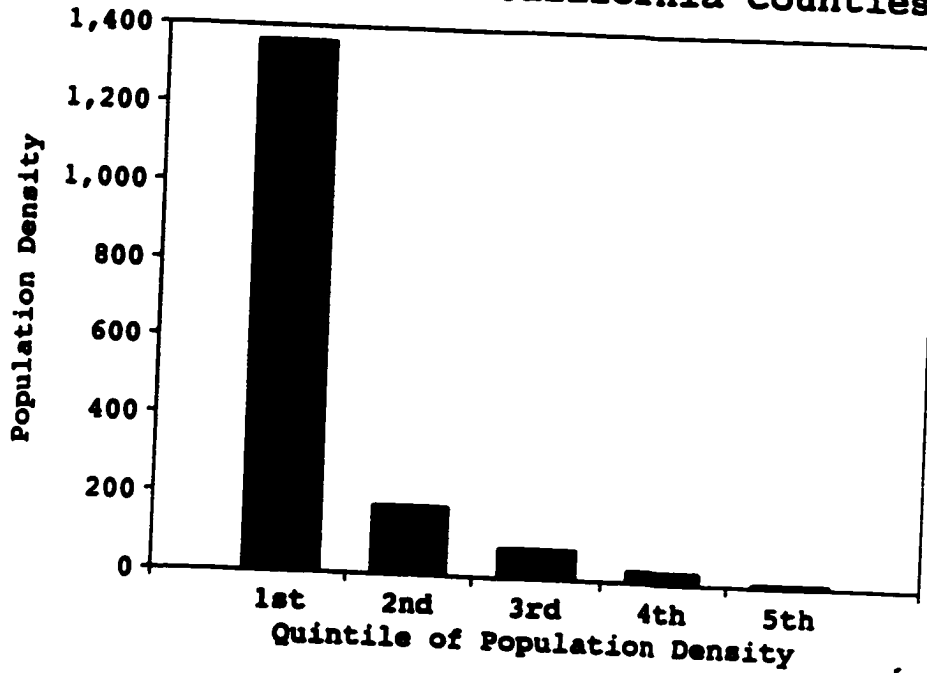


Figure 12. Total Population of Quintiles for California Counties

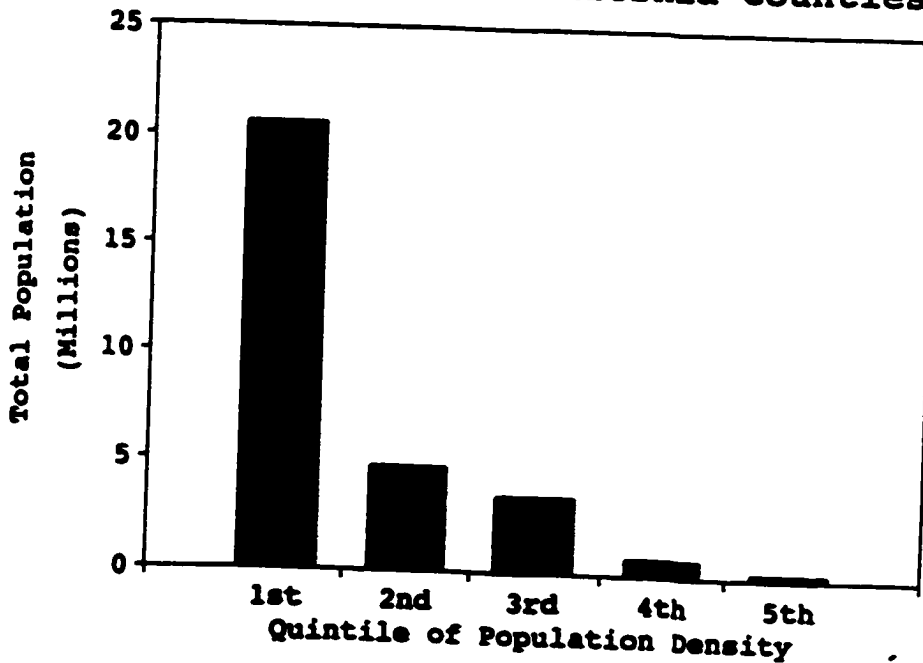
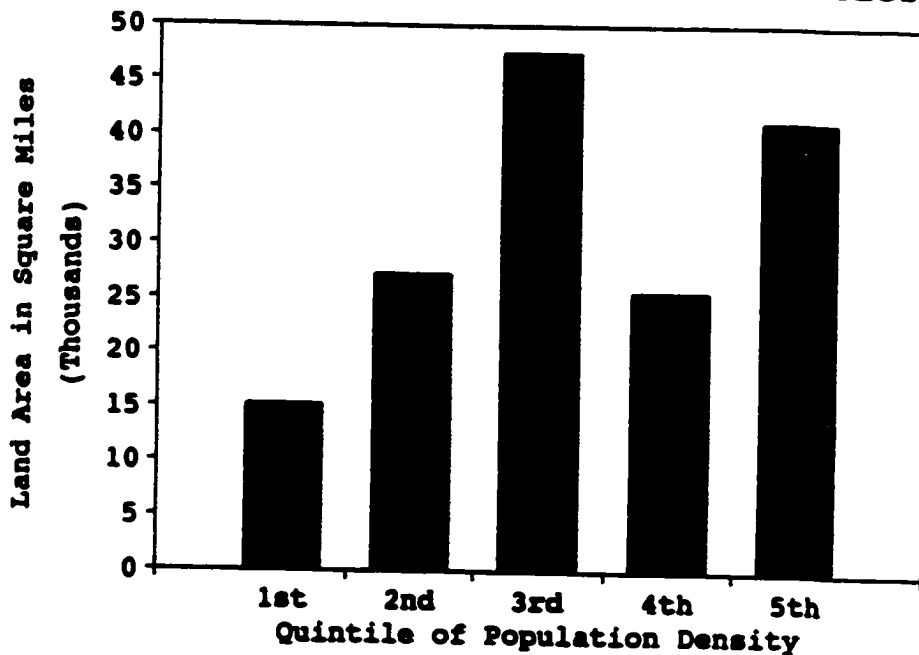


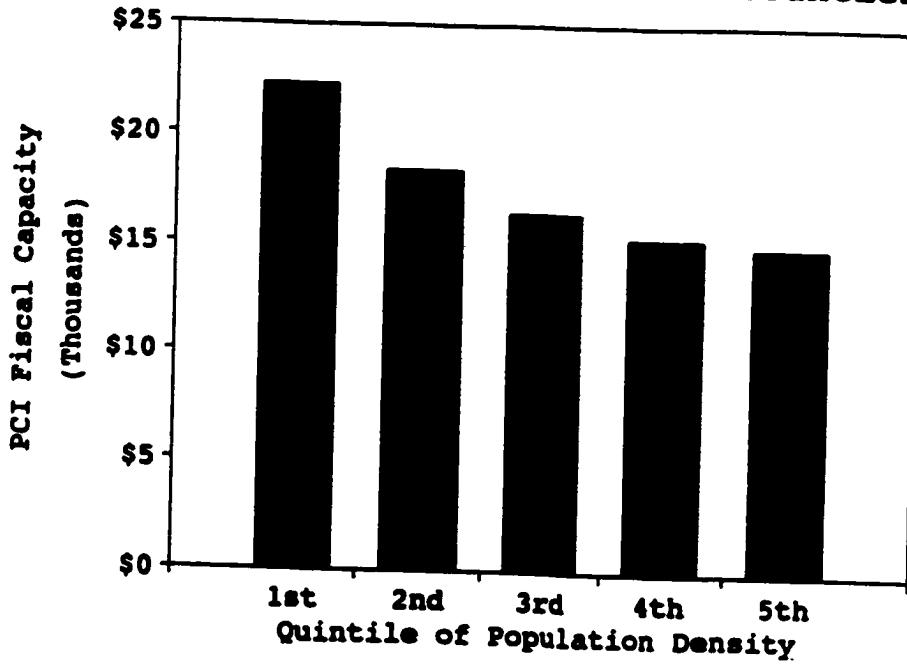
Figure 12 and the second column of Table 3 show that the counties in the first quintile include more than twenty million of the state's thirty million inhabitants, or more than two thirds of the state total. While the first quintile of counties has by far the greatest population of all the quintiles, Figure 13 and the last column of Table 4 show that the first quintile has the smallest amount of land area of the five quintiles.

Figure 13. Land Area of Quintiles for California Counties

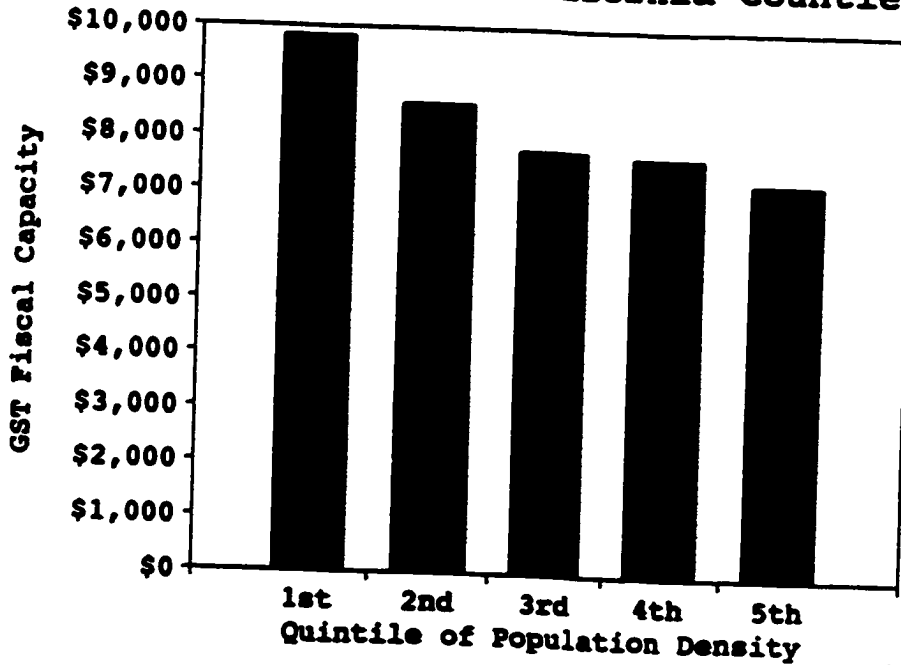


The quintiles of county population density also vary in terms of their fiscal capacities, although the pattern of

**Figure 14. Per Capita Income (PCI)
of Quintiles for California Counties**



**Figure 15. Taxable Sales (GST)
of Quintiles for California Counties**

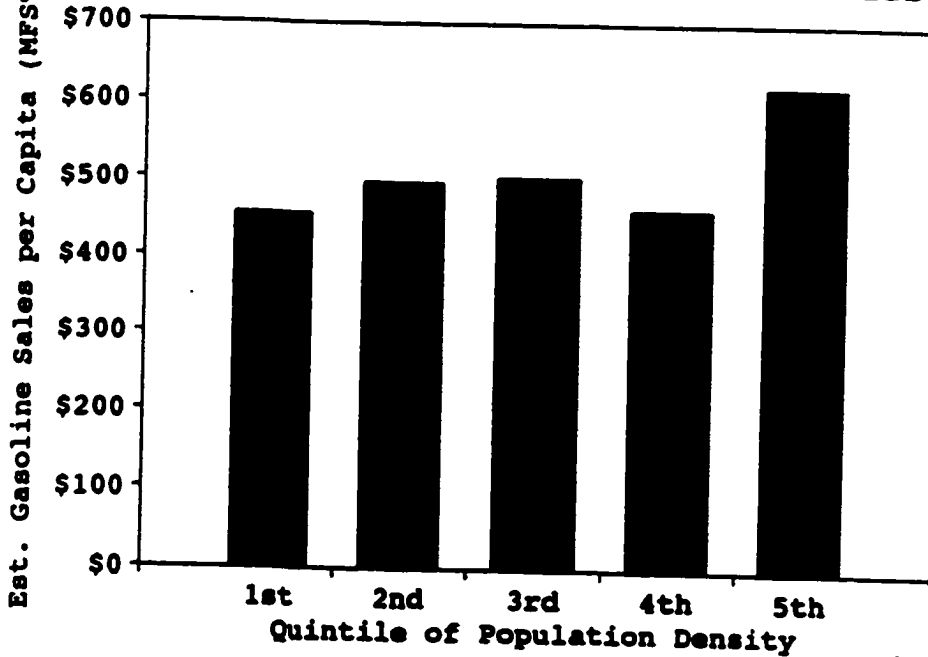


variation depends upon the type of fiscal capacity measure used. Using broad-based fiscal capacity measures, the quintiles with higher population density have higher fiscal capacity. Using benefit-based fiscal capacity measures, the quintiles with higher population density tend to have lower fiscal capacity.

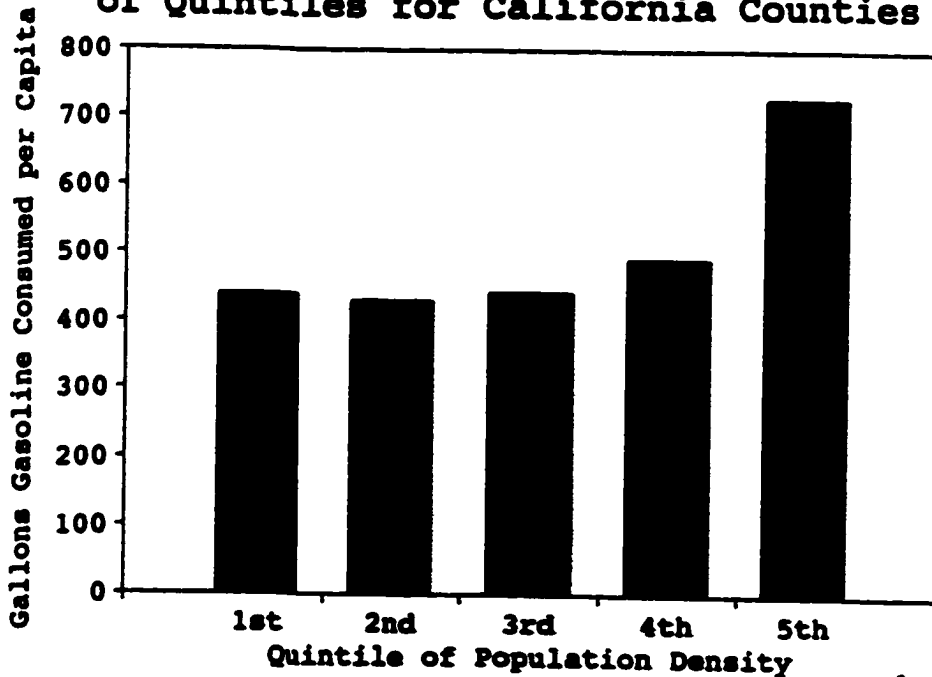
Figures 14 and 15 and the first two columns of Table 4 show that for per capita income (PCI) and per capita taxable sales (GST), the first quintile has the highest fiscal capacity, and capacity declines as population density declines. In contrast, Figures 16 and 17 and the last two columns of Table 4 show that the fifth quintile has the highest fiscal capacity when measured relative to the amount of gasoline sold or consumed per capita, and capacity tends to decrease as population density increases. These patterns indicate that more gasoline is sold and consumed per capita in less densely populated counties than in more densely populated counties.

As with the pattern of state fiscal capacities, the pattern of county fiscal capacity disparities varies according to whether broad-based or benefit-based measures are used. Using the broad-based measures (PCI and GST), more densely populated counties have higher fiscal capacities than less densely populated counties. However, using the two estimates of the benefit-based measure (MFST), the more dense

**Figure 16. Gasoline Sales (MFST)
of Quintiles for California Counties**



**Figure 17. Gasoline Consumption (MFST)
of Quintiles for California Counties**



counties have lower fiscal capacities than less dense counties.

Table 4. Fiscal Capacities of Five Quintiles (per annum)				
Quintile of Counties	(PCI) Per Capita Income	(GST) Per Capita Taxable Sales	(MFST) Gasoline Sales per Capita	(MFST) Gasoline Consumed per Capita (gallons)
1st	\$22,230	\$9,820	\$455	440
2nd	\$18,341	\$8,590	\$495	430
3rd	\$16,384	\$7,770	\$503	443
4th	\$15,289	\$7,660	\$461	492
5th	\$14,922	\$7,220	\$619	729
(Highest fiscal capacity in each column in boldface type)				

Sources: Calculated by author based upon data from CDOF (1991), pp. 52, 141; CSBE (1991), p. 3; CDOT (1994)

As with the states, whether or not one group of counties is classified as higher wealth (high capacity) or lower wealth (low capacity, depends upon the particular measure of fiscal capacity used. Conclusions about the impact of funding apportionments upon higher wealth and lower wealth counties may likewise differ, depending upon the measures of fiscal capacity used.

Chapter 3.

Do Transportation Funding Formulas Equalize Fiscal Capacities?

Two theoretical frameworks are useful for considering the question of whether or not transportation funding formulas result in fiscal capacity equalization. While these two frameworks may be considered independently, they are conceptually linked by the question of fiscal capacity equalization. Table 5 summarizes three key aspects of the two theoretical frameworks.

Table 5. Summary of Two Theoretical Frameworks		
Framework:	(1) Existence of Apportionment	(2) Means of Apportionment
Question:	What is the appropriate level of government to finance a transportation program?	What is a fair distribution of transportation funding by central governments?
Topic:	Fiscal Equivalence vs. Fiscal Equalization	Principled Geographic Redistribution
Policy Relevance:	Devolution Debates	Formula Fights

Each of the two frameworks may be summarized by a single question. The "existence" framework seeks to find a rational

public finance justification for the involvement of central governments⁷⁵ in transportation funding in order to help answer the question: What is the appropriate level of government to finance a transportation program? The "means" framework accepts as a given the role of the central governments in transportation funding, and asks the question: What is a fair distribution of transportation funding by central governments among different local geographic areas?

Theories that arise out of these two frameworks may be considered from both a descriptive and a normative perspective. The descriptive perspective seeks to explain aspects of government policy that may be measured and observed. Alternatively, the normative perspective suggests what form a government policy should take.

Both perspectives on the two frameworks are relevant to this study. The descriptive perspective of the theories may be tested empirically. Such an empirical test can lead to a conclusion regarding whether or not government policies should be altered. If an empirical analysis (the test of the descriptive perspective) shows that the policy is consistent

⁷⁵ For this study, the term "central government" will refer to the level of government distributing funds, usually the national or state government. The term "local government" will refer to the level of government receiving funds, usually the state or county government. This terminology is used to avoid confusion between situations where state governments are distributors of funds and situations where state governments are recipients of funds.

with a normative perspective, then there may not be a justified need to alter the policy. However, if the test of the descriptive perspective results in an empirical finding of inconsistency with the normative perspective, then there are demonstrated grounds for altering the policy. The normative perspective of these two theoretical frameworks is thus related to current policy debates in transportation finance, and is therefore relevant to policy analysts as well as more theoretically oriented observers.

3.1 Fiscal Equivalence versus Fiscal Equalization

The first framework is related to what may be called the "devolution debate" in public policy. At both the federal and state government levels, an ongoing and earnest debate pits proponents of devolution against opponents. While the specifics of the debate may vary, in general proponents of devolution argue that more government programs should be financed and administered at the level of government closest to the citizenry, while opponents argue that there is a legitimate need for the central (federal or state) government to run programs.

Proponents of devolution argue for the federal government to relinquish program and funding authority and devolve such authority to the states, and for state governments to likewise

devolve programs to the local levels. In the area of surface transportation, the devolution debate takes the form of whether or not the federal government should "turn back" authority for transportation program financing and administration to the states.⁷⁶

The first theoretical framework asks the normative question: What is the appropriate level of government to finance a transportation program? More specifically, should local or central governments finance transportation services? One way of looking at this question is to ask oneself whether there is reason for the problem of apportionment as described in Chapter 1 to exist at all. Hence, the first framework looks at the problem of apportionment as a question of existence.

In order to consider possible answers to the existence framework's central question, one must draw from two commonly used pre-existing public finance principles. These two principles are commonly referred to as the "benefit principle" and the "ability-to-pay principle".

The benefit principle suggests that the citizens who should be taxed for a government service are those who would directly benefit from the service. The benefit principle provides a theoretical basis for citizens to pay for a good provided by the government in a manner analogous to how

⁷⁶ ACIR (1987)

citizens buy goods from the private market, such that citizens pay for services in proportion to what they receive.

In contrast, the ability-to-pay principle suggests that the citizens should be taxed for government services in proportion to their ability to pay taxes. This principle is consistent with arguments for progressive tax systems, where higher income individuals pay a greater absolute amount in taxes than lower income individuals for equivalent levels of government services.

Applying the benefit principle in the general form to questions of geographic scope leads to one particular principle called "fiscal equivalence."⁷⁷ The principle of fiscal equivalence states that there should be a "separate governmental institution for every collective good with a unique [geographical] boundary, so that there can be a match between those who receive the benefits of a collective good and those who pay for it."⁷⁸

Some of the important implications of the principle of fiscal equivalence are that the national government should finance programs that provide collective goods at the national level, state governments should finance programs that provide collective benefits at the state level, and local governments

⁷⁷ Olson (1969)

⁷⁸ Olson (1969), p. 483

should finance local public goods.⁷⁹

The principle of fiscal equivalence is sometimes heard in the political debate along the following lines: "Should an elderly widow living on a fixed income in a small town in Nevada subsidize the construction of a highway in the suburbs of New Jersey⁸⁰?" The implicit argument of such a question is that those taxpayers who are asked to pay for transportation improvements should see some benefit from such improvements.

The principle of fiscal equivalence does not provide a justification for geographic redistribution of taxes by the central government, and in fact it provides reason to think that such a redistribution could lead to inefficient results.⁸¹ If the principle of fiscal equivalence were to provide an adequate descriptive theory for government policy, one would not expect to find any geographic redistribution of tax

⁷⁹ According to convention, the terms "public goods" and "collective goods" are used interchangeably.

⁸⁰ Nevada and New Jersey may be substituted for by some other state or district.

⁸¹ Economic theory generally defines the term inefficient as less than pareto-optimal. In a pareto-optimal situation, there is no possible reallocation of goods such that some individual would be better off without making another individual worse off. The principle of fiscal equivalence suggests that geographic redistribution may lead to inefficient results because taxes may be collected in one area to provide a service to a second area where it does not result in utility gains. In such a case, the service may be withdrawn from the second area (without a loss of utility), and the taxes returned to the first area, providing a net increase in efficiency. In other words, geographic redistribution can lead to wasteful spending.

revenues by the central government, except in the provision of a public good.⁸²

As might be expected, the ability-to-pay principle suggests an arrangement of financing responsibilities different from that of the benefit principle. While the general benefit principle is consistent with the specific fiscal equivalence principle, the general ability-to-pay principle is consistent with the specific principle of fiscal capacity equalization, or fiscal equalization. Although the two principles are quite close in their wording, and might easily be mistaken for one another, the meanings and the implications of the two are quite different. Table 6 highlights the important differences between the two principles.

The principle of fiscal equalization states that central governments have a legitimate role to play in equalizing fiscal capacities. Without central government involvement, local governments with high fiscal capacity could provide many services at high levels to their residents. At the same time, local governments with low fiscal capacities would be much

⁸² Public goods are those goods which provide benefits both to individuals who do and to those who do not pay for them. As an alternative to geographic redistribution for specific programs, one might expect purely redistributive grants, such as general revenue sharing grants. However, the history of the general revenues sharing program suggests that such redistributive grants have not been sustainable over long periods of time in the American political system.

more limited in their ability to provide services, perhaps even the most basic services.

The principle of fiscal equalization suggests that the central government should redistribute some tax revenues from high capacity areas to low capacity areas, thereby reducing the existing disparities in fiscal capacities. The result would be that citizens living in high fiscal capacity areas pay more in absolute taxes than citizens living in low fiscal capacity areas for equivalent services, and the residents of different geographical areas do not receive such government

Table 6. Fiscal Equivalence versus Fiscal Equalization			
Specific Principle	General Principle	Central Government Role	Geographic Redistribution Expected?
Fiscal Equivalence	Benefit	Limited	No
Fiscal Equalization	Ability-to-Pay	Expansive	Yes

services in proportion to their tax contribution.⁸³

⁸³ Some critics of the principle of fiscal capacity equalization argue that the residents of geographic areas with high capacity government may or may not themselves be wealthy. However, residents of high capacity areas are usually beneficiaries of local government services provided in such areas, while both poor and wealthy residents of low capacity areas do not receive such benefits. This seems to

Thus, the principle of fiscal equalization provides a justification for geographic redistribution of tax revenues from high capacity to low capacity areas. Although such geographic redistribution could lead to inefficiencies, the general ability-to-pay principle suggests that geographic redistribution to lower capacity areas results in a more equitable distribution of government services. According to proponents of the principle, fiscal capacity equalization can lead to increased fairness, while fiscal equivalence reinforces the favoritism that results from existing disparities in fiscal capacities. If one were to expect the principle of fiscal equalization to explain government policies, one would expect to find some geographic redistribution from high capacity areas to low capacity areas.

The first theoretical framework thus presents the two competing principles of fiscal equivalence and fiscal equalization as alternative explanations (or normative ideals) for government financing policies. If one were to attempt to answer the normative question, "What is the appropriate level of government to finance a transportation program?", one would need to choose between the two principles and examine the empirical data for consistency with the principle selected.⁸⁴

be particularly true with transportation services, which are usually location specific.

⁸⁴ It is possible to answer the question differently with regard to different government programs. For example,

This first theoretical framework may be tested by attempting to answer the empirical question: Does geographic redistribution and fiscal equalization actually occur? An empirical examination could lead to three possible results. The three possible outcomes are graphically illustrated in Figure 18.

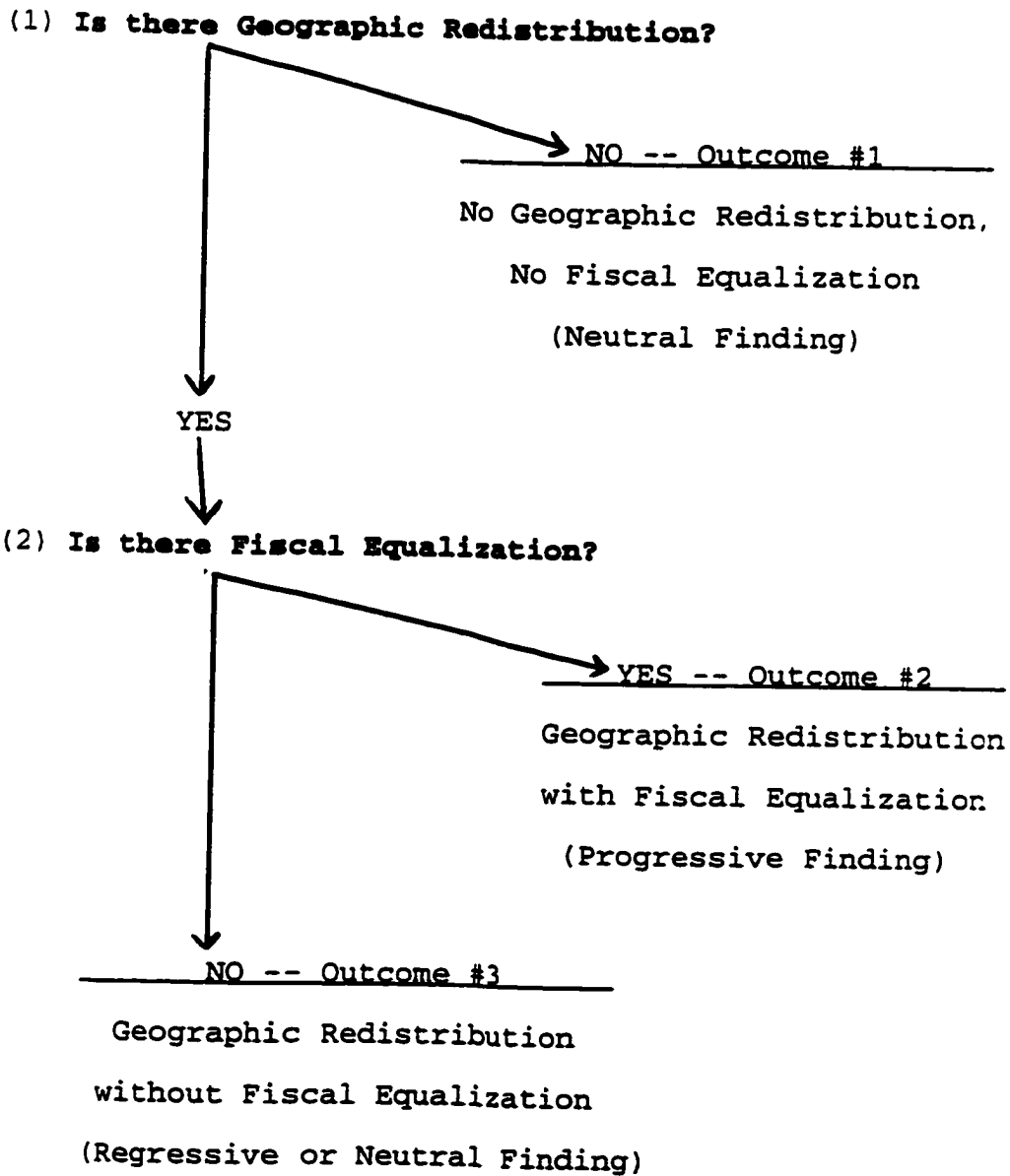
First, geographic redistribution may not occur (Outcome #1). In such a case, fiscal equalization would also not occur, since geographic redistribution is a necessary precondition to fiscal equalization. Second, both geographic redistribution and fiscal equalization may occur (Outcome #2). Third and finally, the data may show that geographical redistribution does occur, but that fiscal equalization does not occur (Outcome #3). In this third case, taxes would be redistributed by the central government, but not in a manner which redistributes funds from high capacity areas to low capacity areas.⁸⁵

it seems reasonable that the central government should seek to provide enough fiscal capacity to insure the provision of a minimal level of accessibility and mobility by all members of society. Such a view would argue for enough fiscal equalization for all local governments to provide transportation services up to that level of service, but would not provide justification for fiscal equalization beyond that point. The difficulty, with this view, of course, is knowing how much fiscal capacity is required to provide the minimal level of accessibility and mobility.

⁸⁵ This third outcome may result in a geographic redistribution from low capacity areas to high capacity areas, or it may show no discernible pattern relative to fiscal capacity.

Figure 18.

Geographic Redistribution and Fiscal Equalization:
Three Possible Outcomes



The first possible finding, that geographic redistribution does not occur, would suggest that the general benefit principle, and in particular the principle of fiscal equivalence, satisfactorily explains government policy. Such a finding could also be described as a "neutral" finding, as opposed to a finding of "progressive" or "regressive" redistribution of tax revenues.

The second possible finding, that geographic redistribution does occur and that fiscal equalization results, would support the conclusion that the ability-to-pay principle better explains government policy. Such a finding would be consistent with a "progressive" policy of taxation and spending, in that taxes from high capacity areas would be subsidizing some of the services in low capacity areas.

The third possible finding, that geographic redistribution does occur but fiscal equalization does not result, could support the conclusions that neither the benefit principle nor the ability-to-pay principle adequately explain government policy, and perhaps would suggest that inefficiencies are resulting. Such a finding may be described as "regressive" if it is found that lower capacity areas are subsidizing the services provided to high capacity areas.⁸⁶

⁸⁶ The terms "progressive" and "regressive" taxation have come to carry normative implications in common usage. The primary reason for using these terms in this study,

It is essential to note that the principles discussed thus far provide a justification for only two of the three possible outcomes. Proponents of the principle of fiscal equivalence would argue that the first outcome leads to both efficiency and equity. Proponents of the principle of fiscal equalization would argue that the second outcome leads to a higher degree of equity than the first.

Neither of the two principles, however, suggests that the third result is the most equitable. In fact, proponents of both principles would probably agree that the third outcome is the least equitable outcome. According to the first theoretical framework, then, the first and second outcomes could both arguably result in fairness, while the third outcome would result in favoritism. The character of the favoritism would be determined by an assessment of the pattern of geographic redistribution.

3.2 Fairness as Principled Geographic Redistribution

While the first theoretical framework is concerned with the question of whether the central government or local governments should have responsibility for financing transportation programs, the second framework accepts as a

however, is not for their normative weight, but rather for their descriptive power.

given the role of the central government in financing such services. The principal question of the second framework is: What constitutes a fair distribution of transportation funding by a central government among the different local areas?

This second framework is not concerned with whether or not the apportionment problem should exist at all, but rather with the means by which apportionment may be accomplished. Hence this framework may be summarized as a question of means, rather than existence.

Just as the first theoretical framework was linked to policy debates surrounding devolution of central government programs, so too is the second framework related to contemporary policy questions. The distribution of transportation funding by central governments is often entangled in "formula fights," or funding apportionment debates.⁸⁷

In these debates, advocates of existing funding formulas, like Senator Moynihan in the case of the ISTEA apportionments, often argue that the formulas in current usage are basically fair to the different local areas. Critics of existing formulas, like Senator Metzenbaum, argue that the apportionment system is unfair, and often propose changes in the formula to reduce the inequity in the system.

⁸⁷ Nathan (1987), Dilger (1982), AASHTO (1990), USGAO (1986), USGAO (1990), USGAO (1992a), USGAO (1992b), USGAO (1994a), USGAO (1994b), USGAO (1994c), USGAO (1995)

One commonly articulated principle for a fair funding formula is that the central government should apportion spending in such a manner as to equalize the fiscal capacities of local governments.⁸⁸ A goal of equalizing the fiscal capacities of different local governments may also be stated as reducing or narrowing disparities in fiscal capacity, since producing smaller disparities between the higher and lower fiscal capacities of local governments results in more equal fiscal capacities.⁸⁹

The principal argument for equalizing fiscal capacities is that it provides different local governments with a "more equal playing field" on which to make decisions regarding spending levels.⁹⁰ A related argument states that all local

⁸⁸ See Reschovsky (1994), Oakland (1994), Ladd and Yinger (1994), Anderson (1994), Downes and Pogue (1994)

⁸⁹ In contrast, a funding formula which does not have an equalizing impact may have the effect of increasing or widening disparities in fiscal capacities, or it may not change the pattern of fiscal capacities to a discernible extent.

⁹⁰ The principle that fairness in funding distribution requires equalization of fiscal capacities of local areas arises from the public finance literature. The principle of fiscal capacity equalization incorporates an important public finance argument: If different geographic areas have different preferences for levels of spending on particular types of government programs, central governments should not dictate to local areas what level of spending to have but instead use inter-governmental grants to reduce disparities in fiscal capacity. Fiscal capacity equalization would increase the ability of all local governments to make individual programmatic spending choices that reflect their varying preferences.

governments should have a minimum level of fiscal capacity in order to provide adequate levels of basic or essential public services, and that equalizing grants provide a fiscal capacity "floor" for all local governments.⁹¹

The literature on equity in public school finance suggests other rationales for fiscal equalization. Some of these arguments have focussed upon fairness to individuals, rather than to governments. Some analysts of equity in public school finance have argued for "locational neutrality". Locational neutrality would exist in the case where "the taxes that individuals bear to have a given level of public service [not] depend on where they reside and engage in economic activities".⁹²

One author has advanced the concept of equity as a "fair compensation" standard. According to this standard, "no citizen should be worse off simply because he or she lives in a city with high costs and/or low resources". In other words, taxpayers should expect to receive an equivalent level of government services for an equivalent burden of taxes.⁹³

While fiscal capacity equalization may have several possible motivations, fiscal capacity is only one of many

⁹¹ Yinger (1986), p. 332 has called this "categorical equity".

⁹² Downes and Pogue (1994), p. 55

⁹³ Yinger (1986), p. 332

possible measures of the relative need of recipient areas for formula funding, and fiscal equalization is only one of many possible principles which may be used for apportioning government funds. Fiscal capacity equalization and other needs-based principles seek to target funds to those local areas which have the highest levels of need. The general argument for needs targeting is the seemingly self-apparent statement that areas which have greater need should receive more funding.

A number of studies have considered the question of whether funds distributed by a central government are targeted to geographic areas according to need.⁹⁴ An often unquestioned assumption of many of these studies is that the particular measure of need used in the study is the most appropriate measure.

In the process of examining whether funding apportionments are well-targeted to the neediest areas, past studies have described which areas one would expect to need more funding and which areas one would expect to need less funding. The definition of need that is used then suggests a specific distributive principle for the apportionment of funding.

This study will define a distributive principle as an

⁹⁴ Dye (1990), pp. 112-114; Nathan et al (1975), pp. 82-94; Rich (1991), pp. 29-49; Taylor (1991), pp. 85-92; Taylor (1994)

apportionment rule that invariably applies to all recipients of funding and can be stated without identifying specific geographic areas. Distributive principles thus defined would incorporate the two standards of equity public finance economists commonly refer to as "horizontal equity" and "vertical equity",⁹⁵ the definition is stated more broadly as to encompass many kinds of distributive principles.

According to this definition, an apportionment rule that explicitly calls for area "A" to receive ten percent of total funding would not fit the definition of a distributive principle. On the other hand, an apportionment rule would fit the definition of a distributive principle when it states that funding should be apportioned on the basis of total population, regardless of whether or not it results in a ten percent apportionment of total funding to area "A".

The main reason for using this definition is that under a distributive principle, area "B" would receive the same amount of funding as area "A" if the two areas had the same relevant characteristics (in this case, total population). However an apportionment rule which does not "treat equals equally" could distribute ten percent of total funds to area "A" and distribute a different percent of total funds to area

⁹⁵ Horizontal equity is commonly defined as an equal treatment of equally situated individuals. Vertical equity is commonly defined as an appropriate differential treatment of differently situated individuals.

"B" even when the two areas are equal in terms of their relevant characteristics.⁹⁶

This definition of a distributive principle is based upon the Rawlsian ideal that principles of fairness should be determined by parties in the "original position," where "no one knows his place in society".⁹⁷ This ideal is difficult to reach in practice, however, even when all parties, in good faith, attempt to situate themselves "behind a veil of ignorance" where they have no knowledge of their particular geographic location or any other description of their place in society.⁹⁸ The definition used here represents a practical application of Rawls' ideal situation.

Given that there are multiple possible definitions and measures of funding needs, and multiple possible distributive principles, how does one objectively evaluate the fairness of funding formulas? One could select one principle, state a rationale for using that principle, and assess the consistency of the funding distribution with the chosen principle. This appears to be the method often used in past funding apportionment studies. However, if one is reluctant to externally impose a distributive principle upon an existing

⁹⁶ The determination of what is a relevant characteristic must be made on a case-by-case basis.

⁹⁷ Rawls (1971), p. 12

⁹⁸ Rawls (1971), p. 136

program, what principle is the most appropriate one to use in order to objectively assess the fairness of a funding formula?

It is proposed here that an objective method to evaluate the fairness of an existing apportionment system is to assess whether the basis of apportionment is consistent with a stated justification for the spending. This assessment compares the proponents' stated rationale for spending with the method of apportioning the funding, using the rationale that the greater the consistency between the justification and the apportionment, the more likely the possibility that the spending will meet the declared goals of the program. This process of analysis will be called justification consistency analysis.

If justification consistency analysis finds little consistency between the basis of apportionment (the distributive principle) and the spending justification, then the proponents of the spending either must forsake their stated justification, or concede that the existing method of apportionment is less likely to meet the stated goals than another apportionment method which has a higher consistency with the justification.

Justification consistency analysis has at least three strengths. First, and most importantly, it relies upon the

internal consistency of the proponent's argument."⁹⁹ Second, this analysis provides a basis for improvement of funding formulas since consistency with the distributive principle is measured in degrees rather than as an either/or proposition. Third, the analysis may be used to illuminate hidden motives, for the method of distributing funding may give some indication as to the implicit goals of a policy effort.

Justification consistency analysis is able to accommodate programs that have multiple justifications in that it provides a quantitative means to measure the relative emphasis of the several justifications. For example, a spending program with two independent justifications may have sixty percent of the funding apportioned in a manner consistent with the first justification and forty percent of the funding apportioned to be consistent with the second justification, thereby demonstrating the 60:40 priority given to the first justification relative to the second.

While multiple possible justifications may be provided for a given transportation funding program, this study tests the consistency of distributions with a single justification

⁹⁹ It is important to note that the starting point of the analysis is to understand the motivation of the programs advocates. While it is legitimate to have criticisms of the stated justifications, the idea of justification consistency analysis is to leave these criticisms aside until the analysis is completed. One advantage of this method of analysis is that it provides for some common ground between the program proponents and the equity evaluators.

in order to demonstrate the usefulness of the method of justification consistency analysis. Future studies would be needed to examine the consistency of alternative justifications with actual funding apportionments.

The justification consistency analyses to be conducted in this study compare the apportionment of funding with the principle of fiscal capacity equalization. Transportation spending programs at the central government level are often justified as efforts to "assist less wealthy areas" or "provide a minimum level of transportation access to all areas".

For example, FHWA Executive Director Richard D. Morgan stated in 1989, "In the absence of federal involvement, extreme polarization of the transportation system would prevail--a condition we cannot afford. Federal involvement assures equity in the distribution of resources and equity in the number of highways in the less wealthy states which are necessary to meet the needs of interstate commerce."¹⁰⁰

Regardless of which particular distributive principle and which particular definition of need has been used, most previous studies have asked the important empirical question: Are funding apportionments distributed in a manner that is consistent with a stated distributive principle? However, the studies undertaken to date often neglect an equally important

¹⁰⁰ USGAO (1989), pp. 28

empirical question which should precede these questions: How much geographic redistribution results from the funding formula?

It is essential to ask this question because central governments ultimately depend upon the same sources of tax revenues as local governments, namely the economic assets and transactions within their borders. Taxes collected by a central government have an opportunity cost to local governments and local taxpayers, since they represent revenues which could have been collected at the local level but were not.¹⁰¹ In agreeing to have the central government levy and collect a particular tax, each of the local governments is relinquishing its opportunity to levy the same tax at the same rate on its share of the tax base and collect directly that portion of taxes which the central government instead collects from the local area.

For any analysis of the geographic impacts of funding formulas, the distribution of taxes collected by the central government conceptually may be considered the apportionment of taxes before central government intervention. The difference

¹⁰¹ The amount of taxes which would be collected by local governments will probably not be exactly the same as amount collected by the central government from the local area due to tax avoidance and changes in consumption which result from increased or decreased taxes. However, the taxes collected from the local area by the central government do represent revenues taken out of the local economy which the local government can not collect.

between the distribution of tax revenues and the apportionments of spending represents a geographic redistribution of tax funds which should have some reasonable logic to it. This geographic redistribution can represent a first order estimate¹⁰² of the opportunity cost of having taxing and spending take place at the central government level rather than at the local level.

It is important for residents and representatives of each of the local areas to have knowledge of the geographic redistribution which occurs as a result of central government taxing and spending. Their cooperation in a system where taxes are collected by the central government suggests an explicit or tacit agreement that the geographic redistribution which actually occurs is desirable, or at least acceptable.

The question of how much geographic redistribution occurs takes into account the larger perspective on fairness in funding formulas, because it provides us with a baseline condition against which fairness and favoritism may be assessed. In order to incorporate this larger perspective, one should revise the question commonly posed in past studies: "Are actual funding apportionments distributed in a manner which is consistent with a stated distributive principle?" The revised question, which highlights the opportunity cost of

¹⁰² Calculation of the true opportunity cost would be much more complicated.

central government taxation and apportionment, becomes: "Do funding formulas result in principled geographic redistribution?"

This second framework does not ask whether the apportionment problem should exist at all, but rather accepts the central government's role in financing, and asks by what means the funds should be apportioned. The second theoretical framework thus provides a second set of reasons for examining geographic redistribution and fiscal capacity equalization in transportation funding formulas.

These reasons are directly related to the central question of what constitutes a fair distribution of funding. It is important to examine geographic redistribution because the situation before redistribution provides a baseline against which fairness may be evaluated. Since arguments based upon fiscal equalization are often used as a justifications for central government funding of transportation, it is also important to know to what extent apportionments of funding are in fact consistent with such a justification.

When a particular transportation funding formula is shown to be consistent with fiscal capacity equalization (Outcome #2), it will be concluded (for this study) that the formula results in fairness, in that the resulting geographic redistribution is consistent with the particular distributive

principle used to justify transportation spending programs.

When a particular transportation funding formula is shown to be inconsistent with fiscal equalization (Outcome #1 or Outcome #3), it will be concluded that the formula results in favoritism rather than fairness. The nature of the favoritism depends upon the pattern of geographic redistribution which is empirically demonstrated. In other words, according to the second framework, to be the beneficiary of favoritism is to benefit from an unchanged inequality of fiscal capacities (Outcome #1) or to be the recipient of a redistribution of tax revenues inconsistent with the stated distributive principle (Outcome #3).

Table 7. Fairness and Favoritism according to the Two Theoretical Frameworks		
Framework	Fairness	Favoritism
(1) Existence: Fiscal Equivalence versus Fiscal Equalization	Outcome # 1 Outcome # 2	Outcome #3
(2) Means: Principled Geographic Redistribution	Outcome # 2	Outcome # 1 Outcome # 3

Table 7 compares the determinations of fairness and favoritism according to the two frameworks discussed. Note that according to both frameworks, Outcome #2 is judged to

result in fairness and Outcome #3 is judged to result in favoritism. The appropriate judgement regarding Outcome #1 depends upon which of the two frameworks is used to assess the result of the funding apportionment.

3.3 Previous Research on Funding Apportionments and Fiscal Capacity Equalization

A considerable number of studies have examined whether intergovernmental funding is distributed in a manner that equalizes fiscal capacities.¹⁰³ Most recent studies have found that funding is not apportioned disproportionately to governments with lower fiscal capacity, although the degree of fiscal equalization has changed over time.

The ACIR reports that studies covering the 1940s found little evidence that federal grants were distributed in greater amounts to those states with lower fiscal capacities.¹⁰⁴ Two studies in the 1960s, however, suggested that federal grants began to show more of an equalization

¹⁰³ This review omits discussion of the literature on school finance which is of considerable size.

¹⁰⁴ ACIR (1978), p. 216

impact upon state fiscal capacities in the 1950s.¹⁰⁵

Reviewing a series of studies from the 1970s and 1980s, Dye concluded that the federal government did not distribute more aid to areas with lower fiscal capacity, although some state governments did do so.¹⁰⁶ Likewise, Peterson has recently found a positive correlation between the fiscal capacities of states and the amount of federal grants received, demonstrating that high capacity states are more likely to receive more per capita federal grants.¹⁰⁷

Researchers who have studied intergovernmental fiscal relations from a comparative perspective have noted that while some countries with federal systems use intergovernmental grants to equalize fiscal capacities among states or provinces, the United States system is notable to the degree that fiscal equalization is not a primary goal of intergovernmental apportionments.¹⁰⁸

The principal effort of this study is to determine whether or not formula apportionments of transportation funding result in fiscal equalization. This effort distinguishes between the overall pattern of intergovernmental apportionments and the constituent parts of that pattern.

¹⁰⁵ ACIR (1964), p. 63; Haskell (1962), p. 107

¹⁰⁶ Dye (1990), pp. 112-114

¹⁰⁷ Peterson (1995), pp. 135-136, 143-145

¹⁰⁸ Bird (1986), pp. 166-167

Most previous studies have attempted to assess the total impact of all federal aid to states. While the overall pattern has thus been researched, the underlying fabric has not been as closely examined.

Individual sectors of government activity may vary in the degree to which the grants do or do not act to reduce fiscal capacity disparities. Thus it is worthwhile to conduct sector-specific analyses in assessing the degree to which fiscal capacity equalization actually occurs.

While two recent studies have found similar patterns of geographic redistribution for overall taxing and spending,¹⁰⁹ the overall pattern of apportionments may well hide significant variation from sector to sector of government activity. For example, Peterson's analysis found that high capacity states received more in per capita federal grants for "developmental" programs than low capacity states, but less in per capita federal grants for "redistributive" programs than low capacity states.¹¹⁰ This suggests that in some sectors fiscal equalization may result from federal government apportionments while in other sectors fiscal equalization may not result.

While past studies show that total federal grants are generally not used to equalize state fiscal capacities, it is

¹⁰⁹ ACIR (1990), Moynihan (1992)

¹¹⁰ Peterson (1995), pp. 135-136

unclear whether or not federal funds for transportation in particular are distributed in such a way as to equalize state fiscal capacities. Haskell suggested in a 1962 study that the federal-aid highway program resulted in some equalization of fiscal capacity.¹¹¹ Likewise, Dales found in 1976 that higher per capita amounts of federal funds for transportation were distributed to states with lower total fiscal capacity.¹¹² However, Peterson recently found that developmental programs, including transportation, distributed more spending to high capacity states.¹¹³

One possible explanation for the difference in findings may be that different measures of fiscal capacity were used. While Haskell and Dales used per capita income (PCI) to measure fiscal capacity, Peterson used the representative tax system (RTS).¹¹⁴ The particular measure of fiscal capacity used may have an important impact on the outcome of a study. In an attempt to reconcile the conflicting findings of past studies, this study assesses the impact of transportation funding formulas on fiscal capacity disparities using both PCI and RTS measures of broad-based state fiscal capacity. In

¹¹¹ Haskell (1962), p. 107

¹¹² Dales (1976), p. 29

¹¹³ Peterson (1995), pp. 143-144

¹¹⁴ Haskell (1962), p. 106; Dales (1976), p. 29; Peterson (1995), p. 202

addition, the study will assess the impacts of funding apportionments using benefit-based measures of transportation-related fiscal capacity which have not been used in past studies.

CHAPTER 4.

THREE CASE STUDIES OF TRANSPORTATION FUNDING FORMULAS

This study considers the geographical impact of transportation formula funding that is distributed from the federal government to state governments and from California's state government to its county governments. The research will consider case studies of the apportionment of three of the largest sources of funding for surface transportation funding in the country. Table 8 summarizes the important aspects of the three case studies.

Table 8. Summary of Three Case Studies			
Case	Type of Apportionment	Name of Fund	Type(s) of Transportation Programs
(1)	Federal to State	Federal Highway Trust Fund	Highway and Transit
(2)	State to County	State Highway Account	Predominantly Highway
(3)	State to County	Local Transportation Fund (LTF)	Predominantly Transit

The first case study will examine the intergovernmental apportionment of funds from the Federal Highway Trust Fund to the fifty states. Chapter 1 showed that of all the federal

grant programs for transportation, the Highway Planning and Construction Program receives the largest amount of total funding. This program has been historically funded out of the Federal Highway Trust Fund, which is financed out of motor fuels taxes and other transportation related taxes and fees. In addition, some federal transit programs have also been funded out of the same Trust Fund. The first case study will examine the fiscal capacity impact of formula apportionments from the Federal Highway Trust Fund.

Many states also finance their highway programs through transportation-related taxes and fees held in state highway trust funds. The second case study will examine intragovernmental apportionments of state funding for highways in California, the state with the largest population in the nation and one of the most extensive highway systems in the country. The largest amount of direct state spending for transportation has historically been devoted to highway planning and construction. In the case of California, transportation-related taxes, including the state motor fuels taxes, are held in and distributed from the State Highway Account. The second case study will examine the fiscal capacity impact of formula apportionments from California's State Highway Account.

The third case study will examine intergovernmental apportionments of California state's spending to counties for

public transit. As the most populous state in the nation, California state government provides grant assistance to the most extensive system of public transportation in the nation. The major source of state funding of local transit is the Transportation Development Act's (TDA) Local Transportation Fund (LTF). The third case will examine the fiscal capacity impact resulting from the California's TDA/LTF's funding formula.

4.1 Federal Highway Trust Fund Apportionments

In the American federalist system of government, state governments fund and administer many governmental programs without funding or mandate from the national government. In the area of surface transportation, state governments own and have responsibility for maintenance of most highways. At the same time, however, the federal government has made a tremendous investment in financing the construction of the Interstate Highway System and other federal-aid highways. One might ask then, why the federal government has not left responsibility for financing public roads entirely to the individual states to be funded by gasoline taxes and other revenue sources at the state level.

A common justification for the federal government's participation in highway financing is that needs arise to

fulfill national goals which cannot be met at the state level. Historically, the two goals of national defense and interstate commerce have provided constitutionally-sanctioned justifications for national transportation programs.¹¹⁵ A national system of Interstate and Defense Highways has thus been justified by arguments that such a system of highways promotes both a strong national defense and vibrant interstate commerce.¹¹⁶

Economic theory commonly uses national defense as an example of a public good which provide general benefits to the residents of all fifty states. In theory, the level of benefit to the residents of the various states from a strong national defense does not vary with the apportionment of funds which each state receives, but rather with the overall level of national defense. If the sole purpose of the Interstate Highway System were to provide for national defense, then one might argue that the most appropriate method of apportioning funds among the states would be the apportionment which results in the highest level of national defense. If some states' highways contribute to the overall level of national defense to a greater degree than other states highways, such

¹¹⁵ See Kooney (1969) for an illuminating discussion of the original debates over federal participation in road construction.

¹¹⁶ See FHWA (1983) for one possible methodology for measuring the contribution to national defense and interstate commerce which interstate segments provide.

states should receive more federal funds to provide access and mobility for national defense purposes.

Similarly, the level of benefits which each state receives from interstate commerce may not be directly proportional to the mileage of highways which are built within each state. Instead, the level of benefits states receive from interstate commerce may depend upon the total level of interstate commerce carried by the Interstate Highway system as a whole. For example, highways which provide access to deep water port facilities provide a critical link in a system of interstate commerce, a link which could potentially raise the level of commercial benefits to all fifty states. As a result, some coastal states may justifiably receive more funding than other states in order to build and maintain highways which provide access to international ports.

Congress has historically recognized the national purposes motivating the construction of the Interstate Highway System and the general benefits it provides to the fifty states. As a result, federal funds for the construction of the Interstate Highway System have been apportioned from the federal highway trust fund to the fifty states in proportion to the estimated costs necessary to complete each state's portion of the Interstate System.¹¹⁷ This method of apportioning highway funds recognized that though some "donor"

¹¹⁷ 23 U.S.C. 104(b) (5) (A)

states would provide a disproportionate amount of gasoline tax and other benefit-based tax funds toward construction of the Interstate Highway System, all fifty states would receive general benefits from the completion of the system.

As the completion of the construction of the Interstate Highway System neared, a critical question that has been raised in public debates is what national purpose or purposes federal surface transportation programs should serve in the future. Once a national purpose for a federal transportation program has been identified, the ideal method of apportionment may be one which would result in the highest level of general benefits to the residents of all states. In any comparison between two proposed methods of apportionment, one which leads to a higher level of general benefits to the states than the other, the preferred method of apportionment would be the one which results in the highest level of general benefits.

For example, Congress has in the past determined that maintenance of the Interstate Highway System serves a national purpose in continuing to serve the goals of providing for a national defense and promoting interstate commerce. As a result, the Interstate "4R" Maintenance program has apportioned funds on the basis of Interstate system extent, as measured in lane miles, and usage, as measured in vehicle miles traveled (VMT).¹¹⁸ Despite some disagreement over the

¹¹⁸ FHWA (1983), pp. IV-5 - IV-7

appropriate weighting of the two factors, the general benefits that all states receive from having a well-maintained Interstate Highway System have been recognized by the Congress.

The formula for apportionment of Interstate Maintenance program funds resulted in some states receiving a disproportionate share of apportionments relative to their Highway Trust Fund payments in a given year. However, all fifty states receive the general benefits of national defense and interstate commerce through the maintenance of the Interstate Highway System.¹¹⁹

At a critical juncture in the consideration of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), the conference committee responsible for crafting the final legislation faced the difficult task of reconciling two alternative proposals for apportioning Highway Trust Fund authorizations among the fifty states. The House of Representatives had approved a formula-based apportionment system--including factors for diesel fuel consumption, population, and vehicle miles traveled--while the Senate

¹¹⁹ In a telephone conversation, AASHTO Executive Director Francois (March 27, 1996) reports that some states, in the absence of the federal Interstate Maintenance program, were prepared to close one lane of some segments of the Interstate Highway System. Such closings would have removed the passing lane from some segments of the system, potentially reducing such segments' capacity for interstate commerce.

version of the bill had specified a fixed percentage of funds for each state, approximately equal to the percentage apportionment of federal transportation funds each state had received during the five year period 1987-1991.¹²⁰

Much conference committee debate over the fairness of funding apportionments focussed on the concerns of "donor" states. "Donor" states are those states which contribute a share of gasoline tax and other tax payments to the Highway Trust Fund greater than the share of apportionments they receive from the Trust Fund. Between 1956 and 1991, the period of construction of the Interstate Highway System, a minority of the fifty states have been historic "donor" states, indicating that the ratio of their total apportionments from the Highway Trust Fund to their total payments into the Highway Trust Fund have been less than 1:1. According to the Federal Highway Administration (FHWA), the ratio of cumulative apportionments to cumulative payments has been less than 1:1 for a total of fourteen states, with five of the fourteen having a cumulative ratio of less than 9:10.¹²¹

The concerns of "donor" states led to negotiations in the conference committee over the percentage return each state

¹²⁰ CQ (1991), pp. 3273, 3372-73, 3447-3448, 3518-22

¹²¹ Larson (1991), p. 50. The nine states with a ratio between 9:10 and 10:10 are Arkansas, California, Florida, Georgia, Michigan, Missouri, New Jersey, Ohio, and South Carolina. The five states with a ratio less than 9:10 are Indiana, North Carolina, Oklahoma, Texas, and Wisconsin.

would receive from the Highway Trust Fund, and resulted in efforts to guarantee states a specific minimum rate of return. "Donor" state representatives were not satisfied with requirements included in 1982 legislation which had guaranteed states an 85 percent return on Trust Fund payments. In order to win the support of some "donor" states' representatives for ISTEA, the final 1991 legislation raised the guaranteed rate of return to 90 percent for all states.¹²²

The resulting legislation guaranteed a minimum return to all states, but did not cap the maximum return states might receive from the trust fund. While ISTEA effectively put a "floor" on the amount of geographic redistribution of tax revenues that might occur, it did not place an explicit "ceiling" on the amount of funding that might be redistributed to any given state.¹²³ Nor did the legislation explicitly specify the nature of the redistribution that would occur. For example, ISTEA did not explicitly state a goal of fiscal equalization.

One goal of this study is to suggest an answer to the question of which states have gained the greatest return from federal highway trust fund apportionments. While all fifty

¹²² CQ (1991), pp. 3447, 3522

¹²³ The guarantee of minimum returns does place an implicit ceiling on the maximum return states may receive, since the total amount of funds that are subject to possible geographic redistribution are limited.

states may receive at least 90 percent of their trust fund contributions back, which states have received more in apportionments than they contribute in payments? What pattern of geographic redistribution has resulted? Is the resulting pattern of redistribution consistent with fiscal equalization?

4.2 California's Highway Apportionment Formula

Article XIX of California's state constitution lays the legal framework for the collection and distribution of benefit-based tax revenues dedicated to transportation improvements. One important section of Article XIX gives the state legislature explicit responsibility for the "equitable, geographical, and jurisdictional distribution" of revenues from motor fuel taxes and vehicular licensing fees. In the section discussing revenue allocation, the state constitution reads:

Any future statutory revisions shall provide for the allocation of these revenues...in a manner which gives equal consideration to the transportation needs of all areas of the state and all segments of the population...¹²⁴

The second case study analyzes the extent to which the California state legislature currently meets its

¹²⁴ California State Constitution, Article XIX, Section 3

constitutional responsibility of providing for an equitable distribution of funds for the improvement of the state transportation system, by examining whether or not the pattern of funding apportionments results in geographic redistribution and fiscal capacity equalization.

Although there are a number of transportation spending programs funded by the state government in California, the majority of the expenditures related to the improvement of the state transportation system have historically come out of the State Highway Account, which receives most of its revenues from state and federal motor fuels and other benefit-based taxes.¹²⁵ In 1991, a total of \$ 1.59 billion was apportioned from the State Highway Account, mostly for capital improvements to highways and transit.¹²⁶

The California legislature most recently revised the system of apportioning State Highway Account funds during the 1982 legislative session. The state Department of Transportation has been distributing funding according to the requirements of the law since the 1983-1984 fiscal year. Two aspects of the current system are relevant to the analysis which follows. First, the North-South split governs the relative distribution of highway account funds between forty-

¹²⁵ Pozdena (1995), pp. 4-7, 13

¹²⁶ CDOT (1993), p. 72

five northern counties and thirteen southern counties.¹²⁷ Second, the County Minimums requirement establishes the minimum amount of funding to be apportioned to each of California's fifty-eight counties.

The California legislature first established the North-South split as part of the 1927 Breed Act. Figure 19 presents a map of California's fifty-eight counties showing the division between the northern and southern counties. The original distribution provided forty-five northern counties with 53.5% percent of state expenditures from the State Highway Account and thirteen southern counties with 46.5%. The Breed Act's North-South division of funds was based upon the distribution of primary and secondary highway mileage in the two parts of the state. In 1947, the legislature passed the Collier-Burns Act, reducing the proportion of spending the north received to 45% and increasing the southern share to 55%. The legislature also altered the rationale for the division of funds, basing the revised apportionments on the population in the two parts of the state rather than on the highway mileage.¹²⁸

¹²⁷ See Appendix 7 for a listing of the specific counties in the two regions of the state.

¹²⁸ CTC (1988), p. I-33

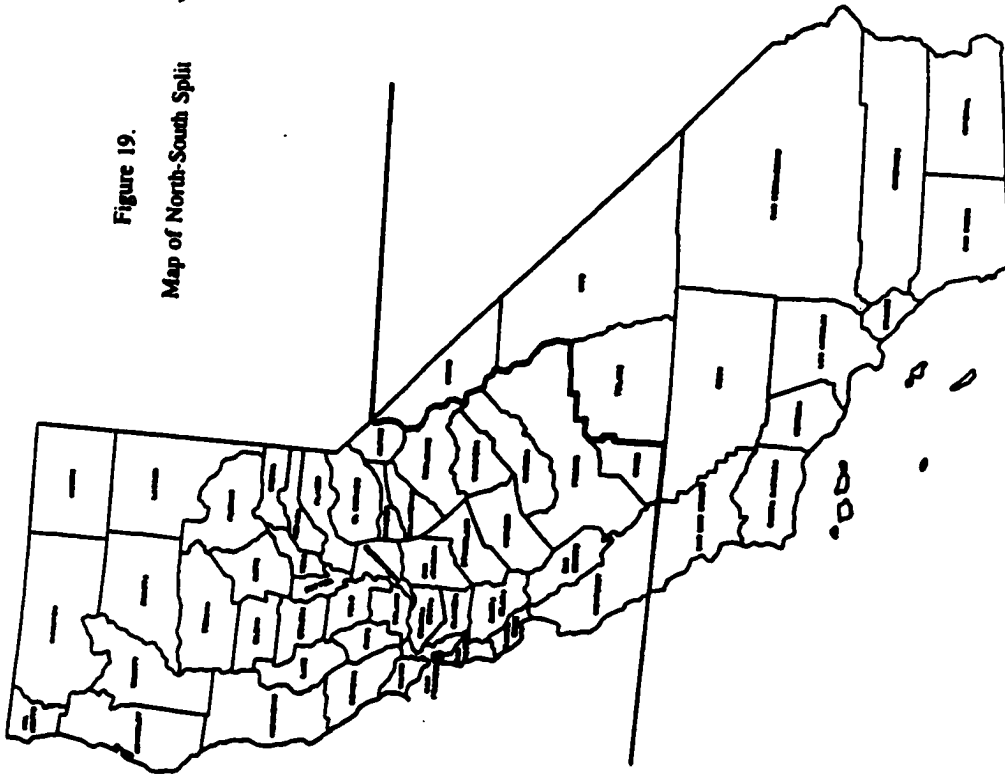


Figure 19.
Map of North-South Split

The current Barnes-Mills-Walsh formula for the North-South split was enacted in 1970, increasing the southern share to 60% and decreasing the northern share to 40%.¹²⁹ Consistent with the Collier-Burns split, each region's share of the state's total population was used as the basis for the current distribution of spending.¹³⁰ Such a population-based distribution is consistent with an egalitarian rationale that each person living in the state, regardless of county of residence, should have an equal opportunity to benefit from improvements to the state transportation system.

¹²⁹ California Streets and Highways Code, Section 188

¹³⁰ CTC (1988), p. I-33

While the North-South split governs the apportionment of all State Highway Account funds, the County Minimums requirement applies to only a portion of the funding apportioned from the State Highway Account. Currently, the County Minimums formula applies to seventy percent of the total expenditures from the State Highway Account. The legislature has given the California Transportation Commission the discretion to direct the remaining thirty percent of spending to the counties it chooses, subject to the constraints of the North-South split. Table 9 shows the apportionments to the northern counties and the southern counties in terms of the share of spending that is apportioned under the County Minimums requirement and the share of spending that is apportioned on a discretionary basis.

Table 9. Shares of California Highway Account Funding According to Manner of Apportionment			
Region of State	County Minimum Apportionment	Discretionary Apportionment	Share of Total Spending
Northern	28%	12%	40%
Southern	42%	18%	60%
State Total	70%	30%	100%

County Minimums were first established by the legislature in the 1947 Collier-Burns Act, which used an administratively-

determined "needs-based" formula, known as the Mayo Formula, to determine the minimum level of spending to be apportioned to each county for a fifteen year period from 1947 to 1963. In 1961, the legislature replaced the Mayo Formula with another "needs-based" formula which apportioned the funds to the twelve administrative districts of the state Department of Transportation rather than to the fifty-eight counties. The county minimums continued to exist only to the extent that each county was guaranteed at least four million dollars in spending each year, a relatively low minimum when compared to overall annual expenditures exceeding five hundred million dollars.¹³¹

The current County Minimums formula, which was enacted in 1982, calls for 70 percent of total State Highway Account expenditures over multi-year periods to be apportioned among the fifty-eight counties.¹³² The formula distributes 75 percent of applicable spending on the basis of population and distributes the remaining 25 percent on the basis of state highway centerline mileage. These distributions are calculated after the North-South split has apportioned the total amount of spending between the two parts of the state.¹³³

¹³¹ CTC (1988), p. I-34

¹³² The period of time covered by the County Minimums has recently changed from a four-year period to a five-year period.

¹³³ California Streets and Highways Code, Section 188.8.

Table 10 shows the regional shares of county minimum spending distributed according to the population and mileage factors.

Table 10. Regional Shares of County Minimum Apportionments			
Region	Population Based Apportionment	State Highway Mileage Based Apportionment	Total
Northern	30%	10%	40%
Southern	45%	15%	60%
State Total	75%	25%	100%

The two aspects of California's existing apportionment system utilize different types of formulas to distribute funds among different geographic areas. The North-South split, while attempting to distribute spending on the basis of population, establishes a fixed 60 percent to 40 percent division of funding. This apportionment does not change over time¹³⁴ as the population distribution changes, but instead retains a funding apportionment based on the 1970 population distribution. Such a fixed apportionment does not describe a distributive principle as defined in Chapter 3, since it requires an assignment of funding percentages to specifically named geographic areas.

¹³⁴ The only means by which such a fixed formula may be changed is new legislation specifying the change.

One result of the fixed formula is that the egalitarian rationale for the population based distribution diminishes over time, since only those persons who were resident in the state in 1970 were counted in the division of the spending between the northern and the southern counties. Additional residents whose presence may change the population distribution after 1970 do not influence the spending distribution, and are arguably "less equal" than those residents who lived in the state as of 1970.

In contrast to the North-South split's fixed apportionment, the County Minimums requirement results in a distributive principle based upon current population and state highway mileage. As the distributions of population and state highway mileage change over time, the formula automatically adjusts the proportion of spending to be apportioned to the various counties. In practice, the population adjustments are made every ten years on the basis of the decennial federal census of population,¹³⁵ and the state highway mileage adjustments are made every two years on the basis of

¹³⁵ Some might argue that rapid changes in population may not be fully incorporated into the distribution of county minimums since population adjustments are made every ten years instead of more often. However, since the decennial census is the only one hundred percent census of population currently undertaken by an official government agency, adjusting the formula results on the basis of non-census population data would require use of population estimates based upon either projections of growth or surveys less than one hundred percent samples.

information provided by the state Department of Transportation.¹³⁶

The analyses for this second case study seek to examine the ongoing pattern of geographic redistribution resulting from the North-South split and the County Minimums requirement. From year to year, the distribution of total spending from the State Highway Account varies. While 70 percent of the funds are consistently apportioned each year to the fifty-eight counties according to the County Minimums formula, year-to-year discretionary distribution of the remaining 30 percent of funds can vary significantly. As a result, the analyses for this case study only examine the geographic redistribution of County Minimum funds.

The current formula for apportioning County Minimum funds among California's fifty-eight counties is a two-factor formula, with a 75 percent weighting for county population and a 25 percent weighting for state highway centerline mileage. The distributional outcome of the funding apportionment depends upon three important aspects of the formula: (1) underlying principles, (2) factor weightings, and (3) specific measures. Table 11 summarizes these three dimensions of California's highway apportionment formula.

¹³⁶ The data is provided by the CDOT Division of Programming. The adjustments in the distribution of state highway mileage are made every two years in tandem with changes to the biennial State Transportation Improvement Plan (STIP).

Table 11. Three Dimensions of Apportionment Formula for State Highway Account		
(1)	Underlying Principles:	(a) Egalitarian (b) Outcome-Oriented
(2)	Factor Weighting:	(a) 75% Population (b) 25% Mileage
(3)	Specific Measure:	(a) Total Population (b) State Highway Centerline Miles

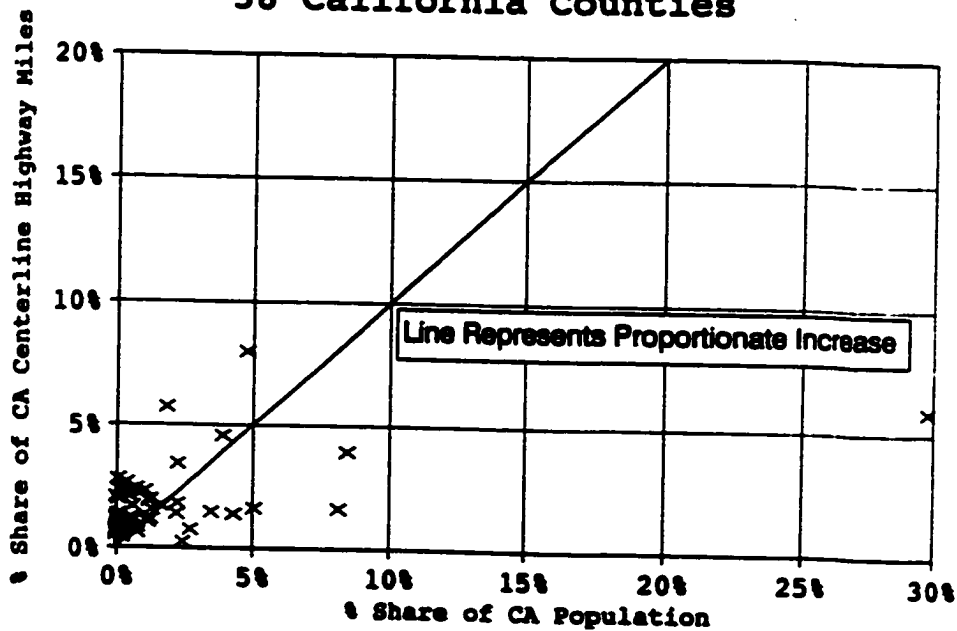
First, the principles underlying the apportionment are what primarily influences the distributional outcome. In the case of the County Minimums, the legislature has compromised between two competing principles--an egalitarian principle and an output-based principle--in establishing the apportionment. These two principles are put into practice by using formula factors for county population and for state highway mileage in each county.

The legislature has produced a formula which is consistent with the following reasoning: Seventy-five percent of spending is distributed according to an egalitarian population basis consistent with the North-South split. Twenty-five percent of spending is distributed according to an outcome-oriented basis which is consistent with the view that counties should receive more spending if they have more state highway mileage, regardless of the level of population

residing in the county.¹³⁷

The outcome-oriented rationale is reasonable if the need for spending in each county is related to the amount of state highway mileage in the county, as would be the case if the spending was used for the purpose of maintaining the state highways. On the other hand, if spending distributed on the basis of state highway mileage was used for the construction of new rail transit facilities, then there might not be a clear relationship between the purpose of the spending and the principle governing the apportionment.

**Figure 20. Factor Weighting Impact
58 California Counties**



¹³⁷ See Appendix 8 for more discussion of alternative distributive principles.

Second, the relative weighting between the two factors significantly influences the outcome. Given the 75 percent and 25 percent weightings in the County Minimums formula, the population factor is weighted three times more heavily than the state highway factor. The weighting of the two factors is important because the distribution of population among the counties differs from the distribution of state highway miles. Figure 20 shows that very few of the fifty-eight counties have the same percentage share of the total population as they have of the total state highway mileage. The straight line of proportionality drawn in Figure 20 represents points where counties would be indifferent between a population-based apportionment and a highway mileage-based apportionment. Since very few of the fifty-eight data points representing each of the counties fall exactly on the line, the relative weighting of the two factors changes the amount of funding almost all of the counties would receive.

Those counties represented by data points falling further from the line of proportionality are affected to a greater degree by the relative weighting of the two factors than those counties represented by data points lying closer to the line. The fact that California's fifty-eight counties fall on both sides of the line indicate that some counties would benefit from a greater weighting toward population while others would benefit from a greater weighting toward state highway mileage.

Third and finally, the specific measures used for each formula factor influences the distributional outcome to some extent. The appropriate measure of population is not subject to much debate, since there appears to be a general consensus that the decennial census conducted by the federal government provides the most accurate measure of county population.¹³⁸ However, a consensus on the most appropriate measure of state highway mileage may not be so easy to reach. The legislature has chosen to measure state highway mileage on the basis of centerline highway miles--the number of roadway miles measured along the centerline or median of all state highways constructed within each county's borders.

Some might disagree with the decision of the state legislature, and argue that a more appropriate measure of state highway mileage would be lane miles, since a four lane highway represents more roadway capacity and may require more expenditures to maintain than a two lane highway. This study will not attempt to make a determination about which measure is more appropriate. It is important to note, however, that the measure chosen does make some difference for the distributional outcome.

¹³⁸ The accuracy of federal census figures is not without controversy. For example, see Washington Post (1996).

If all of California's state highways were two-lane roads, the particular measure chosen would not make a difference, since each county would have a share of total centerline miles equal to its share of total lane miles. Table 12 shows the actual distribution of state highway centerline mileage compared to the number of lanes, showing simply that more than one-third thirty of state highway centerline mileage consists of roads with four or more lanes.

Table 12. State Highway Centerline Mileage by Number of Lanes		
Number of Lanes	Number of Centerline Miles	% of Total Centerline Miles
1 - 3	9,495	63%
4 or more	5,676	37%
Totals	15,171	100%

Source: CDOT (1993), p. 78

Figure 21 compares the distribution of centerline mileage and lane mileage for all fifty-eight counties, and shows that the ratio between the two measures varies significantly. Most counties have a ratio close to the lower boundary of 2 lanes miles per centerline mile. However, some counties have a significantly higher ratio, approaching an upper boundary of 8:1, representing eight lane miles per centerline mile.

**Figure 21. Specific Measure Impact
58 California Counties**

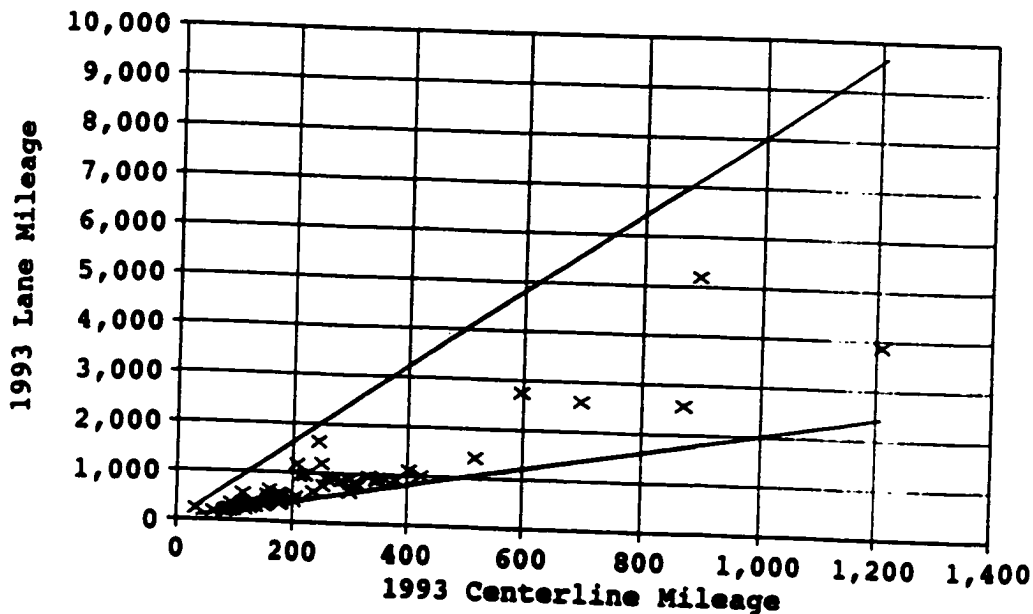


Table 13 shows that a total of nine counties have a ratio of lane miles to centerline miles greater than 4:1. These nine counties would see the greatest increase in County Minimums funding if the state funding formula were to use the lane mile measure rather than the centerline mile measure.

The nine counties with the highest lane mile to centerline mile ratio are also the nine counties in the state with the highest population density, as shown in the last column of Table 13. Thus, the measure of state highway mileage chosen results in a differential distributional outcome for counties with high population density than for counties with lower population density. This finding is one

indication that the less densely populated counties in California may benefit from the existing apportionments formula for County Minimum funds to a greater extent than the more densely populated counties.

Given our understanding of California's highway apportionment formula, what is the relationship between the geographic redistribution of State Highway Account apportionments and the fiscal capacities of California's counties? Are State Highway Account funds geographically

Table 13. Counties with Highest Ratios of Lane Miles to Centerline Miles				
County	Lane Miles Centerline Mileage	Center-line Mileage	Lane Mileage	Population Density Rank
San Francisco	6.91	33	228	1
Orange	6.59	246	1620	2
Los Angeles	5.80	893	5179	3
Alameda	5.56	207	1150	4
Contra Costa	4.80	114	547	7
Santa Clara	4.71	252	1188	6
San Diego	4.58	597	2733	9
San Mateo	4.30	213	917	5
Sacramento	4.24	224	949	8

Data from 1993. Source: California Department of Transportation, Division of Highway System Information

redistributed in such a manner as to narrow or widen the disparities in county fiscal capacities? Is California's system of financing highway improvements geographically progressive--redistributing from more wealthy counties to less wealthy counties--or geographically regressive--redistributing from less wealthy counties to more wealthy counties?

4.3 California's Transit Apportionment Formula

The state of California's principal program for the funding of public transportation has been authorized under the Transportation Development Act (TDA), with the largest share of TDA funding dedicated to the Local Transportation Fund (LTF) program. In fiscal year 1989-90, the TDA/LTF program apportioned more than \$700 million to California's fifty-eight counties, primarily for the funding of public transportation.¹³⁹

Under the LTF program, the state of California levies a one-quarter of one percent general sales tax and apportions the revenues received among the fifty-eight county governments. The state legislature, in providing for the LTF program, also specified the apportionment formula governing the distribution of funds.

¹³⁹ CDOT (1991), p. 188. In some counties, the LTF funds may also be used for local roads.

Each year, the LTF funds are apportioned to the counties in proportion to the amount of sales tax revenues received from each county. This "return to source" apportionment results in each county's receiving in state transit assistance an amount approximately equal to what it would have received if it had levied a local general sales tax at the rate of one-quarter of one percent.

Given the legislatively-prescribed method of apportionment, one might ask whether the LTF represents a state or local tax. In a previous study, Taylor found that the state legislature went to great lengths to give the impression that the sales tax was a local tax, with each county government given the authority to vote to approve the measure. However, the choice that each county faced was between accepting all sales tax revenues from the state, including those from the LTF program, or declining to accept any sales tax revenues. The end result of the "choice" was thus predetermined, and all fifty-eight county governments approved the LTF program in their jurisdiction.¹⁴⁰ Since the specifics of the LTF program were determined by the state legislature rather than by the county governments, for all purposes the LTF program represents a state government program.

Since the TDA/LTF program is a state financed program

¹⁴⁰ Taylor (1991), p. 87

apportioning transit assistance to California's fifty-eight counties, one might ask the same questions that were asked regarding the two other case studies. Are tax revenues geographically redistributed from one county to another? Does the funding apportionment result in fiscal capacity equalization? These are the questions that the next two chapters address.

CHAPTER 5.
GEOGRAPHIC REDISTRIBUTION RESULTING FROM
TRANSPORTATION FUNDING FORMULAS

The question of fiscal capacity equalization has been placed within the context of two conceptual frameworks in Chapter 3. Within both frameworks, the question of whether or not fiscal equalization results from the apportionment of transportation funding formulas depends in large part upon the answer to the question of whether or not geographic redistribution of tax revenues occurs.

At both the federal and state levels of government, tax revenues from gasoline and other motor vehicle related taxes are often dedicated solely to highways and other transportation spending programs. These taxes are often described as "user fees", in the sense that the consumers who ultimately pay the taxes, who presumably drive or ride in motor vehicles, benefit from the improvements to the highways paid for by the tax revenues. Thus, the "users" of the highways are being charged a "fee" in the form of taxes.

However, the link between the benefits received by the users and the taxes paid by the user is often quite weak. For this reason, the Congressional Budget Office has categorized gasoline taxes not as "user fees," but rather as "benefit-

based taxes"¹⁴¹ One important result of the weak link between the taxes paid and the benefits received is the geographic redistribution of gasoline tax revenues. Among the fifty states, the taxes paid into the Federal Highway Trust Fund are not all spent in the states from which they originated. Similarly, within California and other states, the revenues from gasoline taxes paid by the residents of one county are not all spent on transportation improvements which directly benefit the residents of that county.

A review of the literature summarized in Chapter 3 highlights a need to better understand the role that geographic redistribution plays in mediating between funding apportionments and fiscal capacities. Most previous studies have not consider whether or not funding apportionments result in geographic redistribution. As a result, their findings that funds are not well targeted toward local governments with low fiscal capacities may be open to two different interpretations.

One might interpret the evidence to suggest that high capacity states receive disproportionately more in federal grants because they are the sources of more federal taxes.¹⁴² Another possible interpretation, however, is that high capacity states are receiving disproportionately more in

¹⁴¹ Schick (1995), p. 106

¹⁴² Peterson (1995), p. 143

federal grants while paying disproportionately less in federal taxes. This second interpretation would have significantly different implications towards the question of fairness than the first.

Reconciling these two alternative interpretations is analogous to asking whether taxation of individuals is progressive, regressive, or neutral. While the evidence from past studies may indicate that the federal intergovernmental grant system is not progressive, it does not necessarily answer the question of whether the entire system of taxing and spending is progressive, neutral, or regressive. In the process of making this determination, one must consider the net geographic redistribution resulting from central government taxing and apportionment.

5.1 Aggregate Patterns of Geographic Redistribution

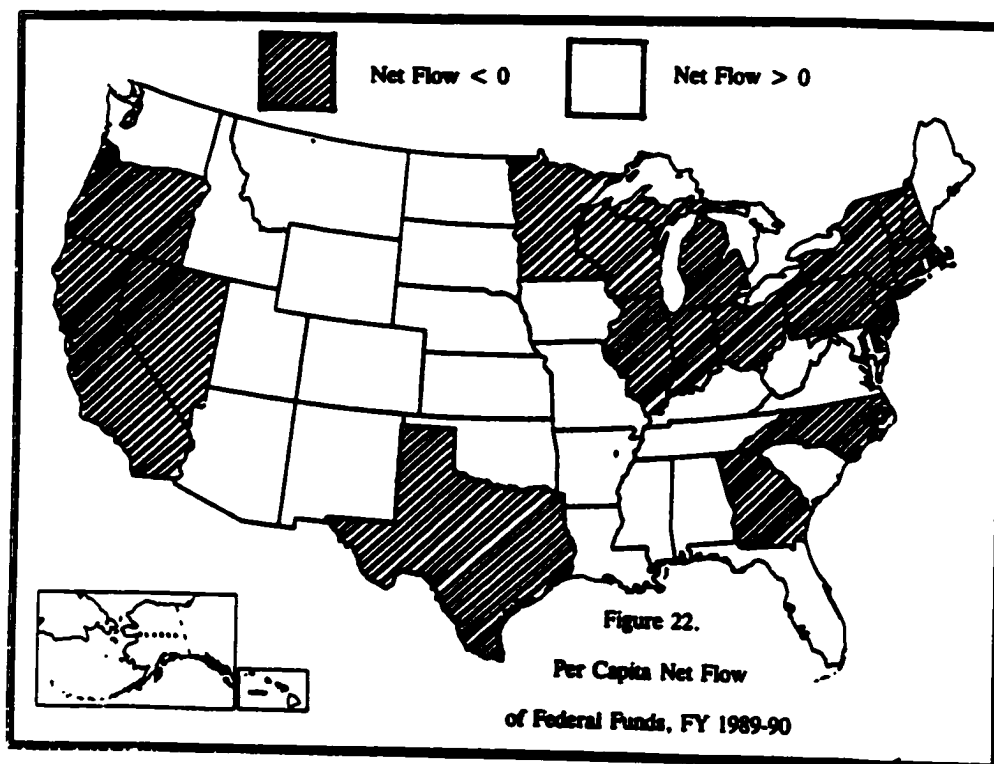
Annual studies conducted by the office of Senator Daniel Patrick Moynihan have focussed on the geographic redistribution of tax revenues between the state of New York and the other states in the union resulting from federal government expenditures. These are probably the most notable studies which have taken both tax payments and funding apportionments into account, and calculated the resulting

degree of net geographic redistribution.¹⁴³

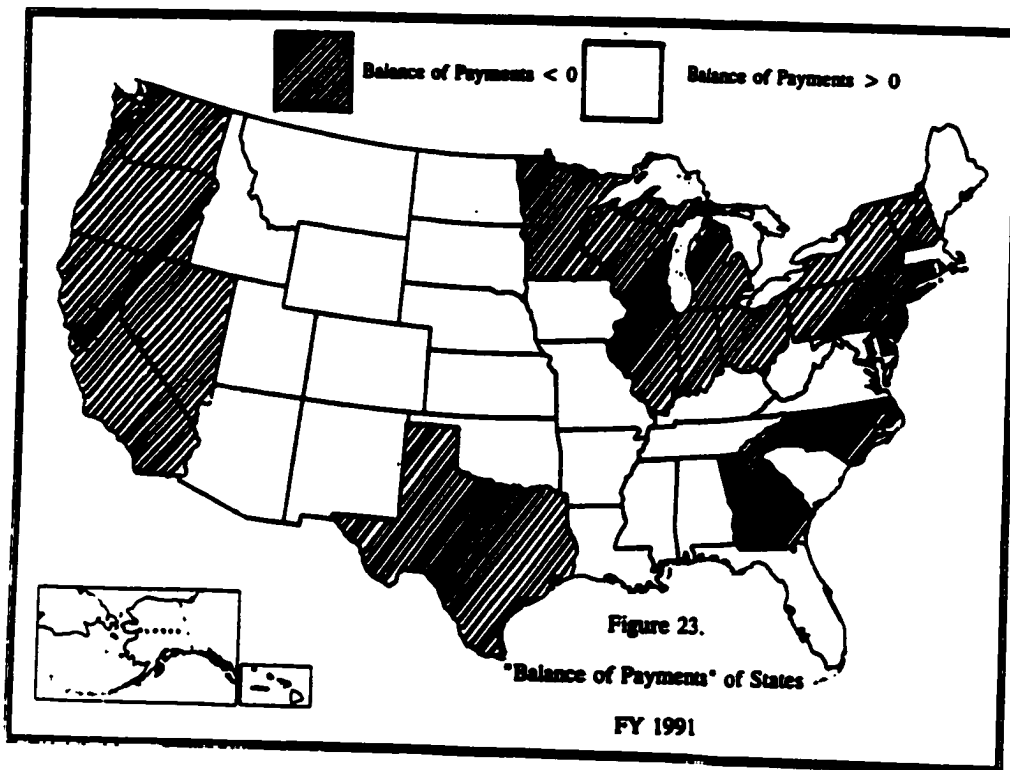
Past reports by the Advisory Commission on Intergovernmental Relations and Moynihan describe the overall pattern of geographic redistribution of tax revenues.¹⁴⁴ Figure 22 illustrates the pattern of geographic redistribution during fiscal years 1989 and 1990, as calculated by the ACIR. During the two-year period, twenty of the fifty states had a net outflow of federal funds, while thirty states had a net inflow. The twenty states with the greatest net outflow were concentrated in the Northeast, Great Lakes, and Pacific Coast regions. In contrast, most of the states with a net inflow of funds were concentrated in the Southeast and Western regions.

¹⁴³ Moynihan (1992). The Moynihan studies use the term "balance of payments" in place of "geographic redistribution".

¹⁴⁴ ACIR (1990), p. 9; Moynihan (1992), pp. 13-43



Moynihan found almost identical results when conducting an analysis of geographic redistribution for fiscal year 1991. As Figure 23 shows, twenty states had a net negative "balance of payments" and thirty states had a net positive "balance of payments". The geographic pattern of redistribution was almost exactly the same as those found by the ACIR during the previous two fiscal years, with net deficit states concentrated in the Northeast, Great Lakes, and Pacific Coast regions, and the net surplus states concentrated in the Southeast and Western regions.



The discussions in Chapter 3 suggest that the aggregate pattern of fiscal equalization may conceal differences in the patterns of fiscal equalization within particular sectors of government activity. Likewise, the aggregate pattern of geographic redistribution demonstrated by the ACIR and Moynihan studies may well hide a great variety of patterns of geographic redistribution in individual sectors.

The remainder of this chapter attempts to determine the pattern of geographic redistribution of tax revenues for the three case studies of government funding in the transportation sector. In two of the three case studies, some geographic redistribution results. However, in the third case, no

geographic redistribution results.

First, the apportionments from the Federal Highway Trust Fund result in a geographic redistribution from the more populous states to the less populous states. Second, the apportionments from the California State Highway Account result in a geographic redistribution from the more densely populated counties to the less densely populated counties. Finally, the apportionments from the California TDA/LTF transit assistance program do not result in any geographic redistribution.

5.2 Redistribution from More Populous to Less Populous States

For fiscal year 1991, approximately one in seven dollars, or 14 percent of the total federal highway trust fund apportionments were geographically redistributed.¹⁴⁵ As illustrated in Figure 24, twenty states were net recipients of the geographic redistribution, while thirty states were net donors in the geographic redistribution.¹⁴⁶

¹⁴⁵ This percentage was calculated by the author using dissimilarity index analysis. The result is consistent with the existing federal legislation, which at the time called for an 85 percent minimum return from the Federal Highway Trust Fund to all states.

¹⁴⁶ Larson (1991), p. 50

states are net recipients, but relative to the Federal Highway Trust Fund, they are net donors.

If we define the "most populous" group of states as being those twenty-five states with the largest total population, and the "least populous" group as being those twenty-five states with the smallest total population, the general pattern of geographic redistribution is one where tax revenues collected from the more populous states are redistributed to less populous states. Table 14 shows that five times as many more populous states are donor states rather than recipients of geographic redistribution. Nearly twice as many less populous states are recipient rather than donor states.¹⁴⁷

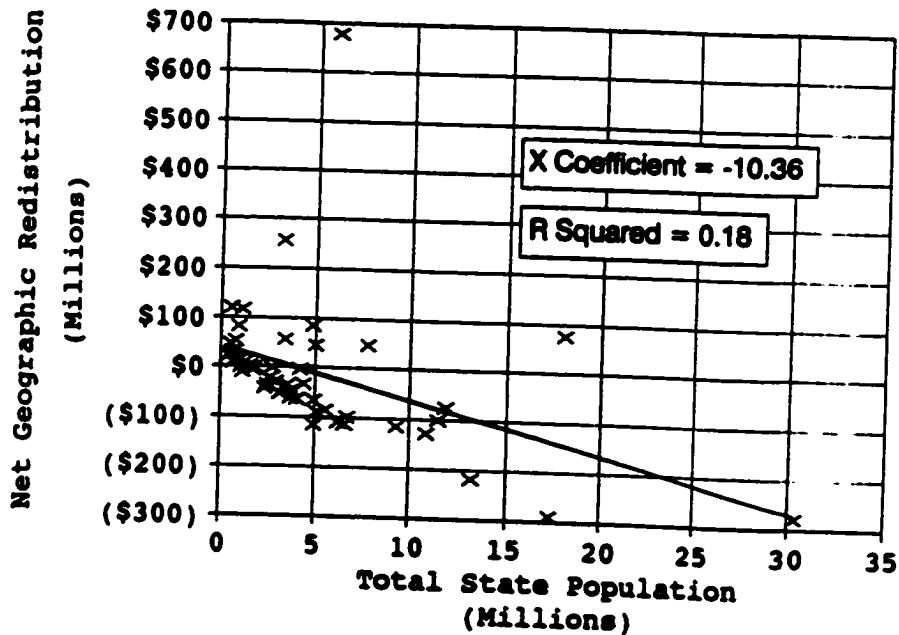
Table 14. Redistribution of Federal Highway Trust Funds			
States	Donor	Recipient	Total
More Populous	21 (84%)	4 (16%)	25 (100%)
Less Populous	9 (36%)	16 (64%)	25 (100%)
Total	30 (60%)	20 (40%)	50 (100%)

Linear regression analysis also finds that geographic redistribution is negatively correlated with state population. Figure 25 shows that for every million person increase in

¹⁴⁷ The Chi Square Test shows that the population group variable is statistically significant at the 0.01 level, or the 99 percent confidence level.

state population, the net geographic redistribution for that state decreases by roughly \$10.36 million. However, the fifty state analysis also indicates that only 18 percent of the variation in net geographic redistribution is accounted for by the variation in state population.¹⁴⁸

**Figure 25. Redistribution & Population
Federal Highway Trust Fund, 50 States**



The changes in state population account for the changes in net geographic redistribution to a much higher degree when

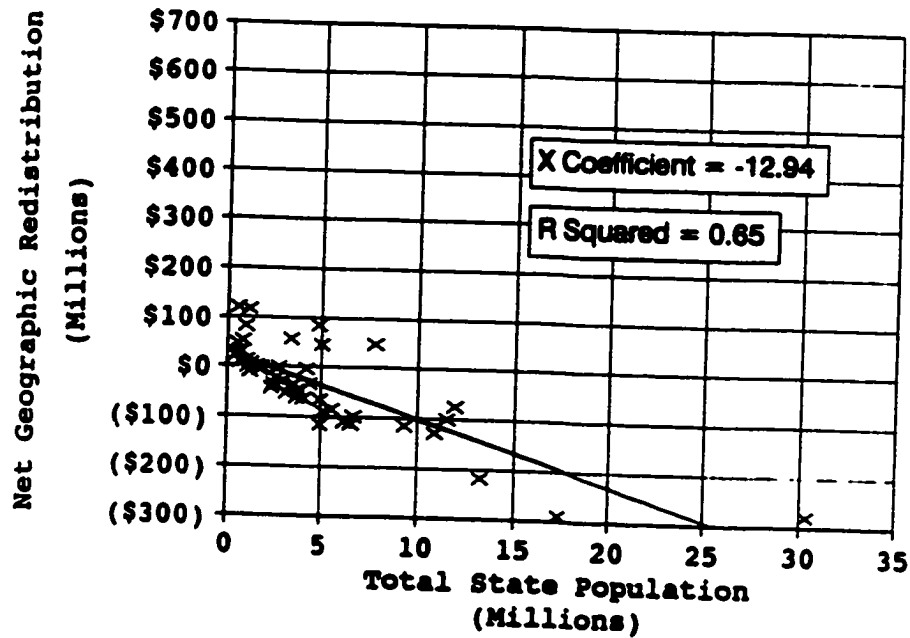
¹⁴⁸ $R^2 = 0.18$, X Coefficient = -10.36. This and all other linear regression analyses omit the District of Columbia as a data point. The District of Columbia is often omitted because of the District's unusual situation where it the state and local government coincide and where the federal government plays a disproportionate influence upon local government finances.

three data outliers are removed.¹⁴⁹ Figure 26 displays a regression analysis with forty-seven states which indicates that variation in state population explains fully 65 percent of variation in net redistribution. Each increase of one million in state population is correlated with a decrease of \$12.94 million in net redistribution.¹⁵⁰

¹⁴⁹ The three outliers are Massachusetts, Connecticut, and New York states. There may be valid explanations for the existence of the outliers not considered here. The major effort here is to understand the general pattern among the states.

¹⁵⁰ X Coefficient = - 12.94, $R^2 = 0.65$. Given the correlation between total state population and net geographic redistribution, one might hypothesize that funds are being redistributed from the more urbanized states to the less urbanized states. However, linear regression analyses show that net geographic redistribution is not well correlated with population density ($R^2 = 0.19$), total urban population ($R^2 = 0.14$), or percentage urban population ($R^2 = .008$).

**Figure 26. Redistribution & Population
Federal Highway Trust Fund, 47 States**



The principle of fiscal capacity equalization may provide a potential justification for the negative correlation that was found to exist between geographic redistribution and state population. However, fiscal equalization justifies the redistribution to states with smaller population if and only if state population and state fiscal capacity are positively correlated.

Yet linear regression analyses indicate that state fiscal capacity is not positively correlated with state population. The most populous states do not as a rule have higher fiscal capacities, and the least populous states do not generally have the lowest fiscal capacities. This appears to be the

case whether one uses broad-based measures of fiscal capacity such as Per Capita Income (PCI) or the Representative Tax System (RTS), or whether one uses benefit-based tax capacity measures related to the motor fuels sales tax (MFST), the motor vehicle operator's licensing tax (MVOLT), or the motor vehicle registration tax (MVRT). Since state population and state fiscal capacity are not positively correlated, the principle of fiscal capacity does not appear to provide a justification for the redistribution of trust fund revenues from states with larger population to states with smaller population. Chapter 6 will address the fiscal capacity impacts of the geographic redistribution more directly.

5.3 Redistribution from Densely Populated to Sparsely Populated Counties

In the previous section, the apportionment of funds from the Federal Highway Trust Fund was found to result in a geographic redistribution from the most populous states to the less populous states. Does the same pattern of geographic redistribution apply to the apportionment of California's state highway funds?

In FY 1991, roughly 11 percent, or one in nine dollars, of total State Highway Account funds were geographically redistributed from one county to another in California. Of the roughly \$1.59 billion dollars in State Highway Account funds apportioned that year,¹⁵¹ approximately \$122 million dollars of County Minimum funds were redistributed from one county to another.¹⁵² This redistribution of tax revenues to some extent represents a geographical cross-subsidy, where the taxpayers of one county pay for highway improvements which

¹⁵¹ CDOT (1993), p. 72

¹⁵² \$1.59 billion * 70% * 11% == \$122 million
70% = percentage of total funds distributed under the county minimums formula.
11% = percentage of county minimums funds which are redistributed geographically.

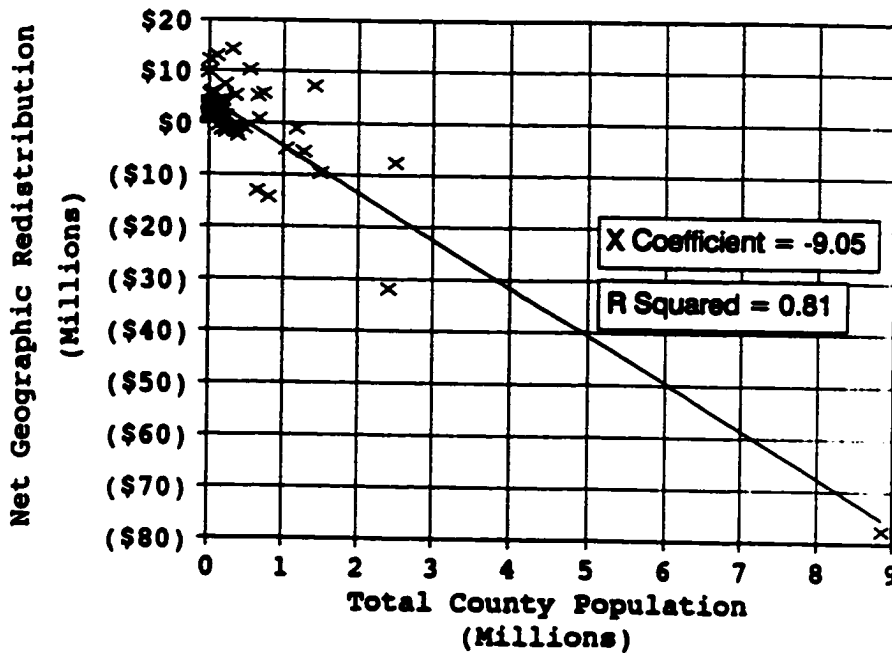
primarily benefit the residents of another county.¹⁵³

In the case of California's highway funding formulas, Figures 27 and 28 show that the apportionment of State Highway Account funds also results in a clear pattern of redistribution relative to total county population. However, whether using either the sales-based estimate (Figure 27) or the consumption-based estimate (Figure 28), some of the more populous counties are net "donors" and some are net "recipients."¹⁵⁴ Likewise, the less populous counties fall

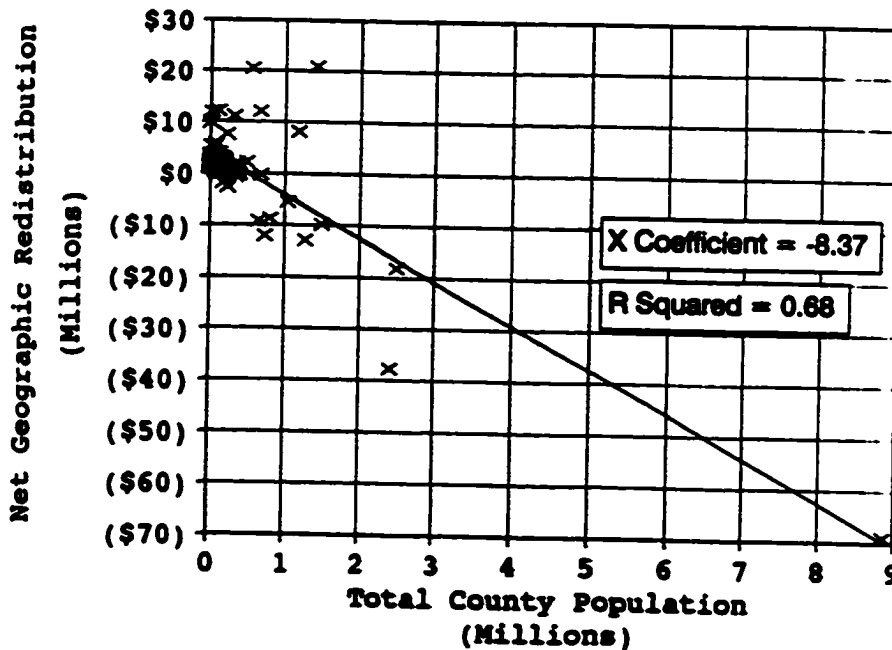
¹⁵³ The analyses in this second case study show the pattern of geographical redistribution by estimating the amount of benefit-based tax revenues that are attributable to each of California's fifty-eight counties and comparing the distribution to the apportionment of County Minimum funds from the State Highway Account. The estimate of the source of tax revenues uses gasoline taxes, the revenue source which provides the largest share of the funding, as a proxy for all revenues which are deposited in the State Highway Account. While the estimate does not provide an completely accurate result, it does provide enough information to describe the overall pattern and the order of magnitude of the redistribution.

¹⁵⁴ See Chapter 2 for an explanation of the two estimates of county gasoline consumption.

**Figure 27. Redistribution & Population
58 California Counties (Sales Est.)**



**Figure 28. Redistribution & Population
58 California Counties (Cons. Est.)**

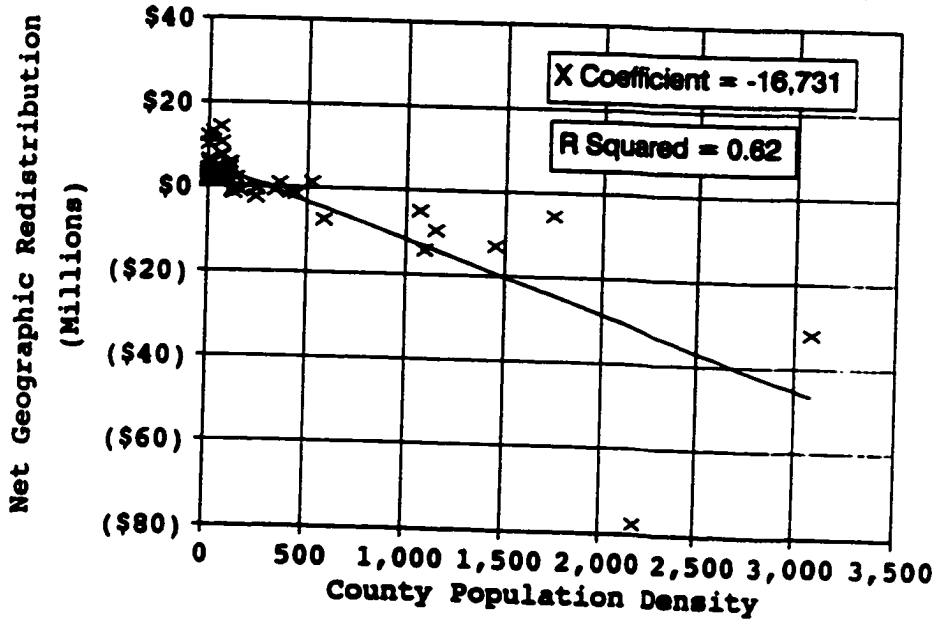


into both categories as net "donors" and net "recipients". As a result, it is not entirely accurate to state that funds are generally redistributed from the most populous to the least populous counties.

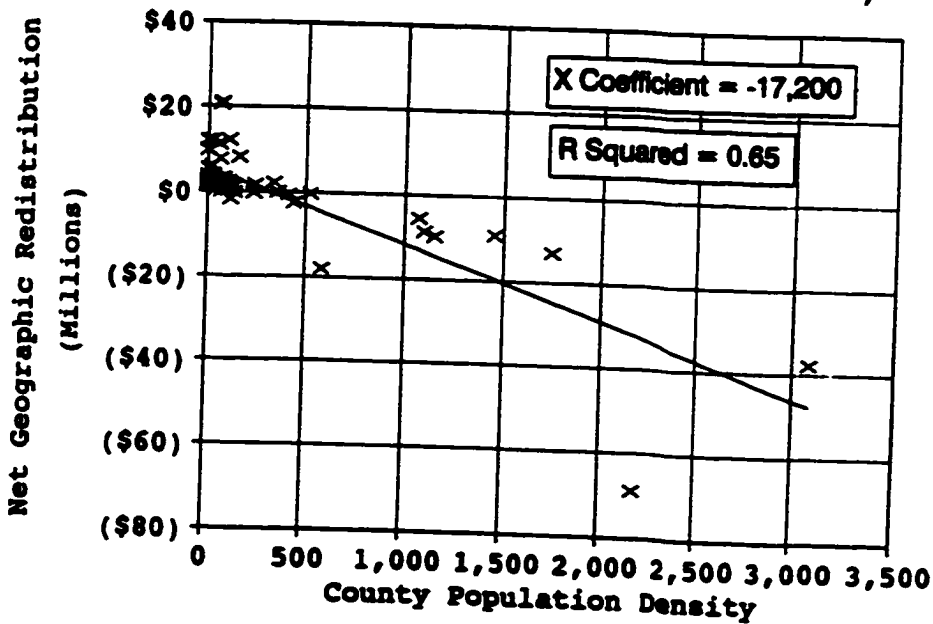
In contrast, Figures 29 and 30 indicate that County Minimum funds are generally redistributed from counties with high population density to counties with low population density. This patterns appears using either the sales-based estimates (Figure 29) or the consumption-based estimates (Figure 30) of gasoline taxes paid. Using either estimate, the counties with higher population density are generally net donor counties, and the counties with lower population density are net recipient counties.

As with county-by-county comparisons, quintile analysis also demonstrates that State Highway Account funds are being geographically redistributed from densely populated counties to sparsely populated counties. As Table 15 shows, the first quintile--those counties with the highest population density--receives a lower share of county minimum funds than it provides in gasoline taxes, using either of the two possible estimates. By contrast, the four other quintiles receive a

**Figure 29. Redistribution and Density
57 California Counties (Sales Est.)**



**Figure 30. Redistribution and Density
57 California Counties (Cons. Est.)**



greater share of funding than the share they provide in gasoline taxes.

Table 15. Quintiles' Share of Apportionments and Taxes Paid			
Quintile	% Share Apportionments	% Share Gas Sales	% Share Gas Consumed
1st	57.0%	67.1%	68.8%
2nd	17.1%	16.8%	15.4%
3rd	16.3%	12.6%	11.7%
4th	5.2%	2.5%	2.8%
5th	4.4%	1.0%	1.3%
Totals	100.0%	100.0%	100.0%

Source: Calculations by author based on data from CSBE (1991), p. 3; CDOT (1994), Figure 19; and CDOT (1993)

When comparing the ratio of the share of apportionments to the share of gas taxes paid, Table 16 shows that the first quintile has a "return" on taxes of less than one, while the four other quintiles each has a "return" on taxes greater than unity. The trend indicates that the "return" increases as the population density decreases, using either of the two possible measures of taxes paid.

In other words, for every dollar of taxes paid by the most densely populated counties (those in the first quintile), approximately eighty-three to eighty-five cents is returned as funding apportionments. In contrast, the least densely

populated counties receive roughly three to four dollars in funding for each dollar in taxes paid.

Table 16. Return on Taxes Paid		
Quintile of Counties	% Apportionments % Gas Sales	% Apportionments % Gas Consumed
1st	0.85	0.83
2nd	1.02	1.11
3rd	1.30	1.39
4th	2.06	1.82
5th	4.38	3.51

5.4 No Geographic Redistribution of California Transit Aid

While apportionments from both the Federal Highway Trust Fund and the California State Highway Account result in some geographic redistribution of tax revenues, the state apportionments for transit under California's Transportation Development Act (TDA)/Local Transportation Fund (LTF) do not result in any geographic redistribution.

The reason for this lack of geographic redistribution is the TDA/LTF program's funding formula, which provides for a

"return to source" apportionment. This result may be described as a "neutral" result, since it produces neither a progressive nor a regressive system of tax revenue collection and funding apportionment. The apportionment neither widens nor narrows the inequalities in the pattern of fiscal capacities. In fact, it has no impact at all on fiscal capacities.

Since there is no geographic redistribution, it is clear that no fiscal equalization results. The apportionment formula for California's primary transit assistance program thus produces an example of Outcome #1, as illustrated in Figure 18 of Chapter 3.

In summary, the analyses of this chapter have shown that transportation funding formulas may or may not result in geographic redistribution. In two of the cases, geographic redistribution does result, while in the third case, no geographic redistribution results.

The formula apportionments from the Federal Highway Trust Fund in FY 1991 resulted in a pattern of geographic redistribution where some of the taxes from most populous states paid for transportation-related expenditures in the least populous states. Meanwhile, the formula apportionments from the County Minimums portion of the California State Highway Account resulted in a pattern of redistribution from the most densely populated counties to the least densely

populated counties. Whether or not these patterns of redistribution are consistent with fiscal equalization remains to be determined in the next chapter.

CHAPTER 6.
FISCAL EQUALIZATION RESULTING FROM
TRANSPORTATION FUNDING FORMULAS

Having determined the degree and the pattern of geographic redistribution of tax revenues resulting in the three case studies of transportation funding formulas Chapter 5, this chapter now turns to the study's central question: Do transportation funding formulas result in fiscal capacity equalization?

Drawing upon the two theoretical frameworks described in Chapter 3, this question takes on larger significance because of its impact upon two important related questions. First, what is the appropriate level of government to finance a transportation program? Second, what is a fair distribution of transportation funding by central governments among different local geographic areas?

As the first framework described, if fiscal equalization is found to occur, then its existence may provide justification for the role the central government plays in financing transportation programs. If, on the other hand, fiscal equalization is found to not occur, then one critical justification for the role of the central government may be called into question.

As the second framework described, if fiscal equalization

is found to occur, then it may be argued that the funding apportionment is fair in the sense that it is consistent with the distributive principle of fiscal equalization. If fiscal equalization is not found to occur, then it may be argued that the funding apportionment is unfair in that it is inconsistent with this principle, which has been stated as a justification for government transportation programs.

6.1 Fiscal Equalization and the Federal Government as Central Government

The completion of the Interstate Highway System and the recent designation of the National Highway System have recently provided the context in which an important question has been asked: Should a central government (in this case, the federal government) play a large role or a small role in the funding of transportation programs?

Prior to the passage of ISTEA in 1991, the federal-aid highway system consisted of a total of 853,826 miles.¹⁵⁵ The National System of Interstate and Defense Highways, commonly known as the Interstate System, consisted of 45,280 miles, making up about five percent of the total federal-aid system.

The 1991 ISTEA legislation, passed by Congress and signed

¹⁵⁵ USDOC (1993), p. 612

by President Bush,¹⁵⁶ authorized the designation of the National Highway System (NHS) and required that a minimum of 67,440 miles be included in the system.¹⁵⁷ The NHS legislation that was signed into law in 1995 designated a total of 160,955 miles¹⁵⁸ to be included in the National Highway System, including 93,515 miles not explicitly required by the ISTEA legislation. Some analysts of the NHS legislation have raised the important question of whether or not there is sufficient justification for federal involvement in a national highway system of this magnitude.¹⁵⁹

Some observers have argued for a smaller role, suggesting that the federal government "turn back" funding and authority for all non-Interstate highways to the states.¹⁶⁰ In such a scenario, federal transportation-related taxes would be reduced and authority for federal transportation programs would be devolved to the states. The remaining federal role would remain concentrated on maintaining the interstate highway system.

In contrast with such proposals for "turnback" of federal

¹⁵⁶ The ISTEA legislation was perhaps the most significant piece of domestic legislation to be signed into law in the last two years of the Bush presidency.

¹⁵⁷ Lipford (1994), p. 6

¹⁵⁸ Public Roads (1996), p. 29

¹⁵⁹ Lipford (1994), p. 32

¹⁶⁰ ACIR (1987), p. 2

transportation programs, a number of arguments may be put forward to justify a continued or expanded federal role in surface transportation. One of the most compelling arguments is that of fiscal equalization. In 1989, FHWA Executive Director Richard D. Morgan argued for the federal role in surface transportation on the basis of equity. "In the absence of federal involvement," Morgan stated, "extreme polarization of the transportation system would prevail--a condition we cannot afford. Federal involvement assures equity in the distribution of resources and equity in the number of highways in the less wealthy states which are necessary to meet the needs of interstate commerce."¹⁶¹ The Executive Director of the American Association of State Highway and Transportation Officials (AASHTO) has suggested the same justification for a federal role, that federal government involvement provides assistance to the less wealthy states.¹⁶²

While the fiscal equalization argument is not new, it is unclear whether or not the federal highway trust fund apportionments actually do result in fiscal equalization. A recent study by Senator Moynihan, claims that prior to ISTEA, New York state provided more in transportation-related taxes

¹⁶¹ USGAO (1989), p. 28

¹⁶² Telephone conversation with Francis Francois, Executive Director of AASHTO. (March 27, 1996)

than it received in federal apportionments from transportation programs.¹⁶³ If the Moynihan study is correct, the study may support the contention that fiscal equalization is in fact occurring, since New York is one of the wealthiest states in the union, according to per capita income (PCI) measures.

Review of FHWA data seems to indicate, however, that Moynihan's claim is incorrect. In FY 1991, New York state paid \$729 million into Highway Trust Fund and received apportionments totaling \$805 million. For fiscal years 1957-1991,¹⁶⁴ New York state paid \$11.9 trillion into trust fund and received \$14.3 trillion.¹⁶⁵ Thus, New York was in FY 1991 and historically has been a net "recipient" state rather than a "donor" state.¹⁶⁶ This data, which shows that New York state is a beneficiary of geographic redistribution, suggests that fiscal equalization may not be occurring.

Fiscal capacity equalization is probably one of the most compelling justifications for a continued (and perhaps enhanced) federal role in the financing of surface

¹⁶³ Moynihan (1992), p. ix.

¹⁶⁴ The period 1957-1991 represents the life of the Interstate Highway program prior to the passage of ISTEA.

¹⁶⁵ Larson (1991), p. 50

¹⁶⁶ It may be the case that Moynihan's conclusion was based upon calculations including transportation programs which are funded out of non-Trust fund revenues as well as Highway Trust Fund revenues. Moynihan does not specify what data the conclusion is based upon.

transportation programs. The analyses in this chapter attempt to answer the question of whether or not apportionments of transportation funding from the have resulted in fiscal equalization. This determination is based upon a comparison of the patterns of geographic redistribution described in Chapter 5 and the patterns of fiscal capacity disparities described in Chapter 2.

A comparison between the data presented in Tables 17 and 18 illustrates the general approach taken in the analyses which follow. Preliminary analysis of recent data as shown in Table 17 suggests that five of the states with the highest ratio of apportionments to payments from the Federal Highway Trust Fund in fiscal year 1991 tend to have higher broad-based fiscal capacities as measured in terms of per capita income (PCI) and the representative tax system (RTS). In contrast, five of the states with the lowest ratio of trust fund returns tend to have lower broad-based fiscal capacities. It appears that the more wealthy states receive a higher return from the federal government on their tax payments than the less wealthy states. The data in Table 17 thus suggests that Federal Highway Trust Fund apportionments do not act to equalize broad-based fiscal capacities.

Table 17. Comparison of Selected States' Highway Trust Fund Return and Broad-Based Fiscal Capacity, FY 1991			
State	Highway Trust Fund Return (1)	PCI Capacity Index (2)	RTS Capacity Index (3)
Hawaii	4.04	111	146
Alaska	3.86	110	178
Rhode Island	2.93	101	89
Connecticut	2.58	136	130
Vermont	2.32	94	105
North Carolina	0.78	88	93
Oklahoma	0.78	81	87
Indiana	0.77	90	90
Wisconsin	0.77	94	90
Texas	0.73	90	97

Sources: Larson (1991), p. 50; ACIR (1993) p. 20

Notes: (1) Apportionments/Payments, US Total = 0.98
(2) US Total = 100
(3) US Total = 100

However, the data presented in Table 18 shows the opposite pattern when benefit-based fiscal capacity is considered. The states with the highest trust fund returns had some of the lowest benefit-based fiscal capacities, as measured in terms of motor fuels tax (MFST) fiscal capacity and motor vehicle operators' license tax (MVOLT) fiscal capacity. In contrast, the states with the lowest trust fund

returns had some of the highest benefit-based fiscal capacities. Here it appears that the less wealthy states receive a higher trust fund return than the more wealthy states, when benefit-based measures are used. The data in Table 18 suggests that federal trust fund apportionments do equalize benefit-based fiscal capacities.

Table 18. Comparison of Selected States' Highway Trust Fund Return and Benefit-Based Fiscal Capacity, FY 1991			
State	Highway Trust Fund Return (1)	MFST Capacity Index (2)	MVOLT Capacity Index (3)
Hawaii	4.04	70	92
Alaska	3.86	93	83
Rhode Island	2.93	77	101
Connecticut	2.58	88	100
Vermont	2.32	113	109
North Carolina	0.78	109	101
Oklahoma	0.78	120	107
Indiana	0.77	116	92
Wisconsin	0.77	99	102
Texas	0.73	109	97

Sources: Larson (1991), p. 50; ACIR (1993) pp. 81, 91

Notes: (1) Apportionments/Payments, US Total = 0.98

(2) US Total = 100

(3) US Total = 100

The data in the two tables seem to suggest that, at least for the federal case, there may be evidence for a finding of

fiscal equalization¹⁶⁷ or for a finding of no fiscal equalization.¹⁶⁸ Do transportation apportionments result in fiscal equalization or not? Does the conclusion depend upon the particular measure of fiscal capacity used? These are the questions which this chapter attempts to answer.

6.2 A Regressive Redistribution of Federal Trust Fund Apportionments

The previous chapter showed that the pattern of geographic redistribution of funds from the Federal Highway Trust Fund was one in which tax revenues were being redistributed from more populous states to less populous states. The analyses also found that state population was not correlated with fiscal capacity. If state population is not positively correlated with fiscal capacity, then what is the impact of the geographic redistribution upon fiscal capacity disparities? Does the redistribution result in "more wealthy" states assisting "less wealthy" states? Is the result a progressive or regressive redistribution of funding?

Three of the measures of fiscal capacity considered in this study are correlated with net redistribution per capita,

¹⁶⁷ Outcome #2 as illustrated in Figure 18 of Chapter 3.

¹⁶⁸ Outcome #3 as illustrated in Figure 18 of Chapter 3.

to differing degrees.¹⁶⁹ Table 19 summarizes the results of the correlation analyses.

The strongest correlation arises for RTS capacity. Figure 31 shows that net redistribution per capita is

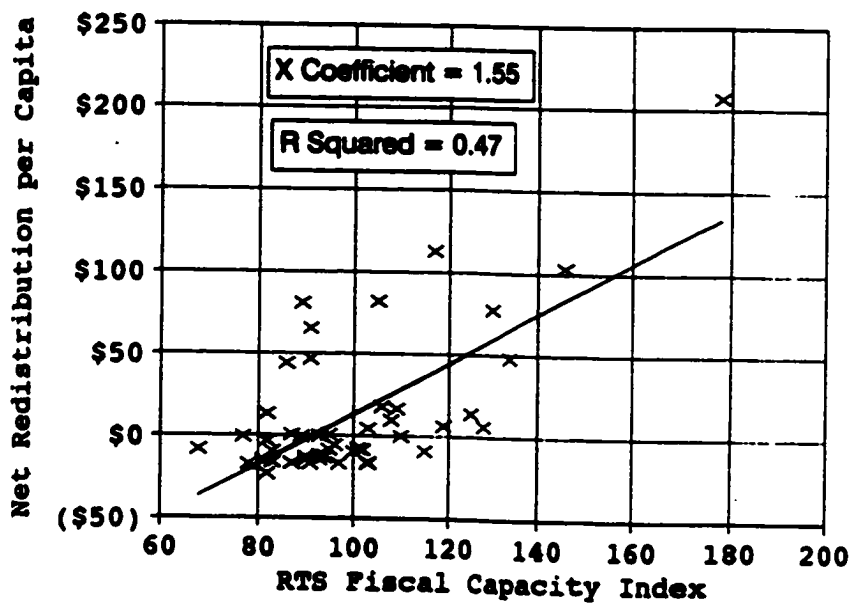
Table 19. Summary of Fiscal Capacity Correlations with Net Redistribution per Capita, Federal Highway Trust Fund			
Fiscal Capacity Measure	RTS	PCI	MFST
% of Variation Accounted for (R ²)	47%	13%	3.2%
Strength of Association	Strong	Weak	Very Weak
<u>Change in Redistribution</u> Change in Fiscal Capacity (X Coefficient)	+1.55	+1.06	-0.39
Fiscal Capacity Equalization?	No	No	Yes
Nature of Redistribution	Regressive	Regressive	Progressive

positively correlated with RTS fiscal capacity. The R² is

¹⁶⁹ Using some benefit-based measures, no clear pattern of correlation appears. The motor vehicle registration (MVRT) fiscal capacity index and the motor vehicle operators' license (MVOLT) fiscal capacity index, two benefit-based measures of fiscal capacity, are neither positively nor negatively correlated with redistribution per capita.

0.47, indicating that 47 percent of the variation in one variable is accounted for by variation in the other.

**Fig. 31. Redistribution & RTS Capacity
Federal Highway Trust Fund, 50 States**

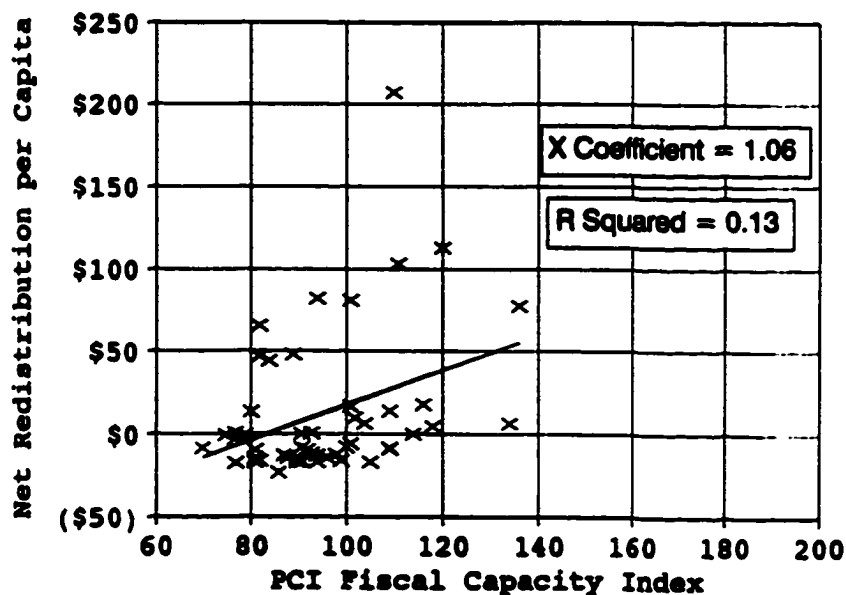


Confirming the hypothesis that was suggested by the data in Table 17, the x coefficient is positive 1.55, indicating that an increase of ten unit in RTS fiscal capacity is correlated with an increase of \$15.50 in net redistribution per capita. The positive correlation shows that lower capacity states are more likely to be net donors and higher capacity states are more likely to be net recipients. The impact of redistribution upon the pattern of RTS fiscal capacities is to increase disparities and therefore widen inequalities among states of broad-based fiscal capacity.

Using the RTS measure of broad-based fiscal capacity, the geographic redistribution of federal highway trust funds may be described as being regressive.

The PCI measure of fiscal capacity and the MFST measure of tax capacity are only weakly correlated with the net redistribution per capita. Figure 32 shows that the PCI measure has a small but positive correlation¹⁷⁰ with redistribution per capita.

**Fig. 32. Redistribution & PCI Capacity
Federal Highway Trust Fund, 50 States**



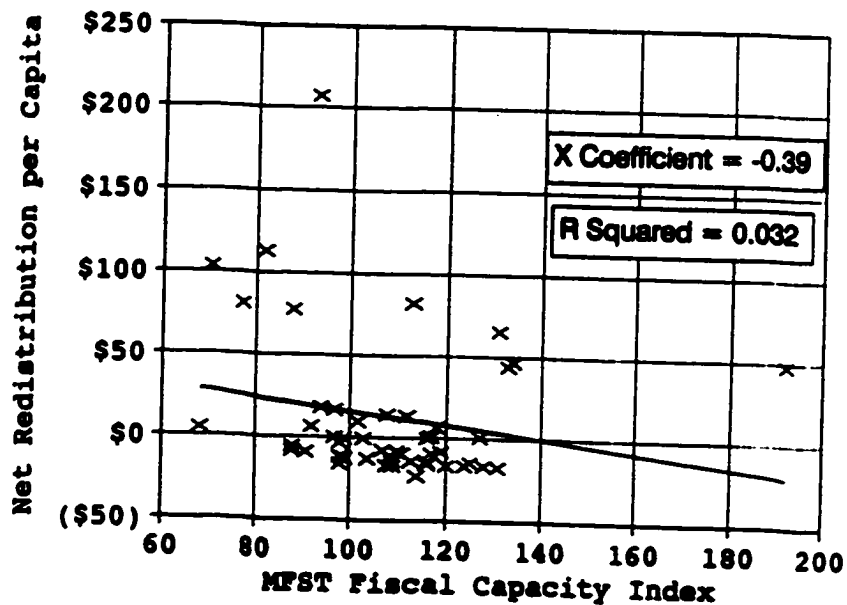
In contrast, there is a negative correlation¹⁷¹ between the motor fuels sales tax (MFST) capacity index and

¹⁷⁰ $R^2 = 0.13$, X Coefficient = 1.06

¹⁷¹ $R^2 = 0.032$, X Coefficient = -0.39

the net redistribution per capita. However, since the correlation coefficient is so small, the evidence as shown in Figure 33 provides only small support for the hypothesis suggested by the data in Table 18, that the pattern of geographic redistribution does result in some fiscal equalization, when benefit-based fiscal capacity measures are used.

**Fig. 33. Redistribution & MFST Capacity
Federal Highway Trust Fund, 50 States**



Using the two broad-based measures of fiscal capacity, the best evidence shows that the redistribution of federal highway trust fund revenues may be described as regressive, resulting in more per capita net redistribution to more wealthy states than to less wealthy states. The small, but

positive correlation between PCI fiscal capacity and redistribution per capita is consistent with the larger and positive correlation between RTS fiscal capacity and redistribution per capita.

However, using the benefit-based measures of tax capacity, the findings are less clear. The motor vehicle registrations tax capacity (MVRT) and the motor vehicle operators' license tax (MVOLT) capacity have neither a positive nor a negative correlation with redistribution per capita. Using the motor fuels sales tax (MFST) capacity measure, regression analysis provides weak evidence that the redistributions may be described as progressive, in that a higher capacity to raise revenues from taxes on motor fuels is somewhat correlated with a lower net redistribution per capita.

In summary, the regression analyses provide relatively good evidence that the redistribution of Federal Highway Trust Fund revenues is regressive, particularly when the RTS measure of broad-based fiscal capacity is used. The evidence with regard to benefit-based tax capacity does not strongly support a finding of progressivity or regressivity.

6.3 A Progressive Redistribution of State Highway Account Funds

Chapter 2 showed that the quintiles of California's counties with higher population density had higher broad-based fiscal capacity, but lower benefit-based fiscal capacity, than the quintiles with lower population density. Given the evidence from the Chapter 5 that the more densely populated quintiles of counties were having their tax dollars redistributed to the less densely populated areas, one would expect to find that fiscal capacity equalization results when using broad-based measures of fiscal capacity and that fiscal equalization does not result when using benefit-based measures.¹⁷² Table 20 summarizes the findings from the regression analyses.

County by county analysis appears to support the latter expectations regarding benefit-based fiscal capacity. Figure 34 shows what one would expect, that the apportionment of State Highway Account funds does not result in fiscal capacity equalization when measured relative to the benefit-based measure, using consumption-based estimates of taxes paid. Instead, the scattergram shows that the higher a county's rate of gasoline consumption per capita, the greater its share of

¹⁷² Note that this is the opposite expectation of that regarding the first case study on federal apportionments.

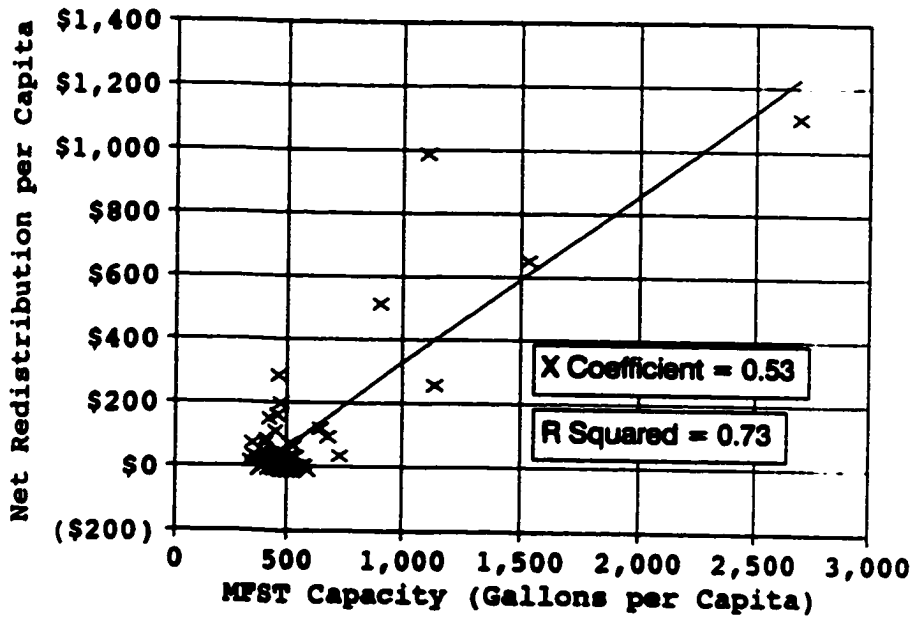
Table 20. Summary of Fiscal Capacity Correlations with Net Redistribution per Capita, State Highway Account			
Fiscal Capacity Measure	GST	PCI	MFST
% of Variation Accounted for (R ²)	35%	(a) 57% (b) 27%	73%
Strength of Association	Weak	(a) Moderate (b) Weak	Strong
Change in Redistribution Change in Fiscal Capacity (X Coefficient)	-2	(a) +6 (b) -1	+3
Fiscal Capacity Equalization?	Yes	(a) Yes (b) No	No
Nature of Redistribution	Progressive	(a) Regressive (b) Progressive	Regressive

funding per capita.¹⁷³ This results in a regressive pattern of geographic redistribution. Figure 35, using the sales-based estimates of taxes paid, does not indicate as a clear a pattern as Figure 34, but it does not show evidence of progressivity.¹⁷⁴ Thus, there does not seem to be positive evidence of fiscal equalization using either estimate of gasoline taxes paid.

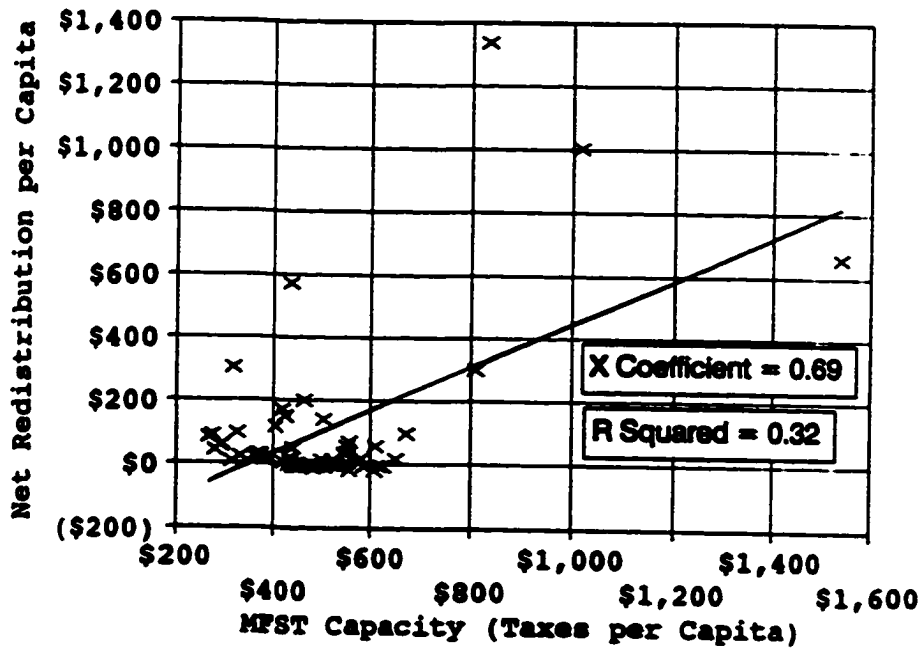
¹⁷³ R² = 0.73, X Coefficient = 0.53

¹⁷⁴ R² = 0.32, X Coefficient = 0.69

**Fig. 34. Redistribution & MFST Capacity
58 California Counties (Cons. Est.)**



**Fig. 35. Redistribution & MFST Capacity
58 California Counties (Sales Est.)**



However, it would not be accurate to conclude that regressive redistribution takes place, because the net recipients of the geographic redistribution fall at both the upper and lower ends of the fiscal capacity distribution. As a result, State Highway Account funds are being redistributed to some low capacity counties and to some high capacity counties.

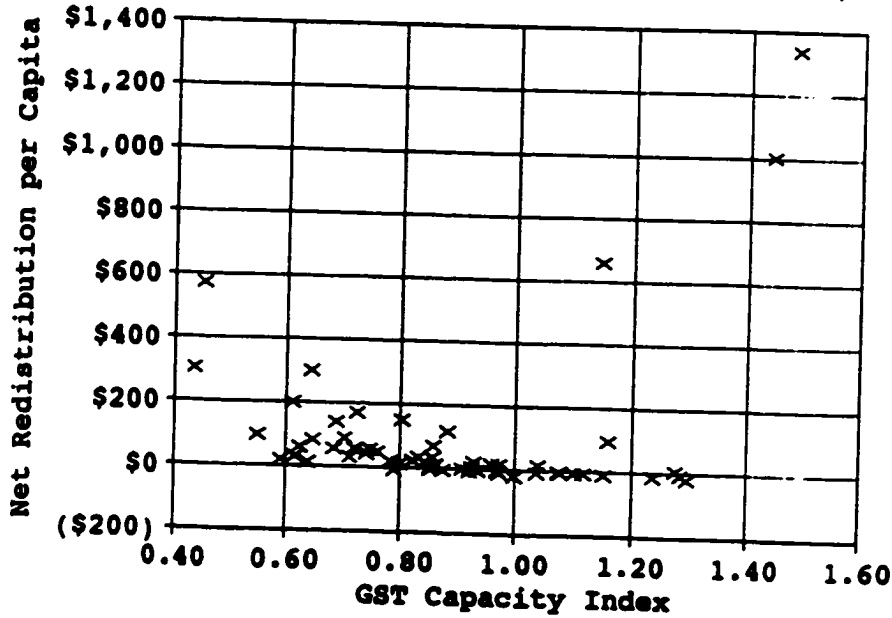
Turning to the broad-based measures of fiscal capacity, the picture becomes more complicated. Figures 36 and 37 show what we might expect--a general pattern of progressivity relative to the general sales tax (GST), with three sparsely populated counties represented by outlying data points.¹⁷⁵ Figures 38 and 39 show that the pattern of redistribution (removing the three outliers) is one where a some fiscal capacity equalization results.¹⁷⁶

When considering broad-based fiscal capacity in terms of per capita income (PCI), the question of progressivity or regressivity becomes quite difficult to answer. Figures 40 and 41 show the redistribution of State Highway Account funds relative to per capita income (PCI). While initially it may appear that no clear pattern exists, careful examination

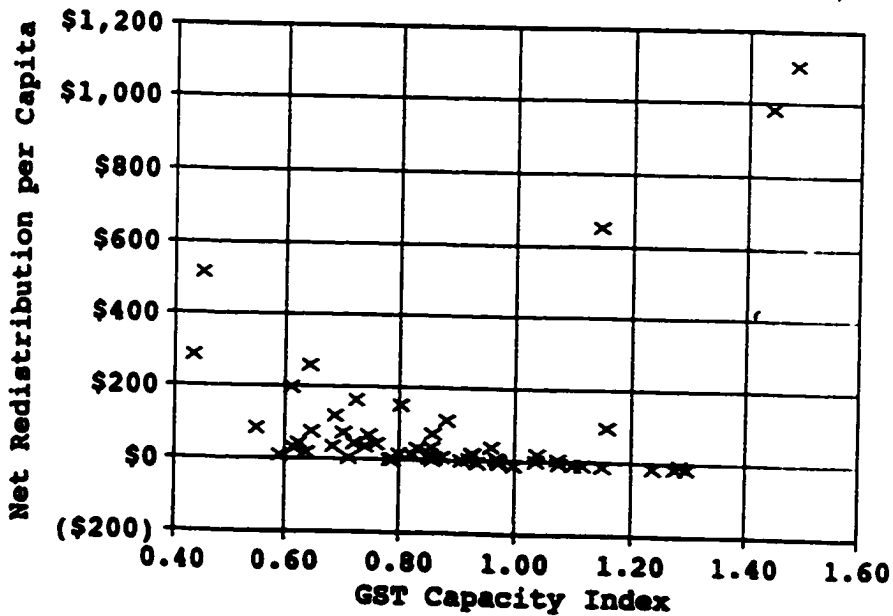
¹⁷⁵ The three data outliers are Alpine, Mono, and Inyo counties--the three counties with the lowest population densities.

¹⁷⁶ Using the sales-based estimate, $R^2 = .35$ and X Coefficient = -290. Using the consumption-based estimate, $R^2 = .34$ and X Coefficient = -260.

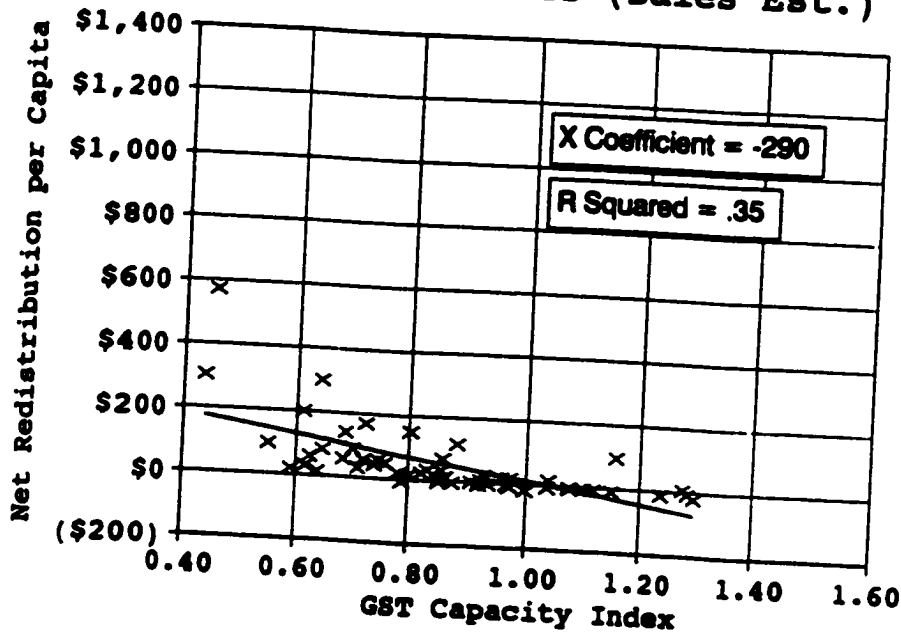
**Fig. 36. Redistribution & GST Capacity
58 California Counties (Sales Est.)**



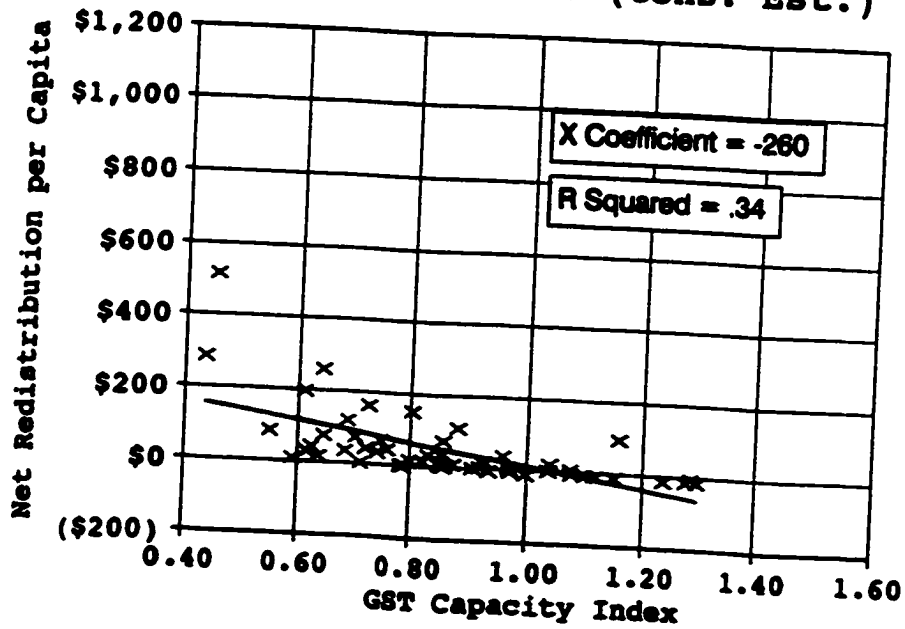
**Fig. 37. Redistribution & GST Capacity
58 California Counties (Cons. Est.)**



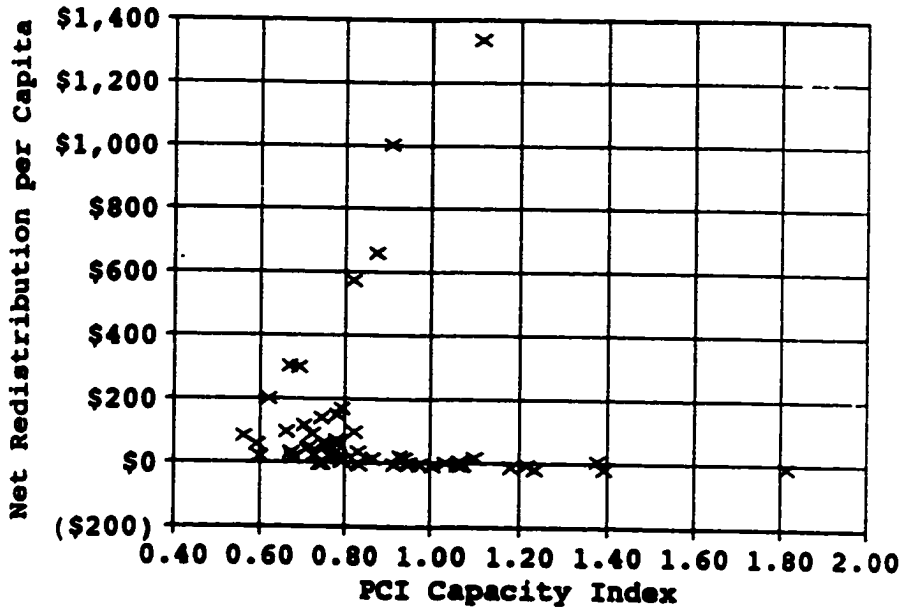
**Fig. 38. Redistribution & GST Capacity
55 California Counties (Sales Est.)**



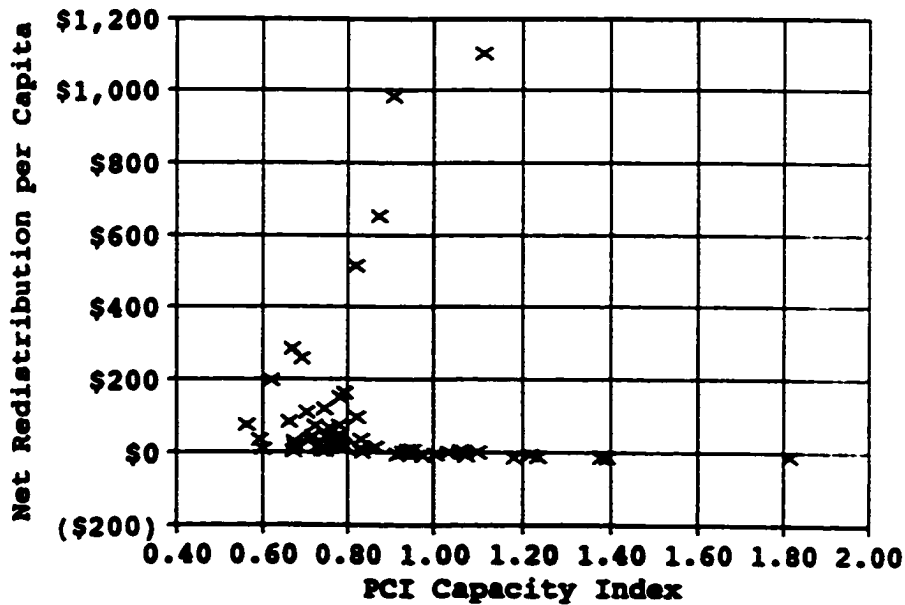
**Fig. 39. Redistribution & GST Capacity
55 California Counties (Cons. Est.)**



**Fig. 40. Redistribution & PCI Capacity
58 California Counties (Sales Est.)**



**Fig. 41. Redistribution & PCI Capacity
58 California Counties (Cons. Est.)**

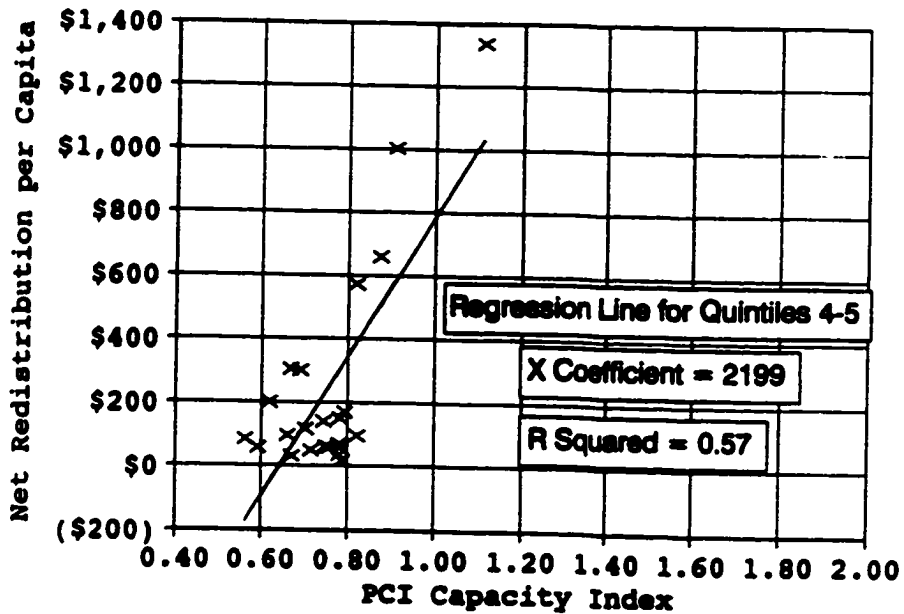


suggests a pattern in one direction for one group of counties and a pattern in the opposite direction for a second group of counties.

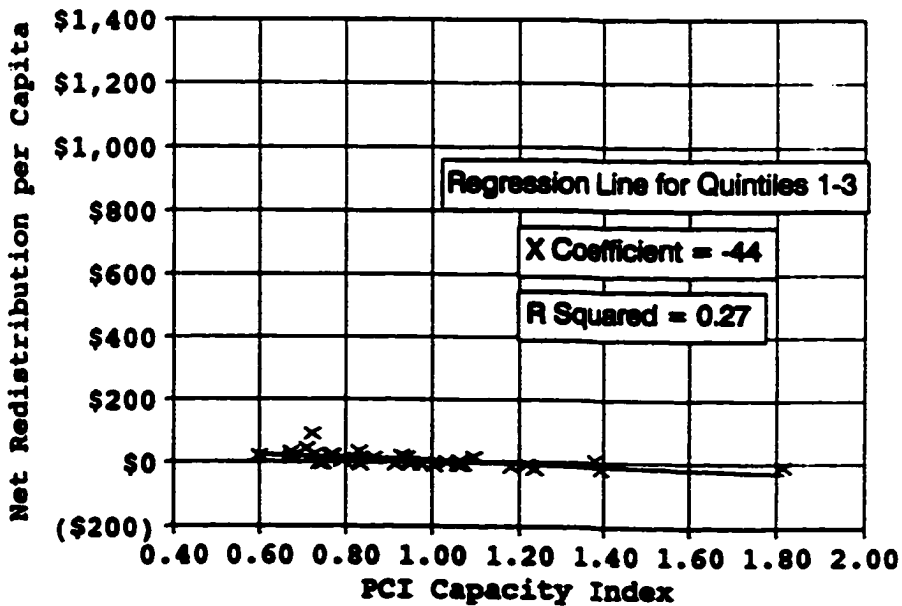
For the first group of counties, a relatively large positive relationship is suggested. For the second group of counties, a relatively small negative relationship is indicated. The group of counties for which a positive relationship (regressivity) is suggested corresponds with the fourth and fifth quintiles of population density. The group of counties for which a negative relationship (progressivity) is suggested corresponds to the first, second, and third quintiles.

As Figures 42 and 43 show, the most densely populated counties, which are also among those with the highest per capita income, are having some of their gasoline taxes redistributed to counties in both the middle range and the lowest range of population density. Overall, it appears that some fiscal equalization results. However, the direction of the regression line among the less densely populated counties in the fourth and fifth quintiles is opposite, such that the "more wealthy" of the sparsely populated counties actually receive more redistribution per capita than the "less wealthy" of the sparsely populated counties. Taken in total, the impact of redistribution upon fiscal capacities, when using the PCI measure of fiscal capacity, provides some evidence

**Fig. 42. Redistribution & PCI Capacity
23 California Counties (Sales Est.)**



**Fig. 43. Redistribution & PCI Capacity
35 California Counties (Sales Est.)**



both for and against equalization. Table 21 summarizes the findings relative to the PCI measure.

Table 21. Fiscal Equalization within County Quintiles using PCI Measure	
Quintile	Fiscal Equalization?
1	Yes
2	Yes
3	Yes
4	No
5	No

In summary, this chapter has found evidence for some fiscal equalization resulting from transportation funding formulas and some evidence against such a conclusion. The different case studies and the different measures of fiscal capacity employed have resulted in different findings, so no general statement can be made about fiscal equalization and transportation funding formulas.

In the case involving the Federal Highway Trust Fund, the most conclusive evidence seems to suggest that fiscal equalization does not occur. In fact, using the broad-based measures of fiscal capacity, the data seems to indicate that a regressive redistribution of trust fund revenues takes place. Thus, the first case study provides an example of

Outcome #3 as described in Figure 18 of Chapter 3.

In contrast, for the case study involving the California State Highway Account, the strongest evidence is for a finding of fiscal equalization. The broad-based measure of GST fiscal capacity provides good evidence that a progressive redistribution of County Minimums funding is taking place. This second case study then provides an example of Outcome #2 as described in Figure 18 of Chapter 3.

CHAPTER 7.

CONCLUSIONS REGARDING FAIRNESS AND FAVORITISM

This study has been centrally concerned with the question of whether or not transportation funding formulas result in an equalization of fiscal capacities. The most important empirical findings of the study are summarized below:

- (1) The study found, for FY 1991, geographic redistribution of 14 percent of Federal Highway Trust Fund apportionments from the most populous states to the least populous states. The redistribution did not result in state fiscal capacity equalization. In fact, the redistribution may be described as being regressive, in that funds were being redistributed from the states with the lowest fiscal capacities, as measured by RTS, to the states with the highest fiscal capacities. This result has been previously described as Outcome #3.¹⁷⁷

- (2) The study found, for FY 1991, geographic redistribution of 11 percent of California State Highway Account apportionments from the most densely populated counties to the least densely populated counties. The redistribution did result in fiscal capacity

¹⁷⁷ See Figure 18 of Chapter 3.

equalization. As a result, the redistribution may be described as being progressive, in that funds were being redistributed from the counties with the highest fiscal capacities, as measured by GST, to the counties with the lowest fiscal capacities. This result has previously been described as Outcome #2.¹⁷⁸

- (3) The study found no geographic redistribution resulting from the apportionments from the California Transportation Development Act (TDA) Local Transportation Fund (LTF) program to the state's fifty-eight counties. Since there was no geographic redistribution, the funding formula did not result in fiscal capacity equalization. This result cannot be described as either a progressive or a regressive result, but is rather best described as a neutral result, since it had no impact on existing fiscal capacity disparities. This result has previously been described as Outcome #1.¹⁷⁹

As Figure 18 previously illustrated, there are three possible outcomes regarding the two questions of geographic redistribution and fiscal capacity equalization. The three case studies examined in this study thus provide examples of

¹⁷⁸ See Figure 18 of Chapter 3.

¹⁷⁹ See Figure 18 in Chapter 3.

each of the three possible outcomes.

This study demonstrates that transportation funding formulas, and by extension all funding formulas, can result in any of the three possible outcomes. On the basis of this study, no blanket statement can be made regarding the outcome of all transportation funding formulas or funding formulas in general. Instead, this study suggests that in order to determine the outcome of funding formulas, empirical examinations similar to those conducted in this study must be undertaken. Any of the three possible outcomes may result in any given case.

7.1 Fairness and Favoritism in Transportation Funding Formulas

Several conclusions can be drawn from the empirical findings regarding the question of fairness and favoritism resulting from transportation funding formulas. Chapter 3 provided two theoretical frameworks for assessing fairness and favoritism that are summarized in Table 7. Based upon these two frameworks, this study draws the following conclusions:

- (1) The formula apportionments from the Federal Highway Trust Fund in FY 1991 resulted in favoritism rather than fairness. This conclusion can be drawn using either of

the two frameworks, as both would view Outcome #3 as resulting in favoritism. The nature of the favoritism is one that benefits the least populous states in the union, and is one that acts to the detriment of the most populous states. The outcome results in favoritism because it is inconsistent with both the principle of fiscal equivalence and the principle of fiscal equalization.

(2) The formula apportionments from the California State Highway Account in FY 1991 resulted in fairness rather than favoritism. Both frameworks would lead one to this conclusion, as both view Outcome #2 as resulting in fairness. In short, this outcome results in fairness because it is consistent with the principle of fiscal equalization.

(3) It may be concluded that the formula apportionments from the California TDA/LTF program resulted in either fairness or favoritism, depending upon which framework one draws upon. According to the first framework, the apportionments result in fairness because Outcome #1 is consistent with the principle of fiscal equivalence. However, according to the second framework, the apportionments result in favoritism because the outcome

is inconsistent with the principle of fiscal equalization. The nature of the favoritism is one which benefits those counties with high fiscal capacities, and acts to the detriment of those with low fiscal capacities.¹⁸⁰

7.2 The Appropriate Roles of Local, State, and Federal Governments in Transportation Finance

(1) The findings relating to the first case study, on federal trust fund apportionments, appear to be sufficient to call into question one of the most common and compelling rationales for federal involvement in financing surface transportation programs. While some have argued for a federal role on the basis of "helping less wealthy states," the best evidence contained in this analysis suggests that the federal government's involvement results in geographic redistribution from less wealthy states to more wealthy states.

Given the evidence that fiscal equalization of federal transportation funds does not occur, the argument for continued or enhanced federal financing is substantially weakened. Unless the federal transportation formulas are

¹⁸⁰ Taylor (1991) reaches the same conclusion of favoritism regarding the program by a different means. He finds the TDA/LTF program to be unfair because it is inconsistent with the distributive principle of consumption-based funding.

reformed to produce fiscal equalization, the justification for the federal role in transportation is to some extent called into question.

Since 1982, the minimum rate of return from the federal highway trust fund has increased from 85 percent to 90 percent. A recent proposal formulated by representatives of some states has suggested that the minimum rate of return be increased further to 95 percent.¹⁸¹

Proposals to increase the guaranteed rates of return from trust fund apportionments appear to ignore the existence of general benefits that may result from the provision of public goods, such as an increased level of national defense. It is possible that the existence and adoption of these proposals signifies an implicit recognition that the incremental general benefits to be gained from continued federal involvement have declined substantially from the days when the Interstate Highway System was first being constructed.

As the guaranteed rate of return increases and approaches 100 percent, one question looms larger. Is the most appropriate role of the federal government merely to collect taxes on behalf of the states and return the revenues to the states where they originated? If this is essentially the role that the federal government plays in transportation finance,

¹⁸¹ The proposal is being developed by a group of representatives of state departments of transportation working under the title "STEP 21".

why not "turn back" the authority for collection and administration of transportation-related taxes back to the individual states?

(2) The second case study has presented data on the geographic redistribution of revenues which indicates that the benefit-based taxes deposited in and apportioned from California's State Highway Account are not pure user fees. A significant amount of geographic redistribution among counties occurs, on the order of 1 in 9 dollars of county minimum funds (11% of total funds).

Is it more accurate to describe the gasoline tax as a benefit based tax? The issue is complicated by the fact that residents of one county travel freely on the highways in other counties, and thereby gain some direct benefit from the use of roads in other counties. In addition, some might argue that indirect benefits should be taken into account, such as the cost of transporting goods from one county to be purchased by residents of another county.

Keeping in mind the likelihood that residents of one county may benefit to some degree from the provision of highways in other counties, the question remains as to whether or not the more densely populated counties need to be subsidizing the provision of highways in less densely populated counties. This question is particularly important

given that a statewide network of highways already exists provide a minimal degree of access between counties. Since funds from the State Highway Account are generally spent on capital construction rather than maintenance of the existing system, most of the benefits accrue to intra-county travel rather than intercounty travel.

The analyses relating to the second case study found that fiscal equalization occurs, when using the GST measure. Such a finding, however, does not answer the question of whether the principle of fiscal equivalence is preferable to the principle of fiscal equalization in the state financing of highways.

An important normative question for the present time, then, is whether or not taxes from more densely populated counties should continue to be redistributed to less densely populated counties to provide incremental improvements to the existing highway system. The fact that densely populated counties are experiencing high degrees of traffic congestion raises the possibility that highly urbanized areas are subsidizing less developed areas while sacrificing the opportunity to make improvements to highways within their own boundaries.

Thus, while this study concludes that the fiscal equalization resulting from the apportionment of County

Minimums funding produces a fair distribution, the tension between the principle of fiscal equivalence and the principle of fiscal equalization remains. Some might argue, on the basis of fiscal equivalence, that the role of the state government should be simply to maintain the existing highway network. If most of the benefits of additional capital construction accrue to the residents of the counties with the construction occurs, then local financing may be preferable to state government financing.

The other side of the argument, though, is that some degree of fiscal equalization is desirable, and even necessary to insure a certain level of accessibility and mobility for all residents of the state. Additional research is needed to determine how much fiscal equalization is sufficient to meet the basic requirements of the state highway system.

(3) The analyses of the third case study found that California's TDA/LTF program do not result in geographic redistribution, nor do they result in fiscal equalization. Whether or not this outcome is desirable is open to some debate, depending upon whether one prefers the principle of fiscal equivalence to the principle of fiscal equalization, or vice versa.

The principle of fiscal equivalence raises the question of whether the benefits resulting from the LTF program have

been predominantly local or statewide benefits. Since most of the LTF has been ultimately spent on local transit, it is likely that most of the benefits resulting from the LTF have been local in nature.¹⁸² As a result, there is not a good match between the level of government financing the transit program and the geographic scope of benefits.

The principle of fiscal equivalence would suggest, then, that since the costs and benefits associated with local transit fall predominantly in local areas, then local governments should be the predominant source of financing for such programs. This, in fact, appears to be the case.

However, the principle of fiscal equalization suggests, as with the second case study, that some degree of geographic redistribution is desirable and necessary if it provides for a minimum level of accessibility and mobility for all residents of the state.

California's TDA/LTF program might best be described as a transit finance program motivated not by fiscal equivalence or fiscal equalization, but rather a mandating of local fiscal effort. In essence, the state government requires that the county governments tax themselves at a minimum rate of

¹⁸² While the provision of some transit service in one county does result in a reduction in some negative externalities to other counties, such as air pollution and traffic congestion, the direct benefits resulting from transit accrue to the transit riders and those persons benefitting from economic transactions resulting from the transit trips taken.

taxation (one-quarter of one percent of all general sales) for the purpose of raising revenues for public transit. At the same time, the state government imposes legal mandates in the specifics of the TDA legislation.

This mandating of local effort appears to be a blunt instrument for attempting to insure a certain minimum level of accessibility and mobility. In effect, it mandates a higher minimum level of transit service in the counties with higher fiscal capacity, and mandates a lower level in the counties with lower fiscal capacity. Reform of the the TDA/LTF program to take into account local fiscal capacities could increase the likelihood that all residents of the state have a minimum level of accessibility and mobility.

APPENDIX 1.

BROAD-BASED FISCAL CAPACITIES OF FIFTY STATES

	Per Capita Personal Income (PCI)	Representative Tax System (RTS)
	<u> </u>	<u> </u>
<u>New England</u>		
Connecticut	136	130
Maine	91	95
Massachusetts	120	117
New Hampshire	114	110
Rhode Island	101	89
Vermont	94	105
 <u>Mid-Atlantic</u>		
Delaware	109	125
Maryland	116	106
New Jersey	134	119
New York	118	103
Pennsylvania	101	96
 <u>Great Lakes</u>		
Illinois	109	102
Indiana	90	90
Michigan	98	94
Ohio	93	93
Wisconsin	94	90
 <u>Plains</u>		
Iowa	91	93
Kansas	96	93
Minnesota	100	101
Missouri	94	91
Nebraska	93	95
North Dakota	82	91
South Dakota	84	86
 <u>Southeast</u>		
Alabama	81	81
Arkansas	77	78
Florida	99	103
Georgia	91	91
Kentucky	82	83
Louisiana	79	89
Mississippi	70	68
North Carolina	88	93

South Carolina	81	83
Tennessee	86	82
Virginia	105	103
West Virginia	75	77
<u>Southwest</u>		
Arizona	87	94
New Mexico	77	87
Oklahoma	81	87
Texas	90	97
<u>Mountain</u>		
Colorado	101	109
Idaho	80	82
Montana	82	91
Utah	77	82
Wyoming	89	134
<u>Pacific</u>		
California	109	115
Nevada	104	128
Oregon	92	100
Washington	102	108
Alaska	110	178
Hawaii	111	146

APPENDIX 2.
BENEFIT-BASED FISCAL CAPACITIES OF FIFTY STATES

<u>State</u>	<u>MFST Index</u>	<u>MVOLT Index</u>	<u>MVR Index</u>
Alabama	125	107	125
Alaska	93	83	125
Arizona	104	96	107
Arkansas	131	108	93
California	91	98	97
Colorado	97	92	125
Connecticut	88	100	85
Delaware	108	109	104
Florida	98	109	97
Georgia	128	104	123
Hawaii	70	92	82
Idaho	112	102	158
Illinois	88	95	90
Indiana	116	92	108
Iowa	116	99	134
Kansas	113	106	111
Kentucky	116	97	118
Louisiana	99	91	106
Maine	110	107	105
Maryland	94	99	93
Massachusetts	82	105	73
Michigan	99	102	101
Minnesota	107	86	96
Mississippi	119	111	97
Missouri	124	108	108
Montana	131	107	150
Nebraska	117	100	130
Nevada	118	106	99
New Hampshire	97	114	107
New Jersey	92	109	79
New Mexico	127	104	130
New York	68	85	64
North Carolina	109	101	108
North Dakota	134	100	155
Ohio	98	102	100
Oklahoma	120	107	126
Oregon	111	121	116
Pennsylvania	88	99	86
Rhode Island	77	101	78
South Carolina	117	101	93
South Dakota	133	106	156
Tennessee	114	102	117
Texas	109	97	106
Utah	98	90	104
Vermont	113	109	108
Virginia	108	110	107

Washington	102	104	125
West Virginia	103	107	109
Wisconsin	99	102	109
Wyoming	192	111	170

**APPENDIX 6.
QUINTILES OF CALIFORNIA COUNTIES,
RANKED BY POPULATION DENSITY, 1990**

County Name	Total Population	Land Area	Population Density
San Francisco	723,959	45	16,088
Orange	2,410,556	782	3,083
Los Angeles	8,863,164	4,069	2,178
Alameda	1,279,182	733	1,745
San Mateo	649,623	447	1,453
Santa Clara	1,497,577	1,300	1,152
Contra Costa	803,732	735	1,094
Sacramento	1,041,219	975	1,068
San Diego	2,498,016	4,261	586
Santa Cruz	229,734	440	522
Marin	230,096	520	442
Solano	340,421	823	414
1st Quintile	20,567,279	15,130	1,359
Ventura	669,016	1,863	359
San Joaquin	480,628	1,412	340
Stanislaus	370,522	1,511	245
Sonoma	388,222	1,604	242
Riverside	1,170,413	7,176	163
Napa	110,765	787	141
Yolo	141,092	1,028	137
Santa Barbara	369,608	2,737	135
Placer	172,796	1,431	121
Fresno	667,490	5,966	112
Butte	182,120	1,645	111
2nd Quintile	4,722,672	27,160	174
Monterey	355,660	3,324	107
Sutter	64,415	603	107
Yuba	58,228	639	91
Merced	178,403	1,958	91
Nevada	78,510	973	81
El Dorado	125,995	1,715	73
Kings	101,469	1,396	73
San Bernardino	1,418,380	20,117	71
San Luis Obispo	217,162	3,183	68
Kern	543,477	8,152	67
Tulare	311,921	4,812	65
Amador	30,039	583	52
3rd Quintile	3,483,659	47,455	73

Madera	88,090	2,145	41
Lake	50,631	1,261	40
Shasta	147,036	3,788	39
Humboldt	119,118	3,586	33
Calaveras	31,998	1,024	31
San Benito	36,697	1,396	26
Imperial	109,303	4,241	26
Del Norte	23,460	1,007	23
Mendocino	80,345	3,511	23
Tuolumne	48,456	2,252	22
Glenn	24,798	1,314	19
<hr/>			
4th Quintile	759,932	25,525	30
<hr/>			
Tehama	49,625	2,982	17
Colusa	16,275	1,152	14
Mariposa	14,302	1,453	10
Plumas	19,739	2,566	8
Stanislaus	43,531	6,282	7
Lassen	27,598	4,561	6
Trinity	13,063	3,173	4
Sierra	3,318	958	3
Mono	9,956	3,027	3
Modoc	9,678	4,097	2
Inyo	18,281	10,130	2
Alpine	1,113	727	2
<hr/>			
5th Quintile	226,479	41,088	6
<hr/>			
California	29,760,021	156,358	190
Quint Totals	29,760,021	156,358	190

APPENDIX 7.

CALIFORNIA COUNTIES UNDER NORTH-SOUTH SPLIT

Northern Counties

- | | | |
|-----------------|-------------------|-----------------|
| 1) Alameda | 16) Madera | 31) San Mateo |
| 2) Alpine | 17) Marin | 32) Santa Clara |
| 3) Amador | 18) Mariposa | 33) Santa Cruz |
| 4) Butte | 19) Mendocino | 34) Shasta |
| 5) Calaveras | 20) Merced | 35) Sierra |
| 6) Colusa | 21) Modoc | 36) Siskiyou |
| 7) Contra Costa | 22) Monterey | 37) Solano |
| 8) Del Norte | 23) Napa | 38) Sonoma |
| 9) El Dorado | 24) Nevada | 39) Stanislaus |
| 10) Fresno | 25) Placer | 40) Sutter |
| 11) Glenn | 26) Plumas | 41) Tehama |
| 12) Humboldt | 27) Sacramento | 42) Trinity |
| 13) Kings | 28) San Benito | 43) Tuolumne |
| 14) Lake | 29) San Francisco | 44) Yolo |
| 15) Lassen | 30) San Joaquin | 45) Yuba |

Southern Counties

- 1) Imperial
- 2) Inyo
- 3) Kern
- 4) Los Angeles
- 5) Mono
- 6) Orange
- 7) Riverside
- 8) San Bernadino
- 9) San Diego
- 10) San Luis Obispo
- 11) Santa Barbara
- 12) Tulare
- 13) Ventura

APPENDIX 8.

A CATEGORIZATION OF DISTRIBUTIVE PRINCIPLES

A central question of the dissertation research has been whether or not transportation funding formulas result in principled geographic redistribution. The dissertation examines fairness in transportation funding formulas using the commonly considered principle of reducing fiscal capacity disparities. In doing so, fiscal capacity of local governments was used as a measure of need for funding from central governments. However, fiscal capacity disparity reduction is only one of many possible principles to use in apportioning funds, and fiscal capacity is only one of many possible measures of the relative need of recipient areas for formula funding.

Need-based principles such as fiscal capacity disparity reduction can provide a useful perspective from which to evaluate the fairness of government apportionments. A number of studies have considered whether or not government apportionments are targeted to the recipient areas that are most in need.¹⁸³ However, studies that define need in terms of fiscal capacity and those that define need in other terms usually choose a measure of need without showing that the measure selected is the most appropriate definition of funding

¹⁸³ Dye (1990), Peterson (1995), Rich (1991), and Taylor (1991)

needs to be used in evaluating the fairness of funding apportionments. This oversight is critical since the findings of the studies will be in doubt if the measure of need is not credible.

In order to provide a more clearly articulated context for considering this important issue, this chapter outlines a system of categorizing distributive equity principles for funding formulas. Each of these distributional equity principles suggests a method of apportioning funding in a manner consistent with principle.

Distributive Equity Principles in Related Research

While a number of previous studies have considered the question of equity in the distribution of transportation, none have comprehensively analyzed what equity principles provide the foundation for transportation funding formulas. Several other authors studying public transportation finance have considered the geographic distribution of governmental subsidy of transit services,¹⁸⁴ but none to date have systematically examined equity principles and the formula apportionment of transportation funds.

In the transportation policy literature, Altshuler et al have stated that different principles of equity compete with one another in the process of transportation policy making.

¹⁸⁴ Taylor (1991), Wachs (1989)

They argue that three equity conceptions, "uneasily coexist and compete for priority":

1. Fee for service: to each according to his or her financial contribution.
2. Equality in service distribution: to each an equal share of public expenditure or an equal level of public service, regardless of need or financial contribution.
3. Distribution according to need: to each a share of public expenditure or service based upon need as government has chosen to define it, preferably with the revenues drawn (by progressive tradition) predominantly from those in least financial need.¹⁸⁵

Altshuler et al note that the first principle of equity predominates in the private market, where individuals receive goods and services in proportion to what they pay. This first equity principle seems to have considerable appeal in part because revenues raised for transportation spending programs are often described as "user fees".

The second principle of equity is consistent with an egalitarian regard for all individuals as equally deserving regardless of circumstance. This principle has significant appeal in legislative processes, since it seems consistent with the ideal of "one person, one vote".

One difficulty with the classification presented by Altshuler et al is that "need" is dependent upon government definition for the third concept of equity. As a result, the third concept seems to be more like a residual category rather

¹⁸⁵ Altshuler et al (1979), p. 254

than a well-defined principle, since need may be defined in innumerable ways.

As the previous chapter has shown, fiscal capacity equalization provides one example of a need-based principle. Another important example of how need can be defined by government arises from the USGAO's 1986 report on highway funding formulas.¹⁸⁶ The USGAO argues that highway funds should be distributed to each state in proportion to the extent and usage of the highway system in the various states.¹⁸⁷ Here one part of the government has defined need being related to two principles, "extent" and "usage". Consistent with Altshuler et al's view that a needs based equity principle is at odds with an egalitarian principle, the report explicitly rejected the practice of distributing funds according to population.¹⁸⁸

In the literature on urban service delivery, a study completed at the University of California, Berkeley by Levy, Meltsner, and Wildavsky presented three "standards of equity for judging outcomes":

¹⁸⁶ USGAO (1986)

¹⁸⁷ USGAO (1986), p. 2

¹⁸⁸ USGAO (1986), p. 41

Three Standards of Equity for Judging Outcomes ¹⁸⁹			
	Market Equity	Equal Opportunity	Equal Results
Schools	The per child expenditure in each school should be proportional to the taxes paid by the neighborhood.	Each child should receive equal dollar expenditure.	Each child should receive enough expenditure so that all children read at the same level.
Libraries	The per resident expenditure in each branch should be proportional to the taxes paid by the neighborhood.	Each branch should receive equal per capita expenditure.	Each branch should receive enough expenditure so that circulation per capita is equal in all branches.
Streets	The per resident expenditure on streets in each neighborhood should be proportional to the taxes paid by that neighborhood.	Each neighborhood should receive an equal per capita (or per mile) expenditure.	Each neighborhood should receive enough expenditure so that the condition of all neighborhood streets in the city is equal.

The three standards presented by the Berkeley researchers corresponds roughly, though not exactly, with the classification proposed by Altshuler et al. "Market Equity" is basically synonymous with "fee for service". "Equal Opportunity" seems to correspond with the egalitarian principle, although Levy et al classified equal per capita expenditure as the same standard as equal per mile expenditure. It could be argued that equal per mile expenditures is actually an application of a need-based distribution, as advocated by the USGAO in their recommendation to distribute funds on the basis of the "extent" of the road system.

¹⁸⁹ Levy et al (1974), p. 370

"Equal Result" is the most ambiguous of the three standards presented by Levy et al. "Results" and "Needs" could be viewed as two sides of the same coin, where meeting a particular definition of need would lead to equal results, in which case the definitions might correspond. Like needs, desired results could be defined in many different ways by government or by any other observer, and falls somewhat short of defining a principle.

Finally, in a comprehensive review of urban service delivery literature, Shoup found a dozen "rules for distributing an urban service,"¹⁹⁰ including: (1) taxes paid,

¹⁹⁰ Shoup was primarily concerned with the distribution of free urban public services. While the analyses he conducts are illuminating, this paper will consider a different though related question. The question posed is on what basis should a governmental agency distribute funds geographically for transportation.

The similarity between Shoup's analysis and the analyses which follow lies in asking the question of geographical distribution. However, it is different to ask the question relative to distribution of funds rather than distribution of services. In fact, more often than not, the determination to distribute intergovernmental assistance geographically does not occur on the basis of service output, but rather on the basis of dollar funds. Public officials making decisions about intergovernmental aid for public transportation often do not decide how much service to provide as much as they decide how much funding to provide to a given geographic area.

In many cases, public officials do not know exactly what amount of service will result in different geographical areas as a result of a given funding distribution. While they can use historical data to estimate what increments of service different geographic areas will receive as a result of specified funding, they cannot foresee the precise level of service which results because of management decisions made within the implementing agency and circumstances in the surrounding environment which are not in their control.

(2) equal inputs, (3) equal outputs, and (4) equal outcome. Distributing urban services on the basis of taxes paid corresponds to Altshuler et al's "fee for service" and Levy et al's "market equity." Equal inputs can correspond to equal per capita expenditures when the value of inputs are summed in dollar terms.¹⁹¹

Shoup notes that appropriate measures of outputs can be difficult to define. Like Levy et al,¹⁹² he differentiates an output (what is produced) from an outcome (consequences of what is produced). Accordingly, equal outputs would suggest that all neighborhoods would have equal hours of street cleaning or equal lane miles of pavement, regardless of the cost. Equal outcomes might exist when all streets have the same level of cleanliness or equal access to roads. In this sense, equal outcomes corresponds with equal results as used by the Berkeley researchers.

Distributive Equity Principles for Funding Formulas

Examination of distributive equity principles in research on transportation policy and urban service delivery suggests that there are several equity principles in competition with one another. The first, market-like principle has been described as "fee for service", "market equity", or "taxes

¹⁹¹ Shoup (1989), pp. 104-111

¹⁹² Levy et al (1974), p. 1

paid". The second, egalitarian principle has been called "equality in service distribution", "equal opportunity", and "equal inputs". The third principle is articulated least well, but has been referred to as "distribution according to need", "equal results", and "equal outcomes". To the extent that the distribution of transportation funding is analogous to the distribution of urban services, corresponding principles of equity may be used in determining how to apportion transportation funding.

The related research suggests a system of categorizing five distributive equity principles for funding formulas.¹⁹³ The first two principles have been fairly well defined in previous research as described above. However, greater specification of other principles is required. The third principle arises from Shoup's concept of "equal outputs". The fourth principle is suggested by the USGAO study which argues for distribution of highway funds on the basis of "usage". The fifth principle has not been found in existing literature, but rather arises from a survey of formula factors used to apportion federal transportation funding.

The five resulting distributive principles are listed below along with the names from related research which correspond most closely. The five principles have been named

¹⁹³ Fiscal capacity equalization may be described as another distributive principle.

in a manner which facilitates their application to the apportionment of funds by formula.

- (1) Return to Source (fee for service, market equity, taxes paid)
- (2) Egalitarian (equality, equal opportunity, equal inputs)
- (3) Output-Oriented (need, extent, equal output, equal result)
- (4) Consumption-Oriented (need, usage, equal result)
- (5) Problem-Oriented (need, equal result, equal outcome)

The five distributive equity principles are described below. Each of the five principles suggests a method of formula funding apportionment. The first distributive principle may be described as return-to-source. This principle suggests a method of apportionment where funds are distributed to states or counties in proportion to the amount of revenues raised in each of the geographic areas. The major rationale for using a return-to-source distribution is that tax-payers should see the benefits of public services in proportion to the amount of taxes paid, particularly when taxes are justified by a user-fee principle.

The second distributive principle may be described as egalitarian. This principle suggests a method of apportionment which distributes equal per capita funds to each

state or county. The rationale for using an egalitarian distribution would be that every resident of the nation or state should be able to equally benefit from the distribution of public services.

The third distributive principle may be described as output-oriented. This principle results in an apportionment where funds on an equal basis relative to the amount of public service output to be produced in each geographic area. The rationale for using an output-oriented distribution is that a fair distribution of resources requires some output of services in all geographic areas.

The fourth distributional principle may be described as consumption-oriented. This principle would apportion funds on an equal basis relative to the level of public services consumed in each geographic area. The rationale for using a consumption-oriented distribution is that the level of need for public services is best represented by the amount of services consumed in each area.

The fifth distributive principle may be described as problem-oriented. This principle would apportion funds according to the severity of the problem to be remedied by the provision of the public service. Since government programs are often attempts to deal with specific problems, a problem-oriented funding distribution would attempt to target funds to the areas of need as measured by the severity of the problem

in each area.¹⁹⁴

¹⁹⁴ When formulas include per capita income, the motivation for using pci as a factor may be ambiguous. Many who have considered the question of fiscal equalization may have presumed that per capita income was intended as a measure of fiscal capacity. However, consistent with this fifth category, per capita income may have been included as a problem-oriented factor. If such is the case, then the reluctance of the Congress to adopt the RTS and other legislative bodies to adopt other measures becomes more understandable, if the intent in using per capita income is not motivated by fiscal capacity equalization. Instead, lawmakers may see low per capita income as a problem to be solved, for example by promoting job growth through improvements to the transportation system.

APPENDIX 9.

STATISTICAL ANALYSIS METHODOLOGY

The analyses in this study consider whether transportation funding formulas have the effect of equalizing fiscal capacities among states and counties. Quantitative data on state fiscal capacities and state apportionments of federal funds was collected from federal government agency reports and databases. Equivalent data on county apportionments and county fiscal capacities was collected from California state government reports and databases.

Using descriptive and inferential statistical techniques including location quotients, indices of dissimilarity, and simple regression, statistical analysis of recent funding distributions assessed whether or not formula-apportioned funding reduces or increases disparities in the fiscal capacities of state and county governments.

The methodological process of answering the central question of this study, "Do transportation funding formulas equalize fiscal capacities?," consisted of a two-part statistical analysis. In the first part of the analysis, the study determined how much geographic redistribution resulted from transportation funding formulas. The second part of the analysis determined whether or not the method of apportionment is consistent with the principle of fiscal capacity

equalization.

All three case study examinations follow a common analytical structure. The three case studies assess the geographic patterns of formula apportionments of:

- (1) Highway funds from the federal government to the fifty states during the fiscal years 1990-91,
- (2) Highway funds from California state government to the fifty-eight counties during the fiscal year 1990-91, and
- (3) Transit funds from California state government to the fifty-eight counties during the fiscal year 1989-1990.

The two parts of the analysis outlined below all required statistical manipulation, all of a common methodology. The statistical analyses compared two sets of data linked to the set of geographic areas to which they correspond. One set of data points corresponds to actual distributions of amounts or proportions of funding for each geographic area, and the other set of data points corresponds to the expected distributions of amounts or proportions of funding for the same geographic area. The two parts of the analysis are summarized below:

(1) How much geographic redistribution results from the formula apportionment of funding? The answer to the first question highlights the opportunity cost of apportionment--the

amount of potential local tax revenue lost or gained by each state or county through participation in fiscal federalism. The methods used provided measures of geographic redistribution to and from individual states and counties, as well as measures describing the overall pattern of geographic redistribution.

The distribution of current apportionments was used as the "actual distribution", and the distribution of current tax payments was used as the "expected distribution". The amount of geographic redistribution resulting from the formula apportionments was determined by calculating an index of dissimilarity.

(2) Does the funding formula equalize fiscal capacities?

Examinations of the second question used the measures of fiscal capacity described above in order to test whether the formula funding distributions are consistent with the principle of fiscal capacity equalization. The analyses examined the effect of funding formulas upon the fiscal capacities of individual states and counties, as well as the effect of funding formulas upon the entire pattern of fiscal capacity disparities. The distributions of current apportionments were used as the "actual distributions", and the distribution of current fiscal capacity were used as the "expected distributions".

The various measures of fiscal capacity and funding needs provide data for statistical analysis in the study. For each measure, a value may be determined for each state when considering federal apportionments and a value may be determined for each county when considering state apportionments.

Since the research is concerned primarily with the distribution of spending among geographic areas, most of the statistical analysis will compare two sets of data, paired according to the specific geographic areas to which they correspond. One set of data points would correspond to expected funding distribution amounts or proportions for each geographic area, and the other set of data points would correspond to the actual funding distribution amounts or proportions for the same geographic area.

In mathematical terms, the actual distribution, D_A , is a set of individual values $A_1 \dots A_{50}$ which apply, in the first case study, to the fifty states. Similarly the expected distribution, D_E , is a set of individual values, $E_1 \dots E_{50}$ which apply to the corresponding fifty states. For the second and third case studies, the set would include fifty-eight values corresponding to each of the fifty-eight counties.

Actual Distribution: $D_A = \{ A_1, A_2, A_3, \dots A_{49}, A_{50} \}$

Expected Distribution: $D_E = \{ E_1, E_2, E_3, \dots E_{49}, E_{50} \}$

The statistical analyses providing individual measures of inequality compare corresponding individual data points with one another, using various functions manipulating the actual value, A_x , and expected value, E_x , for some x between 1 and 50. In addition to comparisons for individual geographic areas, statistical analyses provide overall measures of patterns of inequality by comparing the overall distributions, D_A and D_E , with one another.

Individual Measures: $m_1 = f(A_1, E_1),$
 $m_2 = f(A_2, E_2),$
 etc.
Overall Measures: $M = f(D_A, D_E)$

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