Highway Fund Distribution Policy

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Geographic apportionments of highway funds by the Federal and State governments have greatly increased in importance in recent years. The trend toward centralization in highway finance, especially as a result of Federal decisions, has occurred together with increased highway expenditures on behalf of local travel within geographic regions, particularly in urban areas. The channeling of the enormous central pools of highway revenues to separate regions and road systems is a distinct part of public policy for highway financing.

An economic view is suggested of the apportionment process. The geographic division of highway user tax proceeds links the collection of the revenues with their expenditure for specific investment purposes. Therefore, distribution policy may be analyzed both in terms of the economic objectives of user taxation, and the economic principles applicable to highway expenditures. Both approaches are considered, as well as the problem of drawing them together.

The distribution policies of the Federal and State governments have been influential in shaping the direction of transportation developments among regions. At the time before World War II when nearly all tax collections were expended upon rural roads, the shift of money from cities to rural regions gave intercity and rural motorists the benefit of support from the broad urban highway tax base. In the postwar period, the decision to finance urban freeways from user taxes has been an important factor in the course of metropolitan transport planning. Various economic issues raised by the rural-urban division of highway funds are discussed briefly.

• THIS PAPER discusses the apportionment of highway funds as a question of highway fiscal policy. In highway financing, more attention has been centered on the imposition of taxes, and the collection of revenues, than on the distribution of the proceeds. It is desirable, in view of recent trends, that highway finance analysis be advanced beyond these customary limits to include the allocation of revenues to particular regions and road systems within a taxing area, as well as the total supply of funds.

What is involved in apportionment policy? Highway user taxes are nearly all collected by the Federal Government and the States, and the apportionment process may be said to begin with the division of the revenues between governmental road systems. For example, a fuel tax of $0.10 per gallon within a State is paid as a unit by the motorist, but it might be composed of the following divisions:

a $0.04 Federal tax to pay for the Interstate Highway System and other Federal-aid roads, $0.015 imposed by the State for distribution to local rural governments, $0.005 for allocation to municipalities, and the balance of $0.04 retained by the State for State system highways. The next step is a geographic division of funds for each class of road. This stage may be accomplished by formula or by administrative discretion; a formula is almost a necessity if there is a transfer of money from the tax-collecting government to the spending unit. Even in the absence of intergovernmental transfers, formulas are often used to apportion funds among regions within the taxing jurisdiction, most notably in California. When the distribution of funds is decided entirely by administrative decision, the process may still be controlled by standards and directives set forth in laws governing the use of highway money.

The final apportionment to specific projects is largely an executive procedure, based upon some kind of short-run capital budget which is meant to direct funds to their most productive uses. A central tax-collecting government fully responsible for the planning and administration of all roads and streets within its boundaries might choose to treat the entire division of revenues, from start to finish, as a programing procedure, deciding the direction of funds by a priority-rating system. In this case, apportionment would involve no substantive policy decisions connected with highway financing. At the other extreme, the central government might be merely a collecting agency for highway user taxes, returning funds to the area of their origin without strings attached. Again, no apportionment decision, other than a purely mechanical one, would be required.

It is in the range between the collection of highway user taxes and the final capital budgeting of available funds that apportionment may be regarded as a separate, distinct chapter in highway finance policy and government decision making. The allocation of funds from the central authorities is generally intended to promote broad transport objectives, and to further their accomplishment the distributions are usually accompanied by stringent controls over the use of the funds.

The gap between the payment of highway user taxes and their ultimate use has been widening in recent years, the result of growing central control over finances and increasing expenditures primarily for the benefit of local travel purposes, especially in urbanized regions. Today, the Federal Interstate Highway program, toll roads, and State efforts have brought many States to the point where an actual completion of major intercity, interregional, and interstate road networks can be confidently foreseen. Their completion, in fact, would require only a few years if all highway user tax collections, State and Federal, were expended exclusively for such highways. However, the central governments are now deeply engaged in the sphere of local transport, providing highways to serve predominantly short-distance vehicle trips, and no end to the need for highway funds for this purpose is yet in sight.

These trends have added greatly to the economic significance of apportionment policy, which channels the flow of funds from the enormous central pool of revenues to the separate regions and road systems. In metropolitan communities, much highway planning is now done in the course of comprehensive transportation studies of local transport needs; often, the planning is carried on independently of State highway agencies, or in cooperation with them. These regional plans develop highway needs estimates from predictions of

economic and traffic growth within their study area. But an important planning consideration is beyond local control: the supply of highway funds depends upon taxation and apportionment decisions at the State and Federal levels of government, and fiscal policies must be seen as external circumstances in the area plans.

The purpose of this paper is to suggest some economic considerations by which the apportionment process may be approached and analyzed. The ideas presented here are in part the outgrowth of a research inquiry into California's long experience with dividing highway funds among regions (*1*), but it is believed that they have general application. The theme to be developed is that an economic analysis of highway tax apportionment brings together two different sets of principles: (a) those which are associated with assessing the financial feasibility of an entire highway program in order to devise equitable taxation methods, and (b) those associated with the evaluation of specific highway expenditures in order to establish the "need" for investment in roads. To unite these different branches of economic analysis, it is necessary to examine how taxation objectives and concepts may influence the allocation of funds for specific purposes, and how the monetary factor affects highway investment planning.

METHODS OF HIGHWAY FUND APPORTIONMENT

The division of funds takes place in two ways: (a) by the direct expenditures of the tax-collecting governments on their own road systems, and (b) by intergovernmental aids. Nearly all Federal money is distributed by the second method, but the States spend the majority of their own user tax revenues directly on State-administered highways. The quantity of highway user money that ultimately filters through to a region thus depends on three decisions in public policy: (a) the distribution of Federal funds among the States, (b) the locality of direct State highway expenditures, and (c) the allocation of State tax funds to local governments. These highway revenues may then be supplemented by city and county tax sources, or by tolls.

Apportionment of Federal Government Funds Among the States

The two varieties of Federal apportionments to States, the grants-in-aid to "ABC" roads and the funds for constructing the Interstate Highway System, are allocated according to different principles of distribution which are reflected in the nature of the distribution formulas.

Monies for "ABC" highways—the primary, secondary, and urban Federal-aid road systems—must be matched dollar-for-dollar by the States. In the distribution formula for primary roads, area, population, and the mileage of "rural delivery and star routes" have equal weight. The formula is the same for secondary roads, except that rural rather than total population is used. The entire spread of urban road aids is based on the population of "municipalities and other urban places."

The primary formula has endured since its enactment in 1921. This, perhaps, is less a tribute to the wisdom of the law than an illustration of one characteristic of legislative formulas: once in existence, they are not easily altered, as interests are built up for their continuation. As for its basic intention, Dearing (*2*) wrote of the primary formula that it was "designed to satisfy the national interest" in highways. "It would have been entirely appropriate," he said, "for the government to have pursued [its] declared objectives through the designation, construction, and main-

tenance of its own system of national roads." Instead, the national government chose to supplement and stimulate State efforts by working through State highway organization, and by prescribing certain managerial and construction standards for the use of the funds. "It is also worth noting," he continued, "that in the development of Federal policy no significant effort has been made to distribute funds in accordance with the benefits derived by direct users of the highways." The formula was not framed to approximate the volume of traffic, or the needs of highways, in each of the States. Area, population, and road mileage are broad indications of the relative importance of each State for interstate commerce, national defense, postal service, etc. It was not intended that the funds be used as a public subsidy to motorists, replacing tax revenues that might otherwise have been obtained from highway users, but as an incentive for State action which would further national objectives. This orientation of Federal policy, applies as well to the secondary and urban road aids that are directed specifically to local rural and local urban transport; there is no attempt in the formulas to proportion the size and distribution of the grants to the volume of each class of traffic.

By 1956 highway activities had attained a level of maturity in most of the States sufficient to raise a question as to whether the original purpose of stimulating State activity to further certain national purposes had not been accomplished, so that the continuation of aids could only be interpreted as a deliberate subsidy to motorists. In that year, however, Federal user taxes on motorists became the source of "ABC" funds, which theoretically disposed of the subsidy question. However, no change was made in the distribution formulas to parallel this action. The formulas thus became the means by which motorists in some States now provide large sums of money for the benefit of motorists in other States. It might have been appropriate to reconsider the formulas in the light of the new Federal fiscal policy, but no detailed appraisal appears to have been made at the time, nor has there been one to date.

Funds for the Interstate Highway program, which commenced on a large scale in 1956, are allocated among States in proportion to the remaining cost of completing the system in each State. The intention of Congress was declared in 1956 to be that cost should become the basis of distribution when suitable estimates of needs had been prepared. The need basis was formally adopted in 1958 after an extensive study of system costs. Therefore, legislative power over the spread of funds was limited to a periodic review of the cost estimates, the prescription of certain standards for calculating costs, and the inclusion of new routes in the system. Actual distribution decisions have depended mainly on the determination of costs.

The process of cost ascertainment is not restricted solely to the highway needs of vehicles traveling in interstate commerce but covers all vehicles that use the routes that comprise the Interstate System network. This is logical, inasmuch as the Federal government is charged with 90 percent of the total cost of Interstate highways and can invite only a small amount of State cooperation. It is not feasible, as a rule, for plans to be devised to serve only a portion of the total traffic flow along a route, unless there is some reason and technique for segregating traffic. To remove doubts about the matter, Congress directed in 1956 that local traffic be given "equal consideration" with interstate vehicles "to the extent that is practicable, suitable, and feasible," a proviso that has favored the distribution of funds to States with large volumes of local traffic relative to through vehi-

cle movements—the States, that is, with large urban concentrations. Adding to the force of the foregoing directive was an addition of 2,300 mi of routes to the Interstate System, the entire increase possible under the law, around and through urban areas.

It is not surprising, therefore, that the apportionment of Interstate highway funds is much more closely correlated with the total volume of vehicle travel in each State than with the Federal-aid primary formula, whose factors presumably expressed the national interest in interstate commerce and other national objectives.

(The section 108d formula's percentages, which represent nearly the entire cost of the Interstate System in each State as estimated in 1958, have these simple correlation coefficients: (a) with the Federal-aid primary formula, 0.75; (b) with the 1956 total traffic volume on all roads in each State, 0.93; and (c) with the 1976 total traffic volume predicted in each State, 0.93. The traffic data were reported in *Public Roads,* February 1960.)

Again, the source of the revenue for the system does much to explain the basis of apportionment. The Federal decision to set up the Interstate System program was coincident with, and probably contingent on, the conversion of Federal finances to user taxation. Although the system is expected to handle about one-fifth of the nation's vehicle movement when completed, the Federal user taxes are paid by all motor vehicle travel, and there is an understandable desire that the funds be returned in rough proportion to the State and area of their origin. Notice may be taken of the many recent references to the geographic origin of revenues made to counteract the suggestion that certain segments of the system having the least "national interest" because of a predominance of local vehicles might be deleted from the system.

A modest amount of Federal assistance is extended to forest roads and miscellaneous other purposes but need not be considered here.

Apportionment of State Funds for State Highways

Highway funds received by the States from Federal grants or from State-levied taxes, and used for highway purposes, are either distributed to local governments or spent directly on State-controlled highways.

The policy of each State for distributing State system expenditures among localities within its borders is determined in part by the destination of Federal funds. In most States, nearly all Federal money is retained by the State highway agency, rather than passed on to cities and counties, and it must be matched with State funds. Interstate System money must be used on a specific, limited mileage of roads. This is true also of primary and secondary aids and the matching funds, but the mileage of "ABC" highways, with a few exceptions, includes the majority of State system highways in each State, giving a wide latitude to the place of its investment. After matching the Federal grants and meeting the expenses of maintaining and operating the highway plant, a State may use its remaining construction funds to offset the effect of the Federal constraints. If, for example, Federal money must be used largely in Region "A" because an Interstate route passes through that locality, a State may allocate its own funds largely to Region "B". Of course, a State's ability to do this is no greater than its own highway revenues permit. In California, highway money raised from State taxes is sufficiently ample to overcome virtually any influence that Federal funds might have on the total geographic apportionment of State system expenditures, but few States are able to exercise this much discretion.

A separate, distinct policy for the distribution of State system funds is not often defined by a State. The decisions that govern the geographic allocation are reached when roads are classified as State highway routes (making them eligible for the expenditure of State money), when legislative directives are enacted for the preparation of long-range highway plans or annual budgets, and when provision is made for the administration of the State highway function. States approach the problems in many and varied ways, making general statements about the procedures difficult. (Questionnaires received from 36 States recently showed that 6 States apportioned funds among two or three major regions of the State; 23 States, by districts; and 11 States, to lesser jurisdictions. Of course funds are also split among the several systems. Apportionments provide for a spread of projects, that has not necessarily been made in accordance with relative need, or equity.) (*3*) To the extent that generalization is possible, it appears that a State legislature typically gives formal approval to a comprehensive plan of some kind for constructing a basic road system. Short-term programs designed to accomplish the long-range objectives are prepared by the State's highway administrative agency and are reviewed and approved by a highway advisory commission, the State legislature, or both. In a few instances, California for example, the State legislatures enact apportionment formulas to guide the flow of State system funds among regions within the State, even though there is no transfer of money between governments. Another type of legislative formula gives priority to one class of State highway over another. Such formulas fix limits to the scope of administrative decisions.

One idea has typically dominated past apportionments, that the State is engaged in constructing a single "Statewide" network of roads for connecting major population centers and providing access to all places where there is sufficient Statewide "interest" in good highways. The corollary to this concept is that the proper basis for apportionment is the need of each part of the system for funds to permit its completion, with needs being determined through engineering evaluation. In view of the broadening Federal-State highway activities in local transport during the past decade, this concept might well be reconsidered as a guide to the distribution of funds.

The geographic division of State highway funds is one of the least studied areas of public decision-making in transport today. The effort of the Bureau of Public Roads to provide a compilation of State laws relating to the programing of highway funds is most commendable, and ambitious in view of the variations in practice discovered for a relatively few States (*4*). It is necessary, also, to focus attention on the distributive process itself, on the criteria used and the standards followed, as well as the legal and administrative mechanics of the process.

State Apportionments to Local Governments

The geographic apportionment of State highway aids to local rural and urban governments is accomplished entirely or in part by legislative formulas in all but 4 of the 48 continental States. The funds are technically apportioned as grants in aid, often with certain conditions and controls established over their use.

One study of the subject (*5*) reveals that area, population, road mileage, vehicle registrations, user tax collections (primarily vehicle rather than fuel taxes), and equal portions are the most popular factors included in the formulas, but this list

is by no means exhaustive. The opportunities for improvisation, grafting, and experimentation with different combinations are endless. If a pattern can be discerned, however, it shows that the rural aids are most often distributed according to a combination that includes some measure of over-all need or "interest," such as area or road mileage, and an approximation of local travel volumes, such as vehicle registrations and tax collections. This combination brings together both the characteristics of the grant-in-aid and the shared revenue. For urban apportionments, population is the factor chosen most often. But one hesitates to attribute a high degree of rationality to these formulas. "As a general rule," the study concludes, "it appears the formulas in use have been developed over time by trial and error conditioned by a generous amount of pulling and hauling by opposing local interests."

One explanation of State aids to local roads arises from the very evident need for a system of distributor, feeder, and access streets, without which major arterial highways built by the States with Federal assistance could not function effectively. It might, therefore, be argued that the most appropriate basis of fund allocation is the cost of constructing and maintaining these roads, rather than a return of funds to their source. However, certain objections could be advanced to an apportionment based solely on need. The most important of these is the lack of information: the extensive mileage of rural roads and city streets cannot be surveyed without a huge expenditure of technical manpower which has not been available for this task in most States. Uniform standards for review by State authorities also require considerable improvement. When attempted, local road studies have revealed a large range for the exercise of local discretion about the desirable extent of highway improvement in each area, which does not always admit of a factual solution. Because it is difficult, if not impossible, to harmonize these differences by engineering estimates, it is felt by many that local choice might better be left to local financing; but the difficulty here is that local governments do not have the freedom to impose taxes on road users enjoyed by the States.

Present policies for State distributions to local roads can be summed up by saying that in most instances the States extend a measure of assistance to the cities and rural governments, leaving the balance of the problem to a local solution. The trend is toward larger aids, but definitive apportionment standards based on needs must wait for more reliable appraisals of local highway requirements.

Summary of All Monies

The total division of highway funds is summarized in Table 1 for two years a decade apart. Over this span, the trend toward centralized highway financing is clearly seen. By much the largest increase as a source of funds has been the Federal government. Direct State spending of State-collected revenues has accounted for the next largest growth.

TABLE 1
TOTAL FUNDS MADE AVAILABLE FOR HIGHWAYS IN THE UNITED STATES, 1949 and 1959 [1,2]

Financing Medium	Funds 1949 ($\$\times10^6$)	1959 ($\$\times10^6$)	Increase (%)
Intergovernmental apportionment:			
Federal to State	429	3,035	607
State to local	735	1,513	106
Total	1,164	4,548	291
Intragovernmental funds:			
State	1,577	3,833	143
Local	1,069	1,800	68
Total	2,646	5,633	112
Total all funds	3,810	10,181	167

[1] Source: U.S. Bureau of Public Roads, *Highway Statistics* (1949 and 1959).

[2] Excludes State toll financing and proceeds from sale of bonds.

Small increases have been registered by State transfers of user funds to local governments and local fiscal sources, mostly non-user.

Combined Federal-State spending for highways rose about 250 percent between 1949 and 1959. The spending of local governments, including the aids received from the States, rose by 84 percent in the same period of time.

By 1959, almost one-half of all highway funds (and considerably more than half of all construction money) was being transferred between governments and thus guided by legislative formula to its destination.

ECONOMIC BASIS OF APPORTIONMENT

An examination of the division of highway funds in any State reveals a complex interplay of forces which are pertinent to the public welfare. An economic view of the process deals with but one of its many aspects. It implies an abstraction from other factors, chiefly political, which influence actual policies. "Our frequent naive assumption that the government is a monolithic entity devoted only to the public welfare and knowledgeable about how to attain it has had several most unfortunate consequences," Hitch has observed, speaking for economists; ". . . it has closed some promising fields to economic analysis, *e.g.*, government expenditure and government organization." (*6*)

It seems appropriate, however, to assume that the public interest regarding expenditures for highway purposes is definable by economic standards, and that government activity in this field may be guided by economic principles. The highway is one of the essential elements of motor transport, along with vehicles, drivers, fuel, etc., and in fact highways are a rather small, but nevertheless, strategic, item in the total motor transport budget. Highway cost is an expense complementary to the other costs of travel by motor vehicle, and if highway space is not available in sufficient amount, the motorist suffers the consequences of congestion, delays, and accidents. To use the language of those who inform the American populace as to the urgency of making road expenditures, "we pay for good roads whether we have them or not." The broad purpose of highway policy of all kinds, including financing, is to maintain a balance between the total number of vehicles within an area and the space for them to move about.

Most of the policy issues connected with highway fund apportionment turn on the question of whether the revenues earned from highway user taxes should be returned to the area of their origin or apportioned on some other basis. It is generally claimed by those favoring a return of funds to their geographic source that the failure to follow this policy upsets the desirable balance between the amount of vehicle usage and the provision of road facilities; those arguing for redistribution of user payments, on the other hand usually hold that the sources of earnings do not indicate places of the need for expenditures. There are both size and time dimensions to this controversy. If enough money were available to meet all highway requirements created by motor vehicle travel in all localities, it is quite possible that funds returned to source would also be brought to the places of need. However, apportionments usually must be decided within limited budgets and time periods, forcing consideration of road needs which have the greatest claim on funds currently available. For policy purposes, the more that the size and time horizons can be enlarged, the more opportunity there is to weight both the origin and destination of the funds.

It is the peculiar character of high-

way user taxation among public finances which gives significance to the apportionment problem beyond the scope of direct capital budgeting and programing. The geographic distribution of a lump sum of money, allotted for highway purposes from a general public budget, would raise no immediate issues regarding the origin of the funds. Highway needs, established on economic grounds and in other ways, would constitute a sufficient guide. However, the payment of user taxes is one element in the concept of highway need, since evidence of a willingness to pay for roads is taken as a measure of their value to the motorist.

Economic Principles of Highway User Financing.

The economic basis of highway user taxation is a pricing philosophy, with motor fuel and vehicle taxes on highway use performing the functions of prices. The theory views user taxes as representing to motorists the cost of supplying them with roads. If people travel in cars, they use highways and pay for them; if they do not travel over the roads, they do not pay. There is a presumption in this doctrine that the money contributed by each motorist will be spent for his benefit; otherwise, some drivers would be required to pay for roads they did not use, and other users would enjoy the services of roads for which they made no payment. The implication of this thinking for the apportionment of user revenues is this: over the long run, money should be directed to those areas and roads from whence it originated, so that there will be equal payments made for benefits received. Brownlee and Heller have suggested that if highway user charges are based on production costs "when demand and supply are equal" (*i.e.*, when congestion or excess capacity are absent), the revenues be imputed to each separate portion of the highway system "equivalent to the payment that would have been made for the use of that portion if tolls equal to the established prices had been charged" (*7*).

Fundamental objectives of highway user taxation were presented in 1954 by Richard Zettel (*8*). The list, which seems comprehensive, includes (a) tax equity, (b) tax neutrality, and (c) standards for highway investment. Equity is an objective because highway services are distributed unevenly through the society, and society seeks compensation from each user of the services in proportion to benefits received. User taxation is intended to make tax policy neutral in the choice among transport alternatives, by requiring compensation for the cost of providing services to those who benefit, while not forcing taxpayers to pay for services that they do not use. As an investment standard, user taxation establishes a connection between the expenditure of funds and those who provide them, thus offering a test of how users evaluate the investment of resources on their behalf. The economic virtues of this service are two: it opens a channel for making the demands of users effective, and it supplies a restraint on spending beyond the point of economic gain. Indirectly, user taxation contributes to the intelligent investment of highway funds by setting up a dependable source of revenue as a basis for highway planning, a revenue source related to the principal factors used in estimating highway needs.

These objectives are those of ideal user taxes, the purposes to be sought in practice. This list of advantages is founded on "a conception of the highway function as fundamentally different from other functions of government," as Zettel says; a conception of road policy as a form of public enterprise, operated in a manner analogous to a public utility business, and financed by the specific beneficiaries

rather than the general public. Although the terms "equity" and "neutrality" refer to public financing rather than the market economy (because highway money is raised by taxation rather than by pricing, excepting road tolls), the similarity between user taxes and transportation prices has been often noted, and with justification. The public regulation of transport rates and fares has as its objective that charges afford a fair competitive choice among routes and services but not be unduly preferential or prejudicial to particular buyers. Further, transport prices, like other prices, are meant to "effectively discourage the urgency of all those whose demand for the goods or services in question is less than their disinclination to pay," which confines resources to satisfying wants of the greatest urgency (*9*).

In considering the practical application of these concepts, Zettel discovers such imposing concessions to realism which must be made to accommodate the total philosophy that he concludes:

> For the present, at least, user-tax analysis provides no more than a rough guide to the economic justification of any proposed future highway program. Its principal merit, as we have suggested, is that it incites the active interest and participation of users themselves in the highway function.

Nevertheless, the broad idea that "users pay" for roads has tended to sweep aside a great many other misgivings about the wisdom of highway expenditures which might be expressed if funds had to be voted annually as general appropriations. The commercial principle, or the special benefit basis, has been the underlying economic rationale for the supply of highway money. It has been advanced to support the main pillars of highway finance: taxation in proportion to vehicle ownership and use, earmarking of the proceeds for highways alone, and assignment of main highway costs to users rather than general taxpayers.

These policies are seen as equitable because motorists are required to pay according to vehicle size and distance traveled, the principal elements of highway use. Because payment is not demanded through general taxes if alternative means of transport are preferred, the method of raising revenues is considered neutral. And earmarking of the proceeds requires that the funds be expended only on highways, so that the payments reflect the cost of providing roads, and not the cost of any other public activity. Thus, the link between payment and expenditure is sealed. If one were to judge by the frequent references made to commercial principles, their influence in highway finance policy would seem to be substantial. C. D. Martin, for example, Undersecretary of Commerce for Transportation, spoke to the Congress in support of proposed Federal user tax increases as follows:

> It is a sound business principle that such a highway plant be paid for by charges to its customers at rates which are related as closely as possible to the amount and kind of service received by the user and the cost of providing that service. In the case of our highway system, the State and Federal governments which provide the service must assess and collect charges for use of the facility just exactly like any other business concern.
>
> In this sense, what we are talking about at this hearing is not taxes as such, but rather a schedule of rates to be charged the various users who receive varying amounts and kinds of service. (*10*)

The rational motorist, it may be presumed, would prefer to pay for improved roads rather than their absence, and this idea briefly sums up the purpose of highway user taxation —to allow the motoring public to "vote" on the size of the investment in roads it desires through tax rates that reflect the reasonable expenses of road building and all other relevant costs. In the public enterprise

situation, market demand ("voting" with dollars) is apt to be a more exact measure of popular choice than political balloting, if the institutional setting is properly arranged to foster fair competition and economic efficiency. Such, at least, is the theory summoned in support of taxing for highways in proportion to use, tax earmarking, and reliance on users as the primary source of revenue.

Highway finance theory is only half-satisfied by the appropriate form of taxation; the tax objectives must also be served by the manner in which the money is used.

Zettel points out the fiscal question inherent in the distribution of user revenues among regions and road systems: "Perhaps the greatest weakness of user taxation is that it cannot be adapted to the variability of highway costs in terms of service units." To the extent that there is variation in costs and uniformity in price, the expenditure of funds cannot be strictly in accordance with relative road use, if needs are to be met. Instead, surplus earnings on some roads will have to be shifted to meet deficits on other roads. "The essential public decision to be made is the point at which the disparity between costs and earnings on particular facilities is so great that it is unreasonable to draw earnings from the rest of the highway system to make up the entire difference." (*8*).

User taxes, in other words, are not prices in a competitive market that allows the buyer to value the services of roads in relation to other spending choices. Imposed uniformly over a wide taxing jurisdiction, they cannot be adjusted to the costs of individual roads, so that the motorists does not always pay precisely according to the cost of service rendered. His payment, if it does coincide with cost, indicates a preference for what is offered to him rather than not traveling, but it does not indicate his desire for road service of a certain quality and may only imperfectly reflect his choice of highway transport over other means of movement. These factors can be accounted for in a determination of highway needs, but the transfer of surplus earnings to meet deficits—a process known as "cross-subsidization"—may have a strong influence on how road requirements are evaluated.

It has not been the custom of highway finance analysts to delve deeply into the ultimate destiny of highway revenues, once they have been accumulated. But given today's highly centralized financing and the ability to exercise economic power by shifting funds among regions and road system, it seems important that inquiry be made as to whether policies for distributing user funds are equitable to motorists, impartial to competition, and conducive to rational investment decision making.

To do this, the effect of apportionment decisions on the calculation of needs must be considered. First, it is necessary to examine some of the techniques and assumptions of highway investment evaluation, particularly as they are affected by the availability of money.

Economic Principles of Highway Investment Analysis

In a very rudimentary sense, the principle of highway capital expenditure evaluation is that no investment project is economic unless the benefits it provides are equal to, or in excess of, its costs. At any point in time, those projects have first claim on funds that display the greatest excess of benefits over costs, but over the long run the purpose is to complete all projects for which an economic "need," evidenced by a positive benefit-cost ratio, can be shown, if funds for doing so are available.

The Savings Concept of Benefits.—The rating of existing roads for their adequacy to serve present traffic is

the initial step in assessing the need for highway improvements. The improvement warrant, Campbell explains in an exposition of the engineering evaluation of highways (*3*), is a diagnosis that shows, after a rating has been completed, that a change is desirable. The warrant for action does not prescribe the cure; it merely says that action should be taken because the present facility has worn out or is otherwise inadequate.

The ratings lead to the formation of short-term improvement programs. Their usefulness is greater if preliminary assumptions can be made about some of the broader aspects of highway policy (about improvement standards, over-all highway need objectives, the financial capability to meet needs, etc.) for with these goals and limits given, short-term programs can be framed to meet long-term objectives. But this is a two-way avenue: the rating of roads is a necessary first stage in the preparation of long-range need estimates.

It is also suggested that the sufficiency rating for a road is not an economic rating, but this concept needs clarification. It is difficult to imagine a road on which "action" should be taken according to the rating standards, but for which there is insufficient economic justification for the action. Granted that the rating itself does not show exactly what improvement should be made when there is choice among alternatives, some of which might be economically justified and others not, a highway rated as "deficient" would appear to need at least a minimum correction. Yet, there is an important economic judgment in this idea; namely, that traffic demand will continue in the future. In the case of a deficiency due to insufficient road capacity rather than natural depreciation or obsolescence, the economic assumption is that traffic will continue at least at its present volume. No deficiency could be shown if traffic were expected to decline abruptly in the immediate future.

An illustration will help explain these points. At intersections, the right-of-way must be assigned or apportioned among cars entering on the feeding streets unless vehicle volumes are low. A stop sign is a simple means of assignment. Traffic signals require more expense. Warrants for installing traffic signals are generally related to the volume of vehicles (or pedestrians)—when traffic flows become sufficiently large to create undue delays for vehicles, on the main street or the side street, or cause frequent accidents, signals are considered justifiable. A far more elaborate improvement for intersection control is the grade separation. It is possible that consideration of future growth of traffic might suggest that an expenditure for this purpose would have greater justification than for a signal which could become outdated within a few years. Thus, the minimum improvement of a signal may be warranted because traffic volume has reached a certain level, but a more ambitious improvement could be proposed to serve the level that future traffic flows will eventually attain.

The economic evaluation implicit in the assumption of a given traffic volume is that the "savings" to motorists in vehicle operating costs, time, risks, and other factors that could be credited with monetary value are larger than the cost of improvement. Therefore, an expenditure upon a road intended to provide savings in excess of cost will bring about a reduction in the total cost of movement to motorists and would be accepted by users as an economic gain. This is true of the minimal type of road improvement needed to eliminate a deficiency.

A more complex decision is required when there is a choice between alternative actions, a choice which

depends upon the growth of traffic expected in the future. What value will future traffic place upon an improvement? It cannot be said that the value is necessarily measured by the savings possible to present users from the improvement. Savings cannot be credited to non-existent vehicle use, except by an assumption. This is the future traffic would appear even in the absence of improvement, or at least no more improvement than necesary to maintain the existing level of traffic service.

The Value of Travel.—About the existing, measurable flow of cars, it is known that all drivers value their travel at least enough to accept the time, operating, and other costs prevailing with the present facility, in preference to not traveling, so that any reduction in these costs, if greater than the expenditure needed to effect them, would be counted as a gain by the average users. (It must be conveniently overlooked that not all users are average—not all, for instance, place the same value on saving a minute.) By using the savings to future users as an economic justification for improvement, they are automatically credited with the same value on their travel. There is an identity assumed between the present flow of vehicles, which can be measured, and the increased flow in the future, which must be forecast.

In most instances of correcting road deficiencies, this assumption is not unreasonable. Existing traffic flows originate with the basic causes of traffic generation and interchange (population, land use activities, etc.). If the basic producers of traffic increase in size, a similar rise in travel demand can be anticipated, and if the relationship between traffic and land use remains roughly the same, there is every reason to assume that new users would look on savings from road improvements in much the same way as present users. Nevertheless, the more that predicted traffic becomes a variable factor in the planning of highway improvements, the more economic significance is acquired by the assumption concerning the value of travel to the motorist.

There is usually a large quantity of savings to users along a heavily congested route due to highway improvement. But the rigors of driving prior to such an improvement may also discourage a certain amount of road use. New highways attract new traffic, as well as benefit existing users. It would be an error to credit the full value of savings to those motorists who are specifically induced to travel by the road improvement itself. Previous to the improvement, the cost of travel was higher to the induced motorists than their value upon taking a trip via that route. Therefore, savings would overstate the actual size of the benefit.

To look at the matter another way, the objective of much long-range highway planning is plainly to prevent a chosen standard of traffic service from deteriorating, rather than to improve it. For example, a mainline two-lane highway may become inadequate to carry traffic if normal traffic growth continues, and hence requires conversion to a multi-lane facility. The requisite multi-lane road may be divided or undivided, may have partial or full access controls—there is a range for choice, depending on anticipations about future traffic growth. The problem is to proportion the number of lanes and other design features of the road to the volume of traffic that is forecast. Now there are no "savings" to be shown over the existing road; the optimum road improvement permits vehicle users in the future to enjoy, at minimum reasonable cost, the same quality of movement as was provided by the existing two-lane facility. Consequently, the optimum improvement by allowing sufficiently for traffic growth does provide a substantial benefit in road service to

motor transport, the value of which is realized to its fullest by forestalling a diminution in traffic service values.

Perhaps this is most apparent in the urban context. The conversion of routes from city street to freeway travel standards offers an unquestioned quantity of savings to the users of surface streets with which to offset investment costs. But large-scale urban highway planning is now often involved with determining the amount of freeway capacity that must be built to preserve the ability of the freeway network to provide unobstructed services to motorists. The justification, especially as the mileage of freeway increases, lies less in the benefits to motorists over surface street movement and more in the value of keeping a balance between the number of freeway lanes and the demands of motor vehicles.

The transition in thought, from determining the best facility to serve a given traffic volume to proportioning the total investment in roads to a variable traffic volume, does not always occur in engineering studies. (The economic model portraying the difference between minimizing cost for a given output of highway transport services and adjusting plant to a variable output is excellently presented by Nicholson (*11*).) It is the most conservative type of highway planning to calculate investment needs only to the extent necessary to bring roads up to tolerable service standards for present traffic volumes. Intelligent planning requires consideration of the economic life of an improvement, at least to the extent that predictions of traffic can be made with confidence.

Recognition that the benefits of direct "savings" are insufficient to evaluate the return on forward-looking highway investment has stimulated efforts in highway analysis to enlarge benefit concepts. The total value of the transport service of highways is revealed by the benefits conferred on the economy and the community at large—by the "distributive" and "spillover" effects of highway spending. Recently, the encouragement given by highway improvement to productive enterprises and commercial activities, along with the stimulation of roads to land values, has been given much attention. An enlarged scope for social activities and other "nonpecuniary" effects has also been mentioned. This widening view of highway transport values has opened a fertile field for economic research and theory which will be increasingly exploited by analysts in coming years. However, there is a danger in the broad approach: it requires a vast knowledge of interrelationships in the economy not now possessed, and the quest for certainty may, as Hitch observes, lead to such excursions into remote secondary effects that "perfectionism can stultify otherwise good economics" (*5*). There is much to be said for relying on "expected values" in the face of uncertainty.

More to the immediate point, it is important that these newer benefit concepts not be misrepresented. To show the total return on a highway investment, there is a tendency to add the distributive and spillover values to the "savings" realized by highway users, but this is a most unwarranted combining of two different ideas of value. It confuses the value of savings with the value of the travel to the users. The indirect effects of a highway improvement, if they can be confidently traced to the fact of an improvement in service, suggest that new users have found the total cost of vehicle movement, including the expenditure on the road, sufficiently lowered to make worthwhile travel that otherwise would not have taken place. It would be a distinct error to add savings for nonexistent traffic to those values that explain why new traffic growth

occurs; this is "double-counting," as some writers have pointed out. It would be legitimate to add direct savings accruing to present users to secondary values, as long as all indirect benefits could be associated with new users.

In economic terms, the excess of travel valuation over the highway expense needed to make savings available and other costs of highway movement is a "consumer surplus." For all present users, consumer surplus is increased by the amount of savings they realize from a project. For induced users, the surplus indicates a value of travel in excess of the total cost of movement.

The Role of Money.—One reason for a broader focus on highway benefits has been a growing dissatisfaction about the role of money in investment evaluation. Money is usually considered as an external fact: its availability, or lack of it, indicates whether an investment project is financially feasible, or to what extent there is "fiscal capability" for carrying out a highway program. But as an index of value—as a guide to economic desirability, which is its normal function in economic theory —money does not often enter directly into engineering evaluation.

Nevertheless, some assumption about it cannot be avoided. The customary benefit-cost evaluation of highway needs is framed to show how a given sum of money may be expended most efficiently among alternative spending projects. The starting point is a budgetary constraint of some kind. The size of the constraint may directly influence the standards used for calculating needs; there is a clear disposition among engineering planners to equate an increase in the amount of funds available with a decision to upgrade the quality of the service desired by highway users. On a more elaborate scale, if highways are being planned as a unified system of roads, the needs of any single project cannot be definitely stated until it is known how large a system can be built with the money supply in prospect. As a practical matter, it is desirable as a basis for intelligent highway investment planning that there be a predictable supply of funds from established final policies.

The budgetary constraint is equivalent to the assumption of a fixed traffic volume for highway benefit evaluation; indeed, if a user charge philosophy is accepted for finance, the two come to much the same thing. A fixed flow of funds indicates a public preference to spend at least that sum of money upon highways. Since the source of money is highway travel, the amount available could be interpreted as a measure of the minimum value upon highway service of users, in preference to not traveling by motor vehicle. If this were correct, then any improvement in the quality of service—faster speeds, reduced accident risk, etc.—which produced "savings" in excess of the expense would leave users better off.

In economic terms, the demand for travel would be considered inelastic, to the extent that savings were submitted as a justification for expenditure upon highways. If there were some doubt about the willingness of users to pay highway taxes, the budgetary constraint could not be fixed until the elasticity of the demand had been determined.

For a region within a taxing area, the budgetary constraint is the result of apportionment policy among governments and road systems. It reflects not only what users are willing to pay en masse, but also the decisions about how to employ the revenues. These decisions may be based upon a blend of considerations about how much users would be willing to pay for highway travel if given the opportunity to do so, and the opportunities for achieving greater effi-

ciency in vehicle movement by reducing total travel costs to users.

Actually, neither economists nor engineers have been particularly eager to take on the task of evaluating the necessity of road expenditures, preferring instead to let their own predictions be guided by the standards used in the other field. Thus, the results of engineering determinations have been viewed from the fiscal side of the fence as evidence of the extent that motorists need roads. The engineering results serve as the basis for setting user tax rates, dividing tax responsibility, and arranging that the total supply of funds be guided to the point of need. Engineers have seen the flow of funds as evidence that users want highways, the main object of engineering valuation being to assist in providing the optimum facilities at a minimum reasonable cost, thereby securing the most benefits for the money available. In this peculiar impasse, it is necessary at some point that, as Campbell says, "fiscal and priority planning must lock step."

Position of Fund Distribution in Highway Planning

The appropriate middle ground is being sought in the increased attention given to capital programing of highway funds—to a determination of how large sums of money should be placed to yield the highest return on investment. New techniques of systems analysis, borrowed from fields other than transport, appear to have a profitable application to the problems of programing; *e.g.*, (*12*). The programing approach requires dividing long-range plans into time periods, road systems, and travel purposes to facilitate analysis.

A further division of planning is found in the growing popularity of regional master plans for transport, which take account of all travel purposes and means of movement within a limited region. The "integrated" plans begin with a broad pattern of land usage, continue by predicting the generation and interchange of traffic from this pattern, proceed to determine the transport facilities required for handling the expected flows of vehicles and people, and end by estimating the cost of the proposed transport system, including highways. Eventually the planning mill grinds out an estimate of highway need that, if complete, embraces all requests for the highway tax dollar.

Highway apportionment policy occupies a strategic position with respect to these efforts at better investment planning. Fiscal policy has the power to establish the financial feasibility of the plans. Unfortunately, shelving fiscal considerations to the late stages of system planning for a region has sometimes revealed a wide disparity between total needs and revenues, and unless the difference is made up by a tax rise, all that can be said about financial feasibility is that a certain percentage of the total need may be met. Moreover the percentage may not be the same for different elements of the plan: funds may be overly concentrated on arterial freeway facilities, which could upset the desired balance between freeways and local roads, parking facilities, and public transit.

The tendency is for road planning which is carried on independent of the financial factor, as is true of regional road planning, also avoids a stern analysis of the economic basis of highway need. Instead, this approach invites a direct transition from technically-estimated costs to a finding of financial feasibility, depending on whatever sources of revenues happen to be available. It is natural that highway agencies would be somewhat compelled to develop need estimates sufficient to absorb the anticipated flow of Federal-State funds to their locality. If it is be-

lieved that the statement of highway requirements will directly influence the proportion of the total distribution going to each region, quite liberal estimates of need may be submitted to the central government.

To place highway fund apportionments in their proper economic perspective, the concept of financial feasibility must be broadly interpreted. What the financial feasibility of highway plans may indicate about their economic feasibility should be determined. A study in the water-resource field (*13*) says that the financial feasibility of a water project depends upon whether the project "generates revenues that suffice to cover all costs, including interest on funds borrowed to finance the project." Its "economic feasibility" is determined by whether "the economic valuation of the 'benefits,' to whomever they accrue, exceeds the economic valuation of the 'costs,' to whomever they accrue," when both costs and benefits are discounted to a given year. If there is a divergence found between economic and financial feasibility—between the evaluation based upon costs versus benefits, on the one hand, and actual outlays and receipts, on the other—further consideration would have to be given to the reason for the difference. An investment project which was not financially feasible, could be acceptable economically if government in its decisions took account of costs and benefits, real or alleged, which would not enter into the calculations of private investors.

Following this line of thought, the financial feasibility of a highway investment, or group of projects, would depend upon whether the user revenues earned from travel on the facilities covered their costs. The obvious defects of highway user charges as prices would not ordinarily offer a private investor the test of financial feasibility which would be provided by road tolls on single projects. But the total budget for highways can be as large as the revenues generated collectively by all projects, past and present. A project which does not produce enough revenue to cover its costs can be made financially feasible by a judicious transfer of surpluses on other roads to meet the deficit. When funds are thus distributed by apportionment methods to establish the fiscal feasibility of highway plans, the government is using cross-subsidization among highway users. This course may be justified on grounds of economic feasibility or social necessity, but it should also be asked whether the policy is consistent with the fiscal objectives of highway user taxation.

The Rural-Urban Apportionment Problem.—For example, before World War II, nearly all user tax collections were channeled to rural regions, despite evidence that almost one-half the revenue originated within cities. Although much usage of main rural highways represented travel by urban residents between cities, and although a strong case could be shown for giving priority to the improvement of the main intercity highway network, a good share of the urban-produced funds were expended on local rural roads, whose initial benefits were received primarily by farmers and other rural residents. This type of geographic apportionment also seems to have violated the neutrality standard of fair transport competition. For in the torrid rivalry generated between railroads and intercity trucks, the latter apparently enjoyed the benefits of support from the broad urban highway tax base. Even though the redistribution of urban monies might be interpreted as providing mostly for local rural roads, the motor trucking industry, along with other intercity motorists, was thereby relieved of the costly "branch" and "feeder" routes which plague large transport systems in all lines of transport. Finally, it is doubtful whether the rural alloca-

tion represented the most rational investment of funds.

A contemporary observer of the prewar scene noted that for a number of years there was no dispute over the diversion of urban funds to rural areas. Urban residents, in fact, were leaders in promoting the improvement of intercity rural highways; however, the growing inadequacies of city streets to carry traffic eventually led municipal interests to urge strongly that urban earnings be retained for use within cities (*14*). At that time, Owen commented that the distribution of user funds "is more often a function of the loudness of the demand for funds rather than of any economic consideration of where the money should be spent. Many states grant little or no part of the vehicle-tax fund to cities where the greatest needs of the motorist are generally concentrated, while on the other hand there is often an overgenerous contribution to local rural units and a corresponding incentive to wasteful expenditures." (*15*)

Much of the geographic imbalance between rural and urban areas in the division of highway user revenues has now been corrected. This change was accomplished in part by increases in State tax allocations to cities, even more by direct spending upon State system highways in cities. Most important was the action of the Federal Government in levying taxes upon vehicles and motor fuel and apportioning the revenues on the basis of needs, a large percentage of which were calculated to be within urban limits. Thus, public policy responded to the opinion that the larger economic investment needs for highways were concentrated in the metropolitan regions.

There is adequate cause for considering that this redistribution advanced the objectives of highway user taxation, as well as the benefit-cost principle. The alleged inequity to urban motorists has been reduced as the allocation of funds to urban regions has been brought more into line with urban earnings.

But the case is far from clear, when basic differences are observed in the road system of rural and urban areas. The local rural road network is usually quite costly to construct and maintain, in relation to the number of vehicle-miles it handles. The unit costs of the main rural arterial system are lower. Consequently, if there is cross-subsidization between road users within the rural region, it occurs when surpluses from main highways are transferred to the support of high-cost local roads. In contrast, some of the most expensive highway facilities now being built, both in total cost and cost per vehicle-mile, are the freeways in large metropolitan areas; whereas the urban surface street network, having the primary function of giving block-by-block access to properties rather than facilitating vehicle mobility, generally produces surpluses in highway user earnings. To accentuate this difference, the municipal surface streets have a far larger percentage of their total cost met from non-user tax sources than local roads in rural regions.

There is much evidence (even though the facts are difficult to establish) that the large quantity of surplus earnings from metropolitan city streets are now being directed to the support of urban freeways. Assuming that the total earnings of a metropolitan area are retained within the region, does the use of money primarily for freeway building accord with economic investment principles? It is true that arterial highway service in large cities, if it is to be efficient, must be fairly unobstructed. But the transfer of funds between road systems has also favored a highway solution to the handling of peak period traffic loads. Certain questions may be raised about this policy.

Is it equitable that the costs of commuting by highways be distributed among all motorists? At least one class of highway user (motor truckers) are not a major factor in the urban peak increment; indeed, it appears that they make special efforts to avoid the worst periods of the rush hour. Then, too, other vehicle owners who do their commuting by public transit might find the situation unsatisfactory.

From the standpoint of economic investment, the construction of freeways whose prime justification lies in relieving peak hour congestion on other freeways requires large expenditures for a travel purpose with extremely high marginal costs. Also, the support to peak users from off-peak travel and surface street usage is manifestly not neutral with respect to public transit, which must derive its main economic support from the commuter demand.

CONCLUDING REMARKS

The basic problem of geographic apportionment is to devise consistent rules and criteria for allocating funds among separate regions and districts. Highway finance analysts have felt disposed to leave the question of apportionment largely to the determination of needs because the calculation of road requirements can allow for a certain degree of diversity among regions, whereas tying the allocation of funds to a specific (such as vehicle registrations) leaves highway policy inflexible for meeting different conditions. However, there are distinct difficulties in attempting to estimate and evaluate highway needs completely independent of the sources of finance.

It would be an immense simplification for all concerned with highway planning if the highway-vehicle relationship were in perfectly fixed proportions—if each unit of highway use required exactly the same expenditure for road space. A distribution of funds in proportion to relative highway use in each region would then meet the needs of motorists and would return user tax earnings to their source for the benefit of those who paid them; over time, both taxation principles and the standards of investment efficiency would be satisfied, and the difficult and sensitive policy issues raised by transferring tax funds from one place to another would be overcome. The budgetary process for highway money would still demand intelligent management, but it would be mostly mechanical, without presenting any substantive policy questions for legislative decision.

Because this is not the case, a central highway authority must face the fact that the same engineering standards, fiscal methods, and other highway practices have to be arranged to meet the extremely diverse conditions of transport among regions. The fiscal question in distributing money among regions is whether there are differences that would cause a conflict in standards of investment need and finance—whether economic feasibility, as understood in terms of benefit-cost concepts, agrees with financial feasibility as based on the objectives sought through highway user taxation.

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