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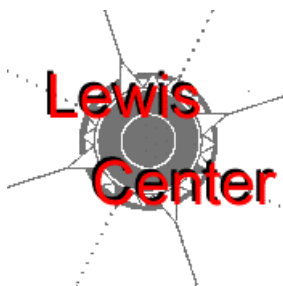
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## **Lewis Center for Regional Policy Studies**

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### ***California's Highway Funding Apportionment Formula: Geographic Redistribution Among Counties***

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Working Paper #21 in the series

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**California's Highway Funding Apportionment Formula:  
Geographic Redistribution among Counties**

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## **ABSTRACT**

California and other state governments use funding formulas to apportion, or geographically distribute, billions of dollars of expenditures for government programs every year. Most previous research on funding formulas has not considered the geographic source of tax revenues, and therefore has not examined the geographic redistribution of funding.

This study examines the pattern of geographic redistribution that results from the principal transportation funding formula governing the State Highway Account, and finds that 11 percent of California's highway funds were redistributed from the most densely populated counties to less densely populated counties.

The study concludes by questioning the continuing need for the densely populated counties in California to be subsidizing the financing of the sparsely populated counties. While there may be legitimate reasons for such a redistribution, the degree of the redistribution may require reassessment.

## 1. AN INTRODUCTION TO FUNDING FORMULAS

In many states, government revenues from gasoline taxes and other motor vehicle related taxes often are dedicated solely to highways and other transportation spending programs. These taxes often are described as "user fees," in the sense that the consumers, who ultimately pay the taxes and 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 and the taxes paid by the users 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." One important component of the weak link between the taxes paid and the benefits received is the geographic redistribution of gasoline tax revenues. In 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. Some portion of the revenues are collected in one county and geographically redistributed to be spent on transportation improvements in another county.

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 . . .<sup>1</sup>

This paper analyzes the extent to which the California state legislature currently meets its 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.

### Apportionment by Funding Formula

In the American federal system, the national and state governments apportion, or geographically distribute, billions of dollars of funding every year. All of these funds must be apportioned among

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<sup>1</sup> California State Constitution, Article XIX, Section 3.

recipient governments, much as pieces of pie must be cut and portions distributed among celebrants at a party.

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

Each year, state legislatures face the 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 to apportion funding in a manner which is fair to all recipients?<sup>2</sup>

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.

Funding formulas are 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.

A simple example of a funding formula follows:

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

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<sup>2</sup> Young (1994), p. 8 distinguishes between the parity principle and the proportional principle. Transportation funding formulas are usually based upon the proportional principle, such that funding is distributed in proportion to the differences in some characteristic of the different geographic areas.

The illustrative funding formula above uses one factor, 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, often debate 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.

## **2. CALIFORNIA'S HIGHWAY FUNDING APPORTIONMENT FORMULA**

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 has historically come out of the State Highway Account, which receives most of its revenues from state and federal motor fuels and other benefit-based, transportation-related taxes. According to the California Department of Transportation, in 1991 a total of \$1.59 billion was apportioned from the State Highway Account, mostly for capital improvements to highways and transit.

### The North-South Split and the County Minimums

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-five northern counties and thirteen southern counties.<sup>3</sup> Second, the County Minimums requirement establishes the minimum amount of funding to be apportioned to each of California's fifty-eight counties.

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<sup>3</sup> See Appendix A for a listing of the specific counties in the two regions of the state and Figure 1 on page 17 for a map of California's fifty-eight counties showing the division between the northern and southern counties.



The California legislature first established the North-South split as part of the 1927 Breed Act. 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 percent. 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 percent and increasing the southern share to 55 percent. 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.<sup>4</sup>

The current Barnes-Mills-Walsh formula for the North-South split was enacted in 1970, increasing the southern share to 60 percent and decreasing the northern share to 40 percent.<sup>5</sup> 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.<sup>6</sup> 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.

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 70 percent of the total expenditures from the State Highway Account. The legislature has given the California Transportation Commission the discretion to direct the remaining 30 percent of spending to the counties it chooses, subject to the constraints of the North-South split. Table 1 shows the apportionments to the northern and southern counties in terms of the share of spending which is apportioned under the County Minimums requirement and that which is apportioned on a discretionary basis.

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%

<sup>4</sup> California Transportation Commission (1988) p. I-33.

<sup>5</sup> California Streets and Highways Code, Section 188.

<sup>6</sup> California Transportation Commission (1988), p. I-33.

County Minimums were first established by the legislature in the 1947 Collier-Burns Act, which used a "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.<sup>7</sup>

The current County Minimums formula, which was enacted in 1982, calls for seventy percent of total expenditures over multi-year periods to be apportioned among the fifty-eight counties. The formula distributes seventy-five percent of applicable spending on the basis of population and distributes the remaining twenty-five 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.<sup>8</sup> Table 2 shows the regional shares of County Minimum spending distributed according to the population and mileage factors.

Table 2. 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%

### Fixed Formulas and Self-Adjusting Formulas

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

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<sup>7</sup> California Transportation Commission (1988), p. I-34.

<sup>8</sup> California Streets and Highways Code, Section 188.8.

of funding. This apportionment does not change over time<sup>9</sup> as the population distribution changes, but instead retains a funding apportionment based on the 1970 population distribution.

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 residents 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,<sup>10</sup> and the state highway mileage adjustments are made every two years on the basis of information provided by the state Department of Transportation.<sup>11</sup>

The analyses in this paper 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 seventy 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 thirty percent of funds can vary significantly. As a result, the analyses in this paper will only examine the geographic redistribution of County Minimum funds.

### Three Dimensions of Funding Formulas

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

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<sup>9</sup> The only means by which such a fixed formula may be changed is through new legislation specifying the change.

<sup>10</sup> 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 with less than one hundred percent samples.

<sup>11</sup> 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).

weighting for state highway mileage. The distributional out-come of the funding apportionment depends upon three important aspects of the formula: (1) underlying principles, (2) factor weightings, and (3) specific measures. Table 3 summarizes these three dimensions of California's highway apportionment formula.

First, the principles underlying the apportionment are what primarily influence 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.

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

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 output-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.

The output-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 would not be a clear relationship between the purpose of the spending and the principle governing the apportionment.

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 2 on page 19 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 2 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 indicates 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 influence 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 federal government's decennial census provides the most accurate measure of county population. 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.

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 4 shows the actual distribution of state highway centerline mileage compared to the number of lanes in 1993, showing simply that more than one-third of state highway centerline mileage consists of roads with four or more lanes.

Table 4. State Highway Centerline Mileage by Number of Lanes <sup>12</sup>		
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%

Figure 3 on page 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 lane 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.

Table 5 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.

Table 5. Counties with Highest Ratios of Lane Miles to Centerline Miles <sup>13</sup>				
County	Lane Miles Centerline Mileage	Centerline 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

The nine counties with the highest lane mile to centerline mile ratios are also the nine counties in the state with the highest population densities, as shown in the last column of Table 5. Thus, the

<sup>12</sup> California Department of Transportation (1993), pp. 78.

<sup>13</sup> California Department of Transportation database, data for 1993.

measure of state highway mileage chosen results in a differential distributional outcome for counties with high population densities than for counties with lower population densities. This finding is an 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.

### **3. GEOGRAPHIC REDISTRIBUTION AMONG CALIFORNIA'S COUNTIES**

In FY 1991, roughly eleven percent of total State Highway Account funds were geographically redistributed from one county to another in California. Of the roughly \$14 billion dollars in benefit-based taxes paid that year, approximately \$1.1 billion dollars was redistributed from one county to another.<sup>14</sup> This amount of tax revenues represents a geographical cross-subsidy where the taxpayers of one county pay for highway improvements which primarily benefit the residents of another county.

Little of the geographical redistribution results from the North-South Split. The southern counties contribute approximately 62 percent of the revenues to the State Highway Account, and receive 60 percent of the spending, resulting in a redistribution of 2 percent from the southern counties to the northern counties. Most of the geographical redistribution results from the County Minimums formula.

#### Redistribution from Densely Populated to Sparsely Populated Counties

In a previous study, Lem (1996) found that the apportionment of funds from the Federal Highway Trust Fund resulted in a geographic redistribution from the states with larger populations to the states with smaller populations. In the case of California's highway funding formulas, however, the apportionment of State Highway Account funds does not result in a clear pattern of redistribution relative to total county population. In fact, some of the more populous counties are net "donors" and some are net "recipients." Likewise, the less populous counties fall into both categories as net "donors" and net "recipients". While there is no clear pattern of redistribution among counties on the basis of total population, County Minimum funds are generally redistributed from counties with high population densities to counties with low population densities.

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<sup>14</sup> The analyses in this paper 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 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 entirely accurate result, it does provide enough information to describe the overall pattern of redistribution.

Quintile analysis shows that State Highway Account funds are being geographically redistributed from densely populated counties to sparsely populated counties. As Table 6 shows, the first quintile--those counties with the highest population densities--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 greater share of funding than the share they provide in gasoline taxes.

Table 6. 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%

When comparing the ratio of the share of apportionments to the share of gas taxes paid, Table 7 shows that the first quintile has a "return" on taxes of less than one, while the four other quintiles have a "return" on taxes greater than unity.

Table 7. Return on Taxes Paid		
Quintile of Counties	$\frac{\% \text{ Funds}}{\% \text{ Gas Sales}}$	$\frac{\% \text{ Funds}}{\% \text{ Gas Consumed}}$
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

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 are 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 8 summarizes the amount of geographic redistribution among counties that results from California's highway funding apportionment formula. Four densely populated southern counties (Los



Angeles, Orange, San Diego, and Santa Barbara) donate 5.5 percent of the County Minimum funds to the remaining nine southern counties. In addition, the southern donor counties also contribute an amount equal to 2 percent of the County Minimum funding to the redistribution to the sparsely populated northern counties. Ten densely populated northern counties (eight Bay Area counties, Sacramento, and Placer) donate an additional 3.5 percent of County Minimum funds to the thirty-five sparsely populated northern counties. In total, about 11 percent of County Minimum funds are geographically redistributed each year.

Table 8. Summary of Geographic Redistribution	
10 Northern Donor Counties	-3.5 %
35 Northern Recipient Counties	+5.5 %
9 Southern Recipient Counties	+5.5 %
4 Southern Donor Counties	-7.5 %

#### **4. CONCLUSION: QUESTIONING THE NEED FOR REDISTRIBUTION**

This study has presented data on the geographic redistribution of motor fuels sales tax revenues which indicate that the benefit-based taxes deposited in and apportioned from California's State Highway Account are not true user fees, since there is a weak link between the benefits received and the taxes paid. A significant amount of geographic redistribution among counties occurs, on the order of 1 in 9 dollars (11 percent) of County Minimum 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 benefits 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 providing such a subsidy for the provision of the transportation system in the less densely populated counties. This question is particularly important given that a statewide network of highways already exists to provide some degree of access between counties. Since funds from the State Highway Account generally are spent on capital construction rather than on maintenance of the existing system, it is likely that most of the benefits accrue to intra-county (predominantly commuter) travel rather than to inter-county travel.

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 the degree that they are to provide incremental improvements to the existing transportation 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 the transportation system within their own boundaries.

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## APPENDIX A.

### CALIFORNIA COUNTIES UNDER THE 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 B.**

### **ESTIMATIONS OF GASOLINE TAX CONTRIBUTIONS**

Nobody knows exactly what percentage of total statewide gasoline taxes is paid in each county in California, since gasoline taxes are not paid directly to the state government at the retail level by the customer. Instead, the state government collects taxes from motor fuel distributors before the gasoline is provided to wholesale and retail sellers throughout the state.

This study uses two methods of estimating the proportion of gasoline taxes that is 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.<sup>15</sup>

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 to the State Board of Equalization. Since gasoline is not the only item sold at service stations, an average statewide percentage (92.7 percent) of total service station sales is estimated to be that portion of sales which can be attributed to gasoline sales.

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. While not all of the gasoline sold in each county is consumed in the same county, the second estimation technique presumes that the county of purchase and the county of consumption are the same for the vast majority of the gasoline sold.

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<sup>15</sup> 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.

## APPENDIX C.

### ANALYSIS USING QUINTILES OF POPULATION DENSITY

In the process of assessing the impact of highway funding apportionments upon California's counties, this study groups the state's fifty-eight counties into quintiles--five groups of a roughly equal number of counties.<sup>16</sup> The counties are grouped according to population density,<sup>17</sup> so that the first quintile includes the twelve counties with the highest population densities,<sup>18</sup> and the last quintile includes the twelve counties with lowest population densities.<sup>19</sup>

Table 9 provides a summary description of the five quintiles. Column two shows that while the population densities for all five quintiles vary, 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 population densities that are many times greater than those of the less developed counties in the other four quintiles. Column three shows 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, the last column shows that the first quintile has the smallest amount of land area of the 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

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<sup>16</sup> Quintiles 1, 3, and 5 include twelve counties, and quintiles 2 and 4 include eleven counties, accounting for a total of fifty-eight counties.

<sup>17</sup> Population Density =  $\frac{\text{Resident Population}}{\text{Square Miles of Land Area}}$

<sup>18</sup> The twelve counties with the highest population densities are (in descending order) San Francisco, Orange, Los Angeles, Alameda, San Mateo, Santa Clara, Contra Costa, Sacramento, San Diego, Santa Cruz, Marin, and Solano.

<sup>19</sup> The twelve counties with the smallest population densities 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.