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Abridgment

Constrained Matching Procedure for Allocating Public Transportation Assistance in Minnesota

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As public transportation subsidy costs increase, federal, state, and local decision makers become more concerned about the effectiveness, fairness, and efficiency of subsidy-allocation procedures. This paper describes a new allocation approach, developed for the Minnesota Department of Transportation, that matches each local subsidy dollar with two state dollars, up to a policy maximum percentage of the total operating costs. Based on a review of the experience in several states and recent proposals for the federal program, we discuss four general subsidy-allocation criteria—equity, efficiency incentives, administrative practicality, and managerial dynamics. Advantages and disadvantages of the constrained matching approach and four other methods are then presented. We also describe the application of the new approach.

Until the early 1970s, user fares covered almost all of the operating costs of public transportation services, and few states or communities provided public subsidies for these services. Currently, however, fares rarely cover the full costs of the services desired by citizens, and increasing amounts of federal, state, and local funds are being committed to subsidizing public transportation systems. Rapidly escalating public transportation costs alarm state and local decision makers and, as competition for public funds has increased, they have sought ways of limiting the growth in subsidy payments to public transportation.

This paper describes a new subsidy-allocation procedure that was developed for the Minnesota Department of Transportation (MnDOT). Based on experience in other states and at the federal level and on four criteria for assessing subsidy-allocation procedures, we present the advantages and disadvantages of five alternative approaches. We present proposals for a new allocation method based on matching local funds to a policy maximum percentage of total operating costs. A complete documentation of these proposals is available (1).

REVIEW OF ALTERNATIVE ALLOCATION APPROACHES

A comprehensive survey in 1978 found 22 states that have 50 programs that provide operating assistance for public transportation services (2). Almost half (23 programs) based the subsidy on deficits in one way or another. Usually, the amount of subsidy was a portion of the net deficit after receipt of federal funds. The next most common procedure (10 programs) was to base subsidies on the amount of funds received from provisions of Section 5 of the Urban Mass Transportation Act of 1964, as amended. Other methods reported included formulas based on patronage, vehicle miles, population or population density, and operating expenses. More recently, California, New York, and the U.S. Department of Transportation have made or proposed various modifications to these procedures (3-5). Pennsylvania has begun to apply performance measures to funding programs.

Criteria for Assessing Allocation Procedures

Four criteria are helpful for assessing allocation schemes: equity, efficiency incentives, administrative practicality, and managerial dynamics (6). One could also assess different allocation approaches based on their effectiveness in meeting the objectives of the subsidy program, but two major limitations make this assessment criterion infeasible:

1. Political and technical problems of determining for any subsidy program specific, quantifiable objectives and their trade-offs and
2. Difficulty of estimating accurately what impacts different subsidy approaches will have on service levels and the resultant ridership or other objectives.

Equity is an important allocation consideration. Subsidy recipients in similar situations should be treated alike. The problem is how to determine what are similar situations and how to deal with very different ones. Establishment of what is equitable can be very difficult; for example, Is a fair process that may lead to unequal outcomes equitable? Should funding be equalized based on population, state taxes contributed, system ridership, or some measure of service such as vehicle hours? There is also a generally held concern that public subsidy programs should use general tax revenues to help lower-income groups rather than the more affluent. However, given the multiple objectives of public transportation programs, the subsidies often benefit different population groups unequally. Legislatures must consider various aspects of fairness and, through discussion and negotiation, establish an equitable procedure. Any procedure can, of course, be challenged in court by affected parties who claim unequal treatment.

The efficiency incentives are significant, both for the recipients and the administering agency. A basic problem is to guarantee whatever support is necessary to ensure a minimum level of performance in meeting program objectives while motivating recipients to improve their performance. Allocation schemes that are independent of system performance,

such as distribution by population, do not encourage or reward economic efficiency. On the other hand, direct subsidization of operating deficits can penalize efficient operations and encourage inefficiency. If recipients receive subsidies without commiting their own funds, they also may have less incentive to control costs.

Administrative practicality must be considered: The costs of administration for the subsidizing agency and the recipients should be minimized. Administrative costs typically include the following: collection and processing of the data to determine the subsidy, determination and enforcement of program regulations, and auditing. If service or ridership data are required for allocation, then some effort will be necessary to check data reliability. A related administrative aspect desirable to both the subsidizing agency and the recipients is predictability of funding levels over future years.

The fourth criterion, managerial dynamics, addresses the question of how the allocation procedure will influence future public transportation services and the industry that provides them. How will a subsidy program influence the continuity of public transportation services and providers? Does a program help the subsidizing agency (and the general public) determine whether program objectives are being met? Are recipients more or less accountable for their performance? Can public transportation managers influence the outcome of their efforts, can they innovate and respond to changing demand or operating conditions? What are the implications for the recruitment of new managers?

Brief Assessment of Five Potential Allocation Procedures

We have selected five basic approaches to the allocation of public transportation assistance. In consideration of the general criteria discussed previously, we take the perspective of a state legislature and present a list of the primary advantages and disadvantages for each.

The potential procedures include the following:

1. Allocation of total state funding to cities or counties by a formula based on demographic characteristics such as population and population density,
2. Coverage of a fixed portion of the nonfederal operating deficit,
3. Coverage of a fixed portion of the total operating costs,
4. Matching of state funds to local funds (two state dollars to every local dollar, for example) with a limit on the percentage of operating costs that can be matched, and
5. Allocation of some proportion of the total funding according to system performance criteria (perhaps based on showing improvement from year to year or by meeting normative standards).

The pros and cons of these approaches are presented in Table 1.

RECOMMENDED SUBSIDY-ALLOCATION PROCEDURE

The basic allocation procedure provides all eligible recipients (local governments or agencies) with two state assistance dollars for each local dollar applied to operating costs, up to a policy maximum on the percentage of total costs that are subsidized. Operating costs above the state policy maximum must be covered by user revenues or other sources of funds without state matching.

In some cases, state and local operating assistance will be equally matched with Section 5 funds; one local dollar will be matched with two state dollars and three federal dollars. However, the amount of federal assistance available to each area is limited: Federal funds in each urban area are set by the Urban Mass Transportation Administration (UMTA) Section 5 allocations, and in nonurban areas they are limited by the total funds allocated by Section 18 of the Urban Mass Transportation Act of 1964, as amended, to the state.

The state policy maximum percentages will be established for groups of recipients who have similar population size, such as urban or rural, or for recipients that provide certain services, such as those exclusively for the elderly or handicapped. Each recipient will continue to select, with technical advice from MnDOT, the type of service (such as dial-a-ride or fixed route) based on local conditions and cost-effectiveness criteria. State subsidy policy will not directly influence which types of service are appropriate for different communities.

The legislature will consider the amount committed by local recipients and appropriate state funds. If state funds are not expected to be sufficient to match all of the local funds committed, then MnDOT can lower the policy maximums. Thus local recipients will either have to increase fares, reduce total costs, or contribute additional unmatched local funds.

Local recipients will be primarily responsible for the planning and management of their transportation programs. Based on local objectives, they will prepare annual plans and budgets under a new local budget review process.

Efficiency Incentives of the New Procedure

The proposed subsidy mechanism does not provide any

Table 1. Advantages and disadvantages of potential allocation procedures.

Allocation Procedure	Advantages	Disadvantages
Demographic formula	Objectives totally locally determined; everyone receives funds, equitably based on demographic criteria; easy to administer; funding is predictable	Funding not directly related to areas' public transportation needs or to systems' performance; no incentives for managers
Cover fixed portion of deficit	Objectives locally determined; related to systems' financial needs; easy to administer	Inefficient systems receive more funds; encourages larger deficits; total funding is unpredictable; no efficiency incentives for managers; may encourage low fares
Cover fixed portion of costs	Objectives locally determined; related to systems' financial needs; easy to administer; may encourage more realistic fares	May encourage higher costs; total funding is unpredictable; not related to systems' performance
Match state to local funds	Objectives locally determined; related to local funding commitment; all recipients' funds equally matched by state funds; relatively easy to administer	Higher-income areas may receive more funds; not related directly to system performance
Portion of funds allocated by performance measures	Directly related to systems' performance; may provide incentives to improve management	May influence local objectives; requires considerable data; funding is unpredictable; difficult to administer; hard to establish and interpret meaningful measures

direct state financial incentives or rewards to local system managers because we believe that administration of such incentives would be much too time consuming and costly for MnDOT. If managers are able to operate their systems below the approved budgets, the systems will receive the state match for the funds spent and not the total state funds approved in their annual budget. If the costs exceed the approved budget, then the entire overrun is a local responsibility. There are also no bonus payments for meeting ridership or other performance goals.

The primary incentives for efficiency are that unmatched local dollars will be required beyond the established policy maximum and local dollars will be necessary for any cost overruns. Local managers and decision makers should be more critical of new service proposals and more concerned about poorly performing existing services as their systems approach or exceed the policy maximums. Every dollar saved above the maximum is a local savings and it will be a clear objective for managers to minimize inefficient services.

MnDOT will continue to provide technical assistance and advice on ways to improve services and cost-effectiveness and will critically review and evaluate each system during the annual budgeting process. A performance incentive program also has been proposed to fund worthwhile local experiments and to recognize innovative managers. The recipients will have the primary responsibility, however, for obtaining and rewarding good managers who plan, budget, and operate services effectively.

Allocating Federal Section 18 Subsidies for Nonurban Areas

These funds can be allocated in the same way as state subsidies by using the proposed procedures. All of the eligibile recipients of Section 18 funds will submit their preliminary operating budgets to MnDOT. Section 18 operating funds can be used to cover up to half of the system's operating deficits. The preliminary budgets will show state and local subsidy dollars matched one for one by Section 18 dollars. MnDOT will compare the total Section 18 dollars allotment set aside for operating assistance. If the former total is less than or equal to the latter, then all of the eligible recipients can be encouraged to proceed with their preliminary budget levels. If not, MnDOT will ration the available Section 18 operating funds by establishing a federal policy maximum on the percentage of total operating costs to which Section 18 funds can contribute. Above this percentage recipients will have to rely on local subsidy dollars matched by state dollars (up to the state policy maximum), unmatched local dollars, and revenues.

Each year, as the amount of Section 18 funds grows the number of eligible systems increases, or the total operating costs change, the federal maximum percentage may change. However, all systems will continue to receive a share of the available federal funds on the same basis.

Proposed Recipient Categories and Policy Maximum Percentages

A primary consideration in allocating assistance is that similar recipients should be treated equally. Recipients can have different demographic characteristics, such as population and geographic travel patterns, institutional arrangements, and transportation supply conditions. For example, recipients in rural areas have lower trip densities and longer trip lengths, less complex public agencies, and fewer transportation providers than do recipients in a large metropolitan area. Because many of the major differences in demographic and institutional influences on public transportation services can be characterized by the population of an area, recipients should be grouped primarily by population of the service area.

The current state funding provides a starting point for determining the allocation among the various groups of recipients. By examining the percentages of total costs subsidized for systems in each category, one can select a reasonable figure for the policy maximum. The intent is to set a level commensurate with current total state funding in each category. Some recipients now will be over and some under this level, but over the years all recipients will tend toward the standard maximum subsidy percentage for their category. For those initially over the maximum, the spending of unmatched local dollars will encourage them to consider raising fares, improving management, and reducing costs. For those currently below the limit, each local subsidy dollar will be matched with state or federal dollars, so local governments will tend to increase their contributions until the policy maximum is reached.

Although the distributions of the recipients' current funding and subsidy levels provide guidance on establishing the maximum levels, the final setting of maximum levels must be a policy determination based on an assessment of the funding commitments of the different groups of recipients and the near- and longer-term state budget priorities. Once the initial policy maximums are set, a procedure could be adopted for adjusting the policy maximums to allocate future state funding adjustments. One option would be to specify that all policy maximums should be increased or reduced in the same proportion. The policy maximums can be changed directly at any time, of course, to bring the state funding level in line with local commitments. This provides for a state subsidy policy under which all recipients can clearly understand how longer-term state budget changes will affect them.

A detailed discussion of the specification of the policy maxima, and the technical and political implementation issues addressed in Minnesota, can be found in Kern and Works in a paper in this Record.

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Analysis of Transit Performance Measures Used in New York State

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A recent study by the New York State Department of Transportation developed transit performance measures to be applied to the full range of the state's transit operations. This paper expands on this initial effort by examining: (a) factors that affect the 15 performance measures developed previously; (b) the interrelationships between measures; (c) the ability of the measures to describe changes in operator performance; and (d) the feasibility of using multimodal measures. The results of this analysis show that the 15 performance measures were not highly intercorrelated or influenced by the component variables used to compute them. The levels of a number of measures did not differ significantly among service types, which suggests their use in multimodal performance evaluations. A preliminary review of the performance levels for the second year reveals the usefulness of the measures as a diagnostic tool to identify possible operator performance problems. Operator levels in future years will be monitored to chart industry changes and to identify the need to modify the department's acceptable and desirable attainment levels.

The massive federal, state, and local investment in public transportation in recent years has led to an increased desire by all levels of government to monitor the impacts of these funds. A number of studies have addressed this need in relation to transit operating assistance and have advocated the use of transit performance measures to evaluate the effectiveness of this assistance (1,2). However, much of the past research into the development of performance measures has suffered from a common problem--that of the collection and use of accurate, reliable, and consistent data. The current collection and dissemination of Urban Mass Transportation Act of 1964, as amended, Section 15 transit operating data should help to alleviate this problem and greatly aid and increase research in this area.

A recent effort by the New York State Department of Transportation (NYSDOT) resulted in the development of transit performance measures to be applied to the full range of the state's transit operations (1). Achievement of at least acceptable levels of performance on each of the appropriate measures is necessary to ensure receipt of all operating aid funds to which an operator is eligible (3). Transit operating data collected by the department from all systems that participate in the state's transit operating assistance program contain many operating statistics not available to earlier researchers (such as employee hours and passenger miles).

This paper expands on initial department efforts by examining, in detail, factors that affect the 15 performance measures developed in 1979. Included are (a) an analysis of the relation between the performance measures and the component variables used to compute the measures; (b) the affect factors outside the control of the transit operator have on the performance measures; (c) interrelationships among the performance measures; and (d) the ability of the measures to describe changes in operator performance. This effort also addresses concerns about the desirability and feasibility of developing and using multimodal performance measures expressed by the transit operators and the planning and research communities after the department's earlier study in this area was publicized.

BACKGROUND

Recent efforts to develop transit performance measures grew from earlier research that described the need for such evaluations. Gilbert and Dajani examined the perspectives from which transit service could be evaluated (federal, state, local government, user, and operator) and outlined a framework for developing performance measures (4). A study by Allen and DiCesare identified possible criteria for measuring the level and quality of transit service (5). Work by Tomazinis and others described in detail the methods, problems, and requirements of creating transit efficiency measures (6). The Proceedings of the First National Conference on Transit Performance outlined the issues and problems involved in studying transit performance and presented recommendations for developing performance measures (7). Innumerable other reports have also described the issues involved in transit performance evaluation and presented possible measures for use in evaluations or as criteria for funding programs (8-10).

One of the first studies to develop and analyze performance measures for a large number of transit operators was by Fielding and Glauthier (11). This work was later extended to compare various California operations against the overall performance of all transit systems studied (2). These efforts were hindered by the unavailability of operating data, which resulted in the use of statistics such as the number of employees and passengers carried rather than more descriptive measures such as employee hours and passenger miles. Despite this problem, these and other similar efforts were valuable in that they not only developed sound performance measures but also analyzed factors that could affect the levels of the performance measures developed.

The NYSDOT effort described the background that led to the development of a set of 15 multimodal performance measures for use in New York State (1). These measures were developed for application to all