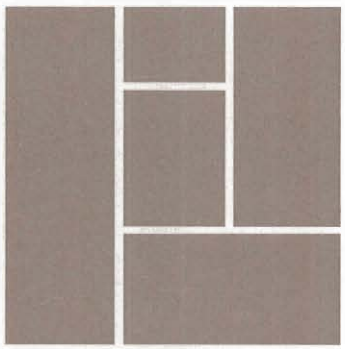
Mobility Assistance in Developing Countries: An Assessment of Options

by

Ulrich F. W. Ernst



THE URBAN INSTITUTE
2100 M Street, N.W.
Washington, D.C. 20037

Project Report

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ABSTRACT

The report examines the issue of public intervention to maintain or improve mobility for certain population groups through lowering the effective cost of travel. It is oriented toward the needs of the planner, emphasizing a comprehensive framework for considering alternative approaches. The discussion touches briefly on the various arguments in favor of mobility assistance programs. It concludes that some political objectives may be viable, but that economic efficiency arguments lack sufficient empirical backup. In fact, the experience with subsidies for public transportation suggests costs in terms of economic efficiency losses.

Approaches to a mobility assistance program are defined in terms of three dimensions: the basis for the assistance, the administrative mechanism, and supporting regulatory and institutional actions. Five major criteria delineate the evaluation of administrative options: efficacy, equity, efficiency, managerial impacts, and administrative costs.

The assessment of different options suggests that approaches basing any assistance on the actual travel of the target groups tend to have the edge in terms of efficacy, equity, efficiency, and managerial impacts. However, they also require an active and continuing administrative involvement, which may exceed the administrative capacity in developing countries. Given the characteristics of the transportation system in most developing countries, more unconventional alternatives for any mobility assistance program should be considered, including input subsidies (e.g., for vehicles) for small public transportation providers, or for user cooperatives in areas with low demand.

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INTRODUCTION

Socioeconomic development depends on increasing levels of mobility. The transition from subsistence agriculture to the exchange of goods, the diffusion of innovation, and the use of improved inputs hinge on a society's ability to overcome the "friction of space." Governments in developing countries and international assistance organizations have therefore come to view transportation policies designed to increase mobility as a cornerstone of any integrated development program.

Policy debate and practice have focused on infrastructure investments -- the construction and upgrading of roads, railroads, and other transport facilities. This focus has also governed the development of planning tools. Planners can draw on an array of fairly well-defined and tested methods for analyzing the likely costs and benefits of transportation-related investments for a developing country, at least at the project level. For virtually all transport investment projects, detailed projections of construction and maintenance costs, and of the economic benefits associated with reduced transport costs and time savings have become standard.

However, infrastructure investments represent only one set of transportation policy instruments -- albeit an important one. Governments can also manipulate the effective transport costs for the user, and thereby mobility patterns, through diverse regulatory and fiscal instruments. Taxes and subsidies in particular can alter the effective price structure in the market for transportation services. Planning tools for exploring the implications of alternative approaches to such market interventions have not reached the same standards as those available for investment project analysis.

Financial assistance to providers to lower the effective cost to the user, or to the users to increase their ability to pay has proved quite attractive to policymakers interested in facilitating travel or maintaining current levels of mobility in the face of rising costs. However, such assistance is rarely employed as part of a coherent transport policy. It is attractive because of its expediency in responding to specific problems or crisis in urban or rural transportation. This expediency tempts policymakers to move ahead with an assistance program without stating clearly the objectives of such an initiative -- what benefits are sought for whom? Even if objectives are stated, though, our limited understanding of the workings of the transportation market, and of the impacts of improved mobility hampers the formulation of approaches to achieve these objectives.

Setting objectives which ultimately involve a redistribution of resources among individuals and activities through some tax-subsidy scheme requires political judgement. How different approaches to implementing an assistance program relate to these objectives is a technical question. This report explores this question. It outlines the decision elements that delineate any assistance approach, and looks at impacts on users, transportation service providers, as well as the administrative costs that should be considered in evaluating options. The discussion takes a pragmatic approach to provide administrators with some guidelines for assessing the implications of proposed assistance policies, or designing an approach to meet specific concerns.

The report does not attempt to resolve any of the issues surrounding the rationale for transportation subsidies. Even so, a brief discussion of the arguments that have been advanced for and against such assistance schemes is essential to establish the background for examining different options and exploring their implications. This review in the first section of the report

focuses on public transportation in its various forms in developing countries, but covers other options for personal mobility and the associated transportation of small freight.

An exploration of the three major elements defining and assistance policy follows -- the subsidy principle (*what* is being subsidized?), the administrative mechanism (*how* is the assistance provided?), and the institutional and regulatory dimension (what organizational changes in the transportation industry and elsewhere are tied to the assistance?). The discussion shows a broad range of choices within each of the elements. Decisions in one dimension may narrow the range of options in the other two; but they usually leave considerable latitude. Thus, choices within each of these three dimensions have to be made explicit.

The next section evaluates alternative assistance approaches against five sets of criteria: efficacy, equity, incentive structure, effects on planning and management, and administrative costs. While the diversity of conditions in developing countries prohibits any absolute statements, the weakness of administrative and financial infrastructures renders any long-term assistance program problematic. In contrast, short-term interventions aimed at specific problems, such as programs supporting vehicle purchases by individuals or cooperatives, offer some attractive features.

THE RATIONALE FOR MOBILITY ASSISTANCE

BACKGROUND

The setting for transportation policies in developing countries varies greatly, across countries, but often even more between major urban centers and rural areas or small towns. Even so, some common characteristics set these countries apart from their counterparts in the developed world.

Vehicle ownership is limited. As a result, walking and public transportation play a greater role. Generally, public transportation in developing countries exhibits a more pronounced diversity. That diversity makes it easier to define public transportation in terms of what it is not, as Beesley (1973, p. 287) has done in a different context:

> ... 'public transport' is understood to apply to any form of transport to which a traveller has, or might have, access and in which the service performed for him is not provided either by himself, a member of his household or by an organization to which he belongs.

Several forms of public transportation in developing countries fall into the category of conventional transit: buses, trolleys (or some form of light rail transit), and rail rapid transit in a few major urban centers. However, other public transportation technologies are often more important: shared-ride taxicab service (like the *dolmus* in Turkish cities); small, sometimes specially constructed minibuses, multipurpose vehicles, or other large passenger vehicles operating in a jitney mode (like the *jeepneys* in the Philippines); or motorized or muscle-powered vehicles carrying passengers or relatively small amounts of freight (like the Philippine *trimobiles* or the *becak* in Indonesia).

Given vehicle ownership patterns in developing countries, public trans-

portation accounts for a higher percentage of all trips. Churchill (1972) estimated a share of 60 to 80 percent of all vehicular urban passenger trips for public transportation in Latin American Countries. Evidence from two mostly rural provinces in the Philippines presents a similar picture, as shown in Table 1. The two provinces form the major part of the Bicol River Basin, a focus for integrated area development efforts. In both provinces, public modes of transportation -- notably jeepneys (jeeps with an enlarged cargo area and with two benches lengthwise) and the trimobiles (motorized tricycles with an enlarged cargo space) -- account for virtually all trips not made on foot. While the share of specific forms of public transportation may vary, its overall preponderance is typical for a developing country. Table 2 shows estimates of the modal split in selected Southeast Asian capital cities -- indicating a public transportation share between 40 and 70 percent.

The diversity of public transportation within and across countries reflects differences in resource costs, as well as less stringent regulatory constraints, particularly in terms of market entry. In much of the developed world, public transportation is subject to tight regulations. One of the most striking examples is the fate of the jitney in the U.S., as well as elsewhere, which was regulated out of existence in most cities, primarily to protect conventional transit operations. In developing countries, low opportunity costs of labor make jitneys a relatively attractive undertaking for local entrepreneurs who face fewer constraints to market entry. As a result, public transportation is often characterized by many small providers, mostly owner-operators. However, this sector offers both an opportunity for capital accumulation and growth, and sufficient appeal for outside investment. Consequently, providers owning several vehicles and employing drivers are by no means uncommon. Rimmer and Dick (1980), in fact, argue that a strictly dualistic view of urban public

Table 1

Modal Distribution of Vehicle Trips
in the Rural Philippines
(in percent of all trips)

Mode	Province of Camarines Sur	Province of Albay
Jeepney	38.7%	27.4%
Trimobile	26.6	36.0
Bus	12.4	9.6
Minibus	8.8	8.6
Car	0.6	1.9
Truck	0.6	1.1
Twowheeler	1.4	3.2
Train	2.3	0.2
Boat	4.5	2.1
Skates	2.5	0.0
Animal-drawn	1.4	0.2
Other (taxicab)	0.0	0.0

Table 2

Estimated Modal Split in Southeast Asian Capital Cities
(in Percent of All Trips)

City	Year	Public Transportation				Private Transport
		All Forms	Conventional (Bus)	Intermediate		
				Fixed Route	Demand-Responsive	
Bangkok	1972	70	N/A	N/A	N/A	30
Jakarta	1976	65	42	10	13	35
Kuala Lumpur	1972	40	40	-	-	60
Manila	1975	75	25	50	-	25
Singapore	1972	64	42	-	22	36

Source: Rimmer and Dick (1980), p. 105

transportation -- conventional versus informal transit -- is inappropriate, given the range of technologies and organizational arrangements in the "informal" sector (at least in Southeast Asian cities).

Operators also tend to have more flexibility with respect to fares. While public agencies may set and oversee fares, fares are often negotiated. These negotiations may take into account the type of trip, origin and destination, time of day, and other characteristics. Moreover, public transportation providers typically also have to deal with fewer regulations concerning service standards.

Fewer regulatory constraints mean more competition. Competition may extend to conventional transit operations. For example, in Cairo (Egypt), the public transit system offers two competing alternatives. Higher-quality service is provided by newer buses at higher fares which operate on essentially the same routes as the older system, although not at the same service density. In other areas, competition among (privately owned and operated) conventional transit systems has led to sometimes chaotic service patterns. However, private and public transit systems can also complement each other, as appears to be the case in Kuala Lumpur (Malaysia), where private operators with smaller buses prosper alongside the publicly owned system.

Because of the importance of public transportation, transportation policy concerns (other than infrastructure investments) have focused on this area. Thus, the justifications that have been advanced for any kind of mobility assistance have been largely concerned with public transportation. However, assistance approaches focusing on vehicle ownership and vehicle use can be and should be considered in the same context.

The brief review of arguments in favor of some form of mobility assistance in the following paragraphs is designed primarily to highlight some of the concerns that pertain to this issue. The arguments are presented to establish

the background for the evaluation of alternative approaches, rather than to justify any assistance programs.

THE POLITICAL ARGUMENT

The most effective argument for mobility assistance in some form or another has been political in nature, related primarily to public transportation. Even under conditions of minimum intervention, governmental agencies may retain some control, particularly with respect to fare policies. Given an interpretation of public transportation as a quasi-public good, public agencies tend to set fares to reflect social objectives as well as market criteria -- regardless of whether they are only overseeing, or whether they are actually operating public transportation services. Administrators face strong political pressures to keep fares low for conventional transit, as social unrest following the announcement of fare increases in several developing countries has shown. At the same time, costs are rising sharply, largely as a result of fuel price increases. Keeping fares low under these conditions means chronic deficits in public transportation (a familiar situation in the developed world). Such deficits would make public subsidies to providers, in some form or another, inevitable.

Social Policy Concerns

Social policy objectives have played a major role in shaping policies toward public transportation in the developed world. Transportation disadvantaged groups -- the very young, the old, the physically handicapped, and the poor -- are unable to achieve the same level of mobility as the general population. Mobility assistance can ameliorate these problems, through subsidies to providers to enable them to provide services to these disadvantaged groups at lower fares, or through earmarked assistance to the respective target groups

to increase their ability to pay. The benefits of increased mobility accrue entirely to the target groups, unless the mobility assistance program removes market constraints, e.g., by enabling the poor to get access to jobs. The discussion returns to the market efficiency argument briefly below.

Developed countries have used a variety of approaches to assist the transportation disadvantaged beyond general subsidies to providers. Examples include free passes, reduced fares, or special services, mostly focusing on physical problems or handicaps, rather than on economic need. In developing countries, economic need would be an overriding concern. General income levels limit access to private transportation. In spite of comparatively low fares, the very poor (who account for a high percentage of the population in urban and rural areas) may be unable to afford public transportation at market fares. Observers have attributed overcrowding in city centers without adequate shelter and other facilities to people's inability to afford travel. Such overcrowding entails significant social costs.

Some arguments in favor of some mobility assistance point to its ability to mitigate distributional inequities associated with transportation investment policies. For example, a particular route for an agricultural feeder road may place some farms at a locational disadvantage. Some form of mobility assistance might be employed to compensate for these effects.

Earmarked Assistance

Any mobility assistance must be somehow earmarked for transportation to accomplish its purpose. Economists have long held that recipients value a given dollar of assistance more highly if they have more flexibility in spending it. Thus, earmarking any assistance for a specific purpose is preferable to any general assistance only if it encourages certain behavior patterns (increased

consumption of some good or service) desirable on social grounds. Bendick (1978) sheds some doubt on the ability of earmarked or in-kind assistance programs to achieve such behavioral objectives, since households will simply reallocate their expenditures to other uses. Earmarking does little to channel increased income to one particular good or service.

This argument, however, is limited to assistance earmarked for necessities, like food and shelter. If the assistance recipient is spending resources on these necessities now, the assistance may simply substitute for these expenditures. The freed-up resources could then be applied to other goods and services. In contrast, if the assistance is effectively earmarked (or provided in kind) for a good or service that is *not* currently consumed, substitution is not possible, unless recipients can somehow sell their entitlements. Thus, mobility assistance targeted at the very poor in developing countries would presumably yield the desired behavioral changes, improved mobility, unless the program is defrauded.

Maintaining A Public Transport Industry

Another, often quite powerful, political argument concerns the survival of the public transportation industry itself, or at least one of its branches. If market fares would result in a level of use that is too low for maintaining services, political pressure to provide financial assistance to keep the service may be substantial. The argument in favor of retaining a particular mode of public transportation is often unrelated to its effectiveness and efficiency in meeting overall transportation policy objectives. Protecting jobs and related objectives play a more prominent role.

EFFICIENCY ARGUMENTS

Much of the technical debate over the rationale for any mobility assistance has focused on microeconomic arguments for subsidies to public transportation. Beesley (1973) identifies seven different propositions in favor of public transport subsidies that have been advanced in the literature. Empirical support for most of these propositions is scant. The overview here can only touch upon these issues.

1. *Subsidies are required because of increasing returns to scale in public transport operations.* Several observers have argued that public transportation is subject to increasing returns to scale, i.e., operates more efficiently as the number of riders increases, e.g., Meyer, Kain, and Wohl (1965), or Mohring (1972). The cost of a small increment in service (marginal cost) thus falls, as the scale of operations increases. Under these conditions, the cost for an additional rider is less than the average cost per rider. If the public transport operations follows the efficient (in terms of overall resource allocation) pricing rule of charging everybody the cost for the additional rider (marginal cost pricing), total revenue falls short of total cost. Public subsidies would enable the operator to adhere to the efficient pricing rules.

Unfortunately, increasing returns to scale in public transportation seem to be the exception, as Beesley (1973) has shown for conventional transit. The few cost studies of other forms of public transportation (paratransit) have yielded no indication of any significant economies of scale. This lack of empirical support for the notion of increasing returns to scale casts doubt on the argument.

2. *Subsidies may be required to allow a service to continue under a flat fare that could break even only under discriminatory pricing rules.* Vickrey (1958) has advanced this proposition; he showed that the need for uniform pricing (flat fares) might render services unprofitable that could pay for themselves if the operator were able to levy fares according to willingness to pay.* The limited understanding of demand characteristics for public transportation makes it difficult to translate this argument into any practical policy prescriptions.

3. *Subsidies may alleviate temporary loss-making situations.* Losses in public transportation may be temporary because of two factors. First, the efficiency of operations may increase as a result of experience, such that cost per user falls below revenue. Second, a temporary provision of services at fares below market rates may allow users to find jobs or increase their income otherwise, thus enabling them to pay higher fares later.

Efficiency gains through learning by doing are rather improbable. They have not been documented. Temporary fare reductions to improve income prospects through increased mobility make sense only for new passengers with particular characteristics. Pursuing this policy on a systemwide basis scatters the impacts of the assistance, and creates a constituency for low fares that may make any planned fare increases difficult. The concept of a temporary loss may therefore be inappropriate; Oi (1973) alludes to the "perpetual need for temporary aid."

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* Vickrey illustrates this point with the example of a service costing $7, for 20 passengers, 10 of whom are willing to pay $0.30 a trip, and 10 are willing to pay $0.50. Under discriminatory pricing rules, the service would be profitable. For a uniform fare, only 10 passengers would use the service if the fare were set above $0.30; if it dropped to $0.30, all 20 would use the service, but would produce a revenue of only $6.

4. *Subsidies may allow public transport to continue operations to have a functioning system available when it is needed.* The "stand-by argument" calls for some maintenance of excess capacity in public transportation as an insurance against future calamities that may necessitate increased use. Regardless of its merits in developed countries, this argument is of limited validity for developing countries where excess capacity is rarely a problem for public transportation.

This argument overlaps with the political issue of retaining a particular public transportation mode.

5. *Subsidies to public transport are justified in terms of the positive externalities it generates and the negative externalities it avoids in comparison to other modes.* This argument is primarily concerned with the allocation of any mobility assistance among modes to alter the relative price structure rather than just lower the cost of travel. Public transportation is seen to mean less congestion, environmental degradation, and energy resource depletion than other modes, especially the private automobile. Infrastructure investments for public transportation (transit stations, for example) may generate some positive externalities in the form of joint development opportunities.

These considerations play a role in transportation policies in developing countries, particularly in some of the modern urban areas. However, public transportation in many of these countries tends to operate at or close to capacity. Trying to divert travel from private vehicles to public transportation through differential subsidies, even if the incentive were strong

enough, would be thwarted by capacity constraints. In addition, capacity expansion would occur primarily through smaller vehicles which often add to traffic congestion as a result of frequent stops.*

6. *If one or more modes are priced incorrectly, compensating (or countervailing) subsidies may be justified for other modes.* This argument, advanced by Meyer, Kain, and Wohl (1965), aims at situations in which governmental interventions for some mode have distorted the price structure to the disadvantage of the public transportation sector. Whether and to what extent this particular proposition applies depends on specific conditions, the overall structure of the transportation system, and pricing policies.

7. *If peak/off-peak pricing differentials are not feasible, cross-subsidization from one mode to another may increase overall efficiency.* Vickrey (1958) demonstrated that under certain cost and demand conditions, cross-subsidization between private and public transportation may be rational. However, without detailed information about costs and demand relationships between peak and off-peak, the argument is primarily of theoretical interest.

This brief review of the principal microeconomic arguments in favor of subsidies for public transportation suggests that such assistance can be justified on efficiency grounds only under special conditions. Moreover, even in these special cases, empirical proof for the need for a subsidy is difficult to establish. The externality argument may be the only exception to this conclusion. The next section explores one aspect of this argument further -- the potential *development impacts* of mobility assistance.

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* Subsidies to public transportation may also conceivably be defended on the grounds that they might help mitigate certain negative externalities. Often, public transportation services are operated in such a way as to jeopardize the safety of passengers and others alike; one example for rather hazardous maintenance and driving practices and the consequences are Kenya's *matatus*.

POTENTIAL DEVELOPMENT IMPACTS

In urban areas in developing countries, transportation policies grapple with problems that often resemble urban transportation problems in the developed world. However, in the rural areas we find a different perspective: transportation policies become instruments of development programs. Rural transportation of persons and agricultural products is a key element in transforming traditional agriculture. Potential development impacts are therefore a main concern in the evaluation of policies focusing on rural areas, such as investments in new or upgraded roads, or particular transportation system management options.

Several studies have sought to ascertain the development benefits of improved mobility. However, statistical and data problems hamper such an analysis. For example, Baron (1980) cites a study, Metschies (1979), which contrasted the relationship between mobility (approximated by transport outlays) and household income in the traditional, rural sector with that in the modern sector. The study found a positive correlation between household income and transport outlays. The problem here is of course one of determining the direction of any causality. The same problem applies to estimates of demand elasticities with respect to transportation cost for different income categories in rural areas in the Philippines, as shown in Table 3. Resolving the question of causality requires longitudinal data gathered through carefully designed studies; some efforts are being undertaken in this direction.

In the meantime, though, quantifying the potential development impacts of a given transportation policy option presents a difficult task for planners. Referring to roads and related investment projects, King (1967) notes that

> .....it is easier to quantify user benefits than developmental benefits, but in spite of this, they may be less significant than developmental benefits for the purpose of appraising economic development projects. (p. 292)

Table 3

Elasticity of Demand for Transport Services
by Income Class and Per Capital Income

Family Income[a]	Per Capital Income[a]	Demand Price Elasticity Total Passenger	Public Transport Passenger
1000-2000	175-350	0.5	0.5
2001-3000	351-525	1.0	1.0
3001-4000	526-700	1.3	1.3
4001-5000	701-875	1.7	1.4
5001-6000	876-1050	2.2	1.4
6001-7000	1051-1225	2.2	1.2
7001-9000	1226-1575	2.2	0.9
9001-12000	1576-2100	2.2	0.6
12001 +	2101 +	2.2	0.5

[a] Presumably in ₱

Source: Project Paper. Rural Roads Project II. FY 1979 - FY 1981. Office of Provincial Development, USAID/Philippines, August 1977, p. 87

Our limited understanding of the actual interactions between transportation and economic development generally has given rise to very creative solutions to exploring the benefits that *should* be associated with certain transportation policy options. Even for the more traditional road investment appraisals, we find a bewildering diversity of methods and assumptions. This diversity tends to increase as we move to non-investment policies, such as rate setting for private transportation service providers, or the operation of governmental transportation services for passengers or freight. As a result, a comparative evaluation of different types of policies with respect to economic development impacts is virtually impossible.

The absence of a unified analytical framework precludes an assessment of the central issue regarding the potential of a mobility assistance with respect to economic development: are the benefits of increased mobility through subsidized travel costs sufficiently large to warrant the expenditure of scarce funds? An exploratory assessment, building on a simple model of transportation and agricultural development by Walters (1968), is summarized in the appendix. Focusing on the interaction between the unit transport cost a farmer faces, and the area that can be profitably cultivated, the theoretical analysis concludes that development benefits generated by transport subsidies may well exceed the subsidy costs. The analysis also highlights the importance of off-road transportation costs as a factor hampering agricultural development.

The assessment summarized in the appendix should of course be regarded as a preliminary step in examining a complex issue. It does not attempt to deal with the question of the form of any transport subsidies. Particularly in rural areas, public agencies face a range of options to manipulate the effective cost of transportation. Marketing boards may vary the prices they pay for products according to the location of the farm. Alternatively, they may operate collection and transportation services themselves, at least for

selected areas. Another option involves preferential credit treatment for vehicle purchase, possibly on a cooperative basis.

ARGUMENTS AGAINST SUBSIDIES

The basic argument against any kind of subsidy in transportation rests on the notion of neoclassical economics that the open interplay of supply and demand in the market yields the most efficient solution to economic problem. Any public intervention to alter the effective price structure through taxes or subsidies is likely to leave us worse off. Many studies of the effects of subsidies on the transportation system lend some credibility to this argument. Well-intentioned subsidy programs have a tendency to produce unexpected and unwanted results.

For example Tye (1973) found that capital subsidies to public transit operators, intended to cope with the problem of an aging fleet, encouraged local managers to substitute new vehicles for proper maintenance. A distortion of the price structure for inputs had led to an inefficient pattern of resource use, for a given level of services. Similar findings have emerged from other studies examining the impacts of subsidies on the performance of public transportation, such as Gwilliam and Prideau (1979), or Webster and Ely (1979).

These findings do not necessarily invalidate the concept of assistance policies that transfer some resources to transportation from other uses. At this point, we do not have any conclusive evidence on the externality argument, in terms of environment, energy, development, or safety. If such externalities exist, public intervention may be justified. How the assistance is handled, however, may make a difference in terms of its effectiveness in increasing mobility. The remainder of this report examines this issue.

DEFINING THE POLICY OPTIONS

INTRODUCTION

Designing an assistance program to facilitate travel and to increase the mobility of the population as a whole or of certain subgroups -- for a given level of infrastructure investment -- requires answers to three basic questions:

- What is the basis for the assistance, that is, what is to be subsidized?
- How should the assistance be administered?
- What regulatory or institutional changes are required to accomplish the objectives of the assistance program?

The first question is of course the most important one. In deciding what to subsidize, a policymaker expresses the program's objectives -- by deliberate choice or by implication. The choice of a basis for the assistance also delineates the options regarding the administrative mechanism, and supportive institutional or regulatory initiatives. The discussion in this section explores the range of choices within each of the three categories, and assesses the extent of their interdependence.

THE BASIS FOR ASSISTANCE

Choosing a basis for the assistance requires not only a clear formulation of the program objectives, but also a differentiated view of the concept of mobility as the end result of a potentially complex process. Mobility can be defined in terms of the target group's *ability to travel,* and the related ability to more goods movements. An assistance program can either focus on

mobility, with the assistance geared toward creating the capacity for increased travel, or on *actual travel impacts*. In essence, the former approach concentrates on the supply side (capacity), while the latter is concerned with the results of demand-supply interactions.

For individual transportation modes, the distinction is straightforward. Assistance programs designed to facilitate vehicle purchase or maintenance are primarily related to mobility, while any assistance based mainly on the variable cost of travel emphasizes travel impacts. For example, tax relief on fuel relates the assistance to actual travel; similarly, any price discrimination by agricultural marketing boards at a collection point according to location of the farm also constitutes a form of mobility assistance related to actual travel.

In the case of public transportation services, the distinction between mobility and travel impacts becomes more complex. In individual travel, transportation services are consumed as they are generated. In public transportation, the identity between services provided and services consumed does not necessarily hold. The provider uses vehicles, fuel, labor, and other inputs to produce a certain level of services, measured in terms of vehicle hours or vehicle kilometers. The effect of that service level on actual travel depends on the demand response; public transportation can and does operate with excess capacity. While the nature of public transportation services in developing countries (their more demand-responsive orientation, and the scarcity of alternatives) keeps excess capacity to a minimum, the distinction between transportation services provided and actual travel remains useful.

Thus, expanding on the distinction introduced by McGillivray (1978), we find four alternatives for a mobility assistance program designed to provide public transportation services at a cost to the user below the market rate:

- *deficit subsidies* -- tax revenues are used to make up the deficit incurred by an operator in providing some level of service at established fares;

- *input subsidies* -- any measures designed to lower the effective price of inputs used in the production of transportation services; they may involve some form of tax relief (such as from fuel or other excise taxes), preferential loans, or direct grants tied to the purchase of capital equipment, such as buses or facilities, for payments to drivers and other labor, or for fuel and other purchases;

- *output subsidies* -- paid according to some measure of the level of service provided, such as vehicle hours or vehicle kilometers;

- *impact subsidies* -- based on some measure of service actually consumed by (eligible) users, such as number of passenger trips or passenger kilometers.

These four approaches delineate the basic alternatives. Refinements are of course conceivable. For example, some assistance programs focusing on public transportation providers have attempt to influence *service quality,* either by establishing certain minimum standards, or by providing direct incentives to improve service quality. Such provisions may also address safely-related issues -- in terms of equipment standards, driver training, or the actual safety record.

ADMINISTRATIVE OPTIONS

Mobility assistance programs can employ a variety of administrative mechanisms. In the discussion of administrative approaches in the developed world, two basic alternatives have played a key role. *Provider-side assistance* goes directly to the provider of public transportation services, based on the amount of subsidized inputs purchased, or on information providers submit regarding deficits, service levels, or mobility impacts. *User-side assistance* goes to the users of public transportation services, or purchasers of inputs to individual transportation. Strictly speaking, the ultimate destination of any funds is of course the provider of transportation services, or the

supplier of transportation inputs. The user becomes a conduit, deciding on the *allocation* of the assistance among competing providers.

For any assistance programs focusing on or including some form of private transportation, user-side assistance approaches are likely to dominate. While direct assistance to the supplier of inputs is feasible, the concern with the user makes such an arrangement less likely. For assistance programs primarily geared toward public transportation services, user-side assistance makes sense only for approaches that base the assistance on the amount of services actually consumed, i.e., for impact subsidies. At this point, the allocation decisions of the user control the distribution of the assistance, regardless of the specific mechanism employed.

In terms of the practical aspects, administrative mechanisms tend to be closely linked to the specific assistance principle chosen. For any assistance to individual transportation, a mechanism is required to target the assistance by user (if certain qualifications are to be met), and by type of input purchased. One option is for the assistance agency to purchase certain inputs from suppliers, domestically or abroad, and to resell them to qualified individuals or groups of individuals at a lower price. Alternatively, certain individuals or groups may be certified to be eligible to buy selected items used in transportation without paying the tax for which relief has been granted. Selected groups or individuals may be given some kind of coupon or voucher which can be used in lieu of cash in paying for some inputs. One example of this approach is the distribution of fuel coupons to members of groups deemed critical for economic development, or for supply of food, to enable them to purchase fuel in the open market at a lower price than the rest of the population. Finally, the administering agency may interact directly

with third parties, for example, by guaranteeing or subsidizing loans to individuals or groups.

Input subsidies can employ similar techniques in the case of public transportation. Young (1977) illustrates one option in his proposal for a scheme to subsidize loans to prospective public transportation providers for vehicle purchase. Such approaches offer reasonably good control over the use of any assistance. In contrast, deficit subsidies require an administrative capability to supervise and audit providers to assure that the deficits have in fact been incurred. Similarly, assistance programs based on the level of services provided call for a reporting mechanism, as well as some monitoring capabilities to assure that the service levels reported are at least roughly correct. As other options that involve the direct disbursement of funds to assistance recipients, these options also call for some mechanism to handle the financial aspects of the program. Planning for programs employing deficit, output, or impact subsidies may also involve the preparation and negotiation of contracts regarding service levels and quality characteristics with providers, particularly if private-sector providers are included.

User-side assistance approaches essentially represent one way to monitor the actual travel impacts achieved by eligible public transportation providers. The selection of eligible providers may employ any number of criteria with respect to financial responsibility, quality standards, or safety requirements. For a given trip, the user may choose among providers (as long as competition is a feature of the program). Depending on the nature of the program and the characteristics of the trip, the user would pay the regular (market) fare, partly with cash, and partly with whatever type of voucher or ticket is being used in the program. The provider collects these vouchers, turns them in to the agency responsible for administering the assistance program, and is reimbursed

in cash. In principle, it is an impact subsidy program, with the provider claims being substantiated by evidence of an agreement between provider and user.

The specific administrative approaches chosen also depend on the existing administrative infrastructure and its particular capabilities. Generally, regulatory boards for public transportation, educational institutions, agricultural marketing boards or extension services, social service or social security offices, health or family planning agencies, taxing bodies, or existing financial intermediaries may all play a role in the administration of a mobility assistance program.

This brief overview of administrative options does not go into the details of the actual procedures. The potential diversity of approaches of the micro-level makes it difficult to offer a concise yet comprehensive treatment in the context of this report. Kirby and Ernst (1981) examine possible administrative procedures in greater detail, focusing on the experience in the U.S.

REGULATORY AND INSTITUTIONAL ASPECTS

While some regulatory or institutional action may be required for mobility assistance programs concerned with individual transportation, the main focus of this question is on programs involving (private) public transportation providers. Some regulatory action may be required to assure minimum service quality or safety. More important from a political point of view are decisions regarding the degree of competition in the public transportation sector. Public sector involvement -- through subsidies or direct (subsidized) operation of services -- has often resulted in the reduction of the degree of competition in the market for public transportation services. The experience of developed countries with the creation of local monopolies for certain providers (regulating

jitneys out of existence to protect the market for conventional transit providers) illustrates this point. This experience has been repeated in a number of developing countries, often directly tied to the introduction of some assistance program. For example, in Manila (Philippines), the government required conventional transit operators applying for subsidies to join one of a few consortia created primarily for the administration of the assistance program.

However, regulatory initiatives can also aim in the other direction. For example, a frequently cited element of user-side assistance is the ability of this option to lower the cost of travel to certain persons or groups in a competitive environment. Thus, steps to allow or encourage competition among providers may be appropriate to complement user-side approaches.

EVALUATION CRITERIA

For a given set of program objectives, different policy approaches to mobility assistance offer different advantages and drawbacks. In this section, we examine several major options to determine their strengths and weaknesses with respect to selected criteria. Following Oi (1973) and Kemp (1979), we can distinguish five main criteria for the evaluation of alternative approaches to public transport subsidies:

- efficacy in meeting the objectives of the program
- equity in terms of the impacts of the scheme on different population groups
- incentives for economic efficiency in the process of increasing mobility
- impacts on planning and management of public transportation providers
- administrative costs for the agency or agencies responsible for the program.

Efficacy and equity criteria pertain primarily to impacts on the users of transportation, the people whose *mobility* an assistance program seeks to increase. Thus, the analysis of the effects of alternative approaches should focus on the mobility and related benefits to users, and their distribution among different user groups. However, if a mobility assistance program includes private providers, especially small operators, the distribution of benefits to them and its equity implications become important as well.

Incentives for economic efficiency refer to a critical aspect of any mobility assistance program. By definition, a subsidy program entails certain income and price reallocation effects which alter the overall efficiency of resource use. Such effects have been studied primarily with respect to taxes, e.g., by Stockfisch (1973), based on concepts of tax-shifting analysis, as outlined by Rolph (1954). Since subsidies can be interpreted as negative taxes, the analytical framework applies to the issue of the *overall* efficiency of mobility assistance programs. However, a detailed analysis of this questions may well exceed the needs of the evaluation of alternative assistance schemes. Here we are more concerned with any changes in the economic efficiency within the transportation sector, in response to changes in the price structure. For example, operators may tend towards over-capitalization of transportation operations, if assistance is granted only for capital purchases.

Impacts on planning and management of public transportation providers refer to three major aspects: changes in the demand structure faced by the provider that are induced by the mobility assistance program; changes in operating characteristics required by the program; and changes in the planning framework and their continuity or reliability -- what Kemp (1979) refers to as "managerial dynamics".

Finally, any subsidy program generates transaction costs. The administering agency must identify prospective recipients of the assistance, ascertain that they meet the criteria, carry out the necessary financial analysis and control to determine assistance entitlements, and perform the functions associated with the actual disbursement of funds. Oi (1978, p. S-8) sums it ups: "... it is costly to give money away."

The prevention of fraud and abuse can account for a major share of administrative costs. Exploring opportunities for misuse of assistance funds, and establishing administrative procedures to prevent it become an integral part of any administrative design. While program designers rarely display the same ingenuity as potential beneficiaries of abuse, appropriate safeguards can limit the possible payoff. Such safeguards usually entail additional transaction costs.

EFFICACY AND EQUITY

Different approaches to mobility assistance seek to overcome different types of barriers. Whether they are effective depends on whether they address the relevant barriers, as well as on the capacity of the transportation system as a whole. For example, focusing on financial barriers to the use of public transportation can improve mobility quite effectively, as long as public transportation has sufficient capacity, or has demonstrated that it can expand capacity quite easily. If the capacity is lacking, as in many rural areas, approaches designed to enable the target population to travel by private transportation or through some form of community-based paratransit may be more appropriate. Such approaches include assistance policies focusing on barriers to vehicle ownership and use.

For a given level of assistance actually disbursed, approaches emphasizing impacts on the target population tend to be more effective than other options. For public transportation, impact subsidies (as defined above) become due only when the trip is taken. Thus, potential recipients have an incentive to increase actual travel. In the case of private transportation, assistance based on variable costs, such as fuel consumed, also become relevant only when travel actually takes place -- provided the assistance is used properly. Assistance

programs based on criteria other than the actual travel impacts do not offer the same level of control regarding travel behavior.

Even so, such alternative approaches can be effective in overcoming actual or potential mobility problems. If the capacity of the system is limited, conditional assistance (based on actual travel) may not be sufficient. The cost may be minimal, but the program would fail in affecting actual mobility levels. In these situations, programs focusing on the capacity of the system may be more appropriate. That has of course been the rationale for the focus on road construction and upgrading in developing countries. Mobility assistance programs could deal with other inputs, such as vehicles, or fuel, if there are indications that market-imperfections affect certain population groups. For example, credit may not be available for the purchase of vehicles. An assistance program involving loan guarantees or grants for vehicle acquisition -- a scheme outlined in greater detail by Young (1977) -- could overcome this particular barriers. The actual impact on mobility depends to some extent on other design features that encourage use, and prevent or at least hinder abuse. One option here would be to promote cooperative vehicle ownership, especially in rural areas with low demand densities.

These considerations already lead into the evaluation of alternative administrative mechanisms, and related institutional and regulatory action. In the area of public transportation, the main choice is between provider-side and user-side assistance. In both cases, it requires recordkeeping and monitoring to determine the actual amount of assistance funds that should go to a particular provider. The provider-side option relies primarily on the provider for reporting of trips. In contrast, user-side assistance schemes may employ some combined reporting of users and providers, through tickets or similar devices, or it may

eliminate reporting requirements altogether by employing some form of prepaid passes sold at a discount to members of the eligible population.* Depending on the specific user-side mechanism employed, and the degree of competition in public transportation, users may enjoy a choice among providers. Economists and other observers have theorized that recipients value each dollar of assistance more highly if they have more flexibility in spending it. Under the right circumstances, a user-side assistance program may therefore give its target population a bonus in the form of increased choice.

Mobility assistance programs focusing on deficits, inputs, or service outputs rely on provider-side mechanisms almost by definition. As long as the assistance is financial, administrative mechanisms are required to assure that the basis for the assistance is adequately documented. In dealing with private providers, especially with numerous small providers, the administrative effort for such documentation and verification may be extensive. In many instances, input assistance could be more effective, as well as easier to administer. Certain items, such as fuel, offer some opportunities for diversion and abuse. Other options, however, can limit the benefits directly to public transportation providers. For example, free or reduced-free maintenance by publicly funded service stations would be an effective way of dealing with some of the safety concerns associated with public transportation.** The problem here would be less the potential for abuse, but the lack of required resources, particularly skilled labor, or parts.

The efficacy of alternative assistance approaches also depends on institutional initiatives and regulatory policies. Alternatives depending on effec-

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* In that case, the administering agency would be concerned with ensuring adequate service levels.

** Paying private service stations for such services again would require administrative procedures for documentation and verification.

tive competition among different public transportation providers may require regulatory action to remove barriers to competition. In the case of a large number of small providers, new institutions might be required to assure adequate distribution of any assistance to achieve the objectives of the program. Finally, any kind of cooperative arrangement for vehicle ownership and use in rural areas may call for the establishment of new or the reorientation of existing institutions.

Equity requires a distribution of assistance that is somehow judged to be "fair" -- according to need, in response to the recipients' own efforts, or on the basis of some other criterion. For mobility assistance programs, equity generally means that policies should focus on population groups with the most serious mobility barriers, and those who contribute the most (at least in relative terms) to overcoming these barriers. Such approaches require targeting by type of beneficiary and by actual travel. In the case of public transportation, equity criteria are therefore more easily met under user-side approaches, which allow for variations in the extent of any assistance by recipient and by use. Pursuing such differentiated objectives under provider-side assistance schemes is feasible, but requires complex reporting and monitoring procedures, putting most of the burden on the public transportation provider.

Equity in any mobility assistance program focusing on public transportation also means a fair distribution of resulting business benefits among providers. That element is particularly important in a situation involving a few big and many small operators. Manila (Philippines) illustrates the potential dilemma; its public transportation sector includes several providers of more or less conventional transit services using regular-sized buses, and a large number of jeepney operators as well as taxicabs. When the conventional transit operators began to encounter financial problems, the government was persuaded to set

aside some funds for subsidies. In the interest of equity, however, plans for the assistance program covered other public transportation providers (jeepneys) as well, even though they had no financial problems. While the more comprehensive approach avoided the inequity and inefficiency of subsidizing only one component of the public transportation sector, it created serious problems in terms of the administrative load associated with the program. These problems are ultimately the result of a reluctance or inability to articulate the objectives of the assistance program.

Even so, equity in the allocation of any mobility assistance through a provider-side scheme presents a difficult political problem since the decisions have to be made by the administering agency. In the case of a user-side assistance, recipients decide on the allocation through their actual travel choices. The administering agency's role in the allocation process would be limited to registering eligible providers who want to participate in the program.* Unless policymakers are deliberately trying to reallocate ridership and revenues among different types of providers, user-side assistance approaches appear preferable to establish or maintain equity among providers.

Mobility assistance programs focusing on private transportation offer essentially the same opportunities for achieving a "fair" distribution of the assistance as user-side approaches for public transportation. Such programs can target the assistance according to the severity of mobility barriers, or the response of likely participants to the lower cost of travel created by the program.

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* In existing applications of user-side assistance schemes in the U.S., primarily for elderly and handicapped users, little advantage has been taken of the option to have more than one provider participate; See Kirby and Ernst (1981).

The evaluation of the likely impacts of different assistance approaches in terms of efficacy and equity has to rely primarily on reasoned judgement, rather than empirical evidence. So far, a systematic empirical assessment of alternative assistance approaches is lacking. User-side assistance, in particular, has been employed in developed countries only in a few cases, often on an experimental basis. A number of studies have examined the experiences with these applications, as summarized by Kendall (1979) for the U.S. However, any comparison to provider-side approaches is hampered by the lack of suitable data, given the typical focus on special user groups, and the absence of an adequate design. Thus, evidence on travel responses and its impacts across different population may provide some guidance, but must be complemented by the judgement of planners and decisionmakers.

IMPACTS OF PUBLIC TRANSPORTATION PROVIDERS

Provider impacts of any given mobility assistance program depend on the existing market structure. Institutional characteristics of the supply side, such as the degree of competition, determine how certain provisions affect the overall functioning of the (public) transportation system. Given the wide range of institutional and operating arrangements in developing countries, the discussion here can only highlight some of the more critical factors that should be considered in evaluating alternative assistance schemes.

One important element concerns the degree to which the mobility assistance is in fact restricted to public transportation providers. Provider-side assistance approaches, by definition, exclude all private public transportation. Most user-side assistance schemes that have been discussed in these terms also are aimed at public transportation. (The major exception are programs to subsidize vehicle purchases or other inputs for certain population groups.) Such a focus

alters the price structure and creates some overall inefficiencies by allowing marginal providers to continue operations. Thus, any mobility assistance tied to the use of public transportation poses a threat to the efficient allocation of resources achieved under the conditions of open competition. The reallocation may be justified to correct market imperfections, such as negative externalities (social costs) associated with private transport. Measuring the cost of correcting such market imperfections in terms of efficiency losses is as difficult as estimating the benefits of these policies.

One of the major arguments in favor of user-side assistance, at least for developed countries, focuses on the opportunities for encouraging competition among providers. Since the user-side approach offers mobility assistance by enabling recipients to purchase more transportation services, rather than by reducing the price, an opportunity exists for distributing the actual subsidy payments among providers. Users decide on the allocation of these subsidies, rather than the administering agency. The argument contrasts these opportunities with provider-side schemes which typically deal with one or few providers, possibly selected through a competitive procurement process. Such restrictions hamper competition; at best, they introduce substantial entry costs. The history of subsidizing public transportation, or its weaker elements, clearly demonstrates a tendency toward creating or protecting monopolies.

So far, the ability of any user-side assistance to allow for and encourage competition in public transportation remains largely untested. User-side programs usually involve some concern to limit the resulting subsidy to "qualified" providers. Since most of the applications of this concept have occurred in smaller communities, the number of qualified providers interested in participating in the program has been small. As a result, competition among provi-

ders has been very limited. Institutional constraints outside the control of program administrators have therefore precluded an assessment of the potential role of user-side assistance in improving competition (and thereby presumably efficiency) in public transportation.

The emphasis on "qualified" providers may also create somewhat of a barrier to market entry. Depending on the criteria used, the necessary certification of providers to qualify for participation in the assistance program could create significant entry costs and delays.

In a situation with a fairly competitive public transportation sector which characterizes many developing countries, basically simple requirements of fiscal and programmatic accountability, and of administrative feasibility may serve to hamper competition -- irrespective of the assistance mechanism used. However, properly designed and administered user-side assistance approaches clearly offer greater flexibility in attempting to foster greater efficiency through competition.

Different options with respect to the basis for assistance provide different incentives for efficiency in the provision of public transportation services. Deficit subsidies offer the weakest incentive, often leading to fairly inefficient operations. A major problem with input subsidies is the resulting distortion of the price structure, favoring the subsidized input over others. The classical study by Tye (1973) shows that federal subsidies for capital purchases in the U.S. transit industry biased decisions away from appropriate maintenance toward faster replacement than would be optimal. Even so, input subsidies can play an effective role in addressing specific problems -- such as finding financing, or assuring access to fuel.

Output subsidies establish stronger incentives for efficiency in the production of transportation services. McGillivray (1978) argues that such subsidies reward providers for efficient operation. However, the experience with such subsidy schemes suggests that basing provider subsidies on measures like vehicle kilometers or related output indices may introduce some perverse incentives. Providers may find it profitable to operate vehicles in a manner that does not serve the transportation needs of the target population best.

Thus, from the standpoint of efficiency incentives, the most preferable approach focuses on the *impacts* of public transportation services -- some measure of service actually consumed by (eligible) users, such as number of passenger trips or passenger kilometers. This approach comes closest to an excise subsidy (a form of negative excise tax) for the public transportation sector. It does not affect the price structure for resources used in the production of public transportation services. Unless factor markets exhibit significant distortions, such an excise subsidy would in fact keep providers on the most efficient production path.

These arguments apply to the overall economic incentives associated with a mobility assistance program. However, efficiency is also affected by the transaction costs affecting the providers. As the incentives for economic efficiency increase, transaction costs for providers also rise as a result of increased information requirements. We explore this aspect further in the discussion of administrative costs below.

Impacts on planning and management of public transportation operations -- Kemp's (1979) "managerial dynamics" -- depend to a large extent on the specific provisions of any mobility assistance program. Generally, programs of this nature are subject to the hazards inherent in all publicly funded programs:

political changes or worsening economic conditions may curtail fundings. Under that general proviso, different approaches may set different parameters for public transportation.

Any approach that makes a gradual reallocation of subsidies more likely than abrupt shifts implies a better environment for any planning. Depending on the nature of the program, subsidized travel may account for a substantial portion of the business of any given provider. If that portion of the business can be taken away by administrative fiat, the provider operates under considerable uncertainty. Such uncertainty may characterize the situation in a provider-side scheme which allocates subsidies on the basis of periodically renewed contracts. If these contracts are awarded on the basis of competition, the approach does not only create temporary monopolies, but impairs the provider's long-term planning.

Subsidy approaches that rely on market (or quasi-market) forces for the allocation of financially supported travel among providers create an atmosphere of greater certainty, since any reallocation of travel will be gradual. Since user-side approaches are inherently more likely or suitable to employ such market techniques, they can contribute to a better environment for planning and managerial decision making in the public transportation sector.

As in the case of efficacy and equity, the exploration of impacts on public transportation providers must rely largely on informed judgement and speculation. While specific effects of particular assistance programs have been documented, the literature does not go beyond case studies. No comparative analysis of the impacts of different choices for the elements of a mobility assistance program exists for developed countries, let alone for developing countries. Some valuable information of the effects of certain

variations within given approaches has been gathered, e.g., by Teal *et al.* (1980), but it provides only limited guidance across the entire spectrum of choices that have to be made in designing and administering a program.

ADMINISTRATIVE COSTS

Administrative costs for any given mobility assistance program ultimately depend on the degree of administrative control desired and pursued. We have already noted that transaction costs can be substantial. They vary with the scope of the program; more important, though, are the specific requirements regarding the determination of eligibility for assistance recipients and providers, the maintenance and auditing of records used to compute the amount of actual assistance payments, prevention and prosecution of fraud and abuse, and basic financial management.

With respect to administrative mechanisms, the discussion of transaction costs (bolstered by few empirical data) has focused on the differences in the scope of the task between user-side and provider-side approaches, and the potential for fraud and abuse. The notion has taken hold that a user-side approach implies more administrative work for the same overall program scale, since there are typically more users than providers. Another argument implies that putting the assistance into the hands of the intended beneficiaries of the program creates more opportunities for abuse or outright fraud. Both of these arguments are spurious.

Administrative demands vary more with the basis for the assistance than with the specific administrative mechanism used. Deficit or input subsidies to providers require little monitoring of actual service levels or service consumption. Provider-side assistance schemes have typically relied on these subsidy criteria, while most user-side schemes for public transportation

relate the assistance to actual trip making. That focus implies a much more active role for the administering agency, regardless of the mechanism used, to monitor travel by the group for which the assistance is intended.

In addition, user-side assistance approaches are also more likely to emphasize targeting, to relate any mobility assistance to some indicator of need of the target group. That emphasis again increases the administrative effort required, because applicants for assistance will have to be screened and monitored. Both tying the assistance to actual travel, and relating it to need can also be accomplished under provider-side assistance schemes. However, the administrative effort is about the same. In fact, since record-keeping and enforcement of any eligibility constraints become the responsibility of the provider under a provider-side option, the total administrative effort for the agency and providers may well exceed that for a comparable program relying on user-side assistance mechanisms.

The potential for fraud and abuse are not limited to user-side assistance schemes. Again, the basis for the subsidy seems more important. For deficit and input subsidies, verification of claims for assistance payment requires little more than standard auditing procedures. While these procedures may not be able to prevent outright criminal acts, they provide sufficient control for fiscal accountability. Once the basis for the assistance shifts to output and travel impacts, monitoring becomes more complex. In the case of provider-side approaches, the administering agencies must depend on recordkeeping by the provider(s). In the case of user-side assistance schemes, the documents submitted by the provider to support a claim (the vouchers or tickets) are the result of an agreement between user and provider. Claiming more trips than were actually provided therefore requires collusion between users and providers under a user-side assistance scheme, while provider-side approaches

would rely on provider reports alone.

In either case, though, detection of gross misrepresentation would be fairly simple, because claims cannot be out of proportion to the scale of operation of the provider. Thus, schemes in which providers purchase vouchers from users at a discount and redeem them for their full face value without providing the services require considerable efforts to manufacture the corroborating information on vehicles and other resources deployed to avoid detection. In any case, the administering agency should check on the scale of operations when it certifies participating providers.

Another concern with fraud relates to the possibility of a black market for vouchers -- assistance recipients sell the vouchers to others (who may not be eligible under the program criteria) at a discount. This possibility is limited to approaches in which the voucher itself is used as proof of eligibility at the time of travel. If identification cards or similar means are required in addition, the black market option becomes negligible. If the opportunity exists, though, program administrators have to decide whether such exchanges are to be tolerated. While they may dilute the targeting of the mobility assistance, they would contribute to improved mobility overall. Thus, trading in vouchers may be permitted.*

Operating conditions in public transportation may facilitate abuses under certain approaches. For example, prepaid passes could be used several times to board a bus, with passengers on board passing them back to those still waiting to get on.

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* Such a "white market" is sometimes allowed under rationing schemes; regulations for emergency gasoline rationing in the U.S. were designed to permit open market exchanges of the rationing coupons.

In summary, administrative costs generally depend more on the level of fiscal and programmatic accountability desired than on the specific administrative approach, i.e., than on the choice between user-side and provider-side assistance. While suitable comparison data are lacking, the often asserted administrative cost advantage for provider-side approaches seems to be due to the generally smaller number of providers (compared to that of users), and to the lower levels of accountability desired. In situations with a large number of providers, which characterize many developing countries, provider-side schemes also have to deal with a large number of assistance recipients. Thus, from an administrative cost standpoint, neither approach appears to have an a priori edge.

The choice of an administrative structure for distributing the mobility assistance presents a critical problem, especially in developing countries. A weak administrative infrastructure may preempt any assessment of administrative costs, because it can jeopardize the overall feasibility of certain approaches. The lack of an adequate administrative and institutional infrastructure affects especially mobility assistance schemes depending on decentralized distribution. In some instances, it may be possible to "piggy-back" to some extent on existing agencies, such as health programs, irrigation or other agricultural extension services, or crop marketing organizations. For example, agricultural marketing boards may provide some indirect mobility assistance through discriminatory pricing practices. However, many of these agencies in developing countries already have difficulties handling their original mission. Burdening them with the responsibility of carrying out a mobility assistance program may entail not only poor performance in that program, but may also jeopardize the basic task of the organization.

Administrative feasibility criteria therefore favor simple approaches that limit the involvement of the administering agency, employing some degree of regional centralization. For example, Young's (1977) proposal for a vehicle loaning office, mentioned above, envisages a single central office in an urban area, with the main burden of the administrative effort devoted to one action -- the granting of loan guarantees to qualified applicants. Mobility assistance schemes in developing countries must exhibit this kind of simplicity in concept and administrative structure to remain feasible.

OVERALL CONCLUSIONS

The decision to subsidize passenger transportation in one form or another reflects political motives. The empirical backup for economic-efficiency arguments in favor of such subsidies is weak. However, maintaining or improving the mobility of certain population groups can represent legitimate policy objectives for an assistance program. While the basic motivation may be similar, specific objectives and concerns for such a mobility assistance program are likely to differ across developing countries, and between urban and rural areas in a given country.

Three dimensions define the different administrative options for a mobility assistance program: the basis for the assistance, the administrative mechanism, and flanking regulatory and institutional actions. The assistance can be based on the extent of actual travel by the target group, or on their ability to travel. The first option focuses on *impacts*, while the second can employ three different criteria: making up the *deficits* of public transportation providers, subsidizing the purchase of *inputs*, or paying on the basis of service *outputs*.

Administrative mechanisms can be classified into user-side assistance or provider-side approaches, depending on the mechanism used for deciding on the allocation of the assistance. Regulatory and institutional actions are primarily concerned with the degree of competition in the (public) transportation sector, and the freedom of choice allowed with respect to technology and organizational arrangements.

The evaluation of resulting alternatives should consider five sets of criteria: efficacy with respect to objectives, equity in the distribution of benefits (and burdens), incentives for economic efficiency, impacts on planning and management in public transportation, and administrative costs. The outcomes of the evaluation depend on the specific objectives and conditions under which the program may be implemented.

Overall, the assessment of different options suggests that approaches emphasizing actual travel impacts tend to have the edge on efficacy, equity, efficiency, and managerial impacts. User-side assistance represents an effective mechanism in this context. However, the relevant options also require an active and continuing administrative involvement, which may exceed the administrative capacity in developing countries. Given the characteristics of the transportation system in most developing countries, more unconventional alternatives for any mobility assistance program may have to be considered, including input subsidies for small public transportation providers, or for users cooperatives in areas with sparse demand.

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APPENDIX:

DEVELOPMENT IMPACTS OF TRANSPORT SUBSIDIES IN RURAL AREAS

The Basic Case: Impacts of a Feeder Road

The analysis focuses on a very simple regional system, sketched in graphic form in Figure A-1. An area of cultivable land is bordered by the sea, with a single port at location U. The coastline is assumed to be straight in a north-south direction. Any agricultural output produced for the market must be shipped to the port, and is taken from there to its final destination. A feeder road extends from U into the interior, at a right angle to the coast. The coast and feeder road can be thought of as forming a coordinate system, with the feeder road as the abscissa (x) and the coast as the ordinate (y). As Squire (1973) points out, the same formal structure would also apply to a situation with a limited-access highway, corresponding to the coast, and a ramp at U.

The agricultural land in the area can either be left uncultivated (or used for subsistence farming) or be used to produce some cash crop. Assume that the transportation cost per ton-km for this crop is t" for off-road movement, and t' on the road.

The analysis of the effects of the feeder road is considerably easier if one assumes that transport can take place only on a north-south and east-west lattice. Walters (1968) makes this assumption. Squire (1973) shows that it is not as restrictive as it appears, given the gradient between off-road and on-road transport which is typically high. The derivation of this result is a convenient introduction into the analysis of the development impacts of transportation policy alternatives.

Consider a farmer located at P_o (with coordinates x_o and y_o) who is producing the cash crop. Given the existence of the feeder road, the farmer's problem is to find the least-cost route or combination of off-road and on-road transport to the port U. Using the notation shown in Figure 1, we can define the farmer's problem formally as follows:

$$\text{(1)} \qquad \min \quad t = at' + ct''$$

subject to

$$\text{(2)} \qquad c^2 = y_o^2 + (x_o^2 - a)^2$$

The minimum transport cost is obtained by choosing the length of the on-road portion of the trip, a, to satisfy the following condition:

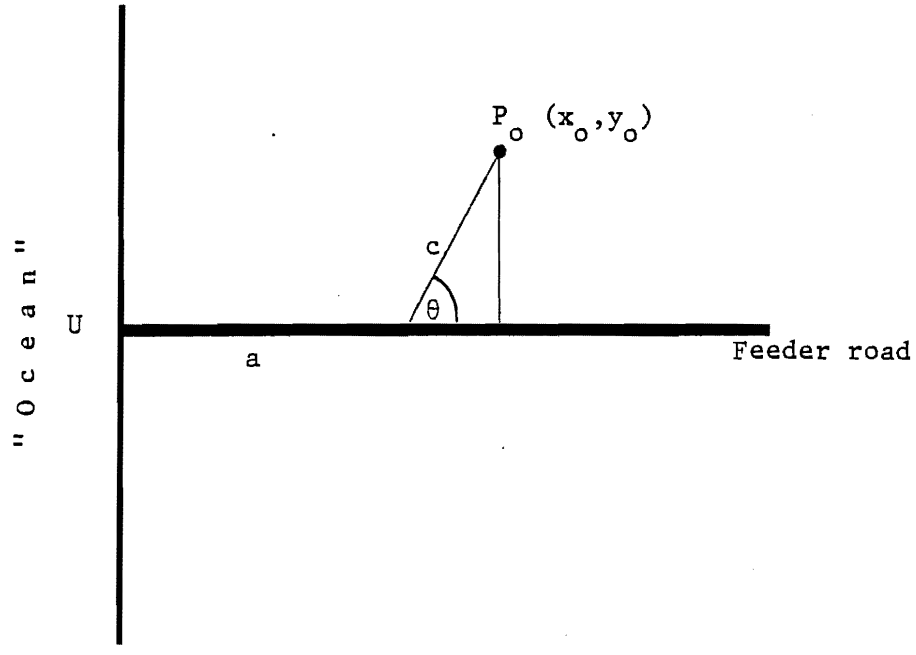

Figure A-1. The Transport Cost Problem

$$t'c = t''(x_o - a) \quad (3)$$

The total transportation cost per ton from location P_o to the market center U is therefore given by

$$t = x_o t' + y_o \sqrt{t''^2 - t'^2} \quad (4)$$

Choosing the length of the on-road portion of the trip, a, also determines the angle of the intercept, θ. This angle can be derived from the relationship:

$$\sin \theta = y_o/c = \sqrt{t''^2 - t'^2} \; / \; t'' \quad (5)$$

The right-hand side of equation (5) approaches 1 as the difference between off-road and on-road transport cost increases. Typically, it is substantially more expensive to transport any crop cross-country than on a road. Usher (1968) provides estimates for Thailand (quoted from Squire (1973)):

t" (buffalo-wagon) = 3 baht/ton-km

t' (motor transport) = 0.3baht/ton-km.

These figures yield movement at almost right angles, with a θ of 84^o. Similar results are obtained for illustrative figures for the Philippines, although the transport cost gradient is not quite as pronounced. In 1977, a transport study found the following average transport costs across five different commodities for two provinces:

Albay province

t" (interior) = ₱23.68/ton-km

t' (roadside) = ₱ 2.92/ton-km

Camarines Sur province

t" (interior) = ₱20.63/ton-km

t' (roadside) = ₱ 4.73/ton-km

For these figures, we would obtain values of θ of 83^o and 77^o, respectively, for the two provinces. The assumption that transport can only take place on a north-south and east-west lattice is therefore not overly restrictive. Being able to make that assumption simplifies the analysis considerably.

Area of influence for the feeder road: Let T denote the "maximum cost of transport per ton of produce consistent with production for the market." (Squire, 1973, p. 28) In other words, we assume that all farmers receive a rent of T-t per ton of produce; production for the market will extend to the point at which this location rent becomes zero. Given this value T, the agricultural area used for producing for the market in the absence of a feeder road is delineated by the triangle ABC shown in Figure A-2. The distance between each of these points and U is T/t". With an "endless" feeder road, such as a link between two market centers, the area ABE can be cultivated for the market. Land outside this triangle can be used at most for subsistence agriculture. The distance between U and E is given by T/t'. If the feeder road terminates at some point D short of E, its area of influence is limited to the unshaded area shown in Figure A-2.

The size of these areas can be readily calculated. In the absence of a feeder road, the market production area is given by:*

$$H_1 = \left(\frac{T}{t''}\right)^2 \tag{6}$$

The area of influence for the "endless" feeder road (extending beyond point E in Figure 2) in turn is given by:

$$H_2 = \frac{T^2}{t't''}. \tag{7}$$

For the truncated feeder road, the area cultivated is obtained as

$$H_2' = z(t'' - t')(2T - zt') + T^2 / t''^2, \tag{8}$$

where z is the length of the feeder road (UD in Figure A-2).

Production benefits of the feeder road: By making it profitable to cultivate a larger land area, the feeder road increases total agricultural output and income. The magnitude of this production benefit depends on the production function for the agricultural sector. One simple assumption is that of constant yield, $\bar{q}$, per unit of land. Under this assumption, the total output without the feeder road would be given by:

* The analysis here is less elegant than that of Squire (1973). By using integrals to calculate the areas, Squire sets up the analysis of production benefits. However, there appears to be a confusion of an auxiliary integration variable with the transport cost variable. Moreover, I also believe that there is a minor error in the integration itself, which renders the conclusions at least in part suspect.

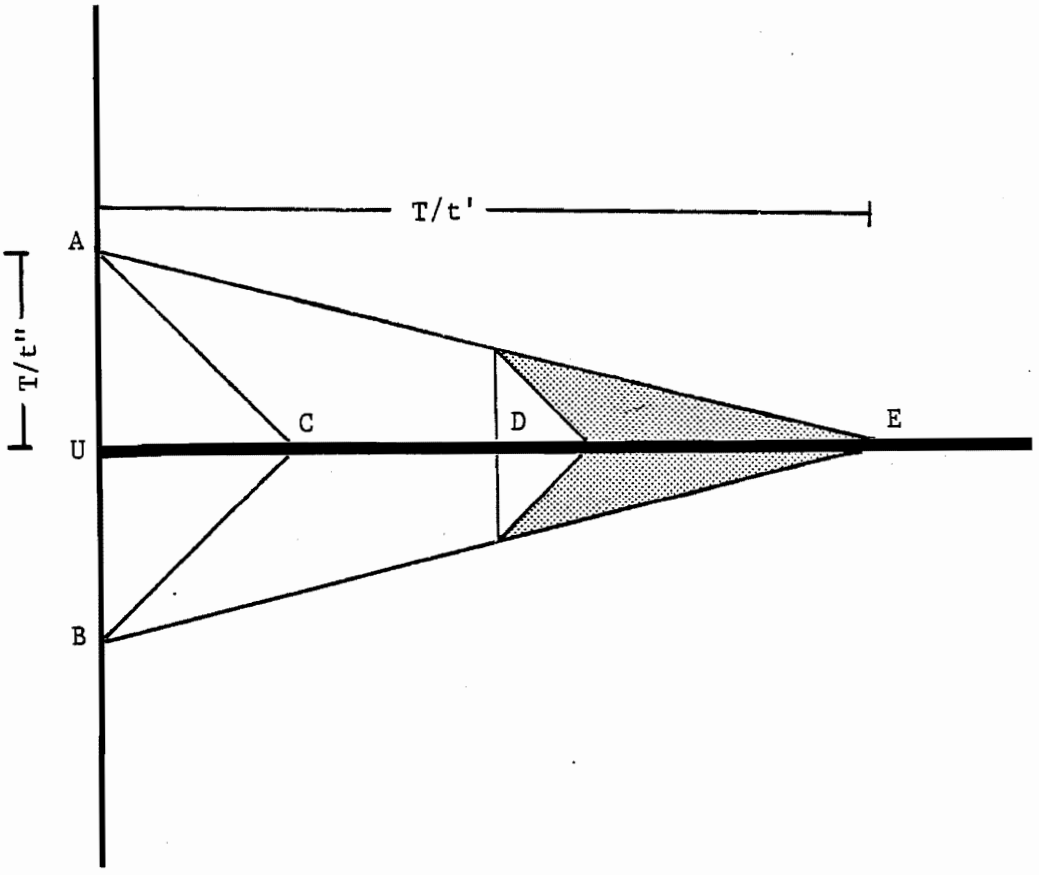

Figure A-2. Area of Influence of Feeder Road

$$(9) \qquad Q_1 = \bar{q}\, H_1 = \bar{q}\, \left(\frac{T}{t''}\right)^2 .$$

Similarly, the total output for the case of the "endless" feeder road would be given by:

$$(10) \qquad Q_2 = \bar{q}\, H_2 = \bar{q}\, \frac{T^2}{t't''} .$$

The output benefit associated with the construction of the feeder road is the difference:

$$(11) \qquad \Delta Q = Q_2 - Q_1 = \bar{q}\, \left(\frac{T}{t''}\right)^2 (t'' - t')/t' = Q_1\, (t''-t')/t'$$

Assume now that the value of one unit of the crop is captured completely in the price offered at the market U, p. This assumption frees us of the need to shadow price the agricultural output. Under these conditions, the total agricultural income in the area without the feeder road is given by:

$$(12) \qquad Y_1 = 2\,\bar{q} \int_0^{T/t''} \int_0^{T/t'' - x} p - xt'' - yt''\, dy\, dx$$

$$= \bar{q}\, \left(\frac{T}{t''}\right)^2 \left(p - \frac{2}{3} T\right) = Q_1 \left(p - \frac{2}{3} T\right)$$

Similarly, the income for the area with the feeder road is obtained as:

$$(13) \qquad Y_2 = 2\,\bar{q} \int_0^{T/t'} \int_0^{(T-xt')/t''} p - xt' - yt''\, dy\, dx$$

$$= \bar{q}\, \frac{T^2}{t't''} \left(p - \frac{2}{3} T\right) = Q_2 \left(p - \frac{2}{3} T\right)$$

Thus, the benefit associated with the construction of the feeder road for a given unit time period is

$$(14) \qquad \Delta Y = \Delta Q \left(p - \frac{2}{3} T\right) = Y_1\, (t'' - t')/t',$$

an expression corresponding to the output difference obtained in equation (11). Under the assumption of a constant yield, the output and income benefits generated by the introduction of a feeder road are simply multiples of the levels before the construction.

Before looking at some numerical examples, it may be useful to look at the implications of changing assumptions about the agricultural production function. Another simple functional form, which has been used in the analysis of agricultural production relationships, is the Cobb-Douglas version. To simplify the analysis, we assume that the elasticities of land (L) and labor (N) are the same, and that we have constant returns to scale. Thus, the Cobb-Douglas production function would be given by:

$$Q = A\, N^{\frac{1}{2}}\, L^{\frac{1}{2}}, \tag{15}$$

where A is the dimensionality constant. The individual farmer would now deploy labor to the point where its marginal value product equals its wage, w, or the marginal valuation of leisure if no labor is hired:

$$w = \frac{Q}{2N}\,(p - t) \tag{16}$$

This condition results in a change in the integrals of equations (12) and (13). We now have:

$$Y_1' = 2\,\frac{A^2}{2w}\int_0^{T/t''}\int_0^{T/t''-x} (p - xt'' - yt'')^2\, dy\, dx \tag{17}$$

$$= \frac{A^2}{wt''^2}\left[\frac{p^2 T^2}{2} - \frac{2}{3}pT^3 + \frac{T^4}{4}\right]$$

With the feeder road, we obtain:

$$Y_2' = 2\,\frac{A^2}{2w}\int_0^{T/t'}\int_0^{(T-xt')/t''} (p - xt' - yt'')^2\, dy\, dx \tag{18}$$

$$= \frac{A^2}{wt't''}\left[\frac{p^2 T^2}{2} - \frac{2}{3}pT^3 + \frac{T^4}{4}\right]$$

Thus, the benefit generated by the construction of the feeder road under the assumption of a Cobb-Douglas production function is given by:

$$\Delta Y' = Y_2' - Y_1' = Y_1'\,(t'' - t')/t', \tag{19}$$

which is essentially the same result that we found for a constant yield.

For the two simple agricultural production functions considered here, the construction of the feeder road would result in the same expansion factor for total output of the cash crop and agricultural income. This factor can be substantial. For the values of t" and t' reported by Usher (1968), 3 and 0.3 baht/ton-km, the numerical value of (t' - t')/t' is 9.0. For the comparative average values for the two Philippine provinces shown above, ₱23.68 and ₱2.92, and ₱20.63 and ₱4.73 per ton-km, respectively, we obtain values for the expansion factor of 7.1 and 3.4. For the individual crops that were used in computing these average transport cost estimates for the two provinces in the Philippines, the value of the expansion factor ranges from 2.5 (abaca, Camarines Sur) to 10.5 (fruits and vegetables, Albay).

It should be pointed out that these estimates are only intended as rough reference points. To what extent they represent the actual impact of a feeder road is unknown, and ultimately irrelevant. There is reason to believe that -- given the production functions assumed here -- the numerical values of the expansion factor understate the impacts of a feeder road on agricultural production and income. Squire (1973) notes that the cultivated strip along feeder roads is generally narrower than would be expected on the basis of the off-road/on-road transport cost comparison. The reason may well be that the off-road transport cost understates the true location-related cost of production, which includes access to various inputs, such as fertilizers and seeds, as well as travel costs for other purposes.

Effects of Transportation Subsidies

Assume now that a program is introduced that provides direct or indirect subsidies that reduce the transport cost for the individual farmer. Given the existence of a feeder road of the type examined here, how would such a subsidy affect agricultural production and agricultural income?

Pertinent for the analysis is the impact of the subsidy scheme on the travel cost borne by the individual traveler. One option is to design the subsidy to reduce transport costs both on and off the road by a constant proportion. Suppose the transport cost per ton-km becomes now $\alpha t''$ off the road, and $\beta t'$ on the road; the total transport cost is then given by

$$\bar{t} = x\beta t' + y\alpha t''.$$

The total area cultivated (with a feeder road) given in equation (7) becomes

now

$$(20) \qquad \tilde{H}_2 = \frac{1}{\alpha\beta} \frac{T^2}{t't''} = \frac{1}{\alpha\beta} H_2,$$

where H_2 is defined in equation (7). The introduction of the transportation subsidy changes other measures of interest by the same factor. Thus, we obtain:

$$(21) \qquad \tilde{Y}_2 = \bar{q} \frac{T^2}{\alpha\beta t't''} (p - \frac{2}{3} T) = \frac{1}{\alpha\beta} Y_2,$$

where Y_2 is defined in equation (13). Similarly,

$$(22) \qquad \tilde{Y}'_2 = \frac{A^2}{w\alpha\beta\, t't''} [p^2 \frac{T^2}{2} - \frac{2}{3} pT^3 + \frac{T^4}{4}] = \frac{1}{\alpha\beta} Y'_2,$$

with Y'_2, the agricultural income with a feeder road under the assumption of a simplified Cobb-Douglas production function, being defined in equation (18). The proportional increases in the area cultivated, the output (not shown here), and the agricultural income are the same. All the measures increase by a factor of $1/\alpha\beta$, the inverse of the product of the respective shares of the transportation costs borne by the traveler.

The assumption of a constant proportion of travel costs defines a very simple transportation subsidy scheme. A host of alternatives can be developed. However, within the confines of the simple model considered here, the options are somewhat limited. For example, any attempt to cover transportation costs above a certain level completely would imply an infinite expansion of the area cultivated -- clearly a somewhat unrealistic result. One possible alternative would involve increasing the subsidy share up to a certain maximum with increasing distance from the road, in an attempt to compensate farmers to some extent for relative locational disadvantages arising from the location of the feeder road.

If Θ defines any of the measures of interest, the relative increase attributable to the introduction of transportation subsidies is given by

$$(23) \qquad \frac{\Delta\Theta}{\Theta} = \frac{1 - \alpha\beta}{\alpha\beta}.$$

For values of α and β of 0.5, equation (23) would yield a value of 3.0; if

both are set at 0.7, we would observe a doubling of the measure of interest. Thus, the impacts of a simple transportation subsidy scheme can be substantial, even at lower support levels.

For this particular subsidy scheme, we may set the following rules for exploring an example: let $\alpha = \bar{\alpha}$ outside the area of cultivation defined by the feeder road in the absence of any subsidies. Let $\alpha = 0$ for $y = 0$, and let it approach $\bar{\alpha}$ in linear fashion as y approaches $(T - xt')/t''$, that is, the border of the original area of cultivation. In that case, we have:

$$(24) \qquad \alpha(y) = 1 - \frac{yt''(1 - \bar{\alpha})}{T - xt'}, \text{ for } y \leq (T - xt')/t''$$
$$= \bar{\alpha} \qquad , \text{ for } y > (T - xt')/t''.$$

For the case of a constant yield, $\bar{q}$, this subsidy scheme would yield the following expression for the total agricultural income:

$$(25) \qquad \hat{Y}_2 = 2 \int_0^{T/t'} \int_0^{T/t'' - xt'/t''} \bar{q} \left[p - xt' - yt'' + \frac{y^2 t''^2 (1 - \bar{\alpha})}{T - xt'}\right] dy\, dx$$
$$+ 2 \int_0^{T/t'} \int_0^{(T-xt')/\bar{\alpha}t''} \bar{q} \left[p - xt' - y\bar{\alpha}t''\right] dy\, dx$$
$$= \frac{\bar{q}T^2}{t't''} \left[\frac{1}{\bar{\alpha}} \left(p - \frac{2}{3}T\right) + (1 - \bar{\alpha})\frac{2}{9}T\right]$$
$$= \frac{1}{\bar{\alpha}} Y_2 + \frac{\bar{q}}{t't''} (1 - \bar{\alpha}) \frac{2}{9} T^3$$

This particular subsidy scheme would therefore result in an additional increase in the agricultural income.

Direct Subsidy Costs

The subsidy costs are given by the difference between the transport bill for the expanded area using original transport costs and the portion paid by the travelers themselves. The transport bill is obtained by integration of the product of the yield and the transport cost per unit. For the assumption of a constant yield, we therefore find for the total without subsidies and without the feeder road:

$$(26) \qquad C_1 = 2\int_0^{T/t''} \int_0^{T/t''-x} \bar{q}\,(xt'' + yt'')\,dy\,dx$$

$$= \frac{\bar{q}}{t''^2}\left(\frac{2}{3}T^3\right)$$

Once the feeder road has been constructed, the total transportation bill for the area now under cultivation is given by:

$$(27) \qquad C_2 = 2\int_0^{T/t'} \int_0^{(T-xt')/t''} \bar{q}\,(xt' + yt'')\,dy\,dx$$

$$= \frac{\bar{q}}{t't''}\left(\frac{2}{3}T^3\right).$$

Thus, for the assumption of constant yield the transport cost increases by a a factor of t"/t' as a result of the construction of the feeder road; this is the same factor that we had obtained for the area cultivated, the total output and agricultural income.

These results suggest that the assumption of a different production function is likely to yield the same factor for the total cost. For the simplified Cobb-Douglas production introduced in equation (15), we find:

$$(28) \qquad C_1' = 2\int_0^{T/t''} \int_0^{T/t''-x} \frac{A^2}{2w}\,(p - xt'' - yt'')(xt'' + yt'')\,dy\,dx$$

$$= \frac{A^2}{wt''^2}\left[\frac{pT^3}{3} - \frac{T^4}{4}\right],$$

and with the feeder road:

$$(29) \qquad C_2' = 2\int_0^{T/t'} \int_0^{(T-xt')/t''} \frac{A^2}{2w}\,(p - xt' - yt'')(xt' + yt'')\,dy\,dx$$

$$= \frac{A^2}{wt't''}\left[\frac{pT^3}{3} - \frac{T^4}{4}\right]$$

The two forms of the agricultural production function assumed here show the same relative response to the introduction of the feeder road; the expansion factor is the same as that found for other economic descriptors. The similarity in the response suggests that the analysis of the impacts of transportation subsidies can be limited to the easier case of constant yield. Use of the simple Cobb-Douglas function does not change the conclusions.

Under the basic subsidy scheme examined above, the traveler pays a share of α for on-road and β for off-road transportation, with the remainder covered by the subsidy. The introduction of the subsidy, given the feeder road, extends the area cultivated. The total transport bill for the expanded area can be segmented into the travelers' costs and the direct subsidy costs (that is, the total amount of transfer payments, without any administrative costs):

$$(30) \qquad \tilde{C}_2 = \int_0^{T/\beta t'} \int_0^{(T-x\beta t')/\alpha t''} \bar{q}\,(xt' + yt'')\,dy\,dx$$

$$= \int_0^{T/\beta t'} \int_0^{(T-x\beta t')/\alpha t''} \bar{q}\,(x\beta t' + y\alpha t'')\,dy\,dx$$

$$+ \int_0^{T/\beta t'} \int_0^{(T-x\beta t')/\alpha t''} \bar{q}\,[x(1-\beta)t' + y(1-\alpha)t'']\,dy\,dx$$

$$= \frac{\bar{q}}{\alpha\beta t't''}\,\frac{2}{3}\,T^3 + \frac{q}{\alpha\beta t't''}\,\left[\frac{(1-\alpha)}{\alpha} + \frac{(1-\beta)}{\beta}\right]\frac{T^3}{3}\,,$$

where the first part of the last line gives the total transport outlays by travelers (and shippers), and the second part delineates the direct subsidy cost.

Comparison of Costs and Benefits

For the example outlined here, with a feeder road and under the assumption of constant yield, we can now compare the subsidy costs and the induced income benefits to obtain an idea of the net benefits generated by a simple transportation subsidy scheme. Let Y* denote the agricultural income induced by the introduction of the transport subsidy:

$$(31) \qquad Y_2^* = \tilde{Y}_2 - Y_2 = \frac{1 - \alpha\beta}{\alpha\beta}\,Y_2$$

$$= \frac{1 - \alpha\beta}{\alpha\beta}\,\frac{\bar{q}T^2}{t't''}\,(p - \frac{2}{3}\,T).$$

Correspondingly, let C* denote the direct subsidy cost, as shown in the

second part of the last line of equation (30). The net benefit is then:

$$(32) \qquad Y_2^* - C_2^* = \frac{\bar{q}T^2}{\alpha\beta t' t''} \left[(1 - \alpha\beta)p + \frac{2\alpha^2\beta^2 - \alpha - \beta}{3\alpha\beta} T\right]$$

Thus, there is a positive net benefit -- disregarding administrative costs -- if the expression in brackets is positive. Whether it is positive depends on the relative magnitude of p and T, that is, on the non-transportation related cost of agricultural production. It can be shown that the expression in brackets in equation (32) is positive, if the following condition is satisfied:

$$(33) \qquad T \overset{!}{<} \frac{3\alpha\beta\ (1 - \alpha\beta)}{\alpha + \beta - 2\alpha^2\beta^2}\ p\ .$$

A few sample calculations suggest that this condition is likely to be met for "reasonable" values of α and β. Table 3 shows the values of the factor applied to p in equation (33) for values of α and β between 0.5 and 1.0. If the transport subsidy scheme were to cover one-half of the cost for both on-road and off-road transportation, T would have to be less than 64 percent of the value of p, i.e. factors other than transportation would have to account for at least 36 percent of the average cost of production (assuming a competitive equilibrium). The required share for other factors decreases as the subsidy shares decline.

Given available data on agricultural production and cost relationships, the analysis here suggests that a transport cost subsidy program is likely to generate positive net benefits in terms of development impacts in agricultural areas. The transport cost component is generally substantially below the levels shown in Table 3 as being required for equation (33) to yield a positive value. In interpreting this finding, which is admittedly based on the analysis of a fairly simple model, it should be recalled that no other benefits of increased mobility, such as improvements in labor use efficiency, deployment of better production techniques, improved access to various inputs (fertilizers, pesticides), have been considered in this analysis.

Table 3. Illustrative Values for Equation (33)

β \ α	.5	.6	.7	.8	.9	1.0
.5	.64	.68	.71	.73	.75	.75
.6	.68	.73	.77	.80	.81	.82
.7	.71	.77	.82	.85	.87	.88
.8	.73	.80	.85	.89	.91	.92
.9	.75	.81	.87	.91	.95	.96
1.0	.75	82	.88	.92	.96	1.0

Note: The values shown are for the factor $\frac{3\alpha\beta\ (1 - \alpha\beta)}{\alpha + \beta - 2\alpha^2\beta^2}$

The conclusions regarding the development impacts of transport subsidies in rural areas do not depend on the form of the subsidy. In fact, any government action that lowers the transport cost to the farmer by a given fraction would yield the same development impacts.

SUMMARY

The discussion in this section suggests that transport subsidies may be a rational policy option for developing countries. A review of the reasons that have been advanced in favor of subsidizing urban public transport in general indicates that developing countries may want to consider subsidies to maintain and improve the mobility of the urban poor, and to keep the price of an important budget item -- transportation -- relatively stable.

Lowering the cost of transportation in rural areas may lead to an expansion of the area under cultivation and increased incomes in the agricultural sector. Thus, in both urban and rural areas, maintaining or improving the mobility of the poor would provide the driving force behind any transport subsidy policy. The common objective allows us to deal with the question of how such a policy could be implemented on common grounds. The next section analyzes the advantages and drawbacks of two major options: to subsidize the providers of transportation services, that is, the traditional option of supporting public transport directly, or to provide the user with the means to purchase transportation services or the resources required to produce such services.