THE DISTRIBUTION OF HIGHWAY USER TAXES IN MICHIGAN

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THE DISTRIBUTION OF HIGHWAY USER TAXES IN MICHIGAN

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I wish to extend my deepest respect to Professor Denzel Cline. His intimate knowledge of Michigan's state and local governments and his familiarity with highway finance theory were my most frequented sources.

My appreciation also goes to my wife, Signia, who gave unreservedly of her time in the final preparation of the thesis.

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Chapter I

Introduction

Basic to American highway finance theory is the principle that those who benefit from highways should pay for them. The existence of special taxes for highways throughout the nation demonstrates the widespread acceptance of the benefit principle in this area of public finance. There is a special structure of highway taxation, under which most of the costs of providing a highway system are assigned to highway users and paid in the form of "user taxes" such as motor fuel taxes and vehicle registration taxes. The remaining costs are assigned to nonusers and paid from general revenues such as the general property tax. Property owners and others also benefit from having improved roads and streets.

But the benefit principle implies more than determining who benefits from improved highways and then taxing them accordingly. Also implied is the obligation of the taxing unit to deploy user tax

revenue to improving and maintaining highways--not to providing schools, mental institutions, and unemployment compensation, desirable as these may be.

A simple earmarking of highway user revenues for highway purposes, while necessary, is not enough, however. Full implementation of the benefit principle obligates the taxing unit to be discriminating in the deployment of scarce user tax revenues, completing those highway improvements which will provide the greatest satisfaction to highway users, and deferring those improvements which are of lesser importance.

Meeting this obligation encounters a substantial obstacle: while most highway user taxes are levied at the state level, the administration of highways is often widely dispersed through the state, county, and municipal levels of government. Consequently, a method or formula must be devised for appropriately allocating state-collected user taxes to local administrative units. The central problem explored by this thesis is: What method or formula for distributing state-collected highway user taxes among state and local highway administrative units provides maximum benefit to highway users?

The analysis centers upon Michigan, where a total of over $200 million in highway user taxes is collected each year and where the responsibility for administering

highways is lodged with a state highway department, 83 county road commissions, and 510 incorporated cities and villages. Together these units administer a 110,000-mile network of highways, roads, and streets.

Chapter II traces the emergence of user tax financing in Michigan, the allocation problem that such a tax structure imposes, and the varied experiments with distribution formulas designed to meet that problem.

Chapter III explains the structure and operation of Michigan's present user revenue distribution formula, as adopted in 1951 and subsequently modified in 1955 and 1957.

Crucial to an evaluation of Michigan's present basis for distribution is a definition of how attainable user benefit is to be measured. Chapter IV shows how engineering studies of highway needs may be used as an index of the amount of highway user benefits that is attainable within each administrative unit.

Chapter V analyzes statistically the performance of Michigan's present distribution formula by comparing allocations on the basis of highway needs with allocations according to the existing formula. For the state trunkline system, each county, and each city of over 5000 population the percentage degree of current misallocation of funds is determined.

Chapter VI explores three alternative approaches to a solution of the distribution problem: (1) eliminate

the distribution entirely, (2) retain the basic structure of the present formula but revise the percentage weightings of the various factors, and (3) restructure the formula around new factors and weightings. In the concluding section of the chapter some policy guidelines for improving the equity of Michigan's present user revenue distribution are presented.

The last chapter, Chapter VII, briefly summarizes the major findings and conclusions of the study.

Much of the data upon which this study is based derives from two major sources, the Michigan State Highway Department and the 1961 highway fiscal study. The latter was conducted, at legislative request, by three economists specializing in public finance, Professors Denzel Cline and Milton Taylor, both of Michigan State University, and Professor James Papke, of Wayne State University.[1] The unrestricted access to materials granted by both of these sources is gratefully acknowledged.

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[1] This study, entitled Michigan Highway Fiscal Study, 1961, represents the most comprehensive, and certainly the most recent, analysis of Michigan highway finance. Because printed copies will not be available until late in 1962, footnote references to the study are by chapter number only.

Chapter II

Development of User Tax Distribution

Prior to 1905 no problem in the distribution of highway funds existed. The use of state revenues for road building was prevented by the Michigan Constitution of 1850 which forbade the state to "be a party to nor interested in any. . .internal improvement, nor engaged in carrying on such work."[1]

By the turn of the century, however, the call to "get out of the mud" was gaining strength. In response, the first State Highway Department was legislated in 1903.[2] It was promptly adjudged unconstitutional as a violation of the internal improvements clause. But public demand for better roads was insistent. An amendment to the constitution permitting the state to promote "the improvement of or aiding in the improvement of the public wagon roads" carried in all 83 counties in 1905.[3]

Instead of an allocation of revenue to cities and counties according to some uniform standard, the first

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[1] Michigan Constitution, 1850, Art. XIV, sec. 9. An effort in 1872 to legislate state funds for a special road in the village of Springwells was ruled to violate this clause by attempting to use state funds for an internal improvement. Hubbard V. Township Board of Springwells, 25 Mich. 153 (1872).

[2] Michigan Public Acts, 1903, No. 203, secs. 1, 2.

[3] Amendment to Michigan Constitution, 1850, Art. XIV, sec. 9.

state aid to local units was made through a system of reward payments.[4] Rewards of $250 to $1,000 per mile were paid to counties or townships constructing designated roads in accordance with minimum state requirements. The rewards averaged 24 per cent of construction costs and were claimed almost entirely by townships rather than counties.[5] Excluded from eligibility for rewards were streets within incorporated cities and villages. From 1905 to 1913 reward payments appropriated from general funds were the sole form of state aid.

Following 1913--the year an integrated 3000-mile network of highways was marked out as a state trunkline system--state participation in highway improvement showed a steady increase. Rewards were doubled (1913),[6] then tripled (1919),[7] extended to include repair costs (1913),[8] and to cover county roads within incorporated places (1915).[9] The state first assumed 75 to 95 per

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[4]Michigan Public Acts, 1905, No. 146. This act also created the first legitimate Michigan State Highway Department.

[5]Robert S. Ford and Marvin A. Bacon, Michigan Highway Finance (Ann Arbor, 1943), p. 16.

[6]Michigan Public Acts, 1913, No. 334, secs. 2, 3.

[7]Michigan Public Acts, 1919, No. 58, sec. 3.

[8]P.A., 1913, No. 355, Chap, 5, sec. 16.

[9]P.A., 1915, No. 75, Chap. 4, sec. 18.

cent of the construction and maintenance cost of rural trunklines (1919),[10] then all such costs (1925).[11]

The years 1913 to 1925 also saw the character of Michigan highway revenues undergo considerable change. In 1913 over 97 per cent of the cost of roads was met from property taxes; by 1938 only 2 per cent came from this source.[12] Replacing the property taxes were the highway user taxes--the motor vehicle registration tax on horsepower (1913),[13] the motor vehicle weight tax (1915),[14] and the gasoline tax (1925).[15] Since these taxes are collected most efficiently on a state-wide basis, the state soon eclipsed the local governments as the dominant body for financing highways.

Thus the powers to tax and to administer highways, originally residing entirely with the local units of government, shifted more and more to the state level. The shift, however, was disproportionate. Local units, under the banner of "home rule," relinquished taxing

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[10] Michigan Public Acts, 1919, No. 19, as amended extra session, 1919, No. 2, sec. 2. Sometimes referred to as the Aldrich Act.

[11] P.A., 1925, No. 17. Sometimes referred to as the Ming Act.

[12] Denzel C. Cline, Michigan Tax Trends as Related to Agriculture (East Lansing, 1940), p. 53.

[13] P.A., 1913, No. 326. This registration tax of 25 cents per rated horsepower was abolished in 1927.

[14] P.A., 1915, No. 302, sec. 7.

[15] P.A., 1925, No. 2. In 1927 the gasoline tax was increased from two to three cents per gallon. P.A., 1927, No. 150.

responsibility willingly but administrative control only reluctantly. By 1934 the state was collecting 75 per cent of all highway revenues but was administering less than ten per cent of all road mileage. A comparative divorce of administrative control and taxing authority had resulted. With that divorce arose the problem of distributing state revenues to local governments according to some uniform basis.

The earliest distribution of state revenues to local units, other than the reward payments, began in 1915 with the adoption of the first motor vehicle registration weight tax. For the next ten years one-half of the revenue collected from this tax in each county was returned to the county in proportion to the amount collected. Beginning at a modest annual total of $179,682 in 1915, the county share under this first distribution formula rose rapidly to $6,030,642 by 1925.[16] From 1925 to 1928 the amount to be distributed was changed from one-half of collections to a fixed $6 million per year; but in 1928, with total weight tax collections standing at $18,308,163 and still rising, the county share was changed back to an amount equal to one-half of collections.[17]

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[16]Computed from Ford and Bacon, Table IX, p. 47.

[17]For some reason, however, $6 million continued to be appropriated from the weight tax collections, with the balance necessary to equal one-half of the collections appropriated from the gasoline tax.

The year 1928 also brought a change in the basis for distribution. Until then the distribution was entirely proportionate to weight tax collections; now seven-eighths was to be distributed on the basis of collections, with the remaining one-eighth to be divided equally among the 83 counties. The new equal division factor was obviously of greatest benefit to those counties receiving the smallest shares. For example, the total shares of Keeweenaw, Oscoda, Montmorency, and Crawford counties increased by over 200 per cent; the counties receiving the largest shares, on the other hand, found the amount gained under the equal division factor more than cancelled by the reduced amount received on the basis of weight tax collections. Wayne county, where vehicle registrations have traditionally been the highest of all counties, lost about 12 per cent of its former share of user revenues.

In the first years of the thirties two further pieces of legislation were passed which significantly altered Michigan highway finance. The McNitt-Holbeck-Smith Act[18] of 1931 called for the transfer of all township roads to county jurisdiction. Each year from 1932 to 1936 twenty per cent of the mileage of these township roads--thereafter referred to as the "McNitt

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[18] P.A., 1931, No. 130.

roads"--was added to the county system. To assist the counties in meeting their increased responsibility, the McNitt Act provided for additional user revenues to supplement the one-half of weight tax collections already being received. Beginning at $2 million in 1932, the McNitt allotment was to be increased $0.5 million a year until $4 million was being distributed by 1936. This amount was to be prorated among counties according to their respective mileage of McNitt roads, marking the first use in Michigan of a mileage factor as a basis for allocating user revenues. In summary, the McNitt Act made two important changes. First, it virtually eliminated the township as a highway administrative unit; now all rural roads were either county roads or rural state highways. Second, it substantially increased the use of state funds for financing local roads, introducing a new factor, road mileage, for distributing those funds.

The second act of major consequence in the thirties was the Horton Act.[19] Passed in 1932, it nearly doubled the amount of user revenues to be distributed and established an elaborate system of priorities for determining the local deployment of those revenues. The county share was increased from one-half of the weight tax to all of the weight tax plus $2,550,000 of

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[19] P.A., extra session, 1932, No. 41.

the gasoline tax. The basis for distribution remained unchanged (seven eighths according to weight tax collections, one-eighth equally). The McNitt allotment of $4 million of the gasoline tax also continued in effect. Thus $6,550,000 of the gasoline tax (which in 1932 equalled $21,572,000) and all of the weight tax was being returned to the counties.

Funds received under the McNitt Act were restricted to use on former township roads only. The allotment to each county under the Horton Act was divided into two equal parts. The first half could be used for the general needs of the county road commission; the second half was restricted to the following series of five priorities. First priorty went to the retirement of the county's Covert road debt. (The Covert Act[20] of 1915 had permitted the widespread use of special assessments on property to finance rural roads. The early depression years found over $37 million in Covert debt outstanding and defaults in payment by assessed property owners at a high and increasing rate. The first priority constituted an effort to relieve this debt.) Second and third priority went respectively to the retirement of county road debt and to the retirement of township road debt incurred before township roads were consolidated

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[20] P.A., 1915, No. 59.

into the county system. Thus the first three of the five claims on state user revenues were for relief of property for road debt service charges. An optional fourth priority allowed the county board of supervisors to vote up to one-half of any remaining funds for additional maintenance of McNitt roads. If funds still remained, a fifth priority stipulated that they be divided between the county, to be used as desired, and the incorporated cities and villages. The division was to be made proportionate to population--the first time such a factor was used in Michigan highway finance.

It is apparent that throughout this period the lion's share of state aid for local roads went to the counties, with the cities and villages receiving scant, if any, state assistance. Assistance to cities for streets other than state trunklines was not given until passage of the Horton Act, 17 years after county roads first received such assistance. Moreover, because of the residual position of the cities as the last of five priorities, there was no certainty that funds would be available. Often the first priority, retirement of Covert road debt, was enough to exhaust the 50 per cent of the total grant available for the five priorities. If any remained, second, third, and fourth priorities still had to be satisfied before the cities were considered. Thus in

1934, 29 counties had no funds available for fifth priority distribution to the cities and villages within them. Of the remaining 54 counties that did share funds with the cities, 24 of them distributed less than ten per cent of their original grant.[21]

That this was becoming increasingly inequitable was revealed in a study by the Michigan Tax Study Advisory Committee. It reported that by 1945 the residents of cities and villages constituted 72 per cent of the state's population, owned 81 per cent of the motor vehicles, and paid 85 per cent of the user taxes.[22] Moreover, it was pointed out that of all motor vehicle miles travelled in Michigan, city streets accounted for one-fourth if urban state highways were excluded or one-half if the latter were included. Yet up to this time the cities had never received more than eight per cent of the total user tax collections.

After the weight tax and $6,550,000 of the gasoline tax were distributed to the counties and cities, the remainder of the gasoline tax (about $15 million in 1932) was reserved for use on the state trunkline system.

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[21]Derived from Bacon and Ford, Table XXVIII, pp. 156-59.

[22]Michigan Tax Study Advisory Committee, Preliminary Report, January, 1945, p. 39.

Four million of this amount was to be set aside each year to form a sinking fund for highway bond retirement; $5 million a year was to be used to meet maintenance costs, while the balance was for new construction. The Horton Act required that 25 per cent of this balance for construction be spent in the Upper Peninsula and 25 per cent in that part of the Lower Peninsula north of Townline 12. The result of "the Townline 12 requirement," as it became known, was to direct half of all new construction funds to the northern, relatively underdeveloped part of the state for the next 20 years. There is general agreement that this resulted in "a comparative overdevelopment of the favored areas in the north at the expense of highways in and near urban centers in the southern half of the Lower Peninsula."[23]

The McNitt Act and the Horton Act remained the primary determinants of the formula for distributing user revenues for two decades. Three changes after 1932 deserve mention, however. In 1937 state aid was made available to help counties with exceptionally heavy snowfall.[24] This snow removal grant of $200,000 was prorated on the basis of each county's "inch-miles" of snowfall, computed by multiplying the number of inches of snowfall

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[23]Hubert H. Frisinger, Michigan State Highway Expenditure Policy (Ann Arbor, 1954), p. 15. Also see Bacon and Ford, pp. 105, 121.

[24]P.A., 1937, extra session, No. 1.

over 60 by the number of miles of county roads. Also in 1938 an "antidiversion amendment" to the constitution was adopted, banning the diversion of any user taxes to purposes other than the meeting of highway needs.[25] The third change occurred in 1944 when a state liquor tax of ten per cent was adopted to supplement highway revenues. This single departure from a user tax structure by the state expired two years later and was not renewed.

Summary

The preceding discussion has traced Michigan's response to the problem of distributing state user revenues to local governments from its beginning in 1915, when the first user tax was collected and distributed, to 1951 when, as the next chapter explores, a major rebuilding of the distribution formula was undertaken. Table II-1 provides a chronological summary of the more important legislation determining the allocation of revenues in this period.

In appraising this record of Michigan's experience the following three observations appear especially significant in understanding the present formula. First, of course, is the ascendancy of state user taxes and the decline of local property taxes as the primary

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[25] Amendment to Michigan Constitution, 1908, Art. X, sec. 22.

Table II-1. Chronology of the methods used to allocate user revenues to Michigan counties, 1915-1951

(Note: No direct allocation of user revenues was made to the cities prior to 1951. After 1932, however, the Horton Act required that any of the county allocation remaining after four priorities had been met by divided between the county and the cities of the county on a population basis.)

Period	Amount to be Distributed	Basis for Distribution
1915-1925	1/2 of weight tax	weight tax collections
1925-1928	$6 million of weight tax	weight tax collections
1928-1932	Amount equal to 1/2 of weight tax: $6 million from weight tax, remainder from gasoline tax	7/8: weight tax collections 1/8: equally
1931-1932	McNitt Act - $2 million from gasoline and weight taxes in 1932, increasing to $4 million in 1936 and after	mileage of township (or "McNitt") roads
	Amount equal to 1/2 of weight tax continued	7/8: weight tax collections 1/8: equally
1932-1951	Horton Act - all of the weight tax plus $2,550,000 of the gasoline tax	7/8: weight tax collections 1/8: equally
	McNitt Act - $4 million (after 1936) of gasoline tax	mileage of township roads
1938	Snow removal allotment from gasoline tax: $180,000 before 1941, $200,000 after	"inch-miles" (county road mileage X inches of snowfall over 60)

revenue source for financing Michigan highways. It is this shift which generated the need for a formula to distribute revenues to local units in the first place.

Second is the much favored position enjoyed by the counties compared to the cities and villages in the first formulas adopted. At no time prior to 1951 did a formula directly allocate user revenues to cities for use on streets of a purely local character. Instead the cities achieved only a residual, fifth priority status under the Horton Act, receiving what funds might remain after various county claims had been satiated. A fortunate city found itself located in a county with a low debt burden, for then less of the user revenues were pre-empted by the county under the first three priorities; the less fortunate discovered their position not dissimilar to that of Mother Hubbard's. This inferior position of the cities relative to the counties in the receiving of state user revenues may explain in part why the cities have consistently surpassed the counties in raising funds locally.

A third observation concerns the increasing variety of factors utilized for allocating revenues in this period. Weight tax collections, road mileage, equal division, population, and "inch-miles" of snowfall all came to be used in the computation of each county's

share of the funds. When the present formula for distributing user revenues was adopted in 1951 its structure constituted a marked departure from the old, yet each of these previously used distribution factors reappeared in the new method. What the structure of the new formula is and how it operates is the subject of the next chapter.

Chapter III

Structure of the Present Distribution Formula

In 1951 Michigan's formula for distributing user revenues to local governments was drastically revised. Under Public Act No. 51 four major changes were made: (1) provision was made for an extensive reclassification of Michigan's roadways into five separate systems according to the type of traffic served; (2) the rates of both the gasoline and weight taxes were raised; (3) a new special fund, the Motor Vehicle Highway Fund, was created to receive all future user revenues prior to their distribution; (4) a new formula for distributing the proceeds of this fund was established, recognizing (a) that the distribution of highway revenues should take account of differences in highway needs, and (b) that cities should possess a status comparable to that of the counties in their eligibility for state funds. This legislation with some modifications, remains in effect as the present basis for collecting and distributing user revenues.

A few words should be said in explanation of the new system of road classification since this reclassification is instrumental in determining the distribution of revenues under the new formula. Before 1951 all roads fell within three classifications: county roads, city streets, and state trunklines. Township

roads had long been merged with the county system under the McNitt Act. The classification since 1951 preserves these three divisions, but further divides both the county roads and city streets into subclassifications according to a "predominate-use" principle. Thus about one-fourth of the 86,000 miles of county roads are classified "county primary roads" since they predominately serve as arteries for through traffic; the remaining three-fourths are classified "county local roads since they serve principally as land access roads for local residents. Similarly, the major arteries of cities other than about 1,600 miles of urban extensions of state and county highways are classified "city major streets." The remaining streets, upon which local traffic predominates, are classified "city local streets." Of the 15,000 miles of city streets, 4,000 are major and 11,000 are local streets. The remaining road system, the state trunklines, contains 9,300 miles of rural and urban highways, of which 1,100 belong to the federal Interstate System.

The formula for distributing revenues to these new classifications of roads deserves careful explanation since it is the focal point of the ensuing analysis. In actuality what has been referred to as "the" distribution formula is not one formula but a hierarchy of several formulas. Briefly, that hierarchy operates in the following way. First, each quarter the Motor Vehicle

Highway Fund is divided into three parts, representing the aggregate shares of the state, counties, and cities; then, the city and county shares are each divided into two parts, corresponding to the two road classifications of each of these local governments; finally the amounts for each type of road classification are prorated among the individual counties or cities according to a number of objective distribution factors. This overview and the structural chart on the next page should lend perspective for the following more intensive examination of each facet of the distribution formula.

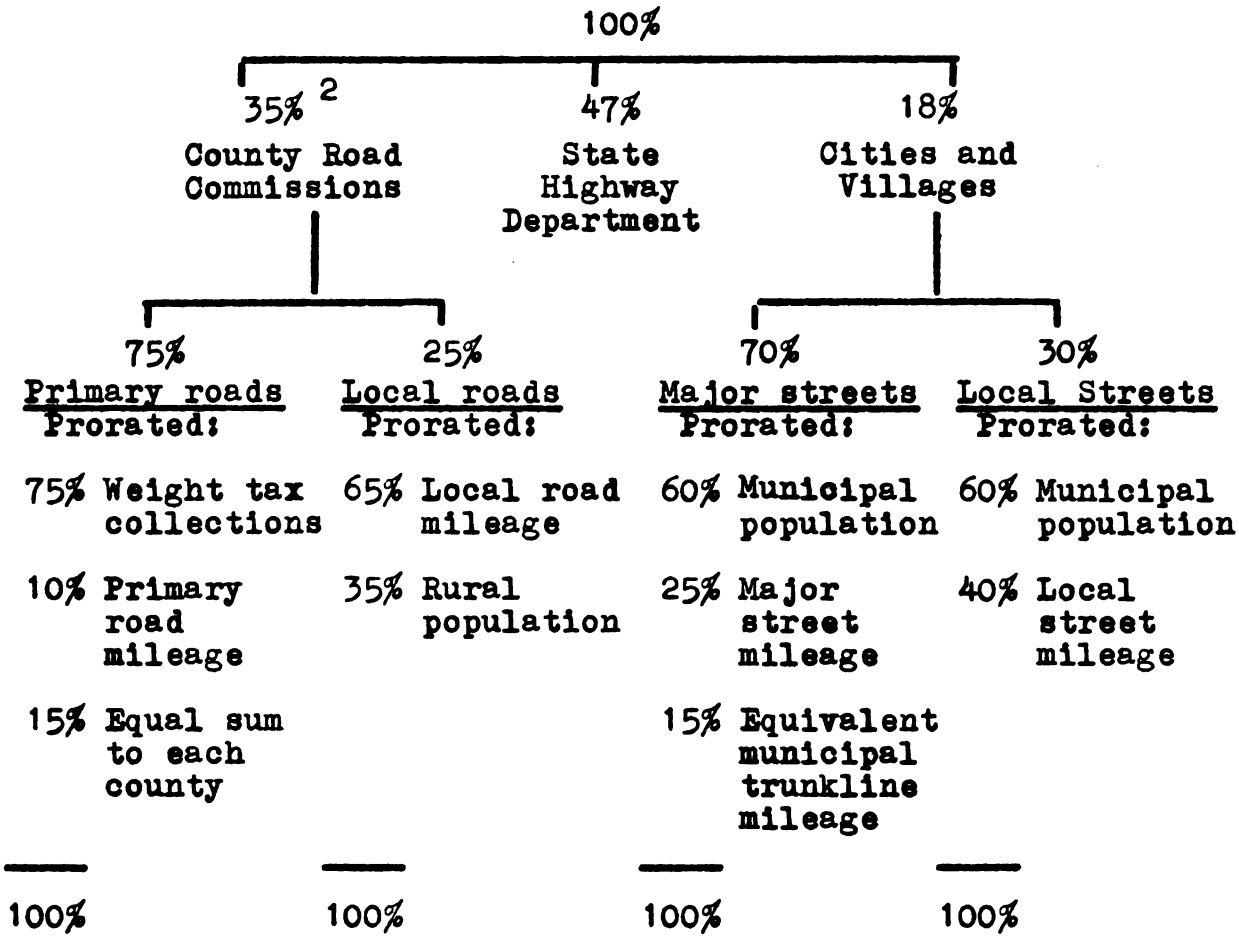
First Level Three-Way Division

Originally Act 51 provided that in the first level three-way division the state would receive 44 per cent, the counties 37 per cent, and the cities 19 per cent of the Motor Vehicle Highway Fund. These percentages were arrived at by compromises between conflicting interests. The new three-way division had the immediate effect of nearly doubling the cities' traditional share at the expense of the state's, leaving the counties' proportion relatively unchanged.

In 1955 the threefold division just described was complicated by the introduction of a second fund which also allocated to the state, counties, and cities. Act 87 of 1955 provided: (1) that the gasoline and weight taxes be increased; (2) that the additional proceeds resulting from the higher rates be deposited

Table III-1. Michigan's highway user revenue distribution formulas

Motor Vehicle Highway Fund[1]



[1]After deduction of collection expenses.

[2]From the 35 per cent share for counties, deductions for special grants for snow removal and registered road engineers are made prior to division of the balance into primary and local road funds.

Source: Denzel Cline, James Papke, and Milton Taylor, Michigan Highway Fiscal Study, 1961, Chapter IV.

in a second separate fund called the Highway Construction Fund; and (3) that the state receive 75 per cent of this fund, while the remainder would be divided between the counties and cities in the same proportion as their grants under Act 51. The act was primarily intended to spur construction on certain designated state highways, thereafter referred to as the "Act 87 highways." This use of two funds was abandoned two years later in 1957 when the Motor Vehicle Highway Fund again became the sole repository for user taxes.[1]

To more closely approximate relative differences in need, as revealed by an engineering study of 1955, the percentages of the three-way division were also changed in 1957 to those currently in effect, namely, 47 per cent for the state, 35 per cent for the counties, and 18 per cent for the cities. The 47 per cent share of the state requires no further division; but the 35 and 18 per cent shares accorded the counties and cities respectively are each redivided twice more.

Second Level Division According to Road Classification

Once the amounts of the aggregate county and city shares have been determined they are each divided into two unequal parts, distinguished on the basis of road classification. The 35 per cent allocated to the counties is divided 75 per cent for primary roads and

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[1] P.A., 1957, No. 262.

25 per cent for local roads; and the 18 per cent allocated to the cities is divided 70 per cent for major streets and 30 per cent for local streets.[2] These particular weightings are the product of two considerations. First consideration is given to the relative differences in future needs for the road classes in question. The ratio of primary to local county road needs and the ratio of major to local street needs provide some indication of how highway revenues should be apportioned. The needs data, however, are qualified by a second consideration: the degree to which the state is willing to commit itself to the financing of the road and street needs of local governments. The Michigan legislature has generally agreed that all needs on primary roads and major streets qualify for state aid. It also has agreed that at least a part of the needs on local roads and streets qualify, although the specific amount has been a subject of some controversy. Some legislators hold that no more than one-half of the local road and street needs should be eligible for state assistance. Others advocate a larger amount. When, in the revision of 1957, the governor threatened

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[2]Actually a small (about one per cent) deduction is made from the counties' 35 per cent share before it is divided according to primary and local roads. This deduction is for two special payments. First, to those counties employing a fulltime registered highway engineer a grant of $5,000 per year is paid. Second, to those counties with over 70 inches of snowfall in the preceding year a snow removal grant is given, to be distributed on the basis of "inch-miles" of snowfall.

to veto the entire bill unless the state's obligation for local roads and streets was clearly limited in some fashion, a compromise was reached whereby no state funds could be used for construction on local roads and streets unless matched dollar-for-dollar with locally contributed funds. Thus the 30 per cent of the city share for local streets and the 25 per cent of the county share for local roads are intended to meet only a portion of the total needs on these two road systems.

Each of the four grants labeled for use on a particular road classification undergoes one further division: its dispersion among individual local administering units.

Third Level Division Among Individual Local Governments

So far the percentages of the formula have been largely determined by relative proportions of highway needs as reported by engineering analysis, although the division according to road classifications was based in part upon a concept of a limited state interest in some roads and streets. For the final division of the four amounts among the 83 individual counties and the 510 (as of March, 1961) separate cities and incorporated villages, however, highway needs as the basis for distribution are abandoned in favor of "more objective" factors.

The Allocation to Counties.

The 75 per cent share earmarked for use on county primary roads is allocated to the individual counties on the basis of three factors;

75 per cent is prorated according to each county's proportion of the total motor vehicle weight tax collections;

10 per cent is prorated according to each county's proportion of primary road mileage;

15 per cent is divided equally.

The remaining 25 per cent of the county share earmarked for use on local roads is apportioned among the individual counties by a two-factor formula:

65 per cent is prorated according to each county's mileage of local roads;

35 per cent is prorated according to each county's proportion of rural population.

It is apparent that since each county is likely to have a unique combination of distribution factors, each will receive a unique ratio of primary to local funds. Thus the 75-25 ratio between primary and local roads is true only in the aggregate, and does not apply to the relative shares of any particular county. In 1961, for example, Wayne County's proportion of local road funds was the lowest of all counties at 6.7 per cent, while Sanilac County's was highest at 48.9 per cent.[3]

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[3]From data supplied by the Michigan State Highway Department, Local Government Division.

The Allocation to Cities and Villages.

The 70 per cent share intended for use on municipal major streets is divided among individual cities and incorporated villages according to three factors:

60 per cent is prorated according to urban population;

25 per cent is proportioned according to major street mileage;

15 per cent is prorated on the basis of equivalent municipal trunkline mileage.

This last factor, the so-called EMTM factor, requires some explanation. Under the Dykstra Act of 1931 the larger cities were obligated to share in the cost of constructing those portions of state trunklines lying within their incorporated boundaries. The revision of 1951 did not repeal this obligation. Instead, the factor of "equivalent municipal trunkline mileage" was included in the distribution formula for the declared purpose of reimbursing the larger cities for their Dykstra Act payments to the state. The factor is computed by multiplying each city's urban trunkline mileage by the percentage of construction cost for which it is obligated.[4]

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[4]Prior to 1957 the percentage obligation of the cities under the Dykstra Act were exactly double the figures cited on the next page and the EMTM reimbursements equalled 25 per cent of the major street allotment. The present schedule of percentage obligations and the reduced EMTM factor of 15 per cent of funds were adopted in 1957 as a step toward Dr. Richard M. Zettle's recommendation in the 1955 fiscal study that the entire Dykstra-EMTM arrangement be repealed. (See Richard M. Zettle, Financing Modern Highways for Michigan (East Lansing, 1955), pp. 27 and 69.)

These percentages under Act 51, as amended in 1957 by Act 262, are as follows:

Over 50,000 population. . . . . .25 per cent
40,000-50,000 population. . . . .22½ per cent
30,000-40,000 population. . . . .17½ per cent

In the eight-year period from 1952 to 1960, 28 cities with populations over 30,000 were subject to the Dykstra Act and hence were eligible for the EMTM reimbursements. The record for these years reveals that not only is it pointless to require cities to share in a cost and then reimburse them for it--it is also quite inequitable. Five cities paid nothing in Dykstra obligations, yet received "reimbursements" totaling $1,054,220; Detroit, on the other hand, rebated $6,171,680 more to the state than it received. For the 28 cities as a whole, $10.3 million more was received under the EMTM factor than was paid under the Dykstra obligation.

The remaining 30 per cent of the city share allocated for use on local streets is divided among the various municipalities by a two-factor formula as follows:

60 per cent is prorated according to urban population;

40 per cent is prorated according to local street mileage.

As with the counties a word of caution must be injected concerning the interpretation of the effect of the formula upon the individual cities. The 70-30 division according to major and local streets is true in the

aggregate only, and not for individual cities. Differences in the relative significance of major and local street mileage and in the EMTM factor make each city's ratio of major to local user revenue receipts a unique one.

The Transfer Option to Provide Flexibility

While the city and county shares of the user tax revenues are allocated to specific road systems, some discretion in their use between road systems is permitted under a transfer option. Under this option a county or city may transfer up to 25 per cent of the amount received for one road system to use on the other. (City transfers from local to major streets may be of any amount, however.) Ostensibly the transfer option was meant to meet emergency situations, and consequently the approval of the State Highway Commissioner was required for all transfers exceeding 10 per cent. In practice, however, approval of transfers is seldom refused.

This option provides more flexibility in some instances than perhaps was intended by the framers of the provision. Consider the case of a county such as Wayne which receives a relatively large proportion of its total allotment for one road classification. If Wayne County were to transfer 25 per cent from major to local streets it could more than double its local street funds. In other instances very little flexibility results. For

example in 1961 the village of Melvin could have transferred $93.52 to its major streets if or when "disaster" strikes.

Summary

Thus the entire formula for distributing user tax revenues under Act 51 of 1951 is a composite of seven subformulas: a tripartite formula determining the aggregate state, county, and city shares; two formulas allocating county and city shares according to four road systems; and four formulas allocating the amount available for each road system among the individual local administering units.

The factors for distribution at the local unit level include: (1) four classes of road and street mileage, as defined by Act 51 and certified by the State Highway Department; (2) urban and rural population, as reported in the federal population census and adjusted for annexations and new incorporations; (3) motor vehicle weight tax collections for the four quarters preceding the quarter of distribution; (4) equal division; and (5) equivalent municipal trunkline mileage.

In 1959 only one state, Illinois, distributed a greater percentage of user revenues to local governments than the 50.5 per cent distributed by Michigan.[5] No state

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[5]U.S. Department of Commerce, Bureau of Public Roads, Highway Statistics, 1959, Table DF 1959, p. 37. Illinois distributed 52.4 per cent of its user revenues to local units in 1959.

used more factors to accomplish that distribution than the five used by Michigan.

Chapter IV

Deriving A Test of Formula Performance

It is scarcely conceivable that the time will come when all of Michigan's 110,000 miles of roads and streets are built to a standard that entirely satisfies the safety and convenience desires of all motorists. In fact, like the Red Queen of Alice in Wonderland, Michigan finds itself having to run faster and faster just to maintain its present position in highway development. Two factors help account for this. First, highway construction is not a onetime affair; highway deficiencies reappear as present facilities succumb to increasing traffic flows and the weathering of a variant climate. The Bureau of Public Roads estimates that even the highest types of highways have a life span of no more than 25 years; for the lower types of roads such as gravel or low-grade bituminous paving, the deterioration period is considerably less.[1]

The second factor intensifying the problem of maintaining even the present level of service is the rising cost

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[1]Michigan State Highway Department, Planning and Programming Division, Procedures and Instructions for Determining Municipal Street Needs (Lansing, 1958), p. 28.

of a mile of highway over the last ten years. Among others, the following reasons can be cited for this: (1) The increased density of traffic flows requires a greater carrying capacity that cannot be met simply by adding a third lane--as the disastrous consequences of the three-lane highways built in the 1930's testify. (2) The increased speeds at which automobiles travel demand more gradual curves, firmer and wider shoulders, reduced slopes, and in more and more cases, limited-access features which are extremely expensive. (3) The increased width and weight of automobiles and trucks require compensating increases in the width and strength of pavements. (4) Finally, highway costs, like living costs, have experienced inflation. Even if highway design standards had not undergone the considerable change that they have, the cost of building a mile of highway still would be almost double that for the same mile in 1940.[2]

Since it is improbable that all needed highway improvements can be met completely, the principle has been accepted that highway revenues should be allocated to fulfilling those needs which would provide the greatest benefit to motorists. Thus an optimum allocation can be defined, for the moment, as one in which no administering unit receives a greater proportion of revenues than its proportion of highway needs will justify.

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[2]Michigan State Highway Department, Michigan's Highways, 1960-1980, A Summary Report (Lansing, 1961), p. 17.

To apply such a performance criterion to the present formula for allocating highway user taxes obviously requires that an extensive engineering study of each administering units highway needs be undertaken. Fortunately, just such a study has been conducted in Michigan on three separate occasions. The first study, Highway Needs in Michigan, An Engineering Analysis, appeared in 1948 under the joint sponsorship of the Michigan Good Roads Federation and the Legislative Highway Study Committee. This study was instrumental in determining the percentage weightings of the 1951 distribution formula. The second study, Modern Highways For Michigan, appeared in 1955 and was again influential in revising the formula. The most recent study, conducted by the Michigan State Highway Department, was released in 1961 under the title, Michigan's Highways, 1960-1980, A Summary Report. Present law requires that further studies be conducted at regular intervals.[3]

The three studies made thus for are not strictly comparable. The first two studies were made on a contractual basis by the engineers of the Automotive Safety Foundation, Washington D.C. The latest study represents the first one by Michigan's State Highway Department. In addition, both the highway standards adopted and the method of analysis employed were changed with each. Since the most recent

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[3] P.A., 1951, No. 51, sec. 9a, as amended by P.A., 1957, No. 153 and No. 262.

of these studies is the one to be used to test the performance of the present formula, a closer look at how it was carried out is warranted.

The 1961 Highway Needs Study

The State Highway Department, the 83 counties, and the 101 cities of over 5000 population in 1950, each submitted estimates of its anticipated highway needs for the 20-year period, 1960-1980. To promote a fair degree of uniformity, the State Highway Department required that standardized estimating procedures be followed by each local unit. To insure that such procedures were adhered to, the reports submitted by the local governments were audited by local screening committees cooperating with the State Highway Department and in some cases were returned to the local units because too much or (as in the case of Detroit) too little had been included in the future cost estimates. For the 409 cities under 5000 population it was felt that local personnel with adequate training to conduct independent needs studies were lacking. Consequently, the State Highway Department estimated the needs of these cities as a group on the basis of a representative sample. Thus separate dollar estimates of highway needs for 1960-1980 are available for the State Highway Department and each county and city, except those cities with a

1950 population under 5000. For the latter, group estimates alone are available.

Needs estimates were required to be determined in the following way. First a distinction was made between construction needs and maintenance needs. The State Highway Department established uniform yearly maintenance rates for different classes of roads, which the local units were required to use. Construction cost estimates were the outgrowth of several considerations. First minimum engineering standards were established for certain classes of roads. No road was to be built with less than six inches of gravel surfacing or with a surface width of less than 20 feet. Under this requirement the several thousand miles of dirt roads and sand trails found in the county local road system automatically rate deficient, even those which may serve only two or three cars per month. Minimum standards also require that county primary roads receive at least a low-grade form of paving. Higher minimum paving requirements are set for state highways.

Minimum safety requirements are established for all types of roads, and govern such features as gradation, curvature, and stopping sight distance. A second consideration is the character of traffic served by road; if a county local road is either a mail route or a school bus route then it qualifies for slightly more than minimum construction standards.

A third factor in preparing estimates of construction cost is the present and future density of traffic flow during times of peak flow. Many of the roads of northern Michigan which are relatively deserted for nine months of the year nevertheless qualify for higher construction standards because they serve large numbers of tourists in the summer months. The probable future density of traffic flows also influences the needs estimates. The 33 billion vehicle miles traveled in Michigan in 1961 are expected to increase by 91 per cent by 1980.[6] Consequently, a part of the dollar needs for 1960-1980 represent construction expenditures for sections of road currently adequate to serve traffic but expected to be deficient under the anticipated future traffic loads.

Finally, the present age and state of repair of each section of road is considered. Since, as has been observed, highway revenues are never sufficient to meet all highway needs, highway administrators are dogged by a persistent backlog of unmet needs which the current state of repair may reflect only too well.

To assist local units further in preparing their construction needs estimates, a schedule of per mile construction costs for typical types of roads is provided. These schedules are very complete, distinguishing, for example, between the costs of road construction on light

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[6] Michigan's Highways, 1960-1980, p. 10.

and on heavy soils.[7] Unlike the maintenance estimates, the construction estimates are not a mandatory guide. But if a local unit submits estimates significantly above the suggested schedule, it must be prepared to show how local conditions warrant the larger amount.

Once each unit has derived maintenance and construction cost estimates for each section of road under its jurisdiction it becomes an easy step to add these estimates to get primary and local county road needs or major and local city street needs for each unit and for the state as a whole. Table IV-1 presents the results of the 1961 study of 20-year highway needs according to the type of road system on which they are found. It reveals that 47.3 per cent of all needs are on the 8.4 per cent of total road mileage comprising the state trunkline system, while 33.7 per cent of needs are on the county road system, and 19.0 per cent are on the city street system.

The Concept of "User Revenue Needs"

Momentarily, an optimum distribution formula has been defined as one which allocates revenues among the state, counties, and cities in accordance with relative differences in highway needs. In light of the standardized

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[7] Procedures and Instructions for Determining County Road Needs, p. 41.

Table IV-1. The distribution of highway needs, road mileage, and travel among the state, counties, and cities

Road System		Engineering Needs[1] (millions)	Per Cent of Total Needs	Per Cent of Total Road Mileage[1]	Per Cent of Vehicle Miles Traveled[2]
State		$5,258	47.3%	8.4%	54.6%
County					
Primary	$1,813				
Local	1,844	3,657	33.7	77.9	24.4
City					
Major	$1,248				
Local	879	2,127	19.0	13.7	21.0
Totals		$11,041	100.0%	100.0%	100.0%

[1] From Michigan's Highways, 1960-1980.

[2] Based on estimates of 1970 travel in millions of vehicle miles prepared by the Office of Planning, Michigan State Highway Department.

procedures used and the care taken in auditing individual reports, it appears reasonable to accept the 1961 engineering needs study as a reliable index to such relative differences in need. But before these needs figures can be used to test the present formula's distribution of user revenues, three adjustments are required:

(1) In addition to the engineering needs reported in the 1960-1980 needs study each level of government has some needs which have been met with borrowed funds and consequently must be paid for out of future revenues. Accordingly the projected amounts of service on debt incurred prior to January 1, 1961 ought to be added to each unit's engineering needs to determine its full physical and monetary needs. To fail to do so would reward those units which have borrowed little, and as a consequence have a greater proportion of their needs in the unmet engineering category rather than in the completed but unrepaid monetary category.

(2) User revenues deposited in the Motor Vehicle Highway Fund are not intended to meet all of the engineering and monetary needs computed for each unit. Some of these needs are to be met from federal aid funds granted to Michigan.[8] Therefore 20-year estimates of federal aid

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[8]The Federal Aid Act of 1916 and the Federal-Aid Highway Act of 1956, as amended. For the five-year period ending in 1961 federal grants accounted for 17 per cent of all highway expenditures in Michigan. See Michigan's Highways, 1960-1980, p. 44.

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for state highways and county primary roads, as projected by the State Highway Department, ought to be deducted from the respective 20-year estimates of needs for each of these systems. No federal aid is granted for city streets.

(3) It is generally agreed that highway users should not bear the full cost of providing roads; benefits from improved highways also accrue to nonusers, examples being increases in property values for property owners and larger marketing areas for merchants. Consequently, the portion of needs on each road system not properly chargeable to user responsibility should be determined and then deducted from the total needs of that system.

The amounts that should be added for debt service and those subtracted for federal aid in steps (1) and (2) are easily determined. But several alternatives present themselves in step (3). One would be to accept the position which limits the nonuser share to one-half of the construction needs on local roads and streets. Taking this view results in a total nonuser share of $885 million.

A second position would be to adopt the proposal that one-half of all local road and street needs, including maintenance as well as construction needs, should be treated as the responsibility of nonusers. This view would increase the total nonuser share to $1,361 million.

A third approach would be to seek a division of user and nonuser shares consistent with current theories of highway finance. This approach was, in fact, taken by the highway fiscal group in 1961. Two methods of allocating highway costs between users and nonusers, the earnings-credit method and the relative-use method, were employed. Because the allocation of costs between users and nonusers is a key variable in testing the present formula, a closer examination of these two methods is warranted.

Briefly, the earnings-credit method[9] is as follows: (1) The maximum user responsibility for each road classification is determined by first assuming 100 per cent user responsibility for interstate and primary state trunklines and then multiplying the cost per vehicle mile on these roads times the anticipated number of vehicle miles to be travelled on each of the other road systems; (2) The maximum nonuser responsibility is determined by first assuming no user responsibility for local roads and then multiplying the cost per mile of these roads times the mileage on each of the other road systems; (3) A compromise is struck by averaging the results of these two cost assignments.

Applying this method, the fiscal study found the nonuser share of all highway needs to be 36.09 per cent.[10]

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[9]Denzel Cline, James Papke, and Milton Taylor, Michigan Highway Fiscal Study, 1961, Chapter VIII.

[10]Ibid.

More specifically, the nonuser share was 76.96 per cent for local roads and 71.89 per cent for local streets. It was found that even county primary roads and state secondary highways should receive over 40 per cent of their support from nonuser sources.

The second current method for dividing highway costs among users and nonusers, the relative-use method, was also used by the fiscal study. Under this method highway useage is divided into three types, through travel, neighborhood travel and property access travel. Then the per cent of travel that is neighborhood and land access on each road system is said to represent that system's share of nonuser cost responsibility. For all road systems as a whole, 29.58 per cent of the travel was of either the neighborhood or access type, implying that 29.58 per cent of all highway needs should be paid by nonusers. As with the earnings-credit method, the relative-use solution yielded substantially higher percentages for the lowest classes of roads; the nonuser shares for local roads and streets were found to be 51.1 and 54.3 per cent respectively.

Having determined the nonuser share of highway costs by each of these two theoretical methods, the highway fiscal study group encountered what they felt to be a dilemma in applying their findings. An assignment to nonusers of 30 per cent of the total anticipated needs

constituted an amount so far above the amount habitually contributed by nonusers as to appear unreasonably burdensome on local taxpayers. The fiscal study staff proposed a compromise between theory and expediency, recommending an "alternative solution" in place of an "ideal solution." According to this compromise the nonusers would be expected to contribute 20 per cent of all those highway needs remaining after anticipated federal aid had been deducted. The $1,831 million thus assigned to nonusers would then be divided between the cities and counties in proportion to their total respective needs and subtracted from their local road or street needs.[11]

This assignment of nonuser responsibility by the fiscal study staff is open to two criticisms. First, the staff began with the assumption that all of the nonuser share, regardless of its composition according to road system, should be charged entirely against the needs on local roads and streets. The same assumption was also made by Zettle in the 1955 fiscal study and is embodied in the current distribution formula under Act 51 of 1951. But both the earnings-credit method and the relative-use method assigned a substantial portion of the nonuser share to the higher road classes, such as the

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[11] Denzel Cline, James Papke, and Milton Taylor, Michigan Highway Fiscal Study, 1961, Chapter XI. (The deduction of federal aid was first made by Papke in Chapter VIII.)

county primary, city major, and state secondary systems. To charge the nonuser assignments for all systems to the local road and street systems does no violence to theory if nonusers subsequently pay the full amount expected of them. But if the nonuser contribution should be less than expected, and most forecasters agree that it will be, then the development of local roads and streets will be unfairly retarded, for their user revenue receipts will have been excessively diminished by the overly-large nonuser adjustment. The higher road classes, on the other hand, will receive proportionately more user revenues than deserved since no nonuser adjustment was made for them. Clearly the amount of the nonuser assignment for any particular road system should not include amounts assigned to other systems.

The second criticism may be addressed to the deduction by Papke of federal aid before computing the user and nonuser shares in Chapter VIII of the study. No purpose is served by distinguishing federally collected user taxes from state collected user taxes; both of them represent a payment by Michigan highway users toward discharging their share of highway costs. In fact, Michigan highway users pay several times more in federal user taxes than the amount returned in federal highway aid. Regardless of how or by whom user taxes are collected they remain payments by users and should be credited as such.

With the hope of providing a solution that avoids these criticisms, yet is both realistically acceptable and theoretically tenable, the following division of Michigan highway costs between users and nonusers is offered. First, the present de facto recognition that certain higher class highways should be financed entirely from taxes on users should become a formal statement of highway policy. Such a policy would be consistent with the "predominant-use" theory of highway finance, in which all costs on a particular road system are assigned to those who predominantly benefit. Of Michigan's five classifications of roads it is suggested that the state trunklines, the county primary roads, and the city major streets be officially designated the financing responsibility of highway users. The fiscal study staff tacitly adopted such a policy conclusion when they deducted no nonuser share from the needs on these road systems.

Second, it is suggested that for the remaining two road classifications, county local roads and city local streets, both users and nonusers should share in the financing. Until one method is shown to be definitely superior to the other, it is proposed that the earnings-credit and the relative-use assignments of the user and nonuser shares of local road and street costs (but not of all costs) be averaged to determine the percentage of cost on each of these systems which should be borne by

nonusers. As shown in Table IV-2, adopting this method would yield a nonuser share for the period 1960-1980 of 64.03 per cent of county local road needs and 63.11 per cent of city local street needs. Since the average of the county and city assignments differ by only 0.92 per cent, an even 64 per cent was selected for both. Table IV-3 brings together for quick comparison the six ways of determining the nonuser shares which have been considered. A nonuser share based on one-half of local road construction needs yields the lowest nonuser share at 32.5 per cent of local road needs while the earnings-credit solution yields the highest at 75.4 per cent.

In review, the raw engineering needs reported in the 1961 needs study require three modifications before they may be used to test the present distribution formula. First, service on debt incurred before the date of the study must be added to the engineering needs, since such debt service represent needs completed before the needs study was made, but which nevertheless must be paid for from future revenues.[12] Second, those needs which will be met from federal highway aid should be deducted, since they have no claim upon the user revenues allocated by Michigan's

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[12]Properly all debt service incurred prior to the needs study in 1961 should be deducted. A practical problem arises, however, from the fact that figures are available only for the debt for which users revenues are pledged in repayment.

Table IV-2. A suggested basis for assigning the nonuser share of highway costs

	County Local Roads		City Local Streets	
I. Per Cent Nonuser Share :				
A. Earnings-credit method	76.96%		71.89%	
B. Relative-use method	51.09%		54.33%	
C. Average	64.03%		63.11%	
II. Dollar Nonuser Share :				
A. Total engineering needs	$1,843,661	(100%)	$878,920	(100%)
B. Nonuser share	1,179,943	(64%)	562,509	(64%)
C. User share	663,718	(36%)	316,411	(36%)

Source: Earnings-credit and relative-use percentages from Michigan Highway Fiscal Study, 1961, Chapter VIII.

Table IV-3. Alternative assignments of the nonuser share of highway costs

Basis for Assignment	Amount Assigned Expressed As: Dollar Amount (In millions)	Per Cent of Local Needs[1]	Per Cent of Total Needs
One-half of local construction needs	$ 885	32.5%	8.0%
One-half of all local needs	1,361	50.0	12.3
Fiscal study staff solution[2]	1,831	67.2	16.6
Earnings-credit solution[3]	2,052	75.4	18.6
Relative-use solution[4]	1,414	51.9	12.8
Average solution[5]	1,742	64.0	15.8

[1] Local road needs of $1,884 million plus local street needs of $879 million, or $2,723 million.

[2] 20 per cent of (total needs less federal aid).

[3] 77 per cent of local road needs plus 72 per cent of local street needs.

[4] 51 per cent of local road needs plus 54 per cent of local street needs.

[5] 64 per cent of local road and street needs.

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distribution formula. Third, the portion of highway needs which ought to be borne by nonusers in the form of locally contributed, nonuser taxes should also be deducted from total needs, on the grounds that nonusers, as well as users, benefit from improved highways.

The effect of these modifications is to establish what portion of each unit's needs qualify for the state user revenues allocated under the distribution formula. For convenience these needs, which are the sum of engineering needs and monetary needs minus federal aid and the non-user local contribution, may be defined as user revenue needs. An optimum distribution formula can now be defined more precisely as a formula which gives to each unit a proportion of user revenue that is neither more nor less than that unit's proportion of user revenue needs. When this condition is fullfilled no individual unit or road system will become comparatively overdeveloped at the expense of another.

The Test Procedure

The statistical technique for testing the present formula for its accuracy in allocating in proportion to user revenue needs is relatively simple and involves four steps:

(1) An arbitrary amount of funds is apportioned to each road system and individual unit according to the present distribution formula.

(2) The same amount is apportioned again, this time in proportion to each road system or unit's

proportion of user revenue needs.

(3) The dollar difference is computed by subtracting the amount received on the basis of need from the amount received on the basis of the present distribution formula; if the latter is less than the former, then the dollar difference is given a negative sign to indicate that unit currently receives less than its proportion of needs warrants. Conversely, a positive dollar difference indicates a unit currently receives more than its proportion of needs warrant.

(4) The positive or negative dollar difference (3) is divided by the amount received according to need (2) and expressed as a correspondingly positive or negative per cent. This figure may be interpreted as the percentage by which the allocation under the present formula is less than (minus sign) or greater than (plus sign) an allocation of the same amount on the basis of user revenue needs.

The percentage figures computed in step (4) are the most revealing. They provide a measure of the relative degree by which distribution under the present formula departs from an optimum distribution. Three points should be remembered in interpreting these percentages. First, an ideal distribution formula would yield zero percentage differences in every case, indicating no road system or

unit receives proportionately more or less than its share of user revenue needs. This is true by definition since an ideal distribution has been defined in advance as one in proportion to user revenue needs.

Second, a reviewing of the statistical procedure will reveal that the percentages of difference will remain the same regardless of the total amount chosen to be distributed, so long as the same arbitrary amount is distributed first by the present formula and then according to needs. Thus it is possible to have a perfect distribution of user revenues even if the total amount to be distributed is known in advance to be insufficient to meet each unit's needs in their entirety. Conversely, it is possible to have enough funds to meet all needs and yet misallocate them among the individual administering units. The percentage differences, therefore, represent deficiencies or surpluses in the proportions in which revenues are being allocated and not deficiencies or surpluses in the total amount of revenues received relative to total needs. Suppose, for example, that a particular city is found to have a positive 68 per cent of difference between its present allocation and a user revenue needs allocation. This does not mean the city receives more funds than it has needs; it means, rather, that the city receives a greater proportion of user revenues than its proportion of needs can justify. It is errors in cutting the pie that are being measured, not deficiencies in the size of the pie.

Third, the percentage differences for each individual city or county can be averaged to provide a measure of how the city or county formulas perform as a whole. In adding the individual percentages for the purpose of averaging, however, plus and minus signs must be disregarded; otherwise plus errors would be cancelled by negative errors. The average per cent figure must therefore be interpreted as simply the average deviation from an optimum distribution, with no distinction as to the positive or negative direction of this deviation.

The preceding has given only a general overview of the test procedure used to test the current formula; omitted are the intricacies and peculiarities encountered in applying such a test--these are more appropriately discussed when they arise under each specific test.

Chapter V

Performance of the Present Formula

Prerequisite to any precise evaluation of the performance of Michigan's present formula for distributing highway user revenues are, first, a definition of what comprises an ideal formula, and second, a method of comparing the existing formula with the ideal. To meet the first requirement Chapter IV defined an ideal formula as one which allocates user revenues among road systems and individual units in proportion to their respective shares of user revenue needs. User revenue needs were in turn defined as all engineering and monetary needs less that amount to be met from federal aid and local contributions.

To meet the second requirement Chapter IV outlined a method for computing the degree to which the existing distribution deviates from an ideal distribution. This degree of deviation may be expressed statistically as the percentage by which the distribution of a given amount according to the present formula is greater (plus sign) or less (minus sign) than a distribution of the same

amount on the basis of user revenue needs. This chapter undertakes the application of these concepts to each of the three levels of Michigan's user revenue distribution formula.

Testing the State-County-City First Level Division

Under the first level division of the highway user taxes deposited in the Motor Vehicle Highway Fund, 47 per cent is allocated to the state, 35 per cent to the counties, and 18 per cent to the cities. It is the appropriateness of these percentages that is to be considered in the following first level test.

The respective user revenue needs of the state, counties, and cities were derived from the following computations:

(1) To the 20-year engineering needs estimate for each of the three levels of government was added that level's anticipated amount of 20-year service on debt incurred before January 1, 1961.[1] (See Table V-1, lines (1), (2), and (3).) Of the projected $650 million in such debt service, about five-sixths is the responsibility of the state.

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[1]While logic dictates that the service on all debt incurred before January 1, 1961 should be counted as part of user revenue needs, figures were available only for that portion (comprising a major share) for which future user revenue receipts have been pledged in repayment.

Table V-1. Derivation of state, county, and city user revenue needs, 1960-1980

(in thousands of dollars)

	State	Counties	Cities
(1) Total physical needs:	$5,258,180	$3,656,600	$2,126,700
(2) Plus service for pre-1961 debt:	513,235	50,504	86,509
(3) Total physical and financial needs:	$5,771,415	$3,707,104	$2,213,209
(4) Less projected federal aid:	-1,777,620	-106,547	---
(5) Less local nonuser contribution:	---	1,179,943	-562,509
(6) User revenue needs:	$3,993,795	$2,420,614	$1,650,700
(7) Per cent of total:	49.52%	30.01%	20.47%

Source: Derived from Michigan's Highways, 1960-1980, and from data supplied by the Michigan State Highway Department.

(2) Twenty-year estimates of federal aid for state trunklines and county roads were deducted from the total of engineering and monetary needs of each of these systems. (Table V-1, line (4).) Almost all of the $1,884 million anticipated in federal aid is scheduled to be received by the state. Under present law no federal aid is given to municipalities.

(3) From the engineering and monetary needs remaining after deducting federal aid was subtracted that portion of county and city needs which ought to be met from locally contributed, nonuser revenues. (Table V-1, line (5).) The $1,742 million so deducted was derived along the lines suggested in Chapter IV, that is, by averaging the relative-use and earnings-credit assignments to local roads and streets.

The balance remaining for each level of government represents its share of user revenue needs. For the years 1960-1980 the state has $3,994 million, the counties have $2,421 million, and the cities have $1,651 million in user revenue needs.

The second step in testing the first level distribution is to apportion a given amount first on the basis of the present formula and then on the basis of user revenue needs. The two distributions can then be compared to determine the degree to which the present formula errs. While any given amount could be validly selected for test distribution,

the $212.2 million actually distributed from the Motor Vehicle Highway Fund in 1961 was chosen to give realism to the dollar differences as well as the percentage differences between the two distributions. The results of these two distributions and the dollar and percentage amounts by which present allocations depart from the ideal are presented in Table V-2.

The adjustment in line (2) takes account of the fact that not all of the amount allocated to the cities is available to meet city needs; present law requires that those cities over 30,000 population must rebate to the state a portion of any construction costs incurred from improving state trunklines within their corporate limits. Consequently, the city share has been diminished, and the state share increased, by the amount of the projected annual Dykstra Act payments by cities of their share of trunkline construction costs.[2]

That the present first level formula fails to allocate optimally is highlighted by the dollar and percentage differences derived in lines (5) and (6). In dollar terms the most flagrant error is the amount presently allocated

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[2]The Planning and Programing Division of the State Highway Department estimated that Dykstra payments would total $51,200,000 for the years 1960-1980. This represents an annual average of $2,560,000, the amount used in making the adjustment.

Table V-2. First level test of the aggregate state, county and city allocations

	State	Counties	Cities
(1) $212.2 million distributed according to existing formula:	$99.7	$74.3	$38.2
(2) Adjustment for the projected annual Dykstra payments, 1960-1980:	+2.6	--	-2.6
(3) Amount available to meet needs:	$102.3	$74.3	$35.6
(4) $212.2 million distributed in proportion to user revenue needs:	105.1	63.6	43.5
(5) Dollar difference (line (3) minus line (4)):	$ -2.8	$10.7	$-7.9
(6) Percentage difference (line (5) divided by line (4)):	-2.66%	16.82%	-18.16%

to the counties; in 1961 the county allocation was $10.7 million, or 16.8 per cent, larger than a distribution on the basis of user revenue needs will justify. The state and the cities, on the other hand, currently receive less than their needs justify. For the state this deficiency is only -2.7 per cent less, but for the cities it is 18.2 per cent less. Placed in terms of the next twenty years, these percentages mean that of their projected total revenues, the counties would receive a total of $384.7 million more than is justifiable in terms of their user revenue needs. This same amount also represents the combined state and city deficiencies which could be expected to result.[3]

Thus these percentage deviations, while of modest size, mean that significantly large absolute amounts of revenues will be misallocated under the first level division in the coming years if no revision is made. Such misallocations would be in addition to any percentage deviations attributable to the second and third level stages of the total distribution formula.

Testing the Second Level Division by Road Classification

At the second level the formula divides the city and

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[3]This estimate is based on the 20-year user revenue projections presented by the fiscal study staff: Denzel Cline, James Papke, and Milton Taylor, Michigan Highway Fiscal Study, 1961, Chapter VIII.

county shares according to road classification. The county allotment is divided 75 per cent for primary roads and 25 per cent for local roads; the city allotment is divided 70 per cent for major streets and 30 per cent for local. Do these percentages yield an optimum allocation between road systems? The following two second level tests, conducted in the pattern of the first, provide a basis for judgment.

The 75-25 Division of the County Share. The derivation of the user revenue needs of each road classification is complicated by the fact that the amounts of projected debt service are not classified according to road system. Consequently, user revenue needs shall be taken to be total primary engineering needs minus federal aid and total local engineering needs minus the local nonuser contribution, as shown below:

	Primary Roads	Local Roads	Total
Total engineering needs:	$1,812,940	$1,843,660	$3,656,600
Less federal aid:	-106,547	---	-106,547
Less nonuser contribution:	---	1,179,943	-1,179,943
User revenue needs:	$1,706,393	$ 663,717	$2,370,110
Per cent of total:	72.00%	28.00%	100.00%

(thousands of dollars)

To complete the test, $74,615,000, an amount typical of the county share in recent years, is allocated to the two road systems, first as the present formula would allocate it, and then in proportion to user revenue needs. These distributions and the dollar and percentage differences that result are as follows:

	Primary Roads	Local Roads
$74,615,000 distributed according to present formula:	$55,961,000 (75%)	$18,654,000 (25%)
$74,615,000 distributed in proportion to user revenue needs:	53,723,000 (72%)	20,892,000 (28%)
Dollar difference:	$ 2,238,000	$-2,238,000
Percentage difference:	4.17%	-10.71%

In terms of the next 20 years these percentage differences mean that if the present formula is retained, $71.5 million of the amount allocated to primary roads would have produced greater benefit to highway users had it been allocated to local roads.

The 70-30 Division of the City Share. Applying the same test procedure to the division of the city share yields the following amounts of user revenue needs for major and local streets:

	Major Streets	Local Streets	Total
Total engineering needs:	$1,247,780	$878,920	$2,126,700
Less nonuser contribution:	---	-562,509	- 562,509
User revenue needs:	$1,247,780	$316,411	$1,564,191
Per cent of total:	79.77%	20.23%	100.00%

(thousands of dollars)

Distributing an arbitrary but representative sum of $38,000,000 according to the present formula and on the basis of user revenue needs yields the following dollar and percentage differences:

	Major Streets		Local Streets	
$38,000,000 distributed according to existing formula:	$26,600,000	(70%)	$11,400,000	(30%)
Adjustment for projected annual Dykstra payments	-2,600,000		---	
Amount available to meet needs:	$24,000,000	(67.8%)	$11,400,000	(32.2%)
$38,000,000 distributed according to user revenue needs:	30,313,000	(79.8%)	7,687,000	(20.2%)
Dollar difference:	$-6,313,000		$ 3,713,000	
Percentage difference:	-20.82%		48.30%	

Thus retention of the existing formula, including the so-called Dykstra payments, would, over the next

20-years, allocate $238 million less for city major streets than the needs on these streets warrant.

Testing the Third Level Distribution Among Individual Cities and Counties

There is, in addition to those misallocations arising from the first and second levels of distribution, the possibility of further misallocation at the third level of distribution, in which the amounts accorded particular road classifications are divided among the individual counties and mumicipalities. In fact, it should not be surprising that the misallocations at the third level will be found to be of a greater degree than those at either the first or second levels. The very number of units involved--83 counties and 510 cities and villages--insures a range of individual peculiarities in need for which a formula based on such factors as population and road mileage will be unable to adequately compensate.

The test procedure for the third level is substantially the same as the first and second level procedure: a percentage comparison of a distribution according to user revenue need with a distribution according to the existing statuatory formula.

The Division Among the Counties--Primary Roads

The derivation of each county's primary road user revenue needs involves just one computation: the deduction of each unit's projected amount of federal

aid from its 20-year engineering needs on primary roads. It will be remembered that the total federal aid to county primary roads was projected to be $106,547,000 over the next 20 years. To determine each county's share of this total amount, the assumption was made that future amounts would be allocated in the same proportions that the total federal aid for the fiscal year ending June 30, 1962 was allocated. Since debt service figures were not available on an individual county basis and since primary roads are not assigned a nonuser share of costs, these two factors did not enter into the derivation of primary road user revenue needs.

A total sum of $55,961,000, typical of the amount actually allocated to primary roads in recent years, was distributed among the 83 counties, first according to the existing formula and then in proportion to user revenue needs. From these two allocations was computed the dollar and percentage amounts by which each county's allotment under the existing formula was greater (plus sign) or less (minus sign) than its allotment according to user revenue needs. These dollar and percentage differences are shown in the first two columns of Table V-3.[4]

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[4]Reproduced from Denzel Cline, James Papke, Milton Taylor, Michigan Highway Fiscal Study, 1961, Chapter V.

Table V-3. Differences in grants for county primary and local road systems, if the apportionment is : (A) according to existing formula, or (B) in proportion to needs

County	Primary Roads $55,961,000 (75%) Difference		Local Roads $18,654,000 (25%) Difference		Both Road Systems $74,615,000 (100%) Difference	
SOUTHERN Over 50,000 Population	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent
Wayne	$ 2,619,222	23.1	$-392,507	-27.9	$ 2,226,715	17.5
Ingham	-138,064	-9.1	-161,908	-34.7	-299,972	-15.2
Allegan	-225,624	-28.4	-77,505	-17.7	-303,129	-24.6
Jackson	53,755	6.3	77,426	25.9	131,181	11.4
Bay	178,384	29.1	65,293	34.2	243,677	30.3
Berrien	105,771	10.3	9,239	2.4	115,010	8.1
Kalamazoo	240,210	27.2	47,282	15.4	287,492	24.1
Calhoun	188,851	24.8	16,246	4.9	205,097	18.8
Kent	1,012,829	65.8	-191,546	-27.0	821,283	36.5
Genesee	250,303	13.0	35,804	6.6	286,107	11.6
Lenawee	-624,741	-48.5	-271,281	-47.8	-896,022	-48.2
Macomb	-157,846	-7.2	11,689	3.1	-146,157	-5.7
Midland	178,471	24.1	18,950	13.2	197,421	42.1
Monroe	35,838	4.8	145,768	73.9	181,606	19.3
Muskegon	341,766	55.1	132,136	62.3	473,902	56.9
Oakland	-1,278,821	-26.4	321,620	62.4	-957,201	-17.8
Ottawa	57,354	7.5	-79,424	-18.9	-22,070	-1.9
Saginaw	301,146	27.8	74,739	19.3	375,885	25.5
St. Clair	-899,081	-53.3	-219,627	-39.3	-1,118,708	-49.8
Shiawassee	-593	-0.1	-3,663	-1.7	-4,256	-0.6
Washtenaw	43,137	4.4	105,406	41.0	148,543	12.1

Table V-3 (continued)

County	Primary Roads $55,961,000 (75%) Difference		Local Roads $18,654,000 (25%) Difference		Both Road Systems $74,615,000 (100%) Difference	
	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent
SOUTHERN Under 50,000 Population						
Barry	$ 1,826	0.6	$ 1,952	1.0	$ 3,778	0.7
Branch	-107,314	-22.4	12,718	7.7	-94,596	-14.6
Cass	69,556	24.0	17,476	9.2	87,032	18.1
Clinton	-172,831	-32.6	-6,612	-2.9	-179,443	-23.6
Eaton	-122,339	-21.8	-98,048	-31.5	-220,387	-25.3
Gratiot	18,293	4.2	-39,938	-15.8	-21,645	-3.1
Hillsdale	-51,153	-11.1	6,502	3.2	-44,651	-6.7
Huron	45,720	13.6	118,962	62.7	164,682	31.3
Ionia	-227,202	-36.0	8,940	4.6	-218,262	-26.5
Isabella	-24,824	-6.0	-46,260	-18.2	-71,084	-10.7
Lapeer	-243,352	-38.3	-26,092	-9.3	-269,444	-29.4
Livingston	-77,623	-16.4	-2,261	-1.0	-79,894	-11.5
Mecosta	-160,113	-36.8	-127,484	-38.8	-287,597	-37.6
Montcalm	19,593	5.2	20,447	7.9	40,040	6.3
Newaygo	-52,992	-14.5	-50,864	-15.1	-103,856	-14.8
Oceana	-35,805	-12.1	7,383	3.8	-28,422	-5.8
St. Joseph	-13,270	-2.9	-21,472	-10.7	-34,742	-5.3
Sanilac	17,947	5.2	104,837	42.4	122,784	20.7
Tuscola	149,915	55.2	158,220	91.5	308,135	69.3
Van Buren	50,218	11.7	28,622	12.6	87,840	13.4
NORTHERN Lower Peninsula						
Alcona	44,358	34.5	28,419	31.5	72,777	33.3

Table V-3 (continued)

County	Primary Roads $55,961,000 (75%) Difference		Local Roads $18,654,000 (25%) Difference		Both Road Systems $74,615,000 (100%) Difference	
	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent
Alpena	$ 44,358	34.5	$ -34,409	-22.2	$ -65,840	-12.8
Antrim	-31,431	-8.8	23,397	20.4	41,044	13.6
Arenac	17,647	9.4	11,123	12.0	34,652	13.1
Benzie	23,529	13.7	33,521	54.6	45,529	19.3
Charlevoix	26,010	13.8	51,477	71.6	77,487	29.7
Cheboygan	-43,493	-16.2	-32,999	-15.1	-76,492	-15.7
Clare	-23,717	-9.4	9,880	6.7	-13,837	-3.5
Crawford	25,376	18.7	51,812	87.1	77,188	39.5
Emmet	-22,775	-8.5	20,784	17.8	-1,991	-0.5
Gladwin	-159,371	-44.0	13,189	11.1	-146,182	-30.4
Grand Traverse	116,636	50.8	65,089	70.5	181,725	56.5
Iosco	-84,767	-24.1	-6,293	-4.0	-91,060	-17.9
Kalkaska	-54,490	-22.6	-61,456	-30.9	-111,946	-26.3
Lake	-84,110	-31.1	-9,304	-5.7	-93,414	-21.6
Leelanau	15,776	9.0	19,052	21.5	34,828	13.2
Manistee	16,425	6.6	17,608	11.0	34,033	8.3
Mason	57,482	28.0	-3,488	-2.0	53,994	14.2
Missaukee	-30,446	-14.3	14,544	9.6	-15,902	-4.4
Ogemaw	-52,769	-18.8	-9,605	-7.2	-62,374	-15.1
Osceola	-72,895	-23.7	-34,649	-17.6	-107.544	-21.3
Montmorency	-69,341	-29.6	29,260	36.2	-40,091	-12.7
Oscoda	-1,593	-0.9	1,908	1.7	315	0.1
Otsego	-28,118	-12.5	46,522	62.2	18,404	6.1
Presque Isle	-150,792	-42.0	-25,595	-16.8	-176,387	-34.5

Table V-3 (continued)

County	Primary Roads $55,961,000 (75%) Difference		Local Roads $18,654,000 (25%) Difference		Both Road Systems $74,615,000 (100%) Difference	
	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent
Roscommon	47,681	34.5	$ 63,934	96.7	$ 111,615	54.7
Wexford	78,303	40.4	-17,148	-9.2	61,155	42.5
UPPER PENINSULA						
Alger	22,816	13.6	28,233	66.3	51,049	24.2
Baraga	9,661	6.0	1,514	2.0	11,175	4.7
Chippewa	-185,831	-34.9	22,313	11.8	-163,518	-22.6
Delta	-15,773	-3.9	-26,524	-16.8	-42,297	-7.6
Dickinson	92,129	42.8	15,145	21.0	107,174	37.4
Gogebic	67,038	33.3	-10,351	-11.7	56,687	19.6
Houghton	-161,308	-31.8	5,202	3.2	-156,106	-23.3
Iron	-39,341	-13.0	4,836	5.9	-34,505	-9.0
Keweenaw	-9,305	-6.0	-2,621	-12.1	-11,926	-6.8
Luce	-32,073	-15.9	-6,663	-10.2	-38,736	-14.5
Mackinac	-86,306	-28.4	-7,773	-7.0	-94,079	-22.7
Marquette	26,699	6.7	45,585	22.9	72,284	12.1
Menominee	-226,507	-38.8	-27,261	-13.1	-253,768	-32.0
Ontonagon	-243,717	-53.7	-34,778	-30.3	-278,495	-49.0
Schoolcraft	-55,849	-21.7	-4,599	-8.4	-60,448	-19.3

Source: Michigan Highway Fiscal Study, 1961, Chapter V.

Of the 83 counties, Kent County recorded the highest positive error, receiving 65.8 per cent more than its needs justify, while Ontonagon County recorded the highest negative error receiving 53.3 less than its needs warrant. The current formula allocations of 40 counties are excessive, relative to need, while 43 are deficient. The average deviation among all counties, disregarding for the moment the positive or negative direction of each county's deviation, is 21.5 per cent.[5]

The Division Among the Counties--Local Roads

Each county's proportion of user revenue needs for local roads is simply its proportion of total local road engineering needs. No federal aid is given for local roads and no adjustment for the nonuser contribution is necessary since deducting a uniform 64 per cent from each county's engineering needs would still leave its per cent of total unchanged.

The dollar and percentage amount by which the current allocation to each county's local roads deviates from a distribution proportional to needs was computed by the same procedure used for the primary road formula, using $18,654,000 as the assumed amount for distribution.

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[5]In other words, the absolute values of the percentage deviations were averaged to prevent positive and negative errors from cancelling themselves when added.

Forty-nine counties are receiving a proportion of user revenues for local roads in excess of their proportion of user revenue needs, of which Roscommon County's is the highest at 96.7 per cent. The remaining 34 counties receive a deficient share of local road revenues relative to need, of which Lenawee County receives the largest at a negative 47.8 per cent. The average deviation in allocating local road funds among the 83 counties is 23.7 per cent.

The Division Among the Counties--The Combined Effect

Since each county receives two allocations of user revenues, one for local and one for primary roads, it is appropriate to ask, what is the combined or net effect for each county? That is, by what degree does a county's proportion of user revenues for both primary and local roads depart from its proportion of user revenue needs on these two systems? This can be determined by (1) adding the dollar differences for local and primary roads, paying strict attention to sign, (2) adding the amounts allocated to primary and local roads on the basis of user revenue need, and (3) expressing (1) as a per cent of (2). An example will help to clarify this procedure. Consider the case of Emmet County in the northern portion of the Lower Peninsula. Emmet receives 8.5 per cent less than needs warrant for its primary roads and 17.8 per cent more than

needs warrant for its local roads. In terms of dollar differences Emmet receives $22,775 less than it should in primary funds, but $20,784 more than it should in local funds. Obviously the net or combined effect is a cancellation of errors. Thus for both systems considered together Emmet receives $1,991 or 0.5 per cent less than it should--an almost perfect allocation of funds even though each allocation, considered alone, errs significantly.

What is true for Emmet is true in some degree for all counties. The net dollar and percentage differences always fall between the primary and local dollar and percentage differences. The results, however, are not always as fortuitous as in Emmet County's case. More representative is Alcona County which receives 34.5 per cent too much for primary roads and 31.5 per cent too much for local roads, yielding a combined or net effect of 33.3 per cent too much for both systems.

The derivation of such a net dollar or percentage effect implies that a county may transfer revenues received by its more favored road system to its less favored system.[6] Such transfers, with some limitations, were shown in Chapter III to be possible under existing law.

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[6]Even when both road systems have been shown to be deficient, one can be said to be relatively more favored than the other.

Therefore the net percentage differences can be accepted as a fair appraisal of a county's total status under the present distribution formula

For all 83 counties the net percentage differences ranged from a positive 69.3 per cent in Tuscola County to a negative 49.8 per cent in St. Clair County. The average deviation among counties, irrespective of sign, was 20.4 per cent. Twenty counties had errors of less than ten per cent; 35 counties had errors exceeding 20 per cent.

What patterns or relationships can be discovered to explain why close to optimal allocations are achieved for some counties under the present formula, while for others large percentage errors result? The geographical distribution of the counties provides no clue--there are as large or larger differences within the southern, central, and northern areas as between them. Neither is a classification of counties as predominately agrarian or industrial fruitful. A similar conclusion applies to a comparison of the sparsely settled counties with the populous. In short, it would appear that individual variables within the counties predominate over commonly shared characteristics, and that such factors as peculiarities in engineering needs, the location and mileage of state trunklines, the proportion of the

county in state forests, and the level of efficiency of the various county road commissions do more to account for the varied and randomly distributed percentage errors.

The Division Among Cities and Villages--Major Streets

The pattern of testing used for the counties can be duplicated for the cities and villages, but with one limitation: separate engineering needs are available for only the 101 largest cities; for the remaining 409 only group totals of needs, arrived at by sample, are available. But since this largest one-fifth of the cities receives over 85 per cent of the total city share of highway user revenues, the test is more inclusive than might first appear.

Because cities do not receive federal aid and because major streets, like county primary roads, are assigned no nonuser share of costs, the amount of each city's engineering needs also represents its amount of user revenue needs.

All the amount that cities receive under the present major street formula, however, is not available to meet these needs. Those cities of over 30,000 population are required to pay to the State Highway Department a part of the construction cost of any state trunkline improvement occurring within their corporate limits. Unfortunately, projections of these so-called Dykstra payments for the

next 20 years were not available on an individual city basis. But since 15 per cent of the major street funds are apportioned as reimbursements to the 32 cities required to share in trunkline costs, the amounts of such reimbursements can be deducted as indicative of each city's trunkline cost obligation.

Once allowance has been made for the Dykstra payments, it becomes possible to compare the amount a city would receive on the basis of a needs distribution with the net amount currently being made available under the formula to meet those needs. As summarized in Table V-4, such a comparison reveals dollar and percentage errors of a startling magnitude. Seventy-one of the 101 cities for which an individual test was possible currently receive a greater proportion of major street funds than their needs warrant; moreover, 23 of these show misallocations exceeding 100 per cent. Highest of all is Allen Park, receiving a major street allocation that is 436.7 per cent greater than its proportion of needs. At the other extreme 30 cities receive proportionately less than their needs warrant, of which Novi, with a negative misallocation of 62.6 per cent, is the largest. The average error for all 101 cities, irrespective of direction, was 75.2 per cent--an average far higher than that found for any

Table V-4. Differences in grants for municipal major and local street systems, if the apportionment is (A) according to exising formula, or (B) in proportion to needs

Municipality	Major Streets $26,600,000 (70%) Difference		Local Streets $11,400,000 (30%) Difference		Both Street Systems $38,000,000 (100%) Difference	
	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent
Detroit	$-3,545,459	-33.2	$ 828,140	38.3	$-2,717,319	-21.2
Population of 30,000 to 250,000						
Allen Park	149,630	436.7	4,623	6.5	154,253	146.1
Ann Arbor	193,497	104.8	3,932	2.9	197,429	61.2
Battle Creek	95,695	38.3	-39,402	-26.0	56,293	14.0
Bay City	54,665	19.0	33,056	36.9	87,721	23.2
Dearborn	491,992	268.9	83,962	59.4	575,954	177.6
East Detroit	146,756	310.8	32,298	54.4	179,054	168.0
East Lansing	108,798	214.8	35,798	162.4	144,596	198.9
Ferndale	-14,081	-8.8	19,711	46.3	5,630	2.8
Flint	-694,307	-40.8	-38,355	-9.6	-732,662	-34.1
Garden City	49,383	42.1	-30,328	-27.1	16,055	7.0
Grand Rapids	470,682	74.2	114,461	39.6	585,143	63.4
Hamtramck	84,341	194.5	31,952	147.5	116,293	178.8
Highland Park	115,932	234.3	33,987	136.2	149,919	201.5
Inkster	123,278	348.2	34,072	67.5	157,350	183.2
Jackson	-579	-0.2	2,192	2.1	1,613	0.4
Kalamazoo	158,296	43.5	-87,602	-34.1	70,694	11.4
Lansing	-320,235	-31.6	-3,353	-1.4	-323,588	-25.7
Lincoln Park	190,410	231.1	42,696	68.1	233,106	160.7
Livonia	136,476	79.8	-85,041	-33.8	51,435	12.2
Madison Heights	35,756	34.7	-20,251	-23.0	15,505	8.1

Table V-4 (continued)

Municipality	Major Streets $26,600,000 (70%) Difference		Local Streets $11,400,000 (30%) Difference		Both Street Systems $38,000,000 (100%) Difference	
	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent
Muskegon	$ 84,322	42.8	$-128,095	-55.5	$ -43,773	-10.2
Oak Park	77,334	116.3	34,455	84.5	111,789	104.2
Pontiac	-239,714	-32.1	-170,222	-49.9	-409,936	-37.7
Port Huron	69,921	35.9	-94,189	-52.8	-24,268	-6.5
Roseville	166,282	184.1	-5,678	-5.1	160,604	79.7
Royal Oak	269,515	228.4	10,891	7.0	280,406	102.8
Saginaw	-29,605	-4.7	-33,004	-13.8	-62,609	-7.2
St. Clair Shores	149,095	77.2	-26,822	-13.3	122,273	31.0
Southfield	-67,902	-21.3	-37,688	-28.1	-105,590	-23.3
Warren	184,548	66.0	-70,246	-25.3	114,302	20.5
Wyandotte	44,668	31.9	23,181	38.1	67,849	33.8
Wyoming	95,935	48.9	-61,807	-36.1	34,128	9.3
15,000 to 30,000						
Adrian	23,533	32.1	-8,092	-16.0	15,441	12.5
Benton Harbor	-38,274	-29.4	-14,659	-27.2	-52,441	18.8
Berkley	16,657	21.8	2,832	6.6	19,489	16.4
Birmingham	-11,043	-9.2	-25,022	-29.9	-36,065	-17.7
Ecorse	47,715	222.3	14,787	86.2	62,502	161.9
Escanaba	40,053	93.8	1,740	5.2	41,793	54.8
Grosse Pointe Park	22,003	51.5	-2,154	-6.6	19,849	26.3
Grosse Pointe Woods	46,694	160.2	20,098	112.0	66,792	141.8
Harper Woods	50,943	214.2	-645	-1.7	50,298	54.1
Hazel Park	63,238	198.9	-8,112	-13.3	55,125	59.3

Table V-4 (continued)

Municipality	Major Streets $26,600,000 (70%) Difference		Local Streets $11,400,000 (30%) Difference		Both Street Systems $38,000,000 (100%) Difference	
	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent
Holland	$ 9,898	8.6	$ -21,168	-24.3	$ -11,270	-5.6
Marquette	43,415	88.1	6,482	17.8	49,897	58.2
Midland	-62,571	-29.4	-7,279	-8.5	-69,850	-23.4
Monroe	-18,705	-15.4	-18,452	-29.7	-37,157	-19.7
Mt. Clemens	14,110	18.7	-18,103	-29.1	-3,993	-2.9
Muskegon Heights	40,152	75.1	-24,823	-36.2	15,359	12.6
Owosso	-5,282	-5.9	-11,376	-22.5	-16,658	-11.9
River Rouge	43,080	166.3	15,404	96.3	58,484	139.6
Sault Ste. Marie	-33,257	-26.6	17,994	59.3	-15,263	-9.8
Southgate	42,871	71.3	-15,143	-19.9	27,728	0.4
Traverse City	8,914	10.9	-13,652	-24.0	-4,738	-3.4
Trenton	38,633	107.8	4,186	11.6	42,819	59.5
Troy	-27,744	-22.4	-3,640	-5.7	-30,784	-16.4
Wayne	33,811	75.6	-5,121	-11.0	28,690	31.5
Ypsilanti	-25,854	-21.2	11,320	39.8	-14,534	-9.7
10,000 to 15,000						
Albion	-50,279	-43.2	-70,997	-72.6	-121,276	-56.6
Alpena	11,237	18.0	-12,251	-25.0	-1,014	-0.9
Cadillac	13,294	31.5	-6,544	-19.8	6,750	8.8
Centerline	12,045	41.9	3,909	23.2	15,954	35.0
Clawson	32,373	129.6	-4,733	-13.7	27,640	46.4
East Grand Rapids	6,563	14.1	-18,455	-41.9	-11,892	-13.1
Grand Haven	-16,760	-21.3	-37,282	-57.6	-54,042	-37.6

Table V-4 (continued)

Municipality	Major Streets $26,600,000 (70%) Difference		Local Streets $11,400,000 (30%) Difference		Both Street Systems $38,000,000 (100%) Difference	
	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent
Grosse Pointe Farms	$ 22,373	69.6	$ 13,470	100.8	$ 35,570	78.2
Ironwood	-40,011	-39.4	-22,770	-43.9	-62,781	-40.9
Melvindale	25,595	114.8	-7,045	-20.9	18,550	33.1
Menominee	4,637	8.6	-13,876	-30.9	-9,239	-9.3
Mt. Pleasant	-667	-0.9	-15,439	-31.4	-16,106	-13.4
Niles	-24,439	-26.9	-11,071	-23.7	-35,510	-25.8
St. Joseph	-74,808	-57.2	-11,199	-29.8	-63,609	-37.8
5,000 to 10,000						
Alma	-40,502	-47.5	-33,756	-59.3	-74,258	-52.2
Beverly Hills	-30,252	-41.1	-4,259	-15.1	-34,541	-33.9
Big Rapids	7,280	23.0	-2,890	-11.4	4,390	7.7
Bushanan	5,585	23.7	-5,544	-29.3	41	0.1
Charlotte	18,666	111.2	-11,887	-39.2	6,779	14.4
Cheboygan	-5,035	-13.0	-8,684	-29.2	-13,719	-20.1
Coldwater	1,872	3.8	-30,174	-57.5	-28,302	-27.7
Dowagiac	17,833	99.5	8,226	71.3	26,059	88.4
Greenville	2,356	6.5	5,359	33.4	7,715	14.7
Grosse Pointe	10,087	48.3	5,239	66.4	15,326	53.6
Hancock	11,287	91.1	-5,399	-28.3	5,888	18.7
Hastings	1,925	5.3	-13,136	-40.0	-11,211	-16.2
Hillsdale	31,443	211.5	8,914	87.7	40,357	161.2
Ionia	12,856	68.1	-4,650	-24.2	8,206	21.5
Iron Mountain	-1,444	-26.9	-47,159	-63.9	-48,603	-38.1

Table V-4 (continued)

Municipality	Major Streets $26,600,000 (70%) Difference		Local Streets $11,400,000 (30%) Difference		Both Street Systems $38,000,000 (100%) Difference	
	Amount	Per Cent	Amount	Per Cent	Amount	Per Cent
Ishpeming	$ 23,632	129.7	$ 7,181	49.6	$ 30,813	94.2
Kingsford	11,196	52.5	3,731	28.1	14,927	43.2
Lapeer	-8,237	-19.9	-11,668	-42.0	-19,905	-28.7
Ludington	14,339	45.7	7,918	42.9	22,257	44.6
Manistee	19,881	71.0	-5,290	-20.1	14,591	26.9
Manistique	8,397	60.8	-6,012	-31.0	2,358	7.2
Marshall	4,053	11.4	-18,270	-51.7	-14,218	-20.0
Negaunee	19,066	104.3	1,196	6.6	20,262	55.6
Novi	-66,375	-62.6	2,621	11.1	-63,754	-49.2
Petoskey	701	2.3	6,010	56.4	6,711	16.1
Plymouth	-35,273	-48.3	-19,091	-47.5	-54,365	-48.0
South Haven	10,324	38.9	-6,596	-28.6	3,728	7.5
Sturgis	5,467	12.4	-8,090	-26.0	-2,623	-3.5
Three Rivers	-33,139	-45.6	-37,260	-63.0	-70,399	-53.4

other part of the distribution formula. In fact, with but three exceptions, this average error exceeds all the individual errors on both county road systems.

In dollar amounts, the 71 positive cities together received $5,910,000 which, on the basis of needs, should have gone to other cities. Over half of this amount should have gone to the city of Detroit, whose -33.2 per cent of difference serves as a reminder that moderate percentage misallocations may nevertheless involve substantial dollar amounts.

The Division Among Cities and Villages--Local Streets

Testing the allocation of local street funds reveals errors that are, in general, less than those for major street allocations. Still, the present local street formula results in significant departures from an optimum allocation. Of the 101 largest cities, 38 receive more, while 63 receive less, than their respective needs warrant. These misallocations range from a positive 162.4 per cent for East Lansing to a negative 72.6 per cent for Albion. The average error for all 101 cities is 36.3 per cent.

The Division Among Cities and Villages--The Combined Effect

As was done with the counties, percentage and dollar differences can be computed for each city to show the degree to which its proportion of revenues received under

both the major and local street formulas is greater or less than its proportion of user revenue needs on both these systems. For 61 cities the combined effect of both formulas is to accord them more user revenues than their proportion of needs justify; the other 40 receive a lesser amount than their needs warrant. The largest positive misallocation, occurring in Highland Park, is 201.5 per cent; the largest negative error, occurring in Albion, is 56.6 per cent. For all cities the average misallocation resulting from both the major and local street formulas is 46.2 per cent.

Unlike the random occurrance of allocation errors at the county level, the percentage errors in distributing user revenues among the cities can be grouped into discernable patterns which help explain their amazing range and magnitude. Specifically, there is a high degree of similarity in the errors within each of the following four types of cities: (1) central or core cities, (2) suburban cities, (3) northern cities (Upper Peninsula and northern Lower Peninsula) and (4) small southern cities.

The central or core cities may be defined as those cities over 30,000 population which are bounded by highly urbanized townships. Of the 13 cities in this group, Detroit, Flint, Lansing, Muskegon, Pontiac,

Port Huron, and Saginaw all receive a proportion of user revenues considerably less than their proportion of user revenue needs. Four of the remaining six cities, Battle Creek, Bay City, Jackson, and Kalamazoo, have positive errors of less than 25 per cent; only Grand Rapids and Ann Arbor, with positive errors of 63.4 and 61.2 per cent respectively, exceed the average error for all cities of 46.2 per cent.

In sharp contrast to the central cities are the 40 suburban cities, of which all but four lie within the Detroit metropolitan area. Contrary to what might be expected, nearly all of these 40 cities receive more--in many cases much more--user revenues than their needs justify. In fact, 13 of them (Allen Park, Dearborn, East Detroit, East Lansing, Hamtramck, Highland Park, Inkster, Lincoln Park, Oak Park, Royal Oak, Ecorse, River Rouge, and Grosse Pointe Woods) currently receive over 100 per cent more user revenues than is warranted by their shares of user revenue needs. Only five suburban cities have negative percentage differences.

The third group, the northern cities, is defined as those cities north of a line through Ludington and Gladwin. In general, the percentage errors for the 18 cities in this group tend to be positive, but are considerably smaller than the positive errors of the suburban cities. All but three of the percentage errors

in allocation fall within the interval from -10 to 60 per cent.

The last group, the smaller southern cities, is a residual grouping encompassing the 30 southern cities which are neither suburban nor core cities. Examples of some of the cities in this group are Holland, Midland, Adrian, Greenville, Albion, and Niles. These smaller southern cities reveal a pattern of error opposite to that found for the northern cities. Twenty-one of the 30 have negative percentage errors, indicating that their current receipts are less than their needs warrant. All but six of the cities have percentage errors within the interval from 10 to -60 per cent. (A notable aberration from the general pattern is the town of Hillsdale, the only non-suburban Michigan city with a misallocation exceeding 100 per cent.)

In brief, then, the following pattern of misallocation emerges: Most of Michigan's 40 suburban cities receive a much greater proportion of user revenues than their needs justify; the 18 northern cities also tend to have positive percentage differences, but these are considerably smaller than those of the suburban cities; the 13 central cities and the 30 smaller southern cities, with several exceptions, tend to receive less user revenues than their proportions of needs warrant.

To group the cities into a consistent pattern, however, does little to explain why such a pattern prevails. Especially intriguing are the findings for the suburban cities. Why should these cities, fastest growing of all cities and with needs that would seemingly be burgeoning on both their local and major streets, nevertheless have extraordinarily greater proportions of revenues than needs?

One possible answer is that the suburban cities have kept abreast of their rising needs by raising a more than normal amount of highway revenues locally, while cities with negative errors have raised a less than normal amount. To determine whether this is the case, each city's total local contribution for the five-year period 1956 to 1960 was expressed as a per cent of that city's total user revenue receipts for the same period. During the five-year period the 101 cities as a whole raised $119,654,796, or 81.6 per cent of their combined user revenue receipts under the distribution formula. But because over one-third of the $146.6 million in such municipal user revenue receipts was allocated to Detroit, an average more indicative of the general level of local effort for all cities is obtained if Detroit is omitted. On this basis the 100 largest cities excluding Detroit made a local contribution that averaged 113.7 per cent of their user revenue

receipts. In other words these cities as a group slightly more than matched their user revenue receipts dollar-for-dollar with local funds.

Assuming, then, that an average or normal local contribution is around 114 per cent of user revenue receipts, what correlation, if any, exists between a given city's degree of local support and its degree of error under the distribution formula? As a comparison of the first two columns of Table V-5 reveals, the large central or core cities which generally have negative percentage allocation errors or small positive percentage allocation errors also tend to contribute a below normal amount of local revenues. In fact, Ann Arbor is the only city of the 13 to contribute more than the 114 per cent average contribution for all cities. The average contribution of these 13 cities is 74 per cent, confirming the suspicion that current deficiencies in allocation may be attributed in part, at least, to a poor past record of local effort. Detroit's record is poorest of all, with a local contribution of only 25.3 per cent of its user tax receipts.

A dramatic contrast to the core or central cities is presented by the 40 suburban cities. The high positive percentage errors of these cities are accompanied in a majority of instances by equally high records of past

Table V-5. A comparison of formula misallocation with the degree of local contribution and the rate of population change, for Michigan's 101 largest cities[1]

(Cities ranked according to formula misallocation)

Central or Core Cities (13)	Combined Major and Local Per Cent Error[2]	Local Contribution as Per Cent of Total User Tax Grant[3] 1956-1960	Percentage Change in Population[4] 1950-1960
Detroit	-21.2 %	25.3 %	-10 %
Grand Rapids	63.4	73.7	0
Ann Arbor	61.2	136.9	40
Bay City	23.2	26.9	2
Battle Creek	14.0	78.1	-9
Kalamazoo	11.4	78.9	42
Jackson	0.4	69.9	-1
Port Huron	-6.5	61.5	1
Saginaw	-7.2	86.4	6
Muskegon	-10.2	108.7	-4
Lansing	-25.7	74.4	17
Flint	-34.1	72.3	21
Pontiac	-37.7	61.1	12
Group average[5]	24	74	
Suburban Cities			
Highland Park	201.5	68.4	-18
East Lansing	198.9	79.0	49
Inkster	183.2	526.6	134
Dearborn	177.6	71.7	-21
East Detroit	168.0	470.6	113

Table V-5 (continued)

	Combined Major and Local Per Cent Error[2]	Local Contribution as Per Cent of Total User Tax Grant[3] 1956-1960	Percentage Change in Population[4] 1950-1960
Ecorse	161.9 %	154.3 %	-3
Lincoln Park	160.7	218.6	84
Allen Park	146.1	182.9	204
Grosse Pte. Woods	141.8	232.3	79
River Rouge	139.6	58.8	-12
Oak Park	104.2	106.7	596
Royal Oak	102.8	152.2	72
Roseville	79.7	116.2	217
Grosse Pte. Farms	78.2	81.9	29
Trenton	59.3	487.3	196
Hazel Park	59.1	161.4	44
Harper Woods	54.1	752.0	119
Grosse Pointe	53.6	149.8	6
Clawson	46.4	247.9	185
Centerline	35.0	271.6	33
Wyandotte	33.8	37.0	18
Melvindale	33.1	133.0	38
Wayne	31.5	186.0	70
St. Claire Shores	31.0	400.0	287
Grosse Pte. Park	26.3	83.0	18
Warren	20.5	72.8	new
Southgate	20.4	21.0	new
Berkley	16.4	133.0	30
Muskegon Heights	12.6	106.0	4
Livonia	12.1	129.0	280

Table V-5 (continued)

	Combined Major and Local Per Cent Error[2]	Local Contribution as Per Cent of Total User Tax Grant[3] 1956-1960	Percentage Change in Population 1950-1960
Wyoming	9.3 %	26.0 %	new
Madison Heights	8.1	356.0	new
Garden City	7.0	248.0	322 %
Ferndale	2.8	47.0	6
East Grand Rapids	-13.4	279.0	71
Troy	-16.4	56.9	new
Birmingham	-17.7	215.7	65
Southfield	-23.3	108.5	new
Beverly Hills	-33.9	20.4	new
Group average[5]	73	183	
Northern Cities (18)			
Ishpeming	94.2	129.8	-1
Marquette	58.2	102.1	15
Negaunee	55.6	307.8	-5
Escanaba	54.8	93.4	1
Ludington	44.6	254.3	-1
Kingsford	43.2	54.0	1
Manistee	26.9	122.7	-4
Cheboygan	20.1	76.0	3
Hancock	18.7	63.0	-4
Petoskey	16.1	142.0	-5
Cadillac	8.8	67.0	-3
Manistique	7.2	58.0	-4
Alpena	-0.9	117.0	12
Traverse City	-3.4	115.0	9

Table V-5 (continued)

	Combined Major and Local Per Cent Error[2]	Local Contribution as Per Cent of Total User Tax Grant[3] 1956-1960	Percentage Change in Population 1950-1960
Menominee	-9.3 %	72.0 %	1 %
Sault Ste. Marie	-9.8	141.2	5
Iron Mountain	-38.1	106.0	-4
Ironwood	-40.9	117.8	-10
Group average	31	119	
Smaller Southern Cities (30)			
Hillsdale	161.2	93.9	5
Dowagiac	88.4	103.1	10
Ionia	21.5	135.0	5
Greenville	14.7	52.0	12
Charlotte	14.4	59.0	16
Adrian	12.5	77.6	11
South Haven	7.5	97.3	9
Big Rapids	7.7	39.0	29
Buchanan	0.1	170.0	2
Mt. Clemens	-2.9	88.0	23
Sturgis	-3.5	117.0	15
Holland	-5.6	115.0	56
Ypsilanti	-9.7	96.0	15
Owosso	-11.9	116.4	7
Mt. Pleasant	-13.4	81.7	31
Hastings	-16.2	83.3	5
Monroe	-19.7	187.2	7

Table V-5 (Continued)

	Combined Major and Local Per Cent Error[2]	Local Contribution as Per Cent of Total User Tax Grant[3] 1956-1960	Percentage Change in Population 1950-1960
Marshall	-20.1	103.6	17
Midland	-23.4	363.6	94
Niles	-25.8	92.9	5
Coldwater	-27.7	83.3	3
Lapeer	-28.7	119.7	0
Benton Harbor	-28.8	93.3	2
Grand Haven	-37.6	82.0	16
St. Joseph	-37.8	279.6	15
Plymouth	-48.0	275.7	32
Novi	-49.2	1.1	new
Alma	-52.2	75.9	8
Three Rivers	-53.4	109.8	5
Albion	-56.6	46.2	23
Group average	30	115	
State average[5]	46	137	

[1]The 101 cities with a 1950 population exceeding 5000.

[2]Taken from the last column of Table V-4.

[3]The average annual local contribution for the years 1956-1960 divided by the average major and local street user revenue grant for the same period. Derived from the Annual Progress Reports, as compiled by the Michigan State Highway Department.

[4]The percentage increase or decrease of the 1960 census over the 1950 census.

[5]Averages are simple averages and disregard sign.

local effort. Thirteen of the suburbs raised over twice as much locally as they received from the state under the formula. The highest of these, Harper Woods, contributed an amount equal to 750 per cent of its total user tax grant. For Inkster and Trenton the percentages were 527 and 487 respectively. There are some notable exceptions to this pattern. Highland Park, River Rouge and East Lansing, for example, all receive large excesses of user revenues in terms of their needs, but contribute less than an average amount of local funds. But in a majority of instances the pattern holds, yielding an average local contribution for all 40 of these suburban cities of 183 per cent of user revenue receipts--an average well over twice that of the central or core cities.

This correlation between formula allocation errors and the degree of local support is far less distinct for the northern and smaller southern cities. The 30 smaller southern cities, which generally receive a deficiency of user revenues, raise close to a normal amount of local revenues. The 18 northern cities, which tend to receive somewhat more in user revenues than their needs warrant, also raise slightly more than an average amount of local revenues.

The foregoing has shown a direct relationship between the degree of formula misallocation and the degree of

local effort. Both of these factors, in turn, can be correlated with a third factor: the rate of population growth (or decline) of each of the 101 largest cities. The third column of Table V-5 expresses this rate of growth in terms of the per cent by which the 1960 population of each city is greater or less than that shown by the 1950 census.

With the exceptions of Ann Arbor and Kalamazoo, the population growth of each of the 13 core cities was less than the 23 per cent average increase for the state as a whole. Detroit, Battle Creek, Jackson, and Muskegon actually lost population.

That many of the 40 suburban cities have high population growth rates--as high as 596 per cent in the case of Oak Park--may come as little surprise. But looking within the group tendency to individual cases exposes some interesting relationships. The few suburban cities that have poor records of local effort turn out to be either (1) cities that have been newly formed since 1950 or (2) cities that have long been established and are now experiencing only slight increases or even decreases in their population. Of the seven newly formed suburban cities, six (Warren, Southgate, Wyoming, Troy, Southfield, and Beverly Hills) have local contribution rates which are below the average for all cities. Typical of the long established

and declining suburbs are such cities as Highland Park, Hamtramck, Ecorse, and River Rouge, all of which match a poor record of local contribution with a diminishing population.

Ten of the 18 northern cities lost population from 1950 to 1960; of the remaining eight cities which gained, the largest gain was only 12 per cent (Alpena). In contrast, not one of the 30 smaller southern cities lost population.

In light of the findings concerning the level of local effort and its relationship to population change, additional care must be exercised in interpreting how each city fares under the present distribution formula. The percentage errors in allocation calculated for each city do not take account of relative differences in past local effort. But engineering needs figures do, and in a way which disadvantages those cities with the best records of local support and rewards those with the poorest. The reason for this result is that engineering needs are based not only upon future variables, such as the rate of road depreciation and changing traffic volumes, but also upon the present condition of a unit's roads, which, in turn, is a partial outgrowth of that unit's degree of past local support. Raising an exceptionally large amount of local revenues has the paradoxical effect of reducing current needs, which in

turn reduces the amount of state user revenues that would be received if the distribution were on the basis of need. For example, consider the case of East Detroit, a city which in the last five years raised locally an amount equal to 470.2 per cent of its state user revenue receipts. If East Detroit had raised only the average amount of 114 per cent, its contribution for these years would have been $3,065,496 less, and there can be no doubt that its needs, and therefore its needs-warranted user revenues, would have been larger than they were.

The converse is true for cities which have raised abnormally low amounts. If they had raised a normal amount, then their needs, and therefore their needs-warranted revenues, would have been lower. Detroit, for example, has one of the poorest records of local effort, raising only 25.3 per cent of its state user revenue receipts. Under the testing procedure Detroit appears to be entitled to $2,717,000 more per year in user revenues. But if Detroit were to raise as large a proportion locally as the average city does, its annual contribution would be at least $9 million more than it has been, and thus convert to a surplus its apparent deficiency of user revenues.

Are cities like East Detroit entitled to more user revenues than their proportion of user revenue needs? They are. The reason becomes clear if two points are

remembered. First, highway needs fall into two classes: needs which should be met from state and federal user revenues and needs which should be met from local nonuser revenues. Second, state and federal user revenues have never been sufficient to cover all user revenue needs. When cities like East Detroit raise more than their assigned nonuser share they are, in effect, electing to finance those needs which would be covered by state user revenues if they were sufficiently large. Certainly if a city elects to complete more of its user revenue needs than user revenues will cover, it should not be penalized for this choice by having its share of user revenues reduced. To provide a just compensation for differences in past local effort will not be easy, but it is one of the factors which should be included in any revision of the present formula.

Chapter VI

Alternatives for Improving the Distribution Formula

The analysis of chapters IV and V has shown that the individual allocations made by Michigan's user revenue distribution formula often deviate from the user revenue needs of the recipients. In the cases of the state, 44 of the counties, and 40 of the 101 largest cities a proportion of user revenues is being received which is <u>less</u> than their respective proportions of user revenue needs. For 39 of the counties and 61 of the 101 largest cities, the proportion of user revenues being received is <u>more</u> than user revenue needs warrant.

Moreover, whether viewed in percentage terms or in absolute dollar terms, many of these errors in allocation are substantial. For 18 counties and 47 cities a proportion of user revenues is being received which deviates by at least 30 per cent from their proportions of user revenue needs; in the cases of 14 cities the deviation exceeds 100 per cent. In dollar terms the misallocations for each of 39 of the counties and 21 of the cities can be expected to be greater than $100,000 annually if the present distribution formula is retained. The present share going to the state, while only 2.66 per cent less than its proportion of needs, involves a dollar misallocation exceeding $2.8 million annually. Thus the

evidence which has been gathered suggests that a revision is needed in Michigan's formula for distributing highway user revenues.

Any revision should at least meet the following criteria: (1) the structure of the distribution formula and its underlying assumptions should reflect the principle that highway revenues should be apportioned to yield the maximum benefit to highway users; (2) the formula should take account of the other revenue sources and obligations of the recipients; (3) the figures used for the factors of the formula should be easy to obtain and keep up-to-date; (4) the figures should be relatively free from manipulation; and (5) the formula should be viable, responding to changing patterns and densities of highway useage.

The problem of devising a distribution formula which satisfies these criteria and yet allocates more accurately than the present formula is intensified by the many diversities which shape the demands placed upon Michigan's 110,000-mile network of highways. First, the population of the state has grown faster than the national average--but it has grown unevenly. Between 1950 and 1960 Michigan's ten Standard Metropolitan Statistical Areas (as defined by the Census Bureau) showed large gains in population to the point where they now contain 73 per cent of the state's total population. These Standard Metropolitan Statistical Areas, all of which are located in the southern half of

the state, form a sharp contrast to the northern cities, many of which actually lost population in this period.[1] The impact of the growth in Michigan's southern urban population upon road needs is reflected in (1) the estimate by the State Highway Department's Office of Planning that nearly 40 per cent of the vehicle miles travelled in 1970 will be upon streets and highways within incorporated city limits; and (2) the fact that 46 per cent of all gasoline sold in the state is sold in the Detroit metropolitan area.[2]

Second, Michigan's diversity is reflected in its industrial structure. Manufacturing provides over 45 per cent of its civilian income; 48 of its 83 counties are among the first 100 counties in the nation in the production of field crops, fruits, and livestock; its tourist trade attracts over ten million out-state people annually--90 per cent of them coming by automobile.[3]

Even differences in Michigan's climate produce

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[1]J. F. Thaden, "Changing Population Characteristics of Michigan, 1950-1960," The Michigan Economic Record, September, 1961, p. 3.

[2]Carol Billingham, "Gasoline Marketing in Michigan," The Michigan Economic Record, March, 1962, p. 6.

[3]Data on industrial diversity from: Michigan State Highway Department, Michigan's Highways, 1960-1980, A Summary Report (Lansing, 1962), p. 10.

differences in highway needs, The unusually heavy snowfall in 1959 in the Upper Peninsula county of Marquette required 1,188 tons of rock salt, 10.1 tons of calcium cloride, 8,453 cubic yards of clorided sand, and 180,915 lineal feet of snow fence to keep the roads clear.[4] Such weather-induced expenditures are in addition to normal maintenance and construction outlays.

These diversities in Michigan, and the differences in highway needs that they engender, underscore the impossibility of devising a formula which will allocate highway user revenues perfectly to each of Michigan's 594 administering units. But as preceding analysis has emphasized, room nevertheless exists for substantial improvement over the performance of the existing formula.

In what directions can improvement be sought? At least three alternatives are possible: (1) eliminate the distribution problem entirely, (2) retain the basic structure of the present formula but revise the percentage weightings of the various factors, and (3) restructure the formula around new factors and weightings. The remainder of this chapter considers each of these alternatives in detail.

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[4]From a statement by the Marquette County Road Commission added to their annual financial report, 1960, as filed with the Local Government Division of the State Highway Department.

Eliminate the Distribution Problem Entirely

One solution to the distribution problem--a drastic one it is conceded--would be to avoid it completely. This could be accomplished in either of two ways: (1) permit the local governments to levy highway user taxes of their own in support of the roads and streets under their jurisdiction or (2) place all roads and streets under the jurisdiction of the state.[5]

While instances can be found of locally collected highway user taxes, the practice is generally rare. The very nature of these taxes makes them most suited for collection on a state-wide basis, where both the volume of gasoline sold and the number and types of motor vehicles owned can be most accurately determined. Moreover, a policy of local user tax finance might result in substantial differences between the size of a local unit's user tax base and its highway needs. For example, those counties with a high proportion of tourist travel might have insufficient amounts of local vehicle registrations from which to finance the roads such travel would require.[6]

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[5]These two possibilities were suggested by Richard M. Zettle in Financing Modern Highways for Michigan (Lansing, 1955), p. 62.

[6]To meet this problem by raising the tax on gasoline would encourage a loss of sales to neighboring counties which might have lower tax rates; raising the vehicle registration tax would represent a subsidy to the tourists by local residents.

On the other hand, some local units might collect large amounts of taxes generated on roads for which they are not responsible, such as state highways.

The other means of eliminating the distribution problem, i.e., by placing all roads and streets under the jurisdiction of the state, is also undesirable. No state follows such a policy, although many administer a greater proportion of their roads at the state level than Michigan does. Aside from the fact that total state administration would be politically unacceptable to Michigan's "home-rule" oriented population, such a scheme would upset the user-nonuser distinction for financing highways. Furthermore, local units would be continually questioning the judgment of the state highway officials in determining where expenditures are most needed.

Without further laboring these two remote possibilities it should be clear that there is no necessary reason why both the financing and administering of highways should be carried on at the same governmental level. The elimination of the distribution problem by either of these methods, then, is neither a practical nor justifiable alternative; but its consideration clarifies the nature of the distribution problem and its essential role in highway finance.

Retain the Basic Structure of the Present Formula But Revise the Percentage Weightings of the Various Factors

Retaining the basic structure with revised weightings has much to commend it. As highway economist Richard M. Zettle has pointed out, the present distribution formula "must be regarded as a tremendous stride towards putting solid highway policy into effect for Michigan's local governments, especially in the light of the previously existing hodge-podge of law and the absence of clear policy objectives."[7]

Adopted in 1951, the formula embodies three important departures from "the previously existing hodge-podge." First, it elevated the cities to equal standing with the state and counties in their eligibility for user tax revenues. Previously they occupied only a residual position as the last of five priorities for disposing of the county allocations. Second, the 1951 revision introduced road classification as a distribution factor. The only prior distinction as to road differences had become a meaningless one, in which former township or "McNitt" roads received a separate allocation from other county roads. Third, the new formula represented first recognition, if not full acceptance, of

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[7] Financing Modern Highways, p. 63.

the principle that highway needs rather than political higgling should guide the structuring of a distribution formula. These improvements suggest that the real question is not whether to retain the present formula structure or not, but rather, how much of the structure should be retained. Each of the three levels of allocation in the present formula need to be evaluated in turn.

The first level three-way division of the total Motor Vehicle Highway Fund into the aggregate shares of the state, counties, and cities represents a sound basis for beginning the distribution of highway user revenues. Only in this way can data reflecting aggregate differences in highway needs be introduced. The initial division also permits adjustments for differences in federal aid and debt service obligations. There is nothing to suggest that the first level division should not be retained, although the specific percentage weightings of the state, county, and city shares would still need to be determined.

The second level division of the aggregate city and county shares according to road classification should also be retained. Eliminating the road classifications altogether would thwart an equitable division of user and nonuser responsibilities. Expanding the current dual classifications for county roads and city streets to threefold classifications would have the advantage of achieving a

finer discrimination in need, but this might be outweighed by the added difficulty in accurately performing such a classification. As with the first level division, the specific percentage shares to be accorded each road class would remain to be decided.

The third level of distribution involves the dispersion of amounts allocated to each road type among the individual counties and cities on the basis of five distribution factors. These factors are (1) road mileage (four types), (2) population (rural and urban), (3) motor vehicle registration tax collections, (4) "equivalent municipal trunkline mileage" (in cities over 30,000 population only) and (5) equal division. Thus the amounts allocated at the third level are not directly determined by need differentials, as were the first and second levels, but by a combination of factors which attempts to approximate need differentials. Whether the third level structure also should be retained depends upon how close an approximation to needs can be obtained through a combination of such factors.

In his 1955 highway fiscal study, Financing Modern Highways for Michigan, Richard M. Zettle evaluated the third level structure of the formula on the basis of group comparisons of county and city needs and revenues.[8] He

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[8] Financing Modern Highways, pp. 66-69.

recommended that the third level structure adopted in 1951 be retained, but suggested the following changes in factor weightings would result in a somewhat closer approximation of highway needs: (1) in the case of the county formulas greater weight should be given to primary and local road mileage and less to weight tax collections and rural population; (2) in the case of the cities and villages, changes in the opposite direction should be made, i.e., more weight to urban population and less to major street mileage. While he felt these changes would improve the third level distributions, Zettle conceded that in many instances large allocation errors might still persist. Moreover, Zettle's use of group totals understates the degree of misallocation, since negative and positive errors for cities or counties within a group tend to cancel.

Because Zettle's findings indicated only a small degree of improvement was possible, further investigation in terms of the 1961 data seemed advisable. It was decided to direct the analysis to the major and local city street formulas, since the average deviation in allocation for these formulas are exceptionally large.

The major street formula is based primarily upon urban population and major street mileage. Its average deviation from user revenue needs for the 101 largest cities is 75.2 per cent. If all of the major street grants were distributed solely on the basis of urban population,

the average deviation from user revenue needs would increase to 82.1 per cent. If, on the other hand, the entire grant was allocated according to major street mileage, the average deviation from user revenue needs would decrease to 72.6 per cent. Thus increasing the mileage factor and decreasing the population factor could be expected to produce a small improvement in the present major street allocations.

The local street formula allocates according to urban population and local street mileage. For the 101 cities the average deviation from user revenue needs is 36.3 per cent. An allocation entirely on population increases this average to 45.2 per cent; an allocation entirely on local street mileage reduces the deviation to 34.0 per cent. Again, a slight improvement is possible for the largest 101 cities if the weighting of the mileage factor is increased at the expense of the population factor.

Both of these findings are in opposition to Zettle's recommendation that population, not mileage, be favored in the city major and local formulas. But more important than this disagreement is the fact that revising the factor weightings will, at best, bring only meager improvements. The cities of Grand Rapids and Flint highlight why so little can be gained in this direction. Grand Rapids currently

receives a share of user revenues that is 63.4 per cent larger than its user revenue needs; Flint's share is 34.1 per cent less. Yet the two cities have almost identical proportions of the various distribution factors. Both have 3.74 per cent of the total urban population in the state; both have 3.09 per cent of the total major street mileage; and Grand Rapids has 3.23 per cent of the local street mileage while Flint has 3.34 per cent. Obviously any shift in the weightings of these factors which improves the distribution for one of these cities, of necessity worsens it for the other. In some other cases cities have similar allocation errors but widely differing proportions of each of the factors, with the result that one city's allocation can be improved by changing the factor weightings, but at the cost of worsening those of others. These examples illustrate why varying the factor weightings yields such small improvements in the general or average level of error.

In summary, the alternative of retaining the present structure of Michigan's distribution formula but revising its percentage weightings comes down to this: (1) it is both advisable and feasible to retain the first and second level structures of the present formula--advisable because of the clear and rational basis these levels provide for distributing revenues, feasible because the percentage weightings for each of these levels can be made to coincide

with relative differences in user revenue needs. (2) But to retain the third level of the distribution formula would require reconciliation to large percentage errors in allocation, for no matter how deftly the percentage weightings of the factors are juggled no significant improvement appears to be possible. For the last level of the formula a new basis for distribution is in order.

Restructure the Formula Around New Factors and Weightings

The third alternative for improving the present formula is to devise a new structure for the formula utilizing new factors and factor weightings. In the literature describing present state formulas, distribution factors usually are distinguished as being either of two types: objective factors or subjective factors.

The objective factors are considered to be those which are completely determined by their definitions, and require no evaluatory judgment in establishing their magnitude. Examples are population, as defined and counted by the Census Bureau, motor vehicle registrations (or the amount collected in registration taxes) and uniform mathematical factors, such as an equal division of revenues to all recipients. Each of these are among those in use in Michigan's current formula.

The subjective factors, on the other hand, are considered to be those which involve a significant amount

of evaluative decision making. Their "subjectivity" stems from the fact that their magnitudes may vary with the ability (or the motives!) of the individual or group doing the evaluating. Examples of subjective factors are engineering needs, such as those computed for Michigan, and variations in per mile construction costs, as currently used in Washington's formula.

However, the line between "objective" factors and "subjective" factors is not as distinct as highway administrators have imputed it to be, for two reasons. First, not all factors treated as "objective" are free from evaluative determinations. Michigan's road mileage, while easily measured, is not always so easily classified. For every city and county evaluations must be undertaken distinguishing primary roads from local roads and major streets from local streets. Moreover, such evaluations are open to constant review as the amount and nature of travel on particular roads changes over time.

Second, not only are the objective factors often more subjective than originally supposed, the subjective factors are generally more objective than they are credited with being. Among others, the following reasons can be cited: (1) As more needs studies are conducted new ways for standardizing methods and auditing results are discovered. (2) Highway administrators are becoming more professionally trained; elective administrative

positions are becoming appointive and incentives are being made to encourage the hiring of personnel with engineering training. (3) The various special interest groups, ranging from the Michigan Municipal League to the trucker's association, watch with care the determination of any factor to insure that it is not unfairly biased against them.

But while the distinction between objective and subjective factors is a blurred one, it is nevertheless a distinction that is useful for contrasting the various ways in which Michigan could devise an improved formula. Specifically, three alternatives present themselves: (1) a formula which allocates entirely on the basis of objective factors, (2) a formula which allocates entirely on the basis of engineering needs or some modified version of engineering needs, such as "user revenue needs," and (3) a formula based upon both objective and need factors.

A Formula Based on Objective Factors

Historically, most distribution formulas adopted by the states and by the federal government have been based entirely upon the so-called objective distribution factors. The following discussion examines some of the more commonly used factors in terms of their underlying assumptions and the problems which arise in their application.

Road Mileage. If all roads had the same traffic, were built to the same specifications, on road beds of the same

composition, over a uniform terrain, and were maintained by administering units which enjoy no particular economies of scale over other administering units, then road mileage would constitute an almost ideal basis for the distribution of revenues. But obviously such uniform conditions do not exist. Instead there exists a formidable gambit of per mile construction costs for various roads, ranging from a few thousand dollars per mile for improved gravel roads to a few million dollars per mile for limited access expressways.

Michigan's formula takes partial account of these differences by dividing its road mileage into five classifications. But differences within road classifications are often as large as those between classes. A county-by-county study in the state of Washington revealed that the estimated total annual cost of a trunk mile ranged from a high of $2,843 per mile in King County to a low of $1,038 in Lincoln County.[9] In Michigan the construction cost of limited access highway has been known to vary from $1,000,000 per mile in rural areas to $12,000,000 per mile in densely settled urban areas.

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[9]Washington State Council for Highway Research, County Gas Tax Allocation Study (Pullman, Washington, 1954), p. 92.

Nearly all of this difference is in the cost of purchasing right-of-way.

In summary, road mileage as a factor correctly assumes the presence of road needs, but it also assumes a uniformity in need that does not, in fact, exist. A division of road mileage into several classes is an improvement, but still does not recognize the possibility of substantial intra-class differences.

Population. As a distribution factor population is intended to reflect the intensity of road use. While it is reasonable to expect traffic volumes to increase with population density, the correlation is not likely to be strictly proportional. In cities which are densely populated, such as New York City, other modes of transportation become increasing substitutes for private automobiles. In sparsely settled rural areas the volume of traffic may be more than proportionate to population. This would be especially true of the popular tourist counties in northern Michigan.

Motor Vehicle Registrations. The number of motor vehicles registered in a particular area or the taxes collected on such registrations represent a more refined indicator of the intensity of road use. Vehicle registrations more accurately reflect the nonproportional relationship between an area's population density and volume of traffic. But the smaller the area involved, the less validity vehicle registrations have as a factor.

For the state as a whole the number of vehicles registered may be a fairly accurate index of travel, since only a small proportion of the total travel will be by vehicles registered in other states. But at the county level a high proportion of inter-county travel can be expected. Livingston County, for example, is a southern agricultural county surrounded by more industrial counties and several large cities. Consequently it receives a higher proportion of inter-county travel than is reflected in its number of local motor vehicle registrations.

The current use of motor vehicle registration tax collections in Michigan's formula for determining each county's primary road allocation has produced a strange unbalance in Wayne county--an unbalance that highlights the inability of objective factors to take account of peculiarities in local conditions. Reflecting the size and growth of the Detroit metropolitan area, Wayne county's motor vehicle registrations constitute nearly one-third of all registrations in the state. But as the old suburban cities have expanded and new ones such as Troy and Southgate are formed, Wayne County has elected to relinquish large amounts of its primary road mileage to the major street systems of these suburban cities. As of July 1, 1961, Wayne contained only 3.2 per cent of the state's total primary road mileage. Thus Wayne County's user revenue

allocation for primary roads has been increasing as its proportion of motor vehicle registrations increases, but its primary road mileage for which these revenues are intended has been decreasing. This may explain why Wayne County's primary road allocation is about $2.6 million more annually than its proportion of primary road needs justifies.

Land Area. The factor of land area has appeared in the distribution formulas of such states as Arkansas, Florida, Kentucky, Mississippi, Oklahoma, South Dakota, and Wyoming. In addition, land area is currently the basis for distributing one-third of the federal aid secondary funds among the states. Very little, however, can be said in its defense. It bears slight, if any, relationship to road mileage or traffic volume. Some of Michigan's largest area counties are dominated by state or national forests.

Equal Division. To allocate all funds equally would be even more inequitable than a distribution according to land area. But there are two reasons why distributing a small fraction, such as 10 or 15 per cent, of the total on an equal basis would be desirable. First, factors such as road mileage, population, and vehicle registrations do not reflect the fixed costs of highway administration. Certain employment costs and building and equipment costs must be incurred regardless of the size of a unit's road

system or the volume of traffic it serves. Second, road mileage, population, and vehicle registrations have been shown to take no account of inter-unit travel. An equal division factor would partially compensate for this omission.

The need for an equal factor to reflect fixed costs and inter-unit travel is greatest when a large proportion of the total revenues is received by only a few of the local units. In Michigan ten of the counties receive 54 per cent of the total county allocations and 12 of the cities receive 47 per cent of the total city funds.

Money Needs Factor. Some states, Washington and Minnesota among them, have recently adopted or considered a "money needs factor" as a basis for distributing a portion of total revenues. The factor is intended to take account of differences among local units in their ability to provide highway revenues from local sources. It is usually based on the taxable value of property of the local administering units and expressed in terms of a standard minimal millage rate which the local units are expected to contribute.

A money needs factor cannot be evaluated in the same terms as the other distribution factors because it is based on a different principle. Most highway distribution factors are intended to yield an allocation which provides

the maximum benefit for motorists, with variations in the benefit obtainable assumed to be proportional to variations in highway needs. A money needs factor tempers the benefit principle with an ability-to-pay principle. In effect it holds that a unit may receive somewhat more user taxes than the benefit principle indicates is warranted if its local tax base is too small to provide an adequate amount of non-user funds.

Some Other Objective Factors. Occasionally bizarre factors appear in the distribution formulas of some states. Michigan has the unique factor of "equivalent municipal trunkline mileage," the product of a peculiar historical development in its distribution formula. (See Chapters II and III.)

In Louisiana, highway user taxes are distributed to the parishes (counties) in the same proportion as the Louisiana gasoline tax was collected 27 years earlier in 1935. It is interesting to note that in a highway fiscal study for Louisiana in 1955, economist William D. Ross found that distributions on the basis of population, road mileage, or land area, or some combination of these factors, could bring only slight improvement over the old formula.[10] This is not a testimony to 1935 as a vintage year; rather

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[10]William D. Ross, Financing Highway Improvements in Louisiana (Baton Rouge, Louisiana, 1955), p. 157.

it points up the impossibility of approximating differences in needs with objective factors alone.

Summary. Michigan's current distribution formula already contains the more desirable objective factors. Analysis has shown that a combination of these objective factors alone, regardless of their relative weightings, fails to approximate the user revenue needs of many local units. Formulas based entirely upon objective factors may be appropriate for states characterized by a fairly even dispersion of highway needs; they do not seem to be suited for use in states such as Michigan which have extreme variations in their populations, economies, climates, traffic patterns, and consequently, in their road needs.

A Formula Based Entirely on Engineering Needs

Alternative to a formula based on objective factors is one based on engineering needs, or some modification of engineering needs such as "user revenue needs." After all, why try to devise an elaborate formula which will approximate needs, when needs data could be used as the basis of distribution in the first place? If needs data are acceptable as the criterion for optimal allocation, why are they not also the most appropriate means for performing the allocation?

Most states have avoided formulas based on needs factors for two reasons. First, the idea of an engineering inventory of a state's total road system is a relatively new one. The first few times such a study is made there is

a natural reluctance to accept the findings as reliable enough to determine the allocation of millions of dollars. Second, there is the persistent fear that the highway administrators making the needs study will manipulate the figures in their favor.

These reservations tend to be overstated, however. Use of standardized procedures, better trained personnel, and the experience gained from previous studies have improved the reliability of highway needs studies. The second reservation, the fear that highway needs will be manipulated if they become the basis for distribution, deserves careful consideration, as it is the most commonly raised objection to the use of needs as a factor.

While the possibility of manipulation cannot be denied, there is good reason to believe that this risk is minimal in Michigan, especially in light of the advantages to be gained from a needs-oriented formula. Three reasons can be given to support this position: (1) The separate needs estimates of each local unit are submitted to audit; not only does the State Highway Department review the estimates, the counties and cities themselves have set up screening committees to assure uniform reporting. (2) The tendency of units to overstate rather than understate their needs has a self-cancelling effect on each unit's proportion of the total. (3) It is doubtful whether a unit could inflate its needs by even as much as 20 per cent and remain

undiscovered; yet under the present formula the errors of over half of the counties and cities exceed 20 per cent.

Recognizing that the virtue of objectivity in factors is meaningless if the formula results in substantial misallocations, and recognizing too, that highway needs studies are grounded on sound engineering principles, the 1961 highway fiscal study staff broke with tradition and recommended that the third level of the distribution formula, as well as the first and second levels, be based upon highway needs. Specifically, they proposed that each county and city receive two types of user tax payments: (1) payment from the total county and city shares of an amount equal to that portion of each unit's annual debt service for highway debt incurred before January 1, 1961 for which user revenue receipts had been pledged in repayment, and (2) payment of the remaining funds in proportion to each unit's proportion of user revenue needs.[11] User revenue needs were understood to be total engineering needs less federal aid and the local nonuser assignment. Among other states which have also considered or adopted highway needs as a distribution factor are Washington, Louisiana, Minnesota, Iowa, and

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[11]Since separate needs are not available for the 409 cities and villages under 5000 population, the fiscal study staff recommended that the amount which needs indicated should go to these cities as a group be allocated among them by the same major and local street formulas now in effect.

North Carolina.

While a distribution on the basis of user revenue needs is preferable for Michigan to any combination of objective factors alone, it still suffers from two defects. First, the method by which the engineering needs estimates were computed makes inadequate allowance for the fixed costs of highway administration. As outlined in the procedural manuals followed by the counties and cities, only those costs directly associated with constructing and maintaining the road and street systems were to be counted. While the manuals permitted the local units to increase their construction cost estimates by 15 per cent to cover the costs of "construction engineering and contingencies," the context of the manuals makes it clear that the allowance was intended to cover costs of a variable nature.[12] Moreover, what is needed is not a standard percentage allowance, but one which is a fixed dollar amount to reflect those costs which are relatively independent of the unit's road mileage or traffic volume.

The second defect in user revenue needs as a distribution factor is that it penalizes those units which

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[12]Michigan State Highway Department, Planning and Programming Division, Procedures and Instructions for Determining Municipal Street Needs (Lansing, 1958), p. 37.

have reduced their needs through a high level of local support and rewards those units which, through a lack of effort, have allowed their needs to accumulate. In the case of the cities this is no hypothetical situation. Chapter V showed extreme differences in the degree of past local effort exist. Most large central cities have a five-year record of contributing considerably less than their user revenue receipts for the same period. Many suburban cities raise two or three times more than is received in user revenues. A distribution on the basis of needs would impose an unfair penalty on the suburban cities, since the more industrious they were in meeting their needs early, the more their present share of revenues would be reduced.

A Formula Based on Both Objective and Need Factors

Whether Michigan's user tax revenues are distributed entirely on the basis of objective factors, such as population and road mileage, or entirely on the basis of engineering needs, inequities of one form or another have been seen to be attendant. The bulk of the evidence indicates, however, that of the two, a needs-oriented formula is more suited to take account of Michigan's diverse highway requirements. The evidence has also shown that highway needs as determined by engineering analysis may be modified by a number of

objective factors which improve the equity of a needs-oriented formula.

Specifically, the following interplay of need and objective factors is suggested as a guideline to policy determination.

First Level Three-Way Division. As explained in Chapter IV, the aggregate engineering needs of the state, counties, and cities should be (1) increased by the amounts of accumulated debt service, (2) reduced by the amounts of anticipated federal aid, and (3) reduced by the amounts of needs assignable to nonusers. The nonuser assignment may be defined as the average of the earnings-credit and relative-use nonuser assignments for local roads and streets. The relative proportions of needs remaining after these three adjustments should determine the relative shares in the first three-way division of funds. The 1960-1980 needs remaining after the three adjustments indicate that the state should receive 49.52 per cent, the counties 30.01 per cent, and the cities 20.47 per cent of the total Motor Vehicle Highway Fund.

The Second Level Division by Road Classification. When the three adjustments in engineering need noted above are applied to the county and city road classifications, the following allocations to each road class are indicated: (1) the total county share should be divided 72.00 per cent for primary roads and 28.00 per

cent for local roads; (2) the total city share should be divided 79.77 per cent for major streets and 20.23 per cent for local streets.

The Third Level Division to Individual Local Units. Future needs studies should include a separate schedule of the debt commitments of each local unit. Until such a breakdown is available, the fiscal study staff proposal appears equitable. Under their proposal, debt service obligations for which future user revenue receipts have been pledged would be paid out of the total county or city allocations before they are divided among the individual units.

The division of the remainder of the city and county shares for each road class should be divided among the individual local units on the basis of two factors: (1) A small portion (not to exceed 15 per cent) should be distributed equally to take account of the fixed costs of highway administration. (2) The balance should be distributed on the basis of needs (where individual needs figures are available) which have been adjusted for (a) the unit's anticipated federal aid, (b) the unit's nonuser assignment, and (c) the unit's record of past local effort. The amount by which needs should be adjusted for past local effort should be computed by subtracting the unit's $\overset{\text{computed}}{\wedge}$ average annual nonuser assignment from its $\overset{\text{actual}}{\wedge}$ average annual local contribution in

the preceding five years. If the balance is positive it should be multiplied by 20 and added to the 20-year user revenue needs, since the unit has been meeting more than its assigned nonuser proportion of needs. If the balance is negative, it indicates that the unit has not been raising its assigned nonuser proportion of needs. In this case no adjustment in user revenue needs is necessary, since the amount of the nonuser share has already been deducted. Each year this adjustment is redetermined on the basis of a moving five-year average of local effort.

An example should help clarify the adjustment for local effort. Royal Oak, a suburb of Detroit, was found to have 1960-1980 engineering needs of $11,930,000 for its local streets, an annual average for the 20-year period of $596,500. The nonuser share of local street needs, as determined by an average of the earnings-credit and relative-use methods, is 64 per cent. For Royal Oak, then, an average annual contribution of $381,760 (64 per cent of $596,500) is required to meet its share of annual nonuser needs. But for the five-year period 1956-1961 Royal Oak contributed an annual average of $646,970, or almost twice the amount that is required. The difference between its actual annual rate of contribution, $646,970, and its assigned annual rate of contribution, $381,760, is $265,210. This difference times 20, or $5,304,200, should be added to Royal Oak's $11,930,000 in engineering

needs. To fail to do so would yield a proportion of total local street needs for Royal Oak which would take no account of the fact that Royal Oak has contributed almost twice the amount of nonuser revenues assigned to it. If, however, Royal Oak's annual rate of contribution begins to decline, it would be immediately reflected in a smaller addition to needs. If its annual rate of contribution were to decline to the point where it was below its annual nonuser assignment, no adjustment would be made in total needs. It is interesting to note that the adjustment for past local effort is limited almost exclusively to the cities. The counties seldom, if ever, contribute locally an amount that exceeds their annual nonuser assignment. For the cities, though, the adjustment is an important one if an equitable distribution is to be achieved. Those units which raise far more than their nonuser share of needs because they have elected to complete more of their total needs than current user revenues will permit, will have their needs adjusted to reflect this choice.

Chapter VII

Conclusions

Since first adoption of the gasoline tax in 1925 the locus of Michigan highway finance has shifted from the local levels of government to a state-wide level, with state-collected taxes on the operation and ownership of motor vehicles supplanting the local property tax as the major source of highway revenues.

The administration of highways has also tended to shift to higher levels of government, but to a far lesser degree. Under the State Trunkline Act of 1913, certain designated county roads (and later their urban extensions) were promoted to administration by the state; township roads were merged with the county system under the McNitt Act of 1931. But in terms of mileage, most of Michigan's 110,000 miles of roads have continued to be administered at the local levels--86,000 miles by the counties and 15,000 miles by the cities.

The disparity which has developed between the financing and administering functions of providing highways introduces a special problem into highway finance: the problem of determining an appropriate basis for allocating state-collected user revenues to

local administrative units.

Historically, Michigan's response to the allocation problem reveals a piecemeal approach unfettered by any concern for structural unity. At first all locally-shared user revenues were allocated to the counties in proportion to the amount of motor vehicle registration tax collections in each. Then an equal division factor was added, later a road mileage factor, then a population factor, still later "inch-miles" of snowfall.

While each of these factors was presumed to bear a correlation with highway administrative requirements, their weighting and structural organization became a matter of political higgling. The power held by the rural interests is reflected in the Horton Act requirement that one-half of all state highway construction funds be devoted to trunklines in the northern portions of the state. The inferior bargaining position of the urban interests is seen in the fact that the only funds allocated to cities were those remaining after the counties and townships had met their road debt obligations. Because of the extensive use of property tax financing in the 1920's these debt obligations were often large, leaving no funds for distribution to the cities and villages. In 1934 there were 29 counties which shared no user revenues with the municipalities within them.

Revision finally came in 1951 when the current formula for allocating user revenues to local units was adopted. The new formula represented a major advancement toward a rationally based formula free from the pressures of political factions. Most significant were (1) the establishment of a new special fund, the Motor Vehicle Highway Fund, for isolating highway user revenues from general state revenues, (2) the introduction of road and street classification as a means for allocating user revenues, and (3) the promotion of the cities to equal eligibility with the counties for user revenue grants. The 1951 revision retained all of the previously used distribution factors--weight tax collections, road mileage, population, and "inch-miles" of snowfall--but restructured them into a simplified, more rational basis for distribution. The incorporation of road classifications in that structure was especially important, recognizing that needs vary with the amount and character of traffic a road serves, not with the political boundaries it crosses.

In spite of the tremendous advancement the 1951 formula represented, however, the question could still be raised, Does this particular structure of factors and factor weightings produce the "best" or most desirable allocation of funds possible?

Clearly the answer to such a question depends upon how a "best" or most desirable allocation of revenues is

defined. In this study two major assumptions were necessary in the definition of an optimum allocation. First, it was assumed that implementing "the benefit principle" should be the major objective of any highway distribution formula. According to this principle taxes paid by highway users should be directed exclusively to providing the maximum attainable benefit for highway users. Second, it was assumed that the best available index of "maximum attainable benefit" is relative differences in highway needs for the periods 1960-1980, as determined by the recent Michigan engineering study. This assumption holds that the benefit obtainable in any administrative unit is proportional to the dollar cost of the improvements that engineering analysis shows will be needed in the coming years to adequately maintain that unit's roads or streets.

What of the possibility that "engineering need" may be an overstatement of "economic need" where by "economic need" is meant the need for roads and streets when weighed against all other alternative public needs, such as for schools, public safety, etc., and ultimately against the alternative of private versus public needs? There can be little doubt that "engineering need" <u>is</u> an overstatement of "economic need." The procedural manuals provided the personnel conducting the needs study with the following instruction: "<u>For the purposes of this study the engineer</u>

should assume that the necessary funds will be available when the improvement is actually needed."[1]

But this overstatement does not compromise the use of "engineering need" as a performance criterion. Consumers of public services make the decision on the economic need for highways when they determine the total amount to be devoted to highways, as opposed to the amounts for schools or other public needs. A distribution formula, no matter how much it is perfected, cannot increase the total amount to be allocated. Thus the use of engineering needs cannot result in the allocation of more funds to highways than consumers of highways desire. Engineering needs are being used to determine only the relative amount each unit should receive, after economic need has determined the total amount to be made available.

While engineering needs constitute a suitable index of attainable benefit, their use as a performance criterion of the distribution formula can be improved with three adjustments: (1) To engineering needs should be added the debt service obligations of each of the administering units. This adjustment takes account of highway improvements which were completed through debt financing and consequently must be paid for out of future revenue allocations. (2) From these engineering and financial needs

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[1]Michigan State Highway Department, Planning and Programming Division, Procedures and Instructions for Determining County Road Needs (Lansing, 1958), pp. 10-11, (their emphasis).

should be subtracted anticipated amounts of federal aid. This adjustment reflects the fact that some highway needs will be met from other user tax grants. (3) From the balance remaining should be deducted the nonuser assignment of highway costs. This last adjustment takes account of the fact that nonusers also derive benefit from improved highways and therefore should bear a portion of their cost. The balance of engineering needs remaining after these three adjustments have been designated "user revenue needs."

The specific amounts of the debt service and federal aid adjustments are fairly easily determined; but the amount which should be deducted as the nonuser contribution hinges upon the theoretical method of user-nonuser cost assignment adopted and how the findings of the method are applied. This study has proposed that until new findings clearly show either the earnings-credit or relative-use nonuser assignment to be superior to the other, that the average assignment of the two be deducted. Furthermore, only the nonuser assignment for local roads and local streets should be deducted, on the grounds that the nonuser share of costs for other highways should not be charged against the needs of these local systems.

Employing user revenue needs as a performance criterion for testing Michigan's present distribution formula reveals the existence of a substantial degree

of misallocation. Many counties and cities receive a considerably higher proportion of user revenues than their proportion of user revenue needs warrant, while others are receiving considerably less. The testing method used also reveals that the average misallocation of 46.2 per cent for the cities is more than double the average error of 20.4 per cent for the counties.

For the counties the pattern of error appears random, with differences within the counties outweighing the effects of commonly shared characteristics. For the cities, however, definite patterns in the misallocation of revenues are discernable. The large central or core cities such as Detroit, Lansing, and Flint receive less than their user revenue needs warrant, while the suburban cities receive exceptionally larger amounts of revenues than needs warrant. The northern cities tend to receive modest excesses of revenues, while the small southern cities receive deficient amounts of revenues relative to needs.

These errors in allocation for the cities usually are positively linked with their past records of local effort. In general, the suburban cities have large positive misallocations and also have a record of high local support for their streets. Most of the central cities have relatively poor records of local support accompanied with negative misallocation errors.

This correlation reveals a weakness of user revenue needs as an indicator of the proper allocation for each unit. Those units which have diminished their level of needs through high levels of local effort are penalized, since their sacrifice has reduced their share of need-warranted revenues. Conversely, units which have allowed their needs to backlog, through a poor record of past local effort, are rewarded with a larger current share of needs-warranted revenues.

The results of the testing procedure clearly indicate that the present distribution formula, although a significant improvement over past methods, is in need of revision. Further analysis reveals that retaining the presently used objective factors for distributing user revenues among individual units will not yield significant improvement, no matter how deftly the percentage weighting of these factors are readjusted. The diversity of Michigan's economy, population, and climate create commensurate diversities in highway needs with which objective factors are unable to cope satisfactorily.

The findings indicate that only by a distribution to local units directly on the basis of user revenue needs can the benefit principle be reasonably implemented. However, a user revenue needs distribution can be further improved by two adjustments: (1) allocation

of a small portion of the funds equally to take account of fixed costs of highway administration not included in the needs estimates, and (2) an upward adjustment of user revenue needs for those units which have raised locally a greater proportion of nonuser revenues than their nonuser assignment requires. The latter adjustment compensates for the penalty which would otherwise result if a fine record of past local effort were permitted to diminish a unit's proportion of current user revenue needs, and consequently, its actual user revenue allocation under a needs-based formula. The amount to be added to the 20-year needs is defined as the difference between the average annual local contribution for the preceding five years and the average annual nonuser assignment multiplied by 20.

The search for an optimal formula for distributing highway user revenues is only one aspect of the total highway finance problem. The best of formulas guarantees neither adequate funds nor their prudent use. On the other hand, a distribution of highway revenues that is ill conceived compounds errors in highway taxation and administration. Michigan's present distribution formula misallocates millions of dollars each year. These dollars are not lost to the highway system as a whole--one unit's deficiency is the surplus of another. What is lost is a measure of the total benefit highway users

might have obtained had revenue allocations more closely approximated relative differences in highway need.

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