EQUITY IN TRANSIT FINANCING: THE DISTRIBUTION OF THE COSTS AND BENEFITS OF TRANSIT SUBSIDIES AMONG INCOME CLASSES

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ABSTRACT

This study examines the nature and extent of the income redistributive impact of government subsidies to mass transit in the United States. To ascertain the net distributional effect, both the costs and benefits of transit subsidization are estimated. This involves analyzing the income characteristics of the users of various types of transit services, the degree of subsidization of each type of transit, and the different mixes of tax mechanisms used to finance the subsidies.

On the basis of aggregate data for the United States and disaggregate data for each of the 26 largest American metropolitan areas, it is estimated that the transit program as a whole has indeed redistributed income from high-income classes to low-income classes. Although the poor have received less than their per-household share of the total transit subsidy, they nevertheless have been more subsidized than they have been taxed. Moreover, because the benefit/cost ratios of services used by poor transit riders exceed those of services used primarily by affluent riders, the distribution of true benefits (utility impacts) has been substantially more favorable to low-income households than is suggested by the distribution of subsidy expenditures.

The current transit subsidy program, therefore, does not exacerbate inequality in the distribution of income; but neither does it redistribute income very efficiently in comparison with other types of government programs designed explicitly to aid the poor. This relative inefficiency in redistribution arises from the very nature of transit services. Less than a fifth of the nation's urban poor use any form of conventional transit, and the vast majority of transit riders are not poor. Thus, transit subsidization provides virtually no benefits to 80% of the poor, and most of the transit subsidy (91%) is spent to serve the non-poor. In contrast, general income assistance programs reach a much higher percentage of the poor and can altogether exclude the affluent. Even welfare assistance in-kind, such as the provision of housing, medical care, and food, is more efficient in this respect. The current transit subsidy program, therefore, is not justifiable solely, or even primarily, on the basis of its benefits to the poor.

Thesis Supervisor: Professor Alan A. Altshuler, Chairman, Department of Political Science

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INTRODUCTION: SUBSIDIZATION OF A DECLINING INDUSTRY

The relative importance of transit in the United States has declined precipitously since the early 1900's, when it was the dominant mode of urban travel. This decline was particularly rapid from 1945 to 1975. Over these 3 decades, transit ridership fell by 80%, and vehicle miles of transit service were reduced by 40%. At the same time, urban auto travel increased substantially, so that the percentage of urban passenger mileage served by transit dropped from 35% to only 3%.[1]

Although the level of transit service decreased sharply over this period, the total operating costs of transit in the United States more than tripled. Even adjusted to control for inflation, operating costs per vehicle mile rose by 67%.[2] These increasing costs, combined with decreasing patronage, rendered the American transit industry as a whole only marginally profitable after 1950 and increasingly unprofitable since 1963, when the industry ran its first operating deficit. The rate of deficit growth has been particularly rapid in recent years. Indeed, since 1970 the national transit operating loss has increased by an average of about 36% per year (29% in constant dollars).[3]

Factors in the Decline of Transit

The most important factors in the decline of transit have been the rising level of personal income per capita in the United States and the suburbanization of both residences and employment within metropolitan areas. For most trip purposes, at most times of day, and over most routes, the automobile clearly provides a superior quality of urban transportation.

It is generally faster, more convenient, more comfortable, and more dependable than transit service and, in addition, offers greater privacy and more flexibility in scheduling and routing. The primary advantage of transit has been its low cost; conversely, the main disadvantage of auto ownership and operation has been its considerable expense. As levels of personal income have grown, the cost savings of transit have been largely offset by the increasingly valued quality of auto transportation, which has become more and more affordable.[4]

Whereas increasing affluence has decreased the number of travelers forced to depend on transit out of economic necessity, suburbanization--especially the very low-density development since 1945--has sharply reduced the proportion of the urban population for which transit is even a conceivable alternative. It has not been feasible for transit operators to extend service to low-density suburbs because travel volumes over individual routes in these areas are usually so low that transit service is uneconomical. Thus, most outer portions of American metropolitan areas currently have almost no viable transit service, and central cities have only about half the vehicle miles of service they had in 1945. Furthermore, the suburbanization of employment, in particular, has reduced the volume of trips to and from the downtown area. Because transit's comparative advantage vis-a-vis the auto is greatest for such trips, the decline of the inner city as an employment center has been especially detrimental to transit's overall economic viability.

Various additional factors have contributed to transit's financial troubles and ridership losses since 1945. The increased peaking of transit use during rushhours has exacerbated the underutilization of transit workers,

vehicles, and rights of way during non-rush hours, and thus has increased the average cost of providing transit service.[5] Moreover, the absolute decline in transit ridership over the last 30 years has, to a significant extent, vitiated the economies of scale in transit, particularly in rail transit operations. Finally, there have been considerable technological improvements in auto design and in the urban highway network that have further widened the quality gap between the auto and mass transit.

The Role of Public Policy

Prior to 1970, government intervention to offset transit's decline was minimal. Indeed, public policy may have inadvertently accelerated this decline. For example, sizable homeowner subsidies, extensive urban highway construction, and neglect of the social costs of the auto both facilitated and reinforced suburbanization and the switch to the automobile.

Considerable suburbanization would have occurred, in any event, as the result of increasing affluence and technological advances in communications and manufacturing, but the rate of suburbanization was undoubtedly accelerated by homeowner subsidies and the political fragmentation of urban areas. Most of the single-family housing construction financed by Federal income tax deduction allowances and mortgage guarantees to homeowners has taken place in the suburbs, where land values have been low enough to permit such low-density development. By 1945, moreover, most of the central portions of metropolitan areas had already been built up, and space for new single-family housing was not generally available. Suburban development, of course, came at the expense of reduced construction and maintenance of higher-density rental housing and withdrew many

potential transit passengers from the central city corridors where most transit service was located. It has been estimated that homeowner subsidies, which amounted to almost $10 billion in 1970 alone,[6] have had the cumulative effect of inflating the geographic size of metropolitan areas by roughly one-fifth.[7] Decentralization was further reinforced by the political balkanization of local governments within metropolitan areas. Such balkanization has encouraged the flight of each area's affluent residents to the suburbs to escape the high tax rates and welfare burden of central cities while still continuing to enjoy many of the public services provided by central jurisdictions.[8]

Massive suburban-oriented expressway construction during the 1960's also facilitated suburbanization and auto use by increasing the accessibility of outlying areas and by enhancing the geographic range and speed of automobiles within urban areas. There is considerable debate as to how much of this freeway construction was economically justifiable and how much, in fact, was excessive. Clearly, however, the vast improvements made in the urban highway network between 1955 and 1975 were essential to the extensive suburbanization during that period. They also increased the relative advantages of auto travel over transit use and consequently led to a further decline in mass transit patronage.

Finally, the social costs of auto use--with the exception of congestion--were largely ignored by government agencies until about 1970. Auto noise, air pollution, and traffic accidents were tolerated as unavoidable side-effects of progress. As elementary economic analysis indicates, however, the failure to internalize these social externalities by incorporating their cost in the price of auto use unambiguously leads to a

socially excessive amount of auto use. The quantitative significance of auto underpricing has been almost totally a matter of subjective speculation, but to whatever extent such underpricing has occurred, it has probably accentuated somewhat the shift away from mass transit.

At the same time public policy abetted suburbanization and auto use, a laissez-faire attitude was taken with respect to the decline of transit, which was viewed as an obsolete industry. Prior to 1965, transit operators were expected to cover virtually all of their operating expenses from farebox revenues, and capital subsidies were grossly inadequate for upgrading or even maintaining transit vehicles and rights of way.[9] In the face of declining patronage and revenues and increasing costs, transit operators were forced to increase fares, eliminate service, and allow the aging capital stock to deteriorate even further. Transit patronage, of course, plummeted even faster in response to these measures, thus exacerbating the financial difficulties of transit. Government aid increased somewhat between 1965 and 1970, but not sufficiently so as to reverse the vicious circle of fare increases, service cutbacks, and ridership losses.

Changing Priorities of Urban Transportation Policy

Around 1970, there was a dramatic shift in urban transportation policy. Widespread dissatisfaction with the adverse environmental and social impacts of urban highways and auto use enhanced the relative attractiveness of transit, whose adverse side-effects were perceived to be much less significant. Moreover, transit was increasingly viewed as essential to the mobility of the poor, the elderly, and the handicapped; to reviving the decaying central cities; and more recently, to conserving energy.[10]

Increased government concern for transit has involved a shift from private to public ownership and operation of transit systems and substantial growth in the level of both operating and capital subsidies. In 1965, only 12 transit systems in the United States were publicly owned.[11] By 1976, the number of publicly-owned systems had grown to 146, and these accounted for 87% of total transit vehicle miles operated in the United States and for 91% of revenue passengers.[12] Accompanying this shift in the locus of responsibility for providing transit service, government financial aid to transit burgeoned, especially after 1970. Indeed, operating subsidies grew from $.3 billion in 1970 to $2.2 billion in 1976; transit fares currently cover less than 55% of total nationwide operating expenses. Capital investment costs of transit are now almost entirely financed by government capital grants, which increased from $.2 billion in 1970 to $1.9 billion in 1976. The total transit subsidy, therefore, rose from $.5 billion to $4.1 billion, an 8-fold increase in only 6 years.[13]

Not only has government financial support increased substantially, but this increase has occurred at a time when virtually all levels of government in the U.S. have been under acute pressure to slow expenditure growth. This period of fiscal austerity, moreover, has been particularly severe for local governments in the large, dense metropolitan areas, where most transit service is concentrated. Thus, the opportunity costs of transit subsidization have increased even more dramatically than the nominal dollar costs.

Transit Subsidies for the Poor

One alleged justification for this increasingly burdensome government financial support of mass transit has been the need to compensate the poor

for the inadvertent disadvantage they have experienced as a result of the massive switch to the automobile and the concomitant decentralization of metropolitan areas. While the urban transportation revolution has dramatically benefitted those able to afford the high costs of auto ownership and operation, low-income travelers have had to rely much more than other groups on transit, the quality of which has diminished as a result both of the absolute decline in vehicle miles of service and the suburbanization of employment and residence, which has rendered most destinations in urban areas accessible only by automobile. The impacts of substandard transportation may be particularly detrimental to the welfare of the poor, because it yet further restricts their range of recreational, cultural, educational, shopping, and employment opportunities, which are already significantly circumscribed by their low incomes and the burden of a number of associated socioeconomic pathologies. Even those low-income households that own autos are virtually forced to do so by the nature of the available options and thus must spend an inordinate portion of their incomes on transportation.

It has been argued that the upgrading (or at minimum, preservation) of transit service and its availability at subsidized, low fares are essential for enhancing the transportation options of the poor, and, more generally, for promoting a more egalitarian distribution of income. In light of the large and rapidly growing public expenditure devoted to transit subsidization, examination of the validity of these arguments becomes increasingly important.

Study Objectives and Overview

The purpose of this study is to examine the extent to which the benefits of transit subsidy programs--as currently designed--actually accrue

to low-income users and the degree to which low-income households ultimately pay the tax costs of these programs. In assessing the distributional impact of transit subsidies, the study should be useful in redesigning the character of the subsidies to improve their effectiveness in achieving redistributive objectives.

To ascertain the net distributional effect, both the benefits and tax costs of transit subsidization are allocated among income classes. The decomposition of user benefits is achieved through analysis of the income distribution of the users of each of the various types of transit services and the degree to which each type of transit service is subsidized. Non-user benefits accruing to transit workers, downtown landowners and businesses are also examined, although precise quantitative estimates of all the resulting distributional impacts are not made.

The incidence of tax costs is estimated by determining the mix of tax mechanisms currently used to finance the subsidies and the percentage contribution from each level of government. These data on the composition of transit subsidy funds are used to weight the incidence pattern of each tax used, and thus to obtain an aggregate tax incidence estimate.

The analysis indicates not only the overall equity impact but also the very different impacts of different portions of the transit program. Moreover, although most of the quantitative distributional estimates are based on nationwide aggregates, considerable attention is focused on the substantial variation in net distributional impact from one type of metropolitan area to another.

PART I: THE BENEFITS OF TRANSIT SUBSIDIZATION AND THEIR DISTRIBUTION AMONG INCOME CLASSES

Transit subsidies provide a number of different types of benefits to a variety of different groups. Transit riders obviously benefit directly from expanded or upgraded service and cheaper fares made possible by subsidization. Owners of downtown land benefit indirectly from the public construction and operation of transit routes, which increase the accessibility of their holdings and thus the value of their land and the rents they can charge. Central city businesses also benefit. They can more easily attract customers and employees as a result of better or cheaper transit service; as a consequence, they can make more sales, charge higher prices, and pay lower wages. Moreover, transit services may provide a number of social benefits--for example, reduced levels of congestion, noise, and air pollution; more compact land-use patterns; greater passenger and pedestrian safety; and increased energy conservation. Although the extent of these social benefits is questionable, they clearly redound to a group much larger than transit riders alone and are quite different in nature from those attributable to time savings, fare savings, or improved ride quality experienced by transit riders.

To some degree transit subsidization also entails a direct transfer of income from taxpayers to factors in the production of transit services. For example, a significant portion of the increasing operating subsidy to transit in the U.S. is believed by many to have been siphoned off by unionized transit laborers via excessive increases in wages and fringe benefits and the forced hiring of an unnecessarily large number of workers. Thus,

much of the operating deficit may be attributable to artificially inflated labor costs. This impact could not be considered a genuine benefit of transit services, but it certainly affects the net distributional consequences of the subsidy program.

The overall benefit distribution, of course, depends on both the relative importance of each type of benefit and the income distribution of each type of benefitting group. These income distributions vary substantially. Transit riders, for example, have lower incomes on average than do transit workers, who in turn have lower incomes than do downtown landowners.

Chapter 1 examines approaches to measuring each of the types of benefits noted above and catalogues the considerable difficulties in making quantitative estimates of them. The income distribution of transit riders is discussed in Chapter 2, which highlights the variations in rider incomes according to type of transit, length of trip, time of day and direction of trip, portion of system used, and type of metropolitan area. On the basis of these income variations, estimates of the distribution of operating subsidies among income classes are made in Chapter 3. Corresponding estimates of the distribution of capital subsidies are made in Chapter 4. The relation of expenditures to actual benefits is discussed in Chapter 5, as is the variation in this relation from one type of subsidy to another.

Although nationwide, aggregate distributions are calculated, a central theme of the analysis is the dramatic variation in distributional impact according to type of subsidy, type of transit subsidized, and size and type of city. For many purposes, the nature and extent of this variation is of greater policy significance than the estimated overall impact.

CHAPTER 1: MEASURING THE BENEFITS OF TRANSIT SUBSIDIES

A major difficulty in evaluating the distribution of transit subsidy benefits is determining the ultimate impact of the subsidies. To what extent, for example, have operating subsidies resulted in lower fares or service improvements as opposed to higher transit labor wages or lower productivity? The relative importance of each effect largely determines the extent to which different types of groups are benefitted, which in turn significantly affects the resulting distribution of benefits among income classes. Precise quantitative estimates of the actual extent of each type of effect are not available, primarily because appropriate data for such a decomposition do not exist. However, the results of sharp changes in the level or rate of growth of transit subsidization in a few cities suggest that all four effects occur at least to some extent.

Short-Run Impacts of Operating Subsidies

Cleveland provides an excellent example of the impact of increased subsidization. From 1974 to 1976, the total operating subsidy increased by 30-fold, from only $1.5 million to $45.3 million. As a consequence, fares were cut in half, and free transfers were allowed throughout the system. Vehicle miles of service were increased by 30%. Special para-transit services were instituted for the elderly and handicapped, and increased police surveillance cut the number of crimes on the transit system by about 50%. These increased passenger benefits, however, came at the price of a 76% increase in total operating costs, a considerable

portion of which was attributable to generous wage settlements with the unions.[1]

In contrast to Cleveland, operating subsidies were actually reduced in Pittsburgh and New York City. In Pittsburgh, the operating subsidy decreased by 10% between 1975 and 1976, whereas it had increased by 84% between 1974 and 1975. Fares were raised by 25%, and vehicle miles of service were curtailed by 7%. Concerted efforts were made to increase efficiency, and the rate of transit labor cost growth fell from 11% to 7%, only slightly in excess of the general rate of inflation in the economy.[2]

The New York City Transit Authority's response to New York's fiscal crisis also yields some insights into the nature of subsidy impacts. The operating subsidy to the Authority decreased by 18% from 1975 to 1976, whereas it had increased by 45% from 1974 to 1975. Vehicle miles of service fell by 5%, fares were increased by 43%, and wages were officially frozen, with increases contingent on definite productivity gains. As a consequence, labor costs grew by only 2% (vs. 15% from 1974 to 1975), and a number of programs were implemented to eliminate inefficiencies and thus to reduce costs.[3]

Thus, the short-run impact of sharp changes in operating subsidization has included all of the effects hypothesized. The precise breakdown of the impact, however, is ambiguous. Even in the three cases just noted, it is difficult to determine, for example, exactly the extent to which labor costs have grown faster than the rate of labor productivity. Indeed, there is considerable controversy as to the apporpriate measure of transit labor productivity. Depending on which measure is used, the estimated degree of excessive labor cost inflation is either negligible, moderate, or very great. It is conceivable, moreover, that the relative importance

of each type of subsidy impact is different over a period of time longer than a year. Data are not available for establishing the extent of the difference between the short-run and long-run impact. Most of the effect of operating subsidization,however, probably occurs during the period of the subsidization; it is unlikely, therefore, that any differences would be significant.

Impacts of Capital Subsidies

The most significant direct impact of the capital subsidy program has been to provide improved or expanded service for riders by financing the construction and maintenance of rail transit rights of way and the purchase of rail vehicles and buses. In general, these improvements have increased the comfort and reliability of transit travel and, in certain instances, have increased vehicle miles of service.

The social benefits of capital subsidies may also be substantial; indeed, the allegedly desirable land-use impacts of rail rapid transit have been one of their main bases of justification. Whatever the degree of truly social benefits, however, large-scale, radial, CBD-focused rail transit systems clearly yield substantial private benefits to downtown landowners. Although central city businesses also benefit, increased rents may minimize their net benefits. Increased property taxes likewise reduce the net benefits of landowners. A quantitative decomposition of the actual impacts of capital subsidies is particularly difficult because benefits tend to be diffuse and, in contrast to operating subsidies, spread over an indeterminately long period of time.

Strategies for measuring benefit impacts are examined in the remainder of this chapter. Both non-rider and rider benefits will be analyzed, and to

the extent that any non-user impacts can be quantified, these estimates are derived. The quantitative estimates of rider benefits are, however, developed in Chapters 2 through 4.

Benefits to Transit Employees

Over the period of the 7-fold growth in transit subsidies since 1970, average transit salaries have increased by 60%.[4] Even when adjusted to control for inflation, the real wages of transit workers have grown more than 3 times as fast as real wages in the rest of the United States economy (13% vs. 4%).[5] Including fringe benefits, the average salary in the U.S. transit industry in 1976 was $18,934.[6] In large transit-oriented cities, the average was higher; for example, it was $22,634 in Boston.[7] Since this average incorporates the relatively low wages of clerks and typists, the average transit operator's wage was even higher. Clearly, transit laborers as a whole are not a low-income group.

Moreover, the rapid increase in transit wages and fringe benefits has come at a time of declining transit labor productivity. Passengers carried per employee fell by 18% between 1970 and 1976, and vehicle miles of service provided per employee fell by 9%.[8] In contrast, labor productivity in the rest of the urban economy (in terms of output per employee hour) increased by 10% over the same period.[9] Yet transit wages have been increasing much faster than those in other sectors of the economy. The implication is that transit wages have grown at least 20% faster since 1970 than would be justifiable on the grounds of productivity changes, and possibly by as much as 30%. Depending on which of the two notions of productivity is applicable (and some undoubtedly would argue that neither

is adequate), from 15% to 22% of the current operating subsidy is directly attributable to what may be termed "excessive" labor costs. To some extent, the low level of labor productivity results from a labor force of unnecessarily large size, but even this is primarily the responsibility of the labor unions, which have vigorously fought for no-layoff contracts, highly inefficient work rules, and, in a few cities, deliberate overmanning of transit vehicles.

The transit unions themselves appear to be acutely cognizant of the benefits they derive from public transit subsidization. Indeed, they have been the single most important backer of Federal transit subsidies, although they have demanded in return for their support a number of provisions (most notably, Section 13c)[10] which virtually guarantee future escalation of transit labor costs.

Of course, there is probably substantial variation from one metropolitan area to another in the extent to which transit subsidies accrue to transit labor. In general, the benefit shift is most pronounced in the largest cities of the Northeast, Great Lakes, and Pacific Coast regions--with the highest rates of unionization--and least significant in small cities or Southern cities. Wage differentials noted in Tables 1.1 and 1.2 suggest such variation.* Within each population size category, much of the variation in transit labor wages can be explained by differences in union bargaining power. Thus, in strong union towns such as New York, Chicago, and Boston, the average hourly wage rates of transit operators in 1975 were $6.72, $7.12, and $7.19, respectively. Wages were much lower

*Unfortunately, it was not possible to adjust for differences in the cost of living by city size. Thus, the figures in Table 2.1 overstate the differences in real wage rates across the urban size spectrum.

Table 1.1 Transit Wage Rates by Population Size[11]

City Population	Average Hourly Rate (1975)
1,000,000 or more	$6.61
500,000 to 1,000,000	6.51
250,000 to 500,000	5.80
100,000 to 250,000	4.99

Table 1.2 Transit Wage Rates by Region[12]

	Average Hourly Rate (1975)	
Region	Nominal	Real*
New England	$6.23	$5.32
Middle Atlantic	6.44	6.07
Border	6.42	6.26
Southeast	5.32	5.85
Southwest	4.42	4.91
Great Lakes	6.39	6.33
Middle West	5.83	5.89
Mountain	5.28	5.56
Pacific	6.50	6.44

in the less unionized towns of New Orleans ($4.41), San Antonio ($4.60), and Houston ($5.05).[13] Even controlling for differences in the cost of living, the difference between the average real wage in the unionized cities and that in the less unionized cities is considerable ($6.28 vs. $5.21).[14]

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*Adjusted for differences among regions in the cost of living.

Benefits to Downtown Landowners and Businesses

Improved transit services can indirectly benefit individuals and firms by making them more accessible from other parts of the metropolitan area. Since transit systems in most cities focus radially on downtown, it is this area that gains most in accessibility by upgrading and expansion of conventional transit service or even by a lowering of fares. Downtown landowners are probably the most significant beneficiaries of this type. Land values and rents have typically skyrocketed in the vicinity of new rail transit construction, and they undoubtedly have also increased--although less spectacularly--as the result of artificially low, subsidized fares or service improvements. It is difficult to determine the exact extent of the net benefit, however; depending on the specific metropolitan area, sharp increases in property taxation of such sites may siphon off much of the increased rent value. Indeed, it has been proposed that such value-capture taxation be employed as a major source of funds for subway construction. Currently, however, it is likely that a considerable amount of the benefits to landowners is not withdrawn in this manner.

Central city businesses also benefit from transit subsidization. To the extent that these are not landowners, however, most of the accessibility benefits derived from the transit improvements are probably extracted eventually by landowners via higher rents. Short-run benefits, in terms of greater accessibility to customers and employees, may nevertheless be substantial.

The degree of benefit to downtown landowners and businesses may be suggested by the strong support these groups have given transit improvement programs. Indeed, at the local level, they have probably been the most effective advocates of transit.

Social Benefits of Transit Subsidies

In support of transit subsidization, it has been alleged that transit service aids in the reduction of auto air pollution, noise, congestion, traffic accidents, and energy use and promotes a more compact land-use pattern. Aside from the issue of who benefits from such impacts, there is the fundamental question of their actual extent. Available empirical studies have focused primarily on measuring the short-run, marginal impact of increases in transit service and have not attempted to calculate either the long-run impact of such increases or the total overall social benefit produced by transit. These analyses have generally estimated that each of the alleged social benefits of increased transit service is in most cities negligible in extent and highly cost-ineffective with respect to the achievement of economic, social, and environmental objectives.[15] Most studies conclude, therefore, that substantial expansion of transit service--and in particular, rail rapid transit construction--cannot be justified on the basis of social benefits this would produce. Such a result can be explained almost entirely by the failure of expansion efforts to attract many additional riders, which in turn is the consequence primarily of the current, high level of auto ownership and the low density of recent urban development, which simply cannot be well served by conventional, high-volume transit technology.

It does not follow from these analyses, however, that the total social benefit of existing transit service is insignificant or that a substantial reduction in the level of transit service is justified. On the contrary, it is quite likely that the oldest transit routes--those in the densest, largest cities--produce much greater social benefit than

proposed extensions in low-density areas. Indeed, whereas existing land-use patterns sharply limit the potential effectiveness of transit expansion, they reinforce the benefits of preserving existing service to high-density districts. Subsidies aimed at maintaining or moderately upgrading existing services in dense corridors of large metropolitan areas may, therefore, yield substantial benefits in terms of making possible the continuation of existing, dense districts, which developed before the widespread use of the auto. Whether or not high-density urban development is necessary or even desirable is another and highly subjective matter. Moreover, it is not clear to what extent the supposed social benefits of compact land-use are not already reflected in higher land values and rents in transit-oriented cities.

Likewise, it is probable that air pollution, congestion, and traffic accident levels in New York and other dense central cities are significantly lower than they would be if everyone drove a car. But for most American cities, land-use patterns are too diffuse to be served efficiently by transit. Even large increases in subsidization have produced negligible ridership gains and consequently have had little impact on ameliorating congestion or any of the other external social costs of the auto.

The benefits of congestion reduction, to whatever extent transit is responsible for it, redound primarily to auto users. In corridors of large, dense cities, where transit is most likely to produce such benefits, these auto commuters tend to have incomes well above average. Air pollution and noise abatement benefits attributable to transit probably redound primarily to central city residents, who have incomes significantly lower than those of suburbanites, on average. Passenger safety benefits obviously accrue to transit riders, who tend to have below-average incomes; non-occupant safety

benefits accrue primarily to central city residents (and to a lesser extent, workers), many of whom currently become the victims of auto accidents.* Energy savings benefits, if any do result from transit, presumably accrue to the country at large, but particularly to those regions heavily dependent on oil.

On the whole, however, the quantitative importance of the social benefits of transit is a matter of considerable dispute; hence, it is not clear how significantly these affect the overall distribution of transit subsidy benefits among income classes.

Benefits to Transit Riders

It has generally been assumed that most of the benefits of transit subsidies accrue to transit riders. Although other groups also benefit from transit subsidies, the assumption of benefits accruing exclusively to riders is a necessary one for purposes of analysis; adequate data simply are not available to measure the extent and distributional impact of benefits to other groups. Moreover, it is quite likely that most--even if not all--of transit subsidy benefits do in fact redound to riders.

The first problem in establishing the extent of rider benefits is determining the degree to which subsidies have resulted in lower fares as opposed to better service. The former effect is more beneficial to low-income riders, who have a relatively high marginal utility of income, whereas the latter is more beneficial to higher-income riders, who place a relatively high value on speed, comfort, and reliability. These fare and

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*Roughly one-third of all urban auto traffic fatalities are pedestrians.[16]

service impacts almost certainly vary in relative importance from one metropolitan area to another, and the impact within any given area is likely to vary according to mode, time of day, and portion of the system. For example, recent service cutbacks in New York were greater for subway service than for bus service (5% vs. 3% decreases in vehicle miles between 1975 and 1976),[17] and the effective fare increase for bus service was less severe due to a lowering of the price of transfers between bus routes. Similarly, percentage service curtailments varied by time of day and specific route.* Because the income distribution of transit riders varies significantly by specific transit mode, time of day of use, and portion of system used, this variation in fare and service impacts of transit subsidies may have substantial distributional impact.

Unfortunately, it is exceedingly difficult to effect a corresponding decomposition at the national level of analysis in the next four chapters. The aggregate figures available conceal the impacts of subsidization by masking the variation among metropolitan areas. Attempts to use regression analysis to isolate the impacts of the subsidy growth between 1970 and 1975 have so far been fruitless; there simply is not enough information. Consequently, the benefit analysis in Chapters 2 through 5 does not distinguish between fare and service impacts of transit subsidies.

The discussion in those chapters would, at any rate, be limited by

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*If the transit authority had been a private firm seeking to maximize revenues, it would have increased fares most in markets with the least elastic demand (thus reducing ridership least) and raised them least in markets with the most elastic demand (where fare increases would have greatly discouraged patronage). Most sudies, in fact, suggest that the elasticity of demand for travel is least for peak-hour use on subways and greatest for off-peak use, especially of bus service. Consequently, one might have expected the fare increases and service cutbacks to have been greatest for rush-hour subway service, which in fact they were.

the inability to translate fare and service changes into true welfare changes and to quantify these utility impacts in a manner such that they would be comparable among different income groups. As explained more fully in Appendix A, sufficient data were not available for estimating the necessary travel demand equations for each income class. Moreover, even if these equations could have been estimated, the derived consumer surplus figures would not have been comparable among different income groups.

In the light of these theoretical dilemmas and practical measurement problems, no attempt was made to measure utility impacts. Instead, the chapters that immediately follow perform a straightforward assignment of subsidy expenditures by income class on the basis of disaggregate data on transit subsidy expenditures by type of transit service and corresponding data on the income distribution of transit riders by type of transit service. This approach, of course, fails to determine the distribution of true benefits. But it does at least yield an estimate of the extent to which subsidy expenditures are devoted to the types of transit services used by low-income groups.

CHAPTER 2: THE INCOME DISTRIBUTION OF TRANSIT RIDERS

The distribution of transit subsidy benefits obviously depends primarily on the income distribution of transit riders. Because the degree of subsidization varies for different transit modes, it is necessary to establish not only how the incomes of transit riders compare with those of auto drivers, but also how the income distribution of riders varies for each transit mode. Moreover, levels of subsidization can vary implicitly by time of day of use, length of trip, direction of trip, and portion of system used. Corresponding variations in rider incomes render these differences in degrees of implicit subsidization of significant distributional consequence as well.

The Composition of Ridership by Income Class

It is certainly not the case that all, or even most, transit riders in the U.S. are poor. Transit riders do, however, have considerably lower incomes on average than do other urban tripmakers. As indicated in Table 2.1, 28% of transit users in 1970 had household incomes of less than $5,000; the same income class accounted for only 10% of auto drivers and only 13% of passengers. Although the average income of transit riders is significantly less than that of travelers using other modes, it is only slightly less than that of the urban population as a whole.* The top and bottom income

*The average income of travelers, of course, is higher than that of the general population because low-income persons have lower trip-making rates. Many of these persons are either elderly or unemployed; thus, they make very few work trips and, moreover, are less able (either physically or financially) to make other types of trips.

Table 2.1 The Composition of Each Urban Transportation Mode's Riders by Income Class (U.S. Aggregate, All Purposes, 1970)*,[1]

Group	Income Class				
	Below $5,000	$5,000-$9,999	$10,000-$14,999	$15,000 or more	All incomes
All Households in the U.S., 1970	28.4%	30.9%	23.0%	17.6%	100%
All Travelers	12.1%	42.0%	29.6%	16.2%	100%
Auto Drivers	10.1%	41.6%	31.1%	17.2%	100%
Auto Passengers	12.7%	43.2%	29.1%	15.1%	100%
Bus or Streetcar Riders**	34.1%	37.8%	16.4%	11.6%	100%
Subway or Elevated Riders	14.9%	41.8%	21.1%	21.1%	100%
Commuter Rail Riders	0%	35.1%	39.6%	25.2%	100%
Taxi Passengers	28.5%	42.3%	26.0%	13.3%	100%
Public Transporation Users (Total, All Modes)	27.6%	37.1%	18.0%	17.7%	100%

*Each line displays the percentage distribution of each group among the four income classes.

**Not including school-bus trips.

classes account for roughly the same percentages of total transit riders as they do of the general population. The overall average income of transit riders is somewhat lower, however, due to the overrepresentation of riders in the $5,000-$10,000 category and a corresponding underrepresentation in the $10,000-$15,000 category.*

For the purpose of evaluating the redistributional effectiveness of transit subsidies relative to all other possible government programs, the relevant base of comparison clearly is the income distribution of the general population. In assessing the distributional impacts of transit subsidies relative to other transportation programs, however, the income distribution of travelers almost certainly is the more appropriate base. Obviously, transit subsidization appears more favorably in this latter context. Both types of comparisons may be useful depending on the specific public policy issue at hand.

Noteworthy as well is the considerable degree of overlapping of modal usage by income groups. Many car drivers are poor, and many transit passengers are affluent. Thus general transit subsidization aids not only the 28% of transit passengers who are in the lowest-income bracket but also the 18% of riders in the top income category. To the extent that equity goals are of primary significance, such general subsidization does not target the poor very effectively.

Differential subsidization of the various types of transit services, however, could increase the concentration of subsidy benefits among the

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*Unfortunately, it as not possible to control for household size. Given the tendency for household size to increase with income, per capita tripmaking ratesof the poor almost certainly are not as low relative to more affluent classes as are per household tripmaking rates. Thus, Table 2.1 exaggerates to some extent the actual income differences between tripmakers and the general population.

poor. There exists substantial variation in the incomes of riders of different transit modes. Commuter rail passengers, for example, have higher incomes than do users of any other mode of urban transportation (see Table 2.1). Patrons of rail rapid transit (subway or elevated) have incomes roughly the same as auto users. At the opposite end of the spectrum, bus riders have the lowest average income of any modal user group; they also have a considerably lower average income than does the general population. These statistics suggest that the subsidization of commuter rail primarily benefits affluent travelers. Government financial support of rail rapid transit services appears to benefit higher income classes slightly more than lower income classes. Evidently, only bus subsidies are strongly progressive* in their distributional impact; even these however, benefit affluent riders to some extent. Undoubtedly, the progressivity of the transit subsidy program as a whole could be increased by shifting subsidy funds out of the rail services and into bus transit.

The Incidence of Transit Use by Income Class

Whereas the compositional statistics of Table 2.1 are useful in evaluating the distributional impact of transit subsidies, they do not throw much light on the potential effectiveness of transit subsidization

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*The term "progressive" is used here and subsequently in this study as shorthand to denote the tendency of a program to make the size distribution of income less unequal. This should not be confused with the technical definition, which denotes a distribution of tax costs (or more generally, any series) such that, as a percentage of income, these increase as income levels increase. Technically, therefore, a progressive distribution of benefits is unfavorable to the poor. Given the widespread, popular impression that the term "progressive" indicates greater equality of income, it has been used here in this sense. With respect to tax costs, of course, the technical and popular interpretations coincide.

in aiding the mobility of the poor and thereby improving their welfare. As suggested by Table 2.2, transit subsidies cannot be expected to be very effective as a general welfare program. Transit was used for only 14% of the trips made by households earning less than $5,000 in 1970. This percentage is three times as high as the corresponding percentage for households in the top income category, but it nevertheless represents a distinct minority of all trips made by low-income households. Over 80% of trips made by even the poorest subgroup sampled (less than $3,000 income) were made by auto.[3] Clearly, however, transit is relatively more important as a mode of travel for the poor; this is attributable almost entirely to the relatively high incidence of bus use at the lower end of the income spectrum. Indeed, the incidence of subway use was roughly the same for all income classes, and no sample households earning less than $5,000 in 1970 used commuter rail at all.*

Cost of Living Bias and Variation in Transit Rider Incomes by City Type

To some extent, the aggregate nationwide statistics presented in Tables 2-1 and 2-2 overstate the real incomes of transit riders relative to auto useres. Similarly, they overstate the incomes of commuter rail and subway riders relative to bus riders. Most transit riders--and all subway and commuter rail passengers--are concentrated in large, dense metropolitan areas, where both nominal incomes and the cost of living are among the highest

*Comparisons of the NPTS data with other rider income surveys suggest that the incidence of commuter rail use among households earning less than than $5,000 in 1970 was somewhat greater than 0%. Most of these studies indicate that from 1% to 4% of commuter rail passengers come from this income group. Corresponding incidence estimatesare likewise slightly greater than 0, but nevertheless confirm that the incidence of commuter rail use is much higher among high-income households than it is among low-income households.[4]

Table 2.2 The Incidence of Urban Transportation Use by Mode of Travel for Each Income Class (U.S. Aggregate, All Trip Purposes, 1970)*,2

Income Class	Modes						Total, All Modes
	Auto Driver	Auto Passenger	Bus or Streetcar	Subway or Elevated	Commuter Rail	Taxi	
Below $5,000	47.6%	37.8%	12.2%	1.5%	0%	.8%	100%
$5,000-$7,499	55.8%	37.0%	5.5%	1.4%	.1%	.2%	100%
$7,500-$9,999	57.6%	38.3%	2.5%	1.0%	.2%	.5%	100%
$10,000-$14,999	60.3%	36.0%	2.4%	.9%	.3%	.2%	100%
$15,000 or More	60.7%	34.0%	3.1%	1.6%	.3%	.3%	100%
All Incomes, Total	57.3%	36.6%	4.4%	1.2%	.2%	.3%	100%

*Each figure in the table represents the percentage of the total trips of each income group made by the indicated mode.

in the United States. Although the average nominal income of transit riders falls far short of that of auto commuters in these large metropolitan areas, these big-city transit users do not appear nearly as poor relative to auto users in smaller cities, where nominal incomes are lower, but the cost of living is also lower. Aggregating across cities without controlling for the cost of living introduces an upward bias in the estimation of the real incomes of transit riders and a downward bias in the estimation of the real incomes of auto users.

Circumventing this aggregation bias, the city-specific data of Table 2.3 indicate the differences in median earnings by mode of journey to work in 1970. Without exception, the median earnings of transit riders are significantly less than those of auto drivers, and are slightly less than those of auto passengers as well, except in the four cities with extensive rapid transit and commuter rail systems. Moreover, the earnings differences would have been significantly greater if the census sample had not been limited to worktrips. The average income of work commuters is, in general, higher than that of non-work travelers. The income gap between transit commuters and non-worktrip transit riders is considerably greater than the corresponding income gap for auto users.[6] Thus, even these city-specific data overstate the relative earnings of transit riders.*

Not surprisingly, Table 2.3 suggests that the higher the quality of mass transit, the more likely it is to attract affluent riders. The table also suggests that incomes of transit riders relative to their automotive counterparts are higher in the largest, densest cities, which typically have the best transit systems. In general, the larger and denser a city is,

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*Unfortunately, city-specific data on non-work traveler incomes were not available except for a few cities.

Table 2.3 Median Earnings of Work Commuters by Mode of Travel for Selected Metropolitan Areas, 1970[5]

Metropolitan Area	Modes					Ratio of Auto Driver's to Transit Rider's Median Income
	All Workers	Auto Driver	Auto Passenger	Public Transportation	Transit Share of Work Trips	
New York*,***	$8,008	$9,577	$7,243	$7,404	47%	1.29
Chicago*,***	7,847	9,144	5,893	6,770	23%	1.35
Philadelphia*,***	7,138	8,304	5,640	5,790	20%	1.43
New Orleans	6,465	7,725	5,354	4,022	20%	1.92
Boston*,***	7,300	8,816	5,461	5,546	19%	1.59
Washington**	8,265	9,490	7,524	6,206	16%	1.53
San Francisco**	7,873	8,825	6,440	6,253	15%	1.41
Pittsburgh	7,148	8,229	5,594	5,463	14%	1.51
Cleveland	7,706	8,840	5,471	5,177	13%	1.49
Baltimore	6,837	8,090	5,484	4,210	13%	1.92
Milwaukee	7,147	8,347	5,201	4,385	12%	1.90
Buffalo	6,995	8,058	5,225	4,203	10%	1.92
Atlanta	7,095	8,016	5,030	3,643	9%	2.20
Minneapolis	7,291	8,512	4,875	4,348	9%	1.96
Miami	6,436	7,413	4,224	3,199	9%	2.32
Detroit	8,400	9,389	5,980	4,880	8%	1.92
Cincinnati	7,113	8,125	5,129	4,205	8%	1.93
St. Louis	7,135	8,089	5,309	4,138	8%	1.95
Seattle	7,930	8,760	5,947	5,198	7%	1.69
Dallas	7,025	7,854	4,667	3,871	6%	2.03
Portland	7,142	7,564	5,838	5,381	6%	1.41
Los Angeles	7,720	8,506	5,411	4,160	6%	2.04
Kansas City	6,951	7,775	4,909	3,856	5%	2.02
Houston	6,974	7,855	4,836	3,440	5%	2.28
Denver	5,970	7,739	4,962	4,241	4%	1.82
San Diego	6,307	7,458	4,782	3,455	4%	2.16

*Designated cities had rail rapid transit in 1970.
**Designated cities had rail rapid transit in 1976 but not in 1970 at the time of the Census.
***Designated cities had extensive commuter rail systems.

the more extensive is its transit system and the more likely is it to have rapid transit and commuter rail service. For those metropolitan areas with rail rapid transit in 1970, the ratio of auto driver median earnings to transit rider median earnings was only 1.43 on average, as opposed to a ratio of 1.90 for cities having only bus transit.

Table 2.4 confirms that transit rider incomes are indeed higher in larger metropolitan areas, but indicates that almost all of the income variation derives from the differential relative importance of rail rapid transit and commuter rail. The more extensively these are available, the higher the average transit rider income. As suggested earlier, the average income of all travelers in aggregate is considerably higher in metropolitan areas with a million or more residents. Relative to the differing base income distributions of all travelers, bus riders have roughly the same incomes regardless of city size.

Other Variations in Rider Incomes

Because implicit levels of transit subsidization can vary by time of day, length and direction of trip, and geographic portion of system used, corresponding variations in rider incomes can significantly affect the overall distribution of transit subsidies among income classes.

Time of Day: Table 2.5 shows that the distribution of transit rider incomes varies significantly according to the time of travel. Households with incomes less than $5,000 in 1970 accounted for 41% of off-peak bus patronage but for only 25% of rush-hour patronage. Similarly, they accounted for 23% of off-peak rapid transit (subway) ridership but for only 9% of rush-hour ridership. Although the average income of transit riders is

Table 2.4 The Composition of Each Urban Transportation Mode's Riders by Income Class by Size of Metropolitan Area.[7] (All Trip Purposes, 1970)*

Mode of Travel	Income Class					Percent of all trips by each mode, total for all incomes
	Below $5,000	$5,000-$9,999	$10,000-$14,999	$15,000 or More	All incomes	
Population of 1,000,000 or more						
All Travelers	10.1%	35.3%	34.2%	20.4%	100%	100%
Auto Driver	7.6	34.2	36.7	21.5	100	57.0
Auto Passenger	10.2	35.5	34.3	20.0	100	33.8
Bus or Streetcar	32.5	39.4	16.7	11.4	100	5.9
Subway - Elevated	14.9	42.8	21.2	21.1	100	2.4
Commuter Rail	0	35.8	38.5	25.6	100	.4
Population of 500,000 to 1,000,000						
All Travelers	15.9%	49.6%	26.6%	7.9%	100%	100%
Auto Driver	14	49.5	27.7	8.8	100	57.6
Auto Passenger	16.5	51.3	25.9	6.2	100	37.8
Bus or Streetcar	34.8	35.7	17.7	11.7	100	4.4
Population of Less Than 500,000						
All Travelers	13.6%	48.5%	24.2%	13.8%	100%	100%
Auto Driver	12.2	48.7	24.6	14.6	100	57.5
Auto Passenger	14.2	49.1	24.2	12.7	100	40.2
Bus or Streetcar	40	33.5	13.8	12.7	100	2.1

*Only trips shorter than 50 miles were included.

Table 2.5 Distribution of Mode of Travel by Income Class by Time of Day[8] (U.S. Aggregate, 1970, All Purposes)[a]

Mode/Time of Day	Income Class					Percentage of Total Trips by Indicated Mode at Indicated Time
	Under $5,000	$5,000-$9,999	$10,000-$14,999	$15,000 or More	All Incomes	
All Modes (off-peak)[b]	12.9%	42.4%	29.3%	15.4%	100%	72.6%
All Modes (rush hour)[b]	10.4	42.1	30.4	17.2	100	27.4
All Modes (all times)	12.2	42.4	29.6	15.9	100	100
Auto Driver (off-peak)	10.7	41.8	30.9	16.6	100	71.6
Auto Driver (rush hour)	8.6	41.2	31.6	18.7	100	28.4
Auto Driver (all times)	10.1	41.6	31.1	17.2	100	100
Auto Passenger (off-peak)	13.3	42.9	28.7	15.1	100	79.3
Auto Passenger (rush hour)	9.9	44.3	31.0	14.8	100	20.7
Auto Passenger (all times)	12.7	43.2	29.2	15.0	100	100
Bus (off-peak)	40.5	37.8	13.1	8.7	100	58.1
Bus (rush hour)	25.4	37.8	20.9	15.8	100	41.9
Bus (all times)	34.2	37.9	16.4	11.7	100	100
Subway (off-peak)	22.6	42.6	19.4	15.4	100	44.8
Subway (rush hour)	8.9	43	22.6	25.5	100	52.2
Subway (all times)	15.1	42.9	21.1	21.0	100	100
Commuter Rail (off-peak)	0	44.8	27.6	27.7	100	38.9
Commuter Rail (rush hour)	0	29.1	47.2	23.6	100	61.1
Commuter Rail (all times)	0	35.1	39.6	25.2	100	100
Taxi (off-peak)	31.2	42.2	16.2	10.4	100	80.2
Taxi (rush hour)	17.3	42.8	15.1	24.8	100	19.8
Taxi (all times)	28.5	42.3	16.0	13.3	100	100

[a]Including intraurban trips only (excluding overnight trips and all trips longer than 50 miles).

[b]Rush hour is defined as Monday through Friday, from 7:00 A.M. to 9:00 A.M. and from 4:30 P.M. to 6:30 P.M. All other times are defined to be off-peak.

thus substantially lower during off-peak hours than it is during rush hours, there is no significant variation in the incomes of auto users by time of day.

Length of Trip: It has been hypothesized that rider incomes also vary according to trip distance.[9] Most transit service either originates or terminates in the downtown area. Because suburban riders live farther from downtown and have higher incomes than do central city riders, the average trip length of low-income transit users might reasonably be expected to be shorter than that of riders with higher incomes. Surprisingly, the very limited empirical evidence on trips lengths by income class only partly bears out the hypothesis. As indicated in Table 2.6, bus trip distances in 1970 were moderately longer for high-income riders than for low-income riders, but rapid transit trips were actually somewhat longer for low-income riders. Of course, the accuracy of the data on which the table is based

Table 2.6 Mean Trip Distance (In Miles) by Income Class for Each Urban Transportation Mode[10] (U.S. Aggregate, 1970, All Purposes)

Income Class	Mode				
	Auto Driver	Auto Passenger	Bus or Streetcar*	Subway or Elevated*	Commuter Rail*
Below $5,000	6.6	7.0	6.0	12.9	-
$5,000 - $9,999	7.3	7.3	6.3	10.8	26.9
$10,000-$14,999	7.6	7.4	6.0	10.1	20.5
$15,000 or More	7.9	7.2	8.5	10.9	34.2

*The transit trip length figures, which are based on survey responses, are considerably higher than those estimated by transit authorities or reported in origin-destination travel demand studies. Transit commuters, unlike automobile drivers, do not have odometers in front of them as they travel.

is questionable, particularly as the trip distances reported were not actually measured but rather were approximated by each of the survey respondents. Nevertheless, it is noteworthy that the anticipated relationship is not fully confirmed.

Specific Geographic Routing: Rider incomes appear to vary considerably according to the geographic portion of the transit system used. As Table 2.7 indicates, the average annual earnings in 1970 of auto commuters in metropolitan areas larger than 100,000 population were $7,598 as compared with only $5,982 for mass transit commuters. The average earnings of long-distance radial commuters living in the suburbs,however, were much higher than those of non-radial commuters either within the suburbs or within the central city. Indeed, transit riders commuting from the suburbs to downtown jobs had the highest average earnings of any category ($10,589), even higher than auto commuters making the same type of trip ($10,432). The commuters with the lowest average earnings were transit riders who either both lived and worked inside the central city or both lived and worked in the suburbs ($5,099 and $4,011, respectively). It should not be surprising, then, that subways and commuter railroads, which primarily provide long-distance, radial service to the downtown area, are patronized more heavily by the affluent than are inner-city or intra-suburban bus lines.

Incidentally, the statistics of Table 2.7 tend to contradict somewhat the trip distance Figures of Table 2.6. Although Table 2.7 refers to worktrips only and does not present precise estimates of length, it does indicate that the most affluent workers are those commuting between the suburbs and downtown, which presumably requires the longest trips. It is conceivable, although unlikely, that intra-suburban transit trips are

Table 2.7 Average Annual Earnings of Workers Living in U.S. Metropolitan Areas with Population Above 100,000 by Mode Used for Journey-to-Work, Place of Work, and Place of Residence in 1970[11]

Principal Mode Used on Journey-to-Work	All Workers Who Live in SMSAs	Average Annual Earnings of Workers Who							
		Live Inside the Central City				Live Outside the Central City			
		Work Inside the Central City		Work in SMSA Outside C. City	Work Outside SMSA of Residence*	Work Inside the Central City		Work in SMSA Outside C. City	Work Outside SMSA of Residence*
		In CBD**	Elsewhere			In CBD**	Elsewhere		
All Modes***	$ 7,557	$ 7,375	$ 6,402	$ 6,998	$ 8,097	$10,468	$ 8,386	$ 6,991	$ 9,326
Private Automobile	$ 7,598	$ 8,370	$ 7,089	$ 7,384	$ 8,397	$10,432	$ 8,515	$ 7,427	$ 9,111
Mass Transport	$ 5,982	$ 6,386	$ 5,099	$ 4,312	$ 7,267*	$10,589	$ 7,998	$ 4,011	$12,692*

*Often these persons work in the central cities of adjacent SMSAs. For example, many persons who live in the Paterson-Clifton-Passaic, Newark, Jersey City, Standford, or Norwalk SMSAs and work outside their SMSA of residence probably work in the New York City SMSA.

**Central business district.

***Other modes besides private automobiles and mass transport include taxi, walking, and work at home.

longer on average. Similarly, cross-hauling within large central cities can entail very long trips indeed. Thus, even Table 2.7 does not definitely confirm the hypothesis that more affluent transit riders take longer trips. Table 2.7 does, however, indicate that peak-direction commuters have much higher incomes than do reverse commuters. Suburban residents headed for downtown via transit during morning rush hours averaged $10,589 in earnings, whereas central city residents making the reverse commute averaged only $4,312.

In summary, transit riders in the U.S. have significantly lower incomes on average than do automobile users. This is primarily due to the very low incomes of bus passengers, who account for about 3/4 of all transit patronage. Subway riders are spread evenly over the income distribution, and commuter rail passengers are much more affluent than the users of any other mode of urban transportation. Incomes of transit riders tend to be higher for rush-hour trips than for off-peak trips, for peak-direction trips than for reverse commuting, for suburb-to-downtown trips than for intrasuburban or intra-central-city trips, and possibly for longer trips than for shorter trips.

These income characteristics of transit riders are, of course, not immutable. Although studies suggest that the distribution of transit rider incomes relative to the distribution of auto user incomes has remained roughly constant since 1963,[12] it is certain that shifts in public policy could significantly change this distribution. Discount transit passes for the poor and improved bus service in low-income neighborhoods would increase transit use at the lower end of the income spectrum. Such a program could be financed by a reduction in the level of operating

subsidies to commuter rail and rapid transit, which, moreover, would result in fare increases and service cutbacks that would reduce the patronage of many affluent riders. Similarly, fare surcharges for peak-direction rush-hour trips would shift downward the relative income distribution of transit riders.

The following chapters, however, do not speculate on the precise degree to which the income distribution would shift in response to various policy changes. They attempt, rather, to assay the income-redistributional impact of the current transit subsidy program given existing fare and service levels and the present distribution of transit rider incomes. This distributional impact is calculated on the basis of variations in the extent to which different types of transit services are subsidized (both explicitly and implicitly) and the corresponding variations in rider incomes.

CHAPTER 3: THE DISTRIBUTION OF OPERATING SUBSIDIES AMONG TRANSIT RIDERS

In light of the difficulties of measuring the utility impacts of transit subsidies, the benefit analysis of this study focuses on the distribution of transit subsidy expenditures among income classes. In the present chapter, the distribution of operating subsidies is estimated on the basis of rider incomes and the differential degree of subsidization of each type of transit service.

Trends in Transit Operating Subsidies

Public subsidization of transit operations in the United States has grown dramatically in recent years. As shown in Figure 3.1, transit operations as a whole were only marginally profitable even at the peak of transit use in the 1940's. They became steadily less profitable during the 1950's and ran their first aggregate operating deficit in 1963. This deficit continued to grow, but only slightly, over the remainder of the decade. The initial response to transit's unprofitability involved service cutbacks and fare hikes by the operators. Government financial assistance to offset the deficit was minimal.[1]

Since 1970, however, public operating subsidies to mass transit have increased faster than almost any other government program and have covered virtually all of the operating deficit. Having grown by an average of 36% per year, these subsidies amounted to $2.2 billion in 1976.[2]

Modal Distribution of Operating Subsidies

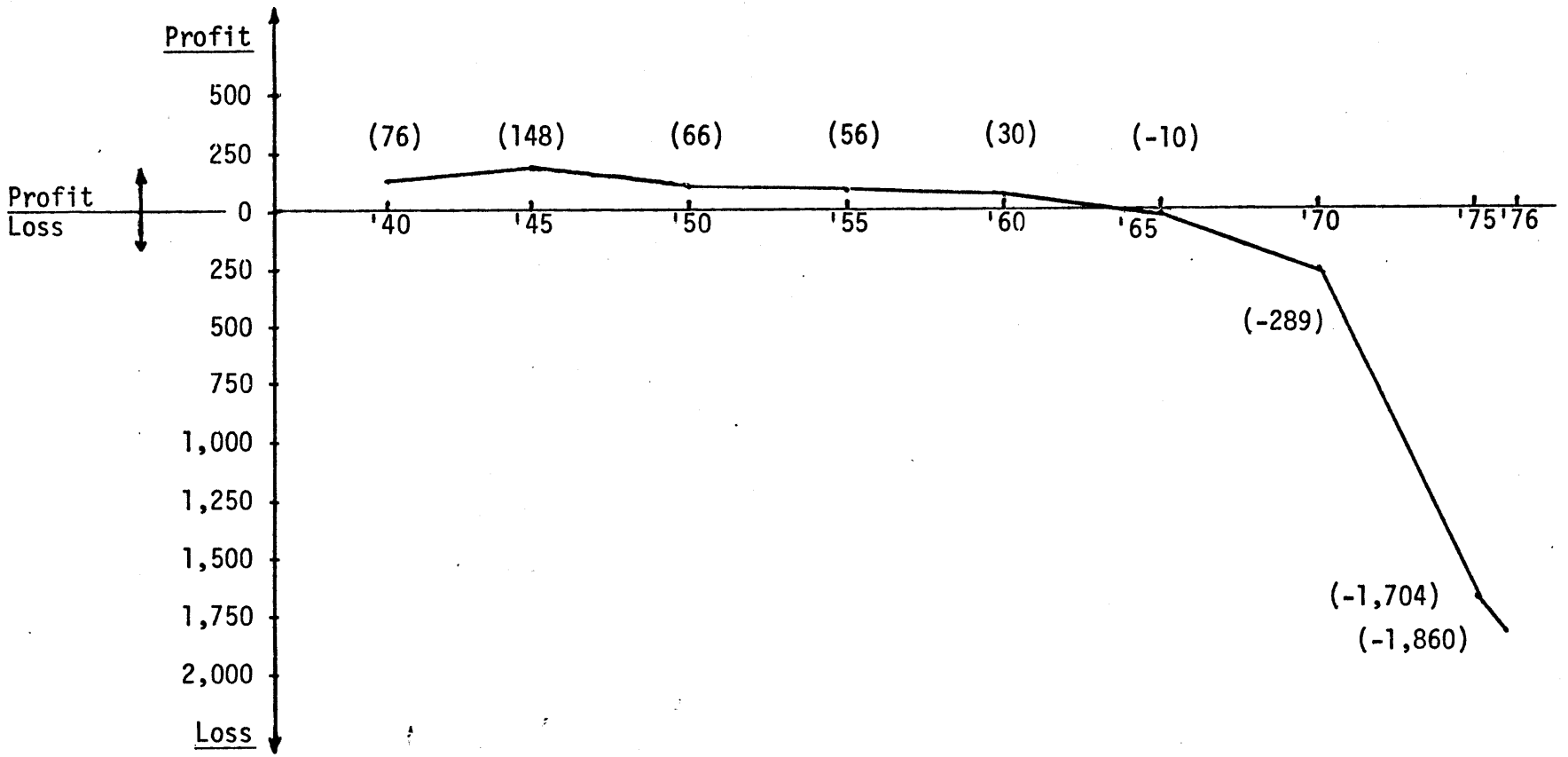
As indicated in Table 3.1, roughly 56% of the total operating

Table 3.1 U.S. Aggregate Transit Operating Statistics by Mode, 1973 - 1976 (In Millions, Except for Ratios)[3]

Statistic	MODE											
	Bus and Streetcar				Subway and Elevated				Commuter Rail			
	1973	1974	1975	1976	1973	1974	1975	1976	1973	1974	1975	1976
Operating Expense*($)	1,599	2,190	2,500	2,651	837	949	1,085	1,188	413	495	571	657
Operating Revenue ($)	1,337	1,434	1,483	1,528	514	502	491	617	250	263	283	334
Operating Deficit ($)	262	756	1,017	1,123	323	447	593	571	163	233	288	323
Operating Revenue/ Operating Expense	.84	.65	.59	.58	.61	.53	.45	.52	.61	.53	.50	.51
Total Passengers	4,946	5,209	5,286	5,434	1,714	1,726	1,673	1,632	239	254	260	260
Operating Expense per Passenger ($)	.32	.42	.47	.49	.49	.55	.65	.73	1.73	1.95	2.20	2.52
Average Fare ($)	.27	.28	.28	.28	.30	.29	.29	.38	1.05	1.05	1.09	1.28
Operating Deficit per Passenger ($)	.05	.14	.19	.21	.19	.26	.36	.35	.68	.92	1.11	1.24

*Includes taxes, excludes depreciation.

Figure 3.1 The Growth in the Aggregate Transit Operating Deficit in the United States, 1940-1976[1] (In Millions of Dollars)*



*The operating profit and loss figures do not include commuter rail, which is incorporated in aggregate transit statistics elsewhere in this study.

deficit is attributable to bus operations, 28% to rail rapid transit, and 16% to commuter rail. Although bus services thus receive most of the operating subsidy, rail operations entail considerably higher deficits per passenger trip. In 1976, for example, these amounted to an average of $1.24 per commuter rail passenger, 35¢ per rail rapid transit passenger, and only 21¢ per bus passenger. Yet fare revenues covered only a slightly higher percentage of operating expenses for bus service than for rail services; most of the differences in per-passenger subsidies among modes are, therefore, attributable to the large differences in operating expense levels.* Because the income distribution of riders varies substantially according to specific transit mode, this variation in degree of subsidization significantly affects the overall distribution of transit subsidies among income classes. Thus, bus riders, who have the lowest average income, receive the least subsidy per trip, whereas commuter rail passengers, who have much higher incomes on average, benefit from a per-trip subsidy that is almost 6 times as large.

Variations in Subsidization Levels Among Cities

The variation in operating subsidy levels among modes is exceeded by the variation in subsidy levels from one city to another. Among major metropolitan areas, for example, the average operating subsidy per passenger ranges from 13¢ in New Orleans to 90¢ in Boston (see Figure 3.2). In general, Western cities have the highest per-passenger subsidies, and

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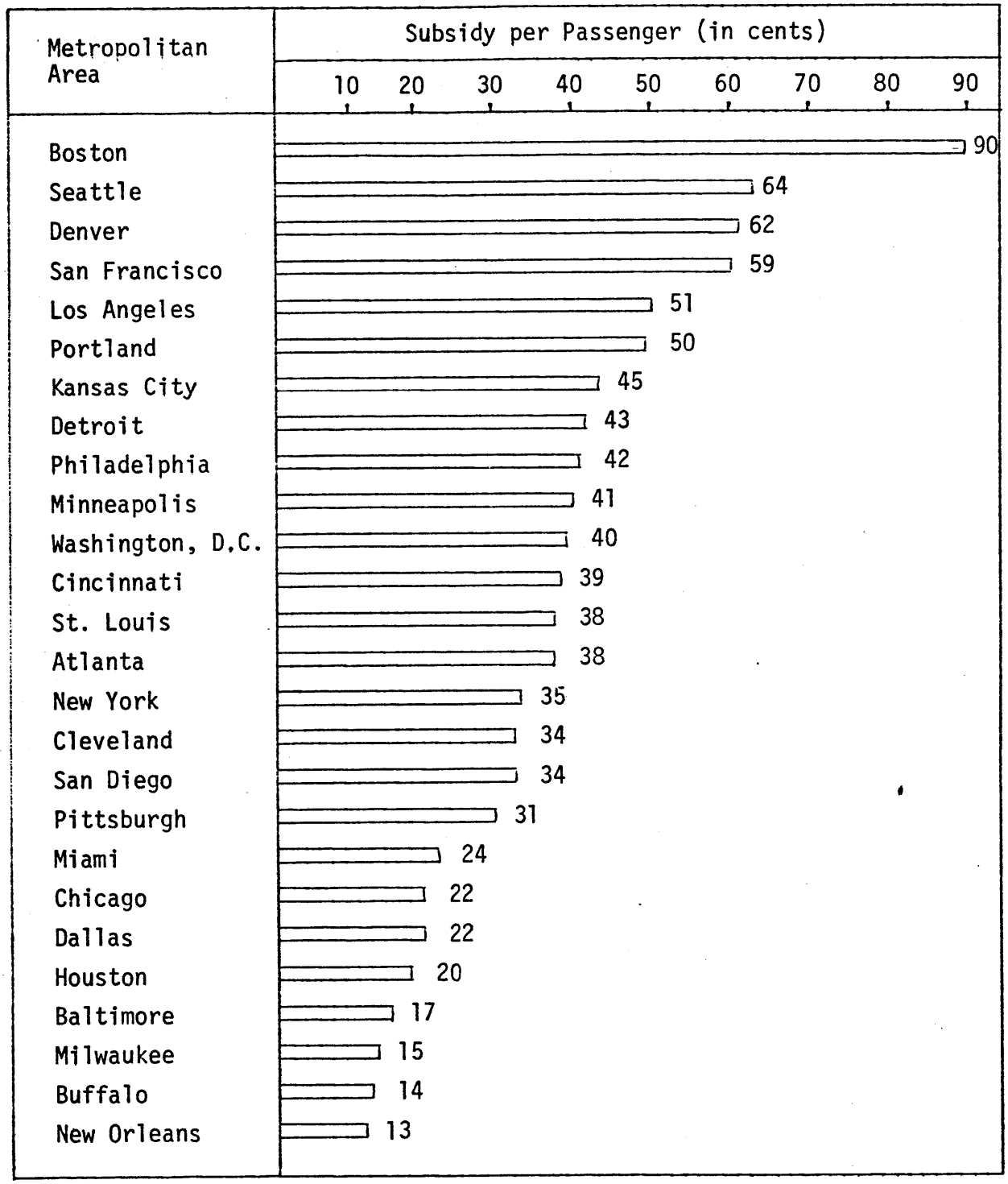
*Of course, these statistics do not necessarily imply that the rail services are less efficient modes than the bus. Commuter rail trips are generally much longer than bus trips, and the quality of service is normally higher. Similarly, subway costs are higher than bus costs per passenger trip, but subway trips are longer and faster.

Figure 3.2 Variation Among Metropolitan Areas in the Operating Subsidy per Passenger Trip (Aggregate for All Transit Modes, 1976)[4]



Southern cities, the lowest. Similarly, there is considerable variation among cities in the relative importance of fares in financing transit operations. Farebox revenues covered only 1/4 of operating expenses in Atlanta but almost 3/4 in Milwaukee (see Figure 3.3).

There is also a great deal of variation in the extent to which metropolitan areas have committed public funds to transit subsidization relative to their population size. As seen in Figure 3.4, for example, the relatively transit-oriented cities of Boston, New York, and San Francisco devote almost 10 times as much subsidy per capita to transit operations as do the much more auto-oriented cities at the other end of the scale. Because the income distribution of transit riders also varies from one type of metropolitan area to another, significant redistributive consequences may result in addition to those suggested by aggregate, nationwide statistics.

Implicit Variations in Subsidy Levels

The degree of transit subsidization also varies significantly by time of day of use, direction of trip, length of trip, and geographic portion of system used. Rush-hour trips implicitly are more subsidized than off-peak trips. Peak-direction trips are more subsidized than trips in the reverse direction. Long trips are more subsidized than short trips. And inner-city trips tend to be less subsidized than those between the suburbs and downtown. Each of these types of implicit subsidization will be elucidated immediately below, but it should be kept in mind that, as shown in the previous chapter, rider incomes vary along significantly corresponding dimensions. Thus, the distributional impacts of the variations in implicit subsidization may be substantial.

Figure 3.3 Variation Among Metropolitan Areas in the Percentage of Operating Expenses Covered by Fares (Aggregate for All Transit Modes, 1976)[5]

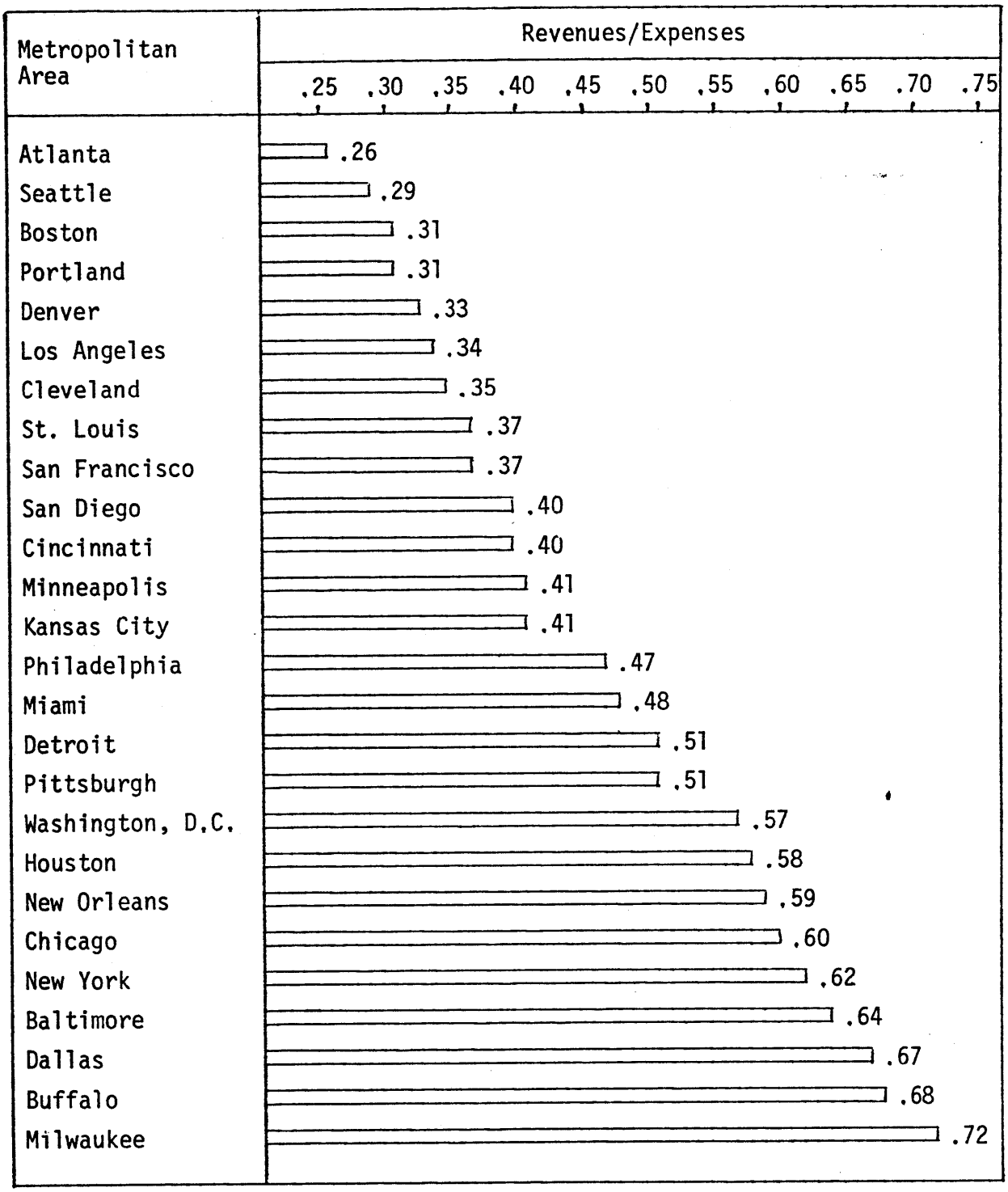
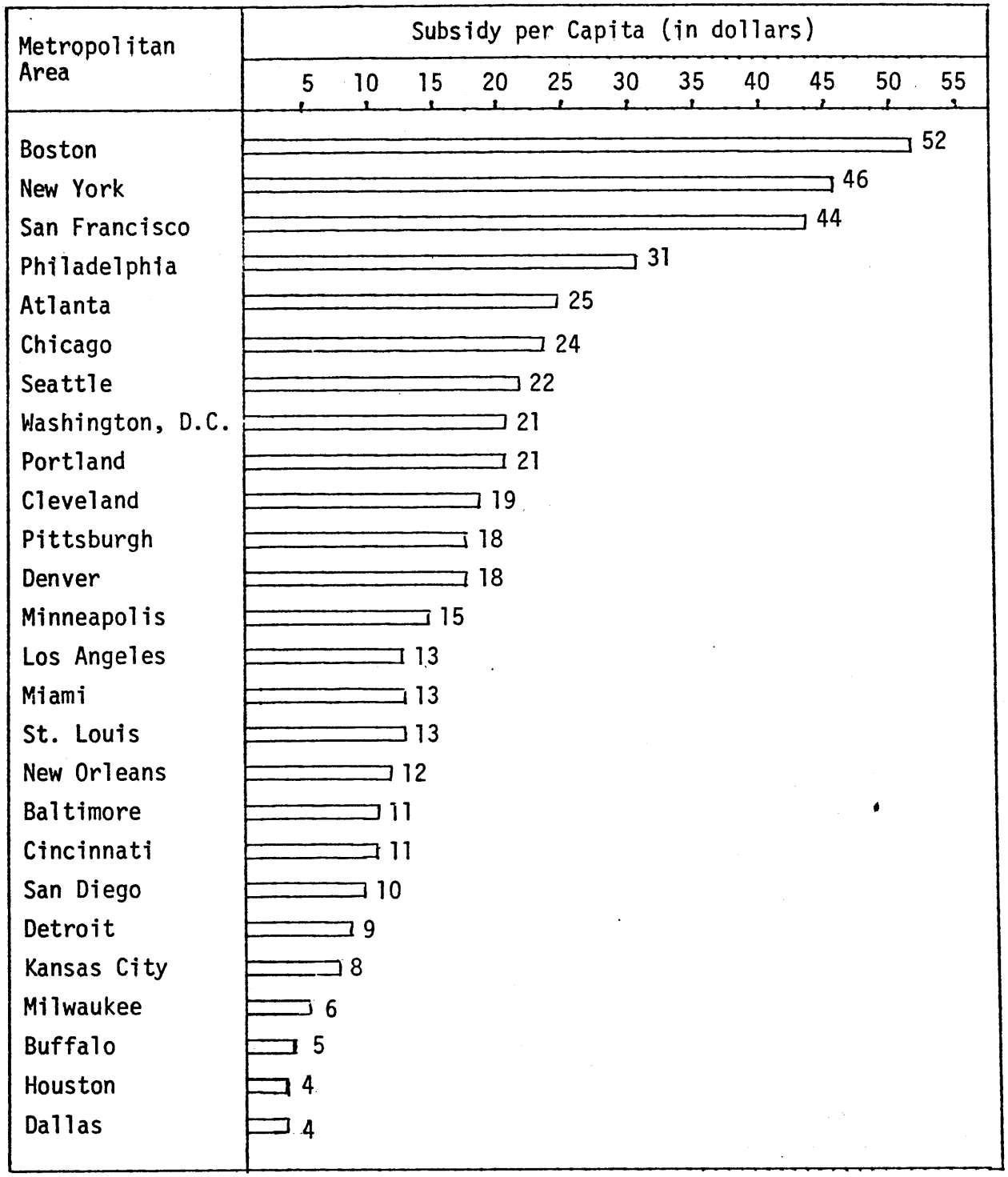


Figure 3.4 Variation Among Metropolitan Areas in the Annual Transit Operating Subsidy per Capita, 1976[6]



Virtually all major transit systems in the U.S. offer from 2 to 3 times as many vehicle miles of service per hour during weekday morning and evening rush-hours as at other times.[7] Consequently, there is great unevenness in the need for transit vehicle operators. Unfortunately, transit management is constrained from adjusting efficiently to this peaking of demand during rush-hours. Transit labor union contracts in virtually all major metropolitan areas prohibit both the hiring of part-time operators for rush-hour use and the splitting of work shifts. Thus a substantial portion (from 1/2 to 2/3) of the transit labor force--hired primarily to transport rush-hour commuters--remain idle during the interim off-peak hours. As a result, overall labor productivity is lowered and labor cost per passenger trip is increased. The true operating cost of transit service--of which about 80% is labor cost[8]--is, therefore, much higher in peak hours than in off-peak hours.* Since most transit systems do not impose a fare surcharge for rush-hour use, peak-hour users are, in effect, subsidized by off-peak users.**

Peak-direction trips tend to be more expensive than reverse-flow trips, primarily due to congestion on peak-flow lanes and tracks, which slows down transit vehicles and thus increases operating cost per vehicle mile. Fare structure almost never take this difference into account, so that peak-direction travelers are implicitly more subsidized than reverse-flow travelers.

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*Lower bus speeds due to rush-hour street congestion further increase the cost of rush-hour bus trips relative to off-peak trips by reducing the number of vehicle miles driven per employee.

**Indeed, commuter rail operations typically offer <u>discounts</u> to regular, peak-hour riders.

Similarly, transit users making long trips are implicitly subsidized by riders making short trips if fare structures do not fully incorporate the higher cost of serving longer trips. Although commuter rail fares are finely gradated by trip distance, fares on other transit modes usually are not. Some bus and subway systems do employ zone fare structures or transfer fees, which impose surcharges on longer trips, but these mechanisms are so crude in most cities that they do not adequately reflect the distance of rides.

Suburban transit routes are typically characterized by much lower load factors than are inner-city routes. Thus, although operating costs per vehicle mile are lower in the suburbs due to faster travel speeds, operating costs per passenger are higher on suburban routes. For example, a study of the new rail rapid transit system in Washington, D.C. indicates that the operating deficit per passenger will be almost 10 times as great for outer suburban portions as for inner-city portions ($1.23 vs. 13¢).[9] Implicit cross-subsidization occurs if fares do not vary by this geographic dimension as well.

The Assignment of Operating Subsidies to Income Classes

The preceding sections established the considerable variation in the degree of subsidization according to mode, type of city, length of trip, and geographic location of trip. This section compares this variation in subsidy levels with the corresponding variation in rider incomes established in Chapter 2 to estimate the distribution of operating subsidies in 1975 among income classes.

Table 3.2 presents rough estimates of this distribution based on modal differences in subsidization and rider incomes. Subsidies here are

Table 3.2 The Distribution of Transit Operating Subsidies Among Income Classes, 1975[9]

Type of Subsidy	Income Classes***				Total, All Income Classes**
	Below $7,500	$7,500-$14,999	$15,000-$22,499	$22,500 or More	
Bus and Streetcar ($000)*	378,542	419,615	182,055	128,711	1,110,094
Rail Rapid Transit ($000)*	88,422	253,989	125,214	125,214	593,432
Commuter Rail ($000)*	0	101,041	113,995	72,542	287,867
Total Operating Deficit, All Transit Modes ($000)****	466,964	774,645	421,264	326,527	1,991,393
Percentage Distribution of Total Deficit****	23.5%	38.9%	21.2%	16.4%	100%
Percentage Distribution of Households	28.4%	30.9%	23.0%	17.6%	100%
Average Subsidy per Household****	$36.94	$54.17	$36.95	$35.01	$41.77

*The amount of the deficit assigned to each income class equals the total deficit for each mode multiplied by the percentage of that mode's riders belonging to the indicated income class.

**The sum of each row does not exactly equal the total subsidy to each mode due to rounding error.

***These categories are the 1970 income classes of the NPTS survey adjusted to account for the growth in personal income between 1970 and 1975.

****When modifications in the above estimates are made to account for operating subsidies accruing to transit laborers in the form of excessive wage increases, the following distributions result:

Total Operating Deficit ($000)	374,449	1,017,995	337,011	261,222	1,991,394
Percentage Distribution of Total Deficit	18.8%	51.1%	16.9%	13.1%	100%
Average Subsidy per Household	$29.62	$71.19	$29.56	$28.01	$41.77

allocated to each income class in direct proportion to the percentage of patronage its travelers accounted for on each mode. The resulting distribution is quite similar to the corresponding distribution of households by income class. The lowest income group, however, received somewhat less than its share of the subsidy, and the $7,500-$14,999 group received considerably more than its share. Households in this class benefited from an average subsidy of $54 as opposed to only about $36 for the other income classes.

The subsidy expenditure distribution would have been even less favorable to the lowest income group if implicit cross-subsidization had been incorporated in the estimates. For example, peak-hour trips are implicitly more subsidized than off-peak trips; because the incomes of transit riders are much higher during rush hours than non-rush hours, low-income transit riders are less subsidized than affluent riders. Similarly, peak-direction trips are most expensive to serve due to the congestion on peak-bound lanes, tracks, and transit vehicles. Affluent transit passengers, who primarily make peak-direction trips during rush hour, are therefore more subsidized than low-income passengers, who account for most of the reverse commuters during rush hour. Since suburban transit routes (and suburban portions of routes extending into downtown) similarly are more unprofitable than inner-city routes, affluent riders are more subsidized on this score as well. It is also probable, although difficult to document, that average transit trip lengths are greater for affluent riders; in effect, then, the longer trips of the well-to-do are cross-subsidized by the short trips of low-income users. Of course, transit

fare structures could be adapted to reflect these cost differentials and thus to neutralize their income distributional impact. Presently, however, fares do not incorporate the cost differences, so that the distributional impact is now significantly perverse. In short, these considerations suggest that the subsidy distribution estimated in Table 3.5 should probably be considered an upper bound on the degree to which subsidies accrue to poor riders relative to affluent riders.

Moreover, as argued in Chapter 1, the non-rider benefits of transit subsidies accrue even less to low-income classes than do rider benefits. In the case of operating subsidies, these non-rider benefits redound primarily to employees of transit systems. If the 20% of the operating subsidy attributable to excessive wage increases is assigned to these transit workers (and only 80% of the total assigned to riders), then the overall subsidy distribution is even more concentrated in the $7,500-$14,999 category.* Indeed, as shown at the bottom of Table 3.5, this class receives about 60% of the total subsidy (although it accounts for only 31% of all households) and more than 3 times as much subsidy per household as the other 3 income groupings. In this light, the operating subsidy program appears to have very little at all to do with relieving poverty, but rather represents a substantial income supplement to the lower middle class.

Whatever the overall impact of the subsidy program nationwide, the variation in distributional impact from one metropolitan area to another is striking. As shown in Figure 3.4, there are substantial differences among cities in the degree to which they devote public funds to

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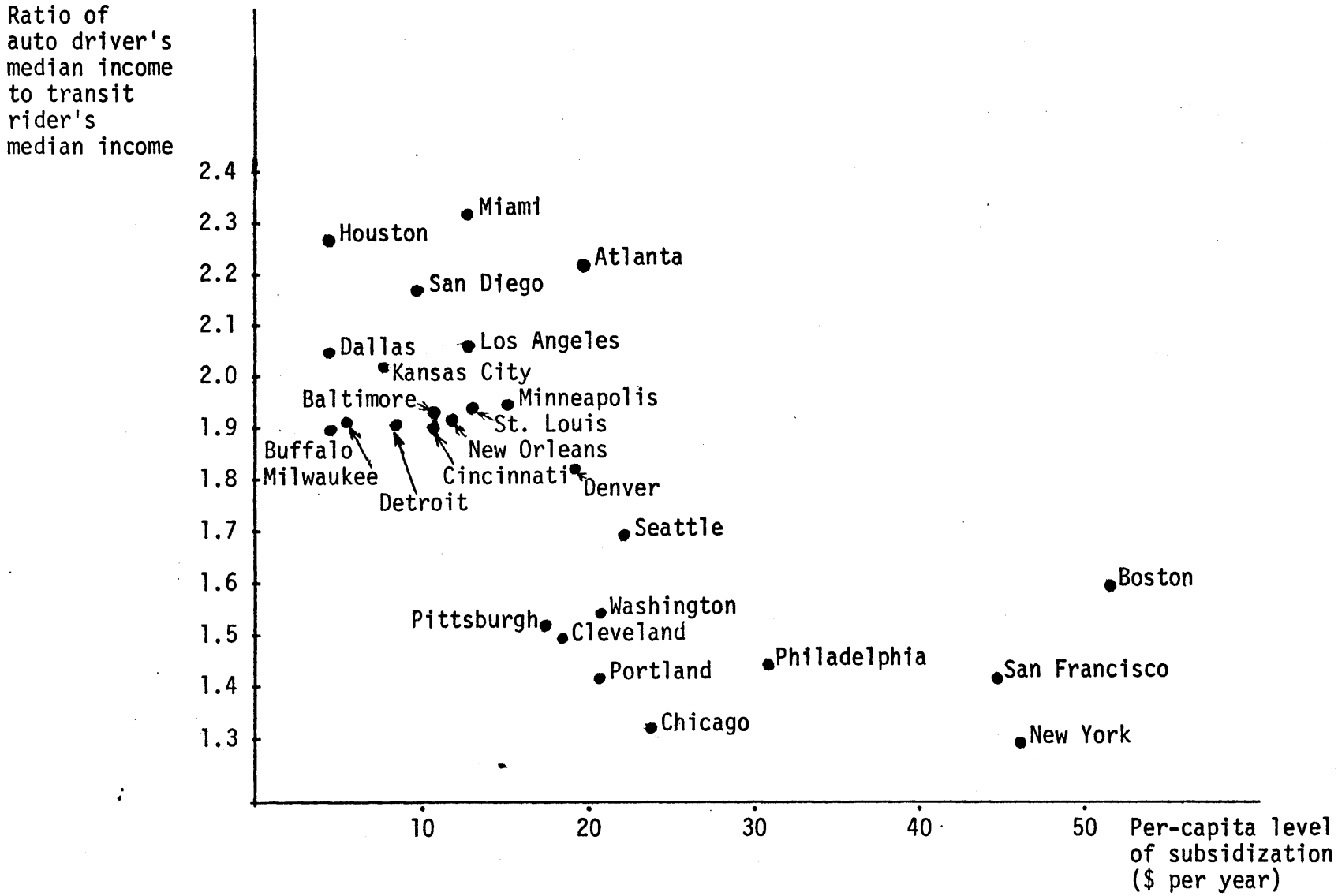
*The average salary of transit workers in 1975 was $13,993.[11] Thus, benefits to this group were assigned to the $7,500-$14,999 category. The highest-paid transit workers, of course, made more than $15,000, but it was not possible to obtain data on the full distribution of transit worker incomes.

subsidizing transit operations. There are corresponding differences in the relative incomes of transit-riders--primarily due to differences in the types of transit serivces offered (see Table 2.3). Combining the rider income and per capita subsidy data, Figure 3.5 indicates that transit tends to be most heavily subsidized--and hence of highest quality--in metropolitan areas where transit riders are most affluent relative to auto drivers.

On the basis of subsidy expenditures, therefore, it is very difficult to argue that the operating subsidy program is designed primarily to benefit the poor.

Figure 3.5 Relationship Between Relative Transit Rider Incomes and Per-Capita Level of Transit Subsidization in Each Metropolitan Area[11]



CHAPTER 4: THE DISTRIBUTION OF CAPITAL SUBSIDIES AMONG TRANSIT RIDERS

Only a minor percentage of the nationwide subsidy to transit operations in 1975 was in fact devoted to services used by the poor; most of this subsidy accrued to the lower middle class. The overall impact of transit subsidization, of course, depends also on the distribution of capital subsidies, which are roughly equal in total magnitude to operating subsidies.

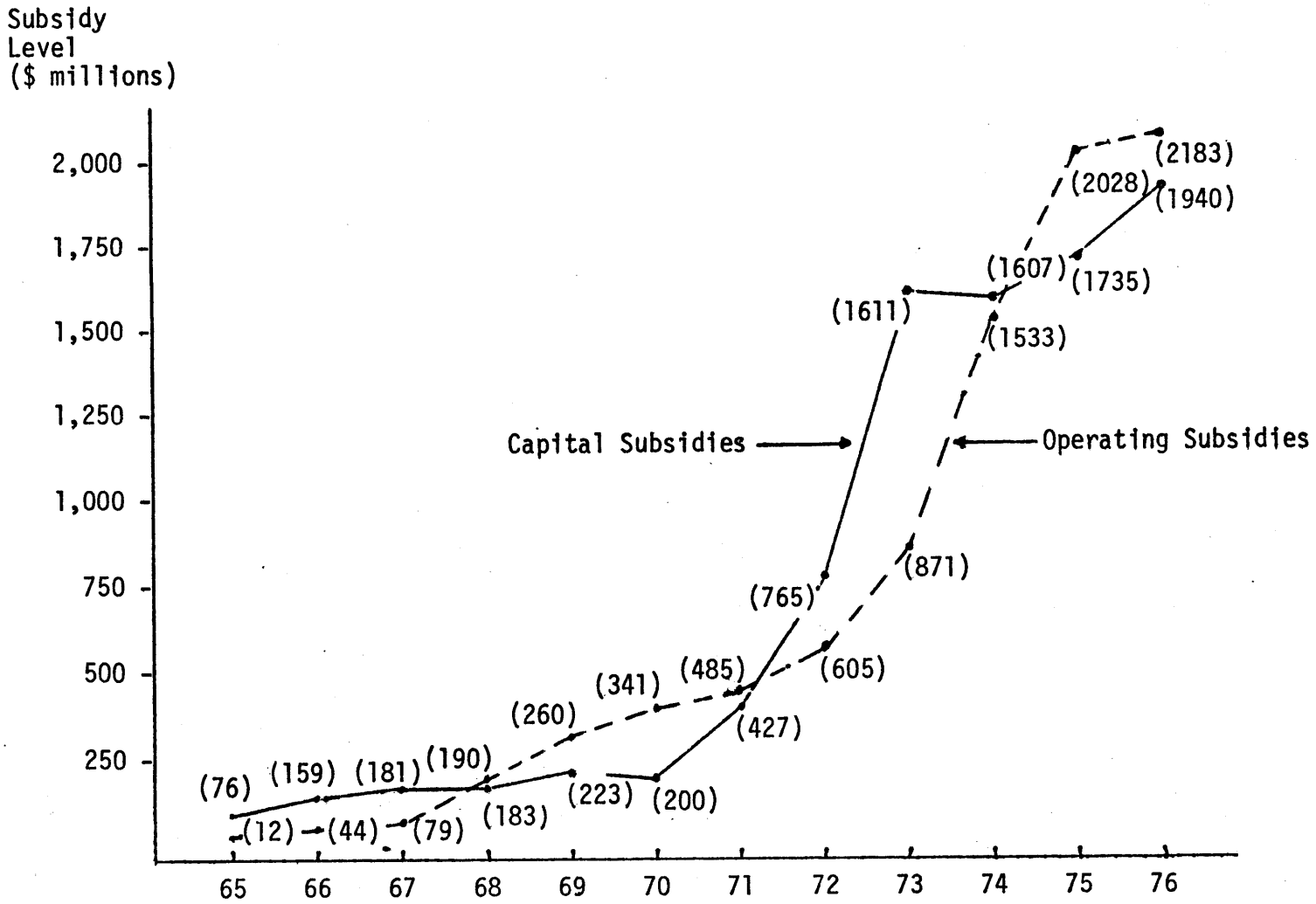
Trends in Capital Subsidization

The transit capital subsidy program in the United States has grown dramatically since 1965, when the Federal government first became actively involved in efforts to rehabilitate the declining transit industry (see Figure 4.1). Amounting to only $76 million in 1965, capital subsidies had increased to almost $2 billion by 1976, only 10% less than the operating subsidy total. Whereas the most rapid growth in the operating subsidy programs occurred from 1972 to 1975, capital subsidies increased fastest from 1974 to 1973. The rate of growth of both programs has leveled off recently, largely due to the general fiscal austerity at all levels of government.

Modal Distribution of Capital Subsidies

In contrast to operating subsidies, capital subsidies have been devoted primarily to rail transit services. Since 1965, 77% of the total cumulative transit capital subsidy has been spent on rail rapid transit

Figure 4.1 The Growth in Transit Capital Subsidies Relative to the Growth in Transit Operating Subsidies,* 1965-1976



*The subsidy figures include commuter rail.

and commuter rail programs, as opposed to 45% of the total operating subsidy (compare Table 4.1 with Table 3.1). This percentage has been declining, however, and by 1975 had fallen to 68% (see Table 4.2).

Because the incomes of rail transit passengers are considerably higher than those of bus riders, the resulting distribution of capital subsidies among income classes has been even less favorable to the poor than the distribution of operating subsidies. It is more difficult, however, to assign precise capital subsidy amounts among income groups than it is to apportion operating subsidies, which produce benefits almost exclusively during the year of subsidization. The capital study program, in contrast, finances investments in right-of-way and vehicles, which yield benefits over a much longer period of time. Thus, the relevant income distribution for capital subsidy assignment is that of future rather than current transit users.*

The Income Distribution for Capital Subsidy Apportionment

The incomes of future transit riders obviously cannot be predicted with certainty. An educated guess, however, is probably more useful in this case than a profession of total ignorance. For example, it is quite likely that the relative incomes of bus riders and commuter rail passengers will remain roughly the same. Capital investments in these modes have focused primarily on improving the quality of service on existing routes rather than substantially expanding or altering the nature of the services currently offered. Roughly half of the rapid transit subsidy, in contrast, has been devoted to the construction of new systems or lines. In terms of distances

*There is, moreover, the problem of how precisely to amortize benefits over future years and what discount rate should be used to make future benefits comparable with current benefits.

Table 4.1 Transit Capital Grants by Mode, Cumulative from 1965 to 1977 (in Millions of Dollars)[2]

Rapid Transit*	Government Level			
	Federal		State and Local	
Section 3	$3,031.8		$ 919.4	
Urban Systems	49.2		12.3	
Interstate Transfers	857.7		214.4	
Special D.C. Metro Program	1,231.0		804.5	
Local BART Funds (prior to Federal match)	0		976.0	
Total Rapid Transit	5,169.7	(62%)	2,926.6	(77%)
Commuter Rail				
Section 3	839.6		209.9	
Interstate Transfers	140.1		35.0	
Total Commuter Rail	979.7	(12%)	244.9	(6%)
Bus**				
Section 3	2,108.4		610.4	
Section 5	59.2		14.8	
Urban Systems	24.0		6.0	
Total Bus	2,191.6	(26%)	631.2	(17%)
Total, All Modes***	$8,341.0	(100%)	$3,802.7	(100%)

*Includes light-rail lines

**Includes trolley coaches but not streetcars.

***This total does not include capital subsidies to ferries, personal rapid transit, inclines, or cable cars.

Table 4.2 Transit Capital Grants by Mode, Federal Fiscal Year 1975 (in Millions of Dollars)[3]

Rapid Transit*	Government Level			
	Federal		State and Local	
Section 3	$ 532.6		$133.2	
Urban Systems	10.0		2.5	
Interstate Transfers	65.7		16.4	
Special D.C. Metro Program	126.9		106.3	
Total Rapid Transit	735.2	(55%)	258.4	(63%)
Commuter Rail				
Section 3	147.6		36.9	
Interstate Transfers	0		0	
Total Commuter Rail	147.6	(11%)	36.9	(9%)
Bus**				
Section 3	430.3		107.6	
Section 5	9.1		2.3	
Urban Systems	5.7		6.0	
Total Bus	445.1	(34%)	111.3	(27%)
Total, All Modes***	$1,327.9	(100%)	$406.6	(100%)

*Includes light-rail lines

**Includes trolley coaches but not streetcars

***This total does not include capital subsidies to ferries, personal rapid transit, inclines, or cable cars.

between stops, areas served, feeder and distributor characteristics, and ride quality, these new systems will be hybrids of conventional subway-elevated systems and commuter rail. Thus, one might expect the income distribution of future rapid transit riders to be higher than that of current riders.

A 1975 survey of the passengers on the new Bay Area Rapid Transit System (BART) in the San Francisco area revealed the distribution shown in Table 4.3 While the average income of BART riders clearly is higher

Table 4.3 The Income Distribution of BART Riders Relative to that of the General Population in the San Francisco Area[4]

Income Class	Percentage of Total Riders (1975)	Percentage of All Households (1970)
Under $5,000	10.5%	22.9%
$5,000 - $6,999	6.8%	9.8%
$7,000 - $9,999	12.6%	16.9%
$10,000 -$14,999	21.6%	25.6%
$15,000 -$24,999	30.6%	19.3%
$25,000 or more	17.8%	5.6%

than that of the population as a whole, it is an extreme exaggeration to claim on the basis of these figures--as some have[5]--that only the wealthy ride BART. Moreover, if the 1970 household income figures were adjusted to control for growth in personal income between 1970 and 1975, the discrepancy between the incomes of BART riders and the general population would have been considerably smaller. Similarly, if the 1970 NPTS transit rider income figures of Table 2.1 are adjusted to account for economic growth and inflation, the income distribution of riders of older rapid transit

lines is not strikingly different (see Table 4.4). Indeed, although BART does derive proportionally more of its patronage from the most affluent income groups, the differences are not great. Moreover, a slightly higher percentage of BART's riders come from the poorest income class. The main difference appears to be that BART is much less used by lower-middle-class riders than are conventional systems; upper-middle-class riders evidently have taken their place.

The criticism of BART as the mode of the rich has, moreover, prompted modifications of other new rail systems which almost certainly will enable these to attract more low-income passengers. Thus, it is unlikely that the income distribution of future rail rapid transit riders relative to the general population will be very different in aggregate than the current one.*

Table 4.4. Income Distribution of the Riders of Older Rapid Transit Systems as Adjusted to Control for Income Growth Since 1970.[6]

Income Class	Percent of Riders
Under $4,500	6.7%
$4,500 - $8,999	19.8%
$9,000 -$14,999	30.2%
$15,000 - $22,499	21.1%
$22,500 or more	21.1%

Assignment of Capital Subsidies Among Classes

Notwithstanding the somewhat less clear interpretation of the resulting

*At maximum, the new systems in San Francisco, Washington, Atlanta, and Baltimore will account for about 10% of total rapid transit passengers nationwide, so that any income differences would, at any rate, have negligible impact on the national income distribution of rapid transit riders.[7]

estimates, capital subsidies can be allocated among income classes just as in the case of operating subsidies. The resulting apportionment, however, must be thought of as representing the distribution of the eventual, long-term stream of benefits rather than of current benefits, as in the case of operating subsidies.

Table 4.5 presents the distribution of capital subsidies among income classes when these are allocated according to the proportion of total riders on each mode accounted for by each class.* Compared with the distribution of operating subsidies (see Table 3.5), capital subsidies accrue in greater proportion to affluent riders and in lesser proportions to the low-income classes.** As in the case of operating subsidies--although to a lesser degree--households in the $7,500-$14,999 income category, obtain the largest subsidy ($45). In contrast, the poorest class (less than $7,500) receives the least subsidy per household ($28).

Implicit Variations in Capital Subsidy Levels

In evaluating the distribution of operating subsidies, it was argued that, for a number of reasons, the true distribution of subsidies was even less favorable to the poor than was the estimated one. This is also the case for capital subsidies.

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*Note that half of the rapid transit subsidy has been distributed according to BART rider incomes, and half according to the income distribution of riders of old rapid transit systems. This is the approximate breakdown of rail rapid transit capital subsidies between new systems and old systems.

**If compared with the modified table at the bottom of Table 3.5, a greater percentage of capital subsidies go to the bottom class than is the case for operating subsidies--when benefits to transit employees are incorporated. This comparison is not appropriate, however; non-rider beneficiaries of capital subsidies (CBD landowners, businessmen) almost certainly have higher incomes on average than do transit employees. Thus, a similar modification of Table 4.5 would probably result in a lower proportion of the capital subsidy accruing to the poor than does the modified operating subsidy table.

Table 4.5 The Distribution of Capital Subsidies Among Income Classes, 1975[8]

Type of Subsidy	Income Classes***				Total, All Income Classes**
	Below $7,500	$7,500-$14,999	$15,000 $22,499	$22,500 or more	
Bus and Streetcar ($000)*	189,700	210,300	91,200	64,500	566,400
Rail Rapid Transit ($000)*	170,402	367,135	219,089	231,012	993,600
Commuter Rail ($000)*	0	64,760	73,062	46,494	184,500
Total Capital Subsidy, All Transit Modes ($000)	360,102	642,195	383,351	342,006	1,734,500
Percentage Distribution of Total Subsidy	20.8%	37.2%	22.2%	19.8%	100%
Percentage Distribution of Households	28.4%	30.9%	23.0%	17.6%	100%
Average Subsidy per Household	$28.49	$44.91	$33.63	$36.67	$36.38

*The amount of the capital subsidy assigned to each income class equals the total subsidy for each mode multiplied by the percentage of that mode's riders belonging to the indicated income class. For rail rapid transit, half of the subsidy was assigned on the basis of the income distribution of riders of old rail rapid transit systems, and half on the basis of the incomes of riders of new rapid transit systems.

**The sum of each row does not exactly equal the total subsidy to each mode due to rounding error.

***These categories are the 1970 income classes of the NPTS travel survey adjusted to account for the growth in personal income between 1970 and 1975.

As has already been documented in Chapter 2, transit rider incomes, on average, are considerably higher during peak hours than during off-peak hours, on peak-direction lanes and tracks than on those going in the reverse direction, on long trips than on short trips (probably), and on suburban portions of radial routes than on inner-city routes. These types of usage--dominated by relatively affluent riders--also incur the highest levels of capital cost per passenger trip.

For example, since the frequency of transit service is from 2 to 3 times greater during rush hours than off-peak hours, 1/2 to 2/3 of transit vehicle capital cost can be exclusively attributed to peak-hour users.[9] Moreover, many high-capacity rapid transit lines have been built primarily to serve the high passenger volumes at rush hour. Considerably less expensive bus services in most instances would have sufficed to carry the lower, off-peak passenger volumes. Thus, a disproportionate share of the transit capital subsidy is devoted to serving the needs of rush-hour commuters with relatively high incomes. For similar reasons, peak-direction transit riders necessitate particularly high capital costs per trip. The true cost of reverse commuting, in contrast, is much lower since the backhauling would occur at any rate. Yet reverse commuters, who have incomes only about half those of peak-direction commuters (see Table 2.7), pay the same fares as peak-direction commuters. Relatively high-income peak-direction rush-hour commuters, therefore, are significantly cross-subsidized by relatively low-income reverse commuters and off-peak riders. To the extent that high-income transit riders make longer trips than low-income riders or make their trips over portions of the system where load-factors are below average (as is undoubtedly the case for suburban services in most areas), these high-income users receive greater subsidies per

trip than do low-income users, provided fare structures do not fully reflect these cost differences--as, of course, they almost never do.

Thus, the true distribution of capital subsidy expenditures among income classes is probably much less favorable to the poor than indicated by the estimates of Table 4.5, which--due to data limitations--do not reflect the impacts of cross-subsidization within modes. There is yet another reason, however, to believe that these estimates overstate the proportion of the capital subsidy accruing to the poor. Downtown landowners and businesses benefit considerably from the operation of transit services focusing on the central business district, and, in particular, from rail rapid transit systems radiating out from downtown.* To the extent that these non-rider beneficiaries reap higher rents or increased profits that are not offset by value-capture property taxation, the overall distribution of capital subsidies is more heavily concentrated among the upper-income classes than the distribution of rider benefits alone.

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*In contrast to operating subsidies, these non-rider benefits of capital subsidies are additions to those for riders, not competitors for them.

CHAPTER 5: THE DISTRIBUTION OF SUBSIDY EXPENDITURES AND THE DISTRIBUTION OF THE BENEFITS OF TRANSIT SUBSIDIES AMONG INCOME CLASSES

Although subsidy expenditures bear an uncertain relation to the true utility impacts of transit subsidization, the distribution of these expenditures throws considerable light on the extent to which the transit subsidy program has been designed with the primary intention of aiding the poor. Expenditures, of course, are not an adequate proxy for actual benefits, but they quite accurately reflect how public resources have in fact been devoted to types of transit that differentially serve different income classes.

The Distribution of Subsidy Expenditures

The sum of the distributions of operating and capital transit subsidies in 1975 is presented in Table 5.1. According to this summary distribution, the poorest income class (below $4,500) received by far the lowest subsidy per household ($42) while the largest subsidies accrued to the $4,500-$8,999 and $9,000-$15,000 classes ($99 and $113 per household, respectively). Although households earning more than $15,000 received subsidies $14 less than the average for all classes, these subsidies nevertheless exceeded by $22 those for the poorest class, whose subsidy per household was only half of the overall average.

Even before considering intramodal variations in subsidization levels, therefore, the overall distribution of transit subsidy expenditures appears to be quite unfavorable to the poor. When account is taken of the significantly greater subsidization--within each modal grouping--of

Table 5.1 The Distribution of Operating and Capital Transit Subsidies Among Income Classes, 1975[1] (Subsidy Amounts in Millions of Dollars)

Type of Subsidy	Income Class***					Total, All Income Classes**
	Below $4,500	$4,500-$8,999	$9,000-$14,999	$15,000-$22,499	$22,500 or More	
Operating Subsidy, Total	163	391	837	337	262	1,991
Bus and Streetcar*	131	286	444	146	103	1,110
Rail Rapid Transit*	32	94	267	100	100	593
Commuter Rail*	0	12	127	91	58	288
Capital Subsidy, Total	157	372	473	383	342	1,735
Bus and Streetcar	82	179	139	91	65	556
Rail Rapid Transit	75	184	278	219	231	994
Commuter Rail	0	9	55	73	46	185
Total Transit Subsidy	320	763	1,310	720	604	3,726
Bus and Streetcar	213	465	583	237	168	1,666
Rail Rapid Transit	107	278	545	319	331	1,587
Commuter Rail	0	21	182	164	104	473
Average Subsidy per Household	$42.02	$99.25	$112.53	$63.14	$64.76	$78.17

*These operating subsidy distributions are based on the modified distributions at the bottom of Table 3.2. They thus assume that roughly 20% of the total operating subsidy accrues to transit workers.

**The sum of each row does not exactly equal the total subsidy to each mode due to rounding error.

***These categories are the 1970 income classes of the NPTS survey adjusted to account for the growth in personal income between 1970 and 1975.

relatively affluent rush-hour commuters heading for downtown* and making long trips on radial lines from the suburbs, the actual distribution of subsidy expenditures is even less favorable to the poor than that estimated on the basis of intermodal differences in subsidization and rider incomes. Indeed, it is difficult to imagine that anyone could have seriously believed the transit subsidy program to be one designed primarily for the benefit of the poor. Neither, however, would it be accurate to characterize the subsidies as flowing primarily to the affluent. Rather, households earning between $4,500 and $15,000 are the main beneficiaries, receiving 56% of the total subsidy although they account for only 41% of all households.

Expenditures and True Benefits

Estimating actual utility impacts of transit subsidies is not feasible given the theoretical complexities, practical measurement problems, and data limitations discussed in Chapter 1 and Appendix A. However, it is possible to establish, at least qualitatively, the relation between the distribution of true benefits and the distribution of subsidy expenditures. On the basis of this relation, bounds can be set on the probable distribution of true benefits.

Establishment of the relation involves two steps. First, one must determine how the objective impact of the subsidies has varied from one type of subsidy to another. How efficient, in other words, have the various subsidies been, relative to each other, in producing more or better transportation services? How many additional passenger miles of

*Heading for downtown during morning rush hours and leaving it during evening rush hours.

service has each type of subsidy financed per dollar of expenditure relative to other types--and at what levels of speed, comfort, reliability, and safety? Second, one must establish the probable variation among income classes in the relation between each unit of additional objective output and the subjective benefit this represents to transit users in each class.

Most studies suggest that those portions of the transit subsidy program most benefiting the affluent are the least efficient at improving or augmenting transportation service. For example, the new rapid transit systems in San Francisco and Washington will have cost at least $8 billion when completed and fully operational.[2] Technical and economic assessments of the systems indicate that bus services could have easily handled realistic projections of passenger volumes at comparable speeds at only a small fraction of the cost of the rail systems.[3] Similar conclusions have been reached with respect to the cost-effectiveness of other new rapid transit systems and extensions of older systems.[4] Thus, although the affluent may receive most of the benefits of expensive new rapid transit service, the benefit/cost ratios of such projects are so low that subsidy expenditures vastly overstate the real benefits accruing to the affluent riders in terms of actual improvements in transportation service. In contrast, the bus services most patronized by the poor are generally believed to be quite cost-effective.

Whatever the actual transportation impacts of the subsidy, it is also likely that, per unit of objective service output, the subjective

welfare impact on the poor is greater than that on the affluent, for the poor can least afford the alternatives to transit. This is particularly so in the inner city, where poor transit users disproportionately live. The costs of auto ownership and operation there are higher than in the suburbs. Theft rates, property taxes, and maintenance costs for autos are abnormally high in low-income areas, and parking and mandatory insurance coverage are either very expensive or simply unavailable. Not only are the costs of any given level of automotive service, therefore, more expensive for the poor,* but any given level of automobile cost is, of course, a greater burden for the poor. Consequently, it is not surprising that only one-third of central-city households earning less than $3,000 in 1974 had an automobile. In contrast, 96% of American household earning $15,000 or more had at least one car.[5] Similarly, although taxi service is an alternative to transit for many urban poor, it is a relatively expensive one. In short, the poor are more dependent on transit than other groups** and would suffer relatively more than high-income users from comparable reductions in transit availability.

Thus, although the transit subsidy program clearly has not been designed primarily to benefit the poor, the subsidy expenditures that are in fact spent on services most used by the poor probably have the greatest welfare impact per dollar.*** This does not deny the inequitable arrangement of the current subsidy program; nor does it suggest the modifications

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*Controlling for vehicle quality and miles of travel.

**See the incidence rates of Table 2.2.

***That is, the greatest degree of true benefit or utility impact per dollar of subsidy expenditure.

should not be made to improve the distributional impact. It does indicate, however, that transit service is especially important to those inner-city riders who are forced to use it, and that curtailment of inner-city bus services, in particular, might cause severe hardships for poor users.

PART II: THE DISTRIBUTION OF THE TAX COSTS OF TRANSIT SUBSIDIES AMONG INCOME CLASSES

The net distributional impact of the transit subsidy program depends not only on the distribution of the benefits of subsidization, but also on the distribution of the tax burden arising from the government financing of the subsidies. Although the poor receive a disproportionately small percentage of the total subsidy, they also contribute a disproportionately small percentage of the total tax revenues raised to finance them. Conversely, the most affluent classes receive larger subsidies per household than the poor, but this relative advantage is offset by their much larger tax contribution.

The distribution of tax costs among income classes is influenced by a number of factors. Because the incidence patterns of different types of taxes vary considerably, the overall incidence of transit financing depends to a significant extent on the composition of transit tax revenues by type of tax. Moreover, effective incidence can vary substantially depending on the level of government at which the tax is levied, the inclusiveness of the base relevant to each tax, and the jurisdictional coverage of the tax. In assessing the distribution of the tax burden of transit subsidization, therefore, examination of these dimensions of transit financing is essential.

Trends in transit financing and a detailed description of its current composition are presented in Chapter 6, which immediately follows. On the basis of these compositional data, available national estimates of the incidence of various types of taxes at different levels of government are weighted and aggregated in Chapter 7 to calculate the overall incidence of taxation for public support of transit.

CHAPTER 6: TRANSIT FINANCING IN THE UNITED STATES

Since 1970, public subsidization of transit has grown from only $541 million to more than $4 billion. This growth has obviously required a correspondingly rapid increase in tax revenues raised to support transit subsidization. As the public burden of transit finance has increased, the composition of government funding has changed substantially. In consequence, the overall incidence of transit finance taxation has been considerably altered.

Trends in Transit Finance

As they have grown in absolute magnitude, the burdens of funding both operating and capital transit subsidies have been shifted to successively higher levels of government. The statutory Federal share of capital subsidy funding, for example, increased from 67% in 1970 to 80% in 1974, and pending legislation would increase the proportion still further.* The Federal share of operating subsidies, although significantly less, has also increased, from 0% in 1973 to 22% in 1976 (see Table 6.1). In contrast, the local share of operations financing fell from 34% to only 20% over the same period. Although the corresponding shares of state and regional levels of government remained roughly constant (23% and 27%, respectively), together they funded 51% of the absolute increase in the total government operating subsidy. Indeed, from 1973 to 1975, state and regional aid was

*The Federal share of the Interstate Transfer portion of the capital subsidy program would be increased from 80% to 90%, thus raising the overall Federal share of the transit capital subsidy program to about 83%.

Table 6.1 Sources of Transit Operating Subsidies, Aggregate for 26 Large U.S. Metropolitan Areas,* 1973-1976[2]
(Amounts in Thousands of Dollars, Percentages in Parentheses)

Type of Funding	Year			
	1973**	1974	1975	1976
Total Government Aid	694,923 (83.7)	1,103,906 (90.3)	1,563,515 (92.4)	1,805,750 (91.9)
Federal	0 (0)	42,241 (3.5)	282,290 (16.7)	422,470 (21.5)
State	189,652 (22.8)	361,682 (29.6)	440,984 (26.0)	431,656 (22.0)
Regional**	221,195 (26.7)	305,979 (25.0)	471,134 (27.8)	553,695 (28.2)
Local	283,446 (34.2)	294,004 (32.2)	371,949 (21.9)	397,828 (20.2)
Other Sources, Total	135,135 (16.3)	118,795 (9.7)	128,578 (7.6)	159,588 (8.1)
Bridge and Tunnel Tolls	120,036 (14.4)	99,216 (8.1)	106,554 (6.3)	133,152 (6.8)
Cross-subsidies from Utility Operations	10,596 (1.3)	13,877 (1.1)	10,858 (.6)	11,192 (.6)
Cross-subsidies from Freight Operations	4,503 (.5)	5,702 (.5)	11,166 (.7)	15,244 (.8)
Total Transit Operating Subsidies	830,058 (100)	1,222,701 (100)	1,694,898 (100)	1,965,338 (100)

*See Table 2.3 for a listing of these metropolitan areas.

**The 1973 totals do not include San Francisco, Washington, or Denver.

***Funding was classified as regional if there existed an explicit (or nearly so) metropolitan-wide transit financing mechanism. Uniform county taxes were classified as regional provided the county was large enough to include most of the metropolitan area.

most responsible for relieving the burden of operating support at the local level. Subsequently, however, the Federal aid has been the primary source of this relief and has sharply curtailed the previously rapid growth in state and regional subsidization.

The shifting composition of government support has significantly increased the progressity of the overall tax structure financing the subsidy program. Increased Federal subsidization, for example, has been financed primarily by income taxation, which is generally believed to be mildly progressive for most income groups, but especially favorable to the poor, who pay little income tax, if any at all. The diminishing need for local tax support of transit has also increased overall progressity. Not only has this shift reduced the reliance of transit financing on increases in the relatively regressive property tax, but it has done so primarily in large, old central cities, where incomes are relatively low and tax bases have been declining. Even the shift to state and regional financing may have increased progressivity. Although these levels rely on generally regressive sales taxation, their increased support has shifted much of the burden fo transit subsidization from the central city to the suburbs, where incomes, on average, are much higher. The overall progressity of transit taxation, therefore, almost certainly has been increasing.*

Finally, there has been a strong trend toward earmarking certain taxes specifically for transit use. Primarily involving percentages of the sales tax at the state or regional level, this earmarking effectively insulates such transit taxes from regular budgetary review. It also ensures dependable growth in transit fund revenues in coming years

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*Alternatively, the overall regressivity has been decreasing.

because sales tax proceeds automatically increase with inflation and economic growth. To the extent that this growth increases the share of the non-Federal funding borne by the suburbs, it suggests--together with proposed increases in Federal funding--the continuing evolution of successively more progressive financing in the future.*

Geographic Variations in Transit Financing

The effective incidence of transit financing varies considerably from one region to another as well as among metropolitan areas in the same region. As shown in Table 6.2, even the relative importance of Federal aid varies among regions, accounting for only 17% of the total operating subsidy in the South as opposed to 29% in the Great Lakes region. Variations in other types of government aid are more striking. State aid, for example, is virtually nonexistent in the South and negligible in the West, whereas it accounts for about 30% of the total subsidy in the Northeast and Interior Rivers regions. Regional funding is extremely important in the Great Lakes, West, and South (49% to 57% of the total subsidy) but much less significant in the Interior Rivers and Northeast cities. Accounting for 18% to 25% of funding in all other regions, local taxation finances only 3% of the operating deficit in the Great Lakes area. Note also the variation in the relative importance of tolls and cross-subsidies, 81% of which are concentrated in the New York metropolitan area.

Variation among specific metropolitan areas is even greater (see Figure 6.1). The percentage of total operating subsidies covered by the

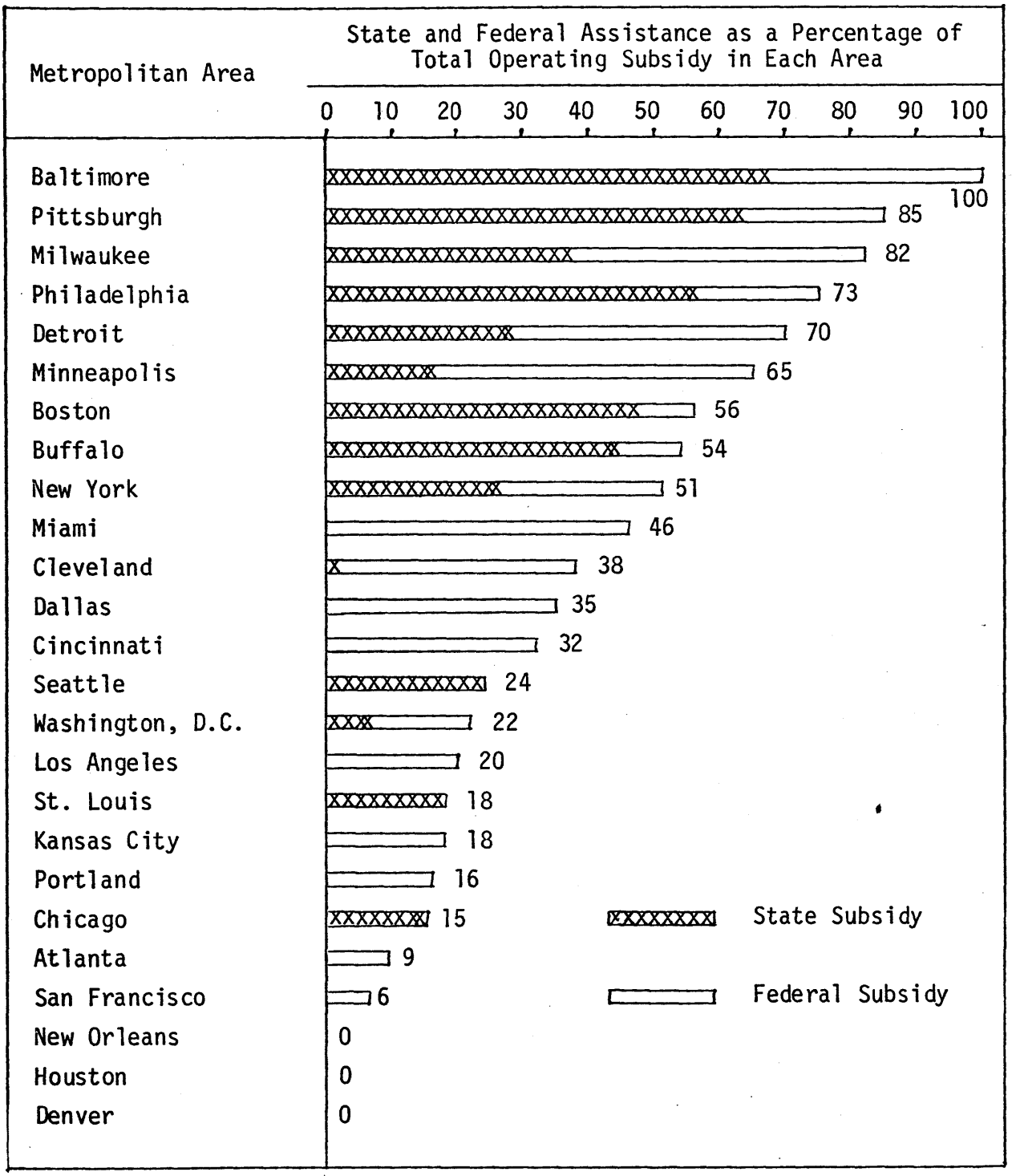
*In almost every case where such earmarked taxes have been adopted, their jurisdictional coverage has included suburban areas.

Table 6.2. Sources of Transit Operating Subsidies for 26 Large Metropolitan Areas, Aggregated by Region, 1976
(Amounts in Thousands of Dollars, Percentages in Parentheses)[3]

Type of Funding	Region*					
	Northeast	Great Lakes	Interior Rivers	South	West	Total, All Regions
Total Government Aid	1,019,050 (88.7)	300,432 (98.0)	117,788 (100)	58,307 (83.9)	310,173 (96.3)	1,805,70 (91.9)
Federal	243,228 (21.2)	88,382 (28.8)	25,169 (21.4)	11,537 (16.6)	54,154 (16.8)	422,470 (21.5)
State	332,484 (28.9)	49,637 (16.2)	37,153 (31.5)	84 (0)	12,298 (3.8)	431,656 (22.0)
Regional	156,085 (13.6)	152,723 (49.8)	27,841 (23.6)	33,971 (48.9)	183,075 (56.8)	553,695 (28.2)
Local	287,253 (25.0)	9,690 (3.2)	27,625 (23.5)	12,614 (18.1)	60,646 (18.8)	397,282 (20.2)
Other Sources, Total	130,353 (11.3)	6,057 (2.0)	0 (0)	11,192 (16.1)	11,986 (3.7)	159,588 (8.1)
Bridges and Tunnel Tolls	130,353 (11.3)	0 (0)	0 (0)	0 (0)	2,799 (.8)	133,152 (6.8)
Cross-subsidies from Utility Operations	0 (0)	0 (0)	0 (0)	11,192 (16.1)	0 (0)	11,192 (.6)
Cross-subsidies from Freight Operations	0 (0)	6,057 (2.0)	0 (0)	0 (0)	9,187 (2.8)	15,244 (.8)
Total Transit Operating Subsidies	1,149,403 (100)	306,489 (100)	117,788 (100)	64,499 (100)	334,145 (100)	1,965,338 (100)

*The Northeast region is defined to include Boston, New York, Philadelphia, Baltimore and Washington. The Great Lakes cities include Buffalo, Cleveland, Detroit, Chicago, and Milwaukee. The Interior River cities include Kansas City, St. Louis, Pittsburgh, Cincinnati, and Minneapolis-St. Paul. The South includes Miami, Houston, Dallas, Atlanta, and New Orleans. The West includes Los Angeles, San Diego, San Francisco, Seattle, Portland and Denver.

Figure 6.1 Variation Among Metropolitan Areas in the Relative Importance of Federal and State Operating Subsidies (1975)[4]



Federal and state levels together ranges from 100% in Baltimore to 0% in New Orleans, Houston, and Denver; other cities span the entire gamut of intervening values. The relative importance of state and Federal aid, individually, also is very different from one metropolitan area to another.

The Federal share of the total operating subsidy varies, moreover, by size of metropolitan area. Federal aid covered only 19% of the deficit in metropolitan areas with at least a million residents, but 35% of the deficit in areas with populations from 500,000 to a million, and 40% in areas with fewer than 500,000 residents.[5] Thus, the smaller the city, the more likely that the overall financing is progressive. Because transit rider incomes are also lowest in small cities, the net benefit distribution in such areas may be especially favorable for the poor.

Current Composition of Transit Financing by Type of Tax

The tax most frequently used for financing operating subsidies in 1975 was the general sales tax, accounting for roughly a third of total funding (see Table 6.3). The property tax and individual income tax each accounted for about a fifth of the total, and various business taxes, excise taxes, and tolls covered most of the remainder. These figures reflect funding patterns only in the 26 largest U.S. metropolitan areas; but the national pattern undoubtedly was almost identical, for these 26 areas account for 85% of the nationwide operating subsidy.

Comparable decomposition by tax type can be roughly approximated for capital subsidy financing. By statutory provision, 80% of capital funds were supplied by the Federal government. As in the case of operating funds, it can be assumed that the composition of supporting taxes was the same as for general Federal revenues since no Federal taxes

Table 6.3 Sources of Transit Operating Subsidy Funds in the 26 Largest U.S. Metropolitan Areas, 1975.[6]

Level of Government/Type of Tax*	Amount (Thousands of Dollars)
Federal**	$280,222
Individual Income Tax	156,924
Corporation Income Tax	78,462
Other	44,836
State	435,142
Excise taxes	75,423
Unidentified	62,647
Gasoline and Motor Vehicle Taxes	12,776
General Sales Taxes	209,018
Business Taxes	36,677
Individual Income Taxes	114,024
Local (including Regional)	848,151
Gasoline and Motor Vehicle Excise Taxes	30,349
General Sales Taxes	328,349
Business Taxes	45,322
Individual Income Taxes	29,136
Property Taxes	345,363
Payroll Taxes	14,799
Unidentified Non-Property Taxes	55,034
Bridge and Tunnel Tolls	105,853
Utility Cross-subsidies	10,858
Freight Cross-subsidies	11,166
Total, All Sources	$1,691,392***

*Where taxes were not specifically earmarked for transit subsidization, the operating subsidy in each metropolitan area was distributed according to the composition of local general tax revenues in each specific area. The same procedure was followed at the state level. (See Appendix to this chapter for tables listing the composition of general revenues at the metropolitan and state levels.) The state and local figures do not indicate any allowance for the Federal contribution to general fund coffers via revenue-sharing grants. These accounted for about 4% of state-local revenues in 1975. Ultimately, therefore, Federal taxes accounted for an even higher proportion of total operating subsidies than shown in the table, and state-local taxes a lower percentage than indicated.

**There are no taxes at the Federal level specifically earmarked for transit. Therefore, amounts of specific taxes under this category reflect the composition of general revenues only, excluding payroll taxes for social security.

***This total excludes about $300 million in operating subsidies to transit in smaller metropolitan areas.

are specifically earmarked for transit use. Such earmarking for capital transit purposes does occur to some extent at non-Federal levels, but data were not available to establish the precise breakdown. Thus, in the incidence analysis of the following chapter, it is assumed that the 20% non-Federal share of capital funding was financed by the same tax composition as was non-Federal financing of operating subsidies.

Of the $3.62 billion government subsidy of transit operating and capital expenditures combined in 1975, $1.19 billion (33%) was funded by local or regional governments. By comparison, the Federal share was $1.73 billion (49%) and the state share was $.70 billion (19%).* By 1976, the Federal share had increased to 53%, and the state and local shares had decreased to 17% and 31%, respectively, reflecting the continuing shift of transit finance responsibility to the Federal government.

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*In making these summary calculations, it was assumed that half of the $341 million non-Federal share of capital financing was attributable to state government, and the other half to local and regional governments. The assumption is rough but reasonable and, at any rate, has very little effect on the overall estimates.

CHAPTER 7: THE DISTRIBUTION OF THE TRANSIT TAX BURDEN AMONG INCOME CLASSES

The distribution of the tax cost of transit subsidization depends both on the degree of progressivity or regressivity of each of the taxes assessed to support the subsidy program and on the relative importance of each tax as a source of subsidy funds. On the basis of the percentage composition of public transit funding by type of tax and level of government, disaggregate estimates of various general tax distributions are weighted and then aggregated to calculate the overall distribution of the transit subsidy tax burden.

National Estimates of Tax Distribution

It is not a simple matter to estimate, even for general government financing, the distribution of the burden of each particular type of tax at each level of government. Indeed, numerous books have been devoted entirely to establishing the distributional characteristics of one or another specific taxes. Although public finance economists have been studying tax incidence for many years, there is still much disagreement on the true ultimate impacts and burden distributions of even the most widely used taxes. Moreover, it turns out that the estimated distributions depend crucially on the subjective tax shifting assumptions which underlie the analysis; it is very difficult to test objectively the validity of these assumptions.

An original, in-depth analysis of tax incidence is quite beyond the scope of the present study. Nevertheless, it is possible to identify the

most agreed-upon assumptions underlying the tax burden distributions and, on the basis of these consensual assumptions, to calculate standard estimtes for each tax type.

This is the approach adopted by Musgrave, Case, and Leonard in their study of the nationwide distribution of fiscal burdens in 1968.[1] First, they examine the different assumptions which have been made with respect to the incidence of various taxes and then either select those that have been most widely adopted by the public finance profession or formulate compromise assumptions on the basis of widely held but conflicting ones. Table 7.1 lists the consensual assumptions chosen for their quantitative analysis. It is assumed, for example, that the personal income tax is ultimately borne by the individual taxpayer, but that half of the corporation income tax is shifted to consumers in the form of higher product prices and that the remainder is borne by recipients of capital income. The sales tax is assumed to fall ultimately on the consumer. And whereas the property tax on single-family houses, by assumption, is borne by homeowners, all of the property tax on rental housing is shifted from the landlord to the tenant.

On the basis of these assumptions, the total amount of each type of tax is allocated among income classes according to the distribution of the utlimate tax base for each tax. The individual income tax, for example, is simply distributed according to the distribution of total tax payments by each income class since it is assumed that no shifting occurs. Similarly, the sales tax is distributed according to the percentage of total consumption expenditures accounted for by each income class. The property tax on rental housing, in contrast, is allocated according to the distribution of rental payments; the property tax on businesses is allocated partly on

Table 7.1 Standard Incidence Assumptions Underlying the Tax Distribution Estimates[2]

Tax	Incidence Assumptions	Allocated According to:
Individual income tax	Stays put	Tax payments
Corporation income tax	One-half on consumption	Consumption
	One-half on capital income	Capital income
Excises and sales taxes	Consumption	Type of consumption
Estate and gift taxes	Donors	Capital income above $25,000
Property tax		
Residences	Homeowners	Ownership
Rental housing	Tenants	Rental payments
Business	One-half consumption	Consumption
	One-half capital income	Capital income
Payroll tax		
Employer	Consumers	Consumption
Employee	Employees	Covered earnings

the basis of the distribution of consumer expenditures and partly according to the distribution of capital income.

The resulting distributions of absolute tax payments of each type are then expressed as a percentage of the total income in each income class. As indicated by the resulting estimates displayed in Table 7.2, there is significant variation among tax types in the degree of progressivity or regressivity.* The Federal individual income tax is estimated to be very progressive, amounting to only 2% of the total income in the under-$4,000 category but 19% in the $92,000-and-over category. The local property tax is moderately regressive, with tax payments declining from 7% of income in the poorest class to 3.3% in the most affluent. The general sales tax, however, is estimated to be very regressive. The most affluent class pays less than a tenth the percentage of its income in sales taxes as does the poorest class (.3% as opposed to 3.4%). For the tax structure as a whole, these distributive differences tend to offset each other so that the overall distribution of the tax burden in the U.S. is roughly proportional. At the lower end of the income spectrum, the distribution is slightly progressive, but the total tax burden as a percentage of income spans a narrow range, from 29% in the poorest category to 36% in the most affluent.** Of course, the same distribution also indicates that

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*A progressive tax, by definition, is one whose burden, as a percentage of total income, is greater for affluent classes than for low-income classes. Conversely, the burdens of a regressive tax represent higher percentages of the incomes of the poor than they do of the affluent.

**As the authors demonstrate, the specific estimates vary considerably with alterations in the incidence assumptions of Table 7.1.[4] The initial assumptions made seen quite reasonable, however, and it is unlikely that the actual distributions are very different from the estimates displayed here. At any rate, the estimates of Table 7.2 were the only comprehensive ones available.

Table 7.2 The Distribution of General Tax Burdens by Income Brackets, 1968[3]
(Taxes as Percentages of Total Income in Each Category)

Taxes	Income Brackets										
	Under $4K	$4K to $5.7K	$5.7K to $7.9K	$7.9K to $10.4K	$10.4K to $12.5K	$12.5K to $17.5K	$17.5K to $22.6K	$22.6K to $35.5K	$35.5K to $92K	$92K and Over	All Brackets
Federal Taxes											
1) Individual income tax	2.0	2.8	5.9	7.1	7.9	10.1	10.6	12.7	14.8	18.5	9.9
2) Estate and gift tax	-	-	-	-	-	-	-	0.6	2.0	2.7	0.4
3) Corporation income tax	5.1	6.1	5.0	4.0	4.3	4.6	4.8	5.1	5.3	6.6	5.0
4) Excises and customs	2.5	2.8	3.1	3.0	2.9	2.7	2.1	1.1	0.9	0.6	2.3
5) Payroll tax	5.5	6.3	7.0	6.9	6.7	6.1	5.2	4.2	1.5	0.6	2.2
6) Total	15.2	17.9	20.8	21.6	21.6	23.4	22.6	23.8	24.5	29.1	22.7
7) Total excluding line 5	9.7	11.6	13.9	14.7	14.9	17.3	17.4	19.6	23.0	28.5	17.5
State and Local Taxes											
8) Individual income tax	-	0.1	0.3	0.6	0.7	1.1	1.4	2.3	1.6	1.3	1.0
9) Inheritance tax	-	-	-	-	-	-	-	0.2	0.6	0.8	0.1
10) Corporation income tax	0.4	0.5	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.5	0.4
11) General sales tax	3.4	2.8	2.5	2.3	2.2	2.0	1.7	1.0	0.5	0.3	1.8
12) Excises	2.7	3.0	3.3	3.0	2.9	2.5	1.9	1.0	0.8	0.6	2.1
13) Property tax	6.7	5.7	4.7	4.3	4.0	3.7	3.3	3.0	2.9	3.3	3.9
14) Payroll tax	0.2	0.5	0.8	1.0	1.0	1.0	1.1	1.2	0.2	0.1	0.8
15) Total	13.4	12.1	11.9	1 .6	11.1	10.6	9.7	9.1	7.1	6.9	9.5
16) Total excluding line 14	13.2	12.1	11.1	10.6	10.1	9.6	8.6	7.9	6.9	6.8	9.5
All Levels											
17) Total	28.5	30.5	32.8	33.1	32.8	33.9	32.4	32.9	31.6	35.9	33.0
18) Total excluding lines 5 and 14	22.9	23.7	25.0	25.3	25.0	26.9	26.0	27.5	29.9	35.3	27.0

affluent individuals pay much larger absolute tax bills than do low-income persons.

The Distribution of the Burden of Transit Taxation

The distribution of the burden of transit taxation could conceivably be very different from the overall distribution of the burden of taxation for all purposes. Were it dominated by the sales tax, for example, it would be much more regressive, whereas if dominated by the income tax, it would be more progressive. Adjusting the general tax distributions to conform with the different composition of transit revenues, the following analysis calculates tax distributions specific to transit operating subsidies and subsequently, capital subsidies. These two distributions are then simply added to calculate the overall distribution of the transit tax burden.

Estimating the modified tax distributions for operating subsidies involved three steps. First, each of the general distributions was normalized so that distributions for different taxes would be comparable. In Table 7.2, the percentages in line 1, for example, are much higher than those in line 4 simply because total Federal income tax proceeds were more than 4 times as great as Federal excise taxes and customs fees. Each line of this table, therefore, was proportionally adjusted to reflect the burden distribution of $1 of tax revenue from each tax.

Next, each tax's distribution was weighted by the percentage of the total transit subsidy financed by that specific tax at each level of government. Thus, the sales tax, for example, was given 40 times as much weight in the aggregate distribution as was the state and local payroll

tax.

Finally, all percentages in the table were adjusted proportionally so that,in aggregate, the distributions would reflect the percentage of total U.S. personal income in 1975 devoted to transit subsidization (.298%). The distributions of the various types of taxes at each level of government were added to obtain the estimates of the distribution of the operating subsidy tax burden displayed in Table 7.3.* Although the Federally-funded portion is moderately progressive, it is overwhelmed by the much larger state and local portion, which is significantly regressive. The distribution for all government levels, therefore, is moderately regressive. Whereas households with incomes less than $4,000 pay taxes equal to .209% of their incomes to support transit operations, households earning more than $35,500 pay only about half this percentage (.116%).

The distribution of taxation to fund capital subsidies was estimated in roughly the same manner, but not in tax-by-tax detail because data were not available on the specific taxes used to finance capital subsidies at the state and local level. It was assumed, therefore, that the 20% state-local portion of capital funding was financed by the same composition of taxes as was used at this level for operating subsidies. Thus, although the absolute percentages differ, the percentage distribution of the state-local tax burden among income classes is assumed to be the same for both types of subsidies.

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*Because the 1968 Musgrave estimates were the most recent available, it was necessary to assume that the tax structure remained roughly constant from 1968 to 1975. Although rates of taxation have increased somewhat, the overall tax structure at each government level has not changed significantly.

Table 7.3 The Distribution of Transit Capital and Operating Subsidy Tax Burdens by Level of Government (Taxes as Percentages of Total Personal Income in Each Income Category), 1975[5]

Level of Government	Income Class*										
	Under $4K	$4K to $5.7K	$5.7K to $7.9K	$7.9K to $10.4K	$10.4K to $12.5K	$12.5K to $17.5K	$17.5K to $22.6K	$22.6K to $35.5K	$35.5K to $92K	Over $92K	All Incomes
Operating Subsidies											
Federal	.015	.018	.022	.023	.024	.028	.028	.031	.037	.045	.028
State and Local	.194	.176	.162	.154	.147	.141	.127	.106	.078	.072	.132
Total, All Levels	.209	.194	.184	.177	.171	.169	.155	.137	.115	.117	.160
Capital Subsidies											
Federal	.058	.070	.084	.088	.090	.104	.104	.118	.138	.172	.105
State and Local	.049	.042	.041	.039	.037	.036	.032	.027	.019	.018	.033
Total, All Levels	.107	.112	.125	.127	.127	.140	.136	.145	.157	.190	.138
Transit Subsidies, Total**											
Federal	.073	.088	.106	.111	.114	.132	.132	.149	.175	.217	.133
State and Local	.243	.218	.203	.193	.184	.177	.159	.133	.097	.090	.165
Total, All Levels	.316	.306	.309	.304	.298	.309	.291	.282	.272	.307	.298

*The unusual income categorization is identical to that used in the study from which the general tax distribution estimates of Table 7.2 are derived. It was used in that study for computational convenience. Due to the unavailability of more recent estimates, we have necessarily been forced to assume that the relative distribution of the tax burden did not change significantly from 1968 to 1975.

**These incidence estimates do not incorporate the impact of Federal general revenue-sharing grants to state and local government, which accounted for almost four percent of state and local revenues in 1975. If these inter-governmental transfers are included in the incidence calculations, the resulting distribution of the total transit subsidy tax burden is less regressive.

Federal	.077	.092	.111	.117	.120	.139	.139	.156	.184	.228	.140
State and Local	.233	.209	.195	.185	.177	.170	.153	.128	.093	.086	.158
Total, All Levels	.310	.301	.306	.302	.297	.309	.292	.284	.277	.314	.298

Similarly, although for different reasons,* the Federal tax burden arising from the funding of capital subsidies is the same as for operating subsidies, although, as at the state-local level, the absolute percentages vary due to the difference between absolute amounts of capital funding and operating funding.

As shown in Table 7.3, capital subsidy financing, overall, is moderately progressive, with households earning $92,000 or more contributing almost twice as high a percentage of their incomes for capital subsidization as did households earning less than $4,000. This result follows, of course, from the dominance of progressive Federal taxation in the funding of capital subsidies.

When aggregated for both types of subsidies, the Federal portion obviously retains the same degree of progressivity as the Federal distributions for each subsidy type. The same holds for the state-local portion. In the aggregation over government levels, however, the Federal progressivity dominant in the capital subsidy financing just offsets the state-local regressivity dominant in the operating subsidy financing so that the overall financing of transit subsidization is roughly proportional. When adjusted to account for Federal general revenue-sharing grants to state and local government, the overall distribution is only slightly regressive over most of its range and actually becomes slightly progressive at the very highest income levels. Nevertheless, at least at this national level of aggregation, transit financing does appear to be somewhat

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*Namely, that the Federal level is not disaggregated by type of tax for either operating or capital subsidies because no Federal taxes are earmarked for transit use.

more regressive than the financing of government expenditures in general.*

Variations Among Metropolitan Areas

The distribution of the transit tax burden obviously is not the same for every metropolitan area. As documented in Chapter 6, there are significant differences among areas in the percentage composition of transit funding by level of government. Financing in smaller metropolitan areas, for example, almost certainly is more progressive than in large areas because the Federal share of operating subsidies is about twice as high in areas with fewer than a million residents than it is in larger cities. Moreover, since state governments rely primarily on the sales tax and personal income tax whereas local governments depend mainly on the property tax, the varying composition of non-Federal support by level of government probably has considerable distributional consequences.

There are also substantial differences in the specific tax mechanisms employed at the state and local levels, the jurisdictional coverage of local transit taxes, and the inclusiveness of the bases of state and local taxes. Portland, for example, derives almost all of its non-Federal

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*The aggregate distributional estimates presented here do not account for the pronounced geographic clustering of state and local transit financing in the dense, transit-oriented cities and heavily-urbanized states of the Northeast and Great Lakes, or more generally, in the 25 or so largest American metropolitan areas. The aggregate distributions assume that the state-local tax burden is spread evenly over the United States and do not control for the relatively insignificant contributions from rural or low-density urban areas to support transit. Because incomes, on average, are considerably higher in urban areas than rural areas, and because state and especially local transit taxation is concentrated in these high-income areas, the national estimates probably overstate the regressivity of state and local taxation. Unfortunately, it was not possible to adjust the national estimates to reflect the geographic clustering.

subsidy funds from a regionwide employer payroll tax, whereas Miami raises its corresponding non-Federal share via a county-wide gasoline tax, and Cincinnati raises its share from an earnings tax. Boston and Milwaukee, in contrast, rely entirely on the property tax for local funds, although there are supplemented by state subsidies roughly equal in magnitude. Most major cities have regional mechanisms of some sort to extract contributions from the suburbs; but in a few areas, the suburbs escape this burden, and the local financing of transit in such areas tends to be more regressive as a result. Finally, the inclusiveness of each tax base, which also varies from one area to another, can affect the incidence of any given tax. When food and clothing are exempted, for example, the sales tax becomes much less regressive. Because non-Federal funding can vary significantly in each of these dimensions, the overall regressivity of non-Federal transit financing may vary considerably from one metropolitan area to another.[6]

Improving the Distribution of Transit Financing

The present chapter has estimated the distribution of the tax burden of transit subsidization on the basis of the current composition of transit financing by level of government and type of tax. This composition, of course, is hardly immutable; rather, it is the outcome of deliberate public policy and can certainly be expected to change over time. Indeed, the trends toward increased Federal subsidization noted in Chapter 6 suggest that the regressivity of transit financing has been steadily diminishing and will probably continue to diminish at least in the near future.

Many state and local officials undoubtedly would prefer the Federal government to foot the entire bill for transit subsidization. Such exclusively Federal financing might enhance progressivity, but it almost certainly would introduce strong incentives for inefficiency in the use of public resources. Local government officials would have virtually no incentives for cost control, and transit authorities would feel little pressure to increase productivity or curb wage inflation. Moreover, such Federal subsidization would further weaken the link between the benefits and costs of transit. At least currently, expansion of transit service requires local public officials to balance somewhat the anticipated benefits with probable tax costs. With 100% Federal funding, no tax costs would be perceived by local officials, and overexpansion would probably result. Indeed, such an impact is already evident with 80% Federal funding of capital subsidies and 10%-50% Federal funding of operating subsidies.

Thus, while the transit financing structure is not immutable, neither can it be changed at will simply to achieve one out of the many objectives of transit subsidization. To some extent, the tax structure at any time represents a compromise among these many goals.

PART III: SUMMARY AND POLICY IMPLICATIONS

This final part of the study draws together and compares the benefit and cost analyses of Parts I and II. On the basis of net benefit calculations at selected income levels, conclusions are drawn with respect to the overall distributional impact of transit subsidization. Policy implications of these are discussed, and suggestions are made for improving the effectiveness of the transit program in achieving equity objectives.

CHAPTER 8: THE NET DISTRIBUTIONAL IMPACT OF THE TRANSIT SUBSIDY PROGRAM

The benefits analysis of Part I suggests that most of the $4 billion nationwide transit subsidy is devoted to transit services used primarily by riders with incomes between $4,500 and $15,000. This income group is estimated to receive 56% of the total subsidy, although it accounts for only 41% of all households. In contrast, the poorest class, which includes 17% of all households, receives at most only 9% of the total subsidy* (see Table 5.1). Thus, although the transit program is often touted as being particularly beneficial to the poor, the program, in fact, is designed so that an almost negligible percentage of subsidy funds is devoted to improving the transportation of low-income travelers. Transit subsidies, as they are currently used, may be justified on other grounds, but they appear to be very inefficient means of relieving poverty.

Nevertheless, the poor do not contribute much in taxes supporting the transit subsidies, so that whereas the program undoubtedly is not strongly progressive, neither is the distributional impact of transit subsidization severely regressive. As estimated in Part II, the tax structure of public transit financing is roughly proportional (see Table 7.3). The poorest income class pays only a slightly higher percentage of its total income for transit taxation (.310% as opposed to .298% for all income classes) and, of course, contributes much smaller absolute

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*This figure represents an upper bound because it does not take into account intramodal cross-subsidization of affluent riders at the expense of poor riders.

amounts. A household earning $20,000, for example, is assessed more than 6 times as much in transit taxes as a $3,000 household although it receives only 1.5 times as much of the transit subsidy as the poor household.

Sample Calculations of Net Benefit

Table 8.1 presents a number of sample net subsidy calculations for households at selected income levels. These estimates indicate that, although the poor receive less than their share of transit subsidies, they pay so few taxes that their net benefits are positive. For example, a household with an income of $3,000 receives, on avarege, $33 more in subsidies than it pays in transit taxes. The largest net gains, however, accrue to households earning $7,000 and $12,000; they receive at least $77 more, on average, than they pay to finance subsidization. The big losers, on net, are households in the most affluent categories. Transit taxes of households earning $50,000 and $100,000 exceed their transit subsidies by $74 and $249, respectively. Middle-income groups just about break even.

These results should not be construed as justification for overall expansion of the transit program on equity grounds. Most other government programs are also financed by taxation that is roughly proportional and thus requires minimal absolute tax payments by the poor. The net absolute benefits to the poor of many other programs--even those not intended to relieve poverty--are thus also positive although only a small percentage of the total benefits accrues to the poor. Nevertheless, the sample calculations of Table 8.1 do suggest that, however inefficient transit subsidization is relative to other explicitly redistributive programs, it

Table 8.1. Sample Calculations of Per Household Transit Subsidies, Net of Tax Costs, for Selected Income Levels, 1975[1]

Household Income	Transit Subsidy Per Household	Transit Tax Per Household	Net Transit Subsidy Per Household
$ 3,000	$42	$ 9	+ $33
$ 7,000	99	21	+ 78
$12,000	113	36	+ 77
$18,000	63	52	+ 11
$25,000	65	71	- 6
$50,000	65	139	- 74
$100,000	65	314	- 249

definitely does not aggravate income inequality.

General Conditions for Progressivity

It is noteworthy that the calculated net subsidy to the poor would have exceeded that to the most affluent even if the tax financing had been significantly regressive and the transit subsidies accruing to high-income groups had been even larger relative to those accruing to the poor than was estimated for 1975. Suppose, for example, that the effective transit tax rate had been twice as high for households with incomes less than $4,000 as, in fact, it was (.620% vs. .310%) and that the rate for households with incomes exceeding $92,000 had been half what it was (.157% vs. .314%). Assume, further, that subsidies to households earning more than $22,500 had been twice as large as they actually were. The net transit subsidy to the $3,000 household would still have exceeded that of the $100,000 household (+ $23 vs. - $27) although the difference obviously would not have been as great as it was in fact (+ $33 vs. $-249).

With even greater regressivity,this result could, of course, be reversed. Moreover, if the same comparison is made between less extreme income groups, the less affluent group in some cases receives less absolute net subsidy. In general, though, the absolute net subsidy will decrease as income levels rise unless the tax system is so regressive that absolute tax payments increase more slowly as incomes increase than do absolute subsidy levels. Given the moderate differences among income groups in per-household transit subsidies, the tax structure would have to be extraordinarily regressive for transit subsidies net of tax costs to increase monotonically over most of the income distribution.

Of course, the welfare of low-income groups would be most aided by a combination of progressive taxation and a benefit distribution characterized by per-household subsidies declining with increasing income. As argued above, however, the distribution of income, under certain conditions, may be made more equal even by programs that are regressively financed and for which per capita benefits are greatest for the affluent.*

Indeed, when one compares the overall degree of progressivity of the current public financing of transit operating deficits and capital investments with the alternative, "free-market" type of financing via fare increases and service cuts, it is likely that the present method of financing--though far from ideal--is considerably less regressive. The negligible tax savings that would accrue to the poor as a result of subsidy cutbacks almost certainly would be offset by the deterioration in the quality of transit service and the substantial increase in transportation costs.** In spite of below-average transit subsidies for the poor, low-income households are better off than they would be without a transit program at all.

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*Technically, for the size distribution of income to be made more equal, it is only necessary that positive net benefits--as a percentage of income--decrease with higher income levels (or that negative net benefits increase). Thus, even if the absolute net benefits of a program are greater for affluent households, it is conceivable that the size distribution of income nevertheless is equalized, provided that absolute net benefits increase less rapidly than total income. (If absolute net benefits are negative, however, these must increase more rapidly than income for equalization of the distribution.) At any rate, when net benefits are positive for low-income groups and negative for high-income groups, the size distribution of income unequivocally is made more equal.

**Transportation costs of the poor would increase both directly, as a result of increased fares, and indirectly, as the result of the elimination of certain routes or types of transit service, which would force some low-income travelers to resort to much more expensive taxi service or auto ownership. Almost all affluent households already own at least one car; this second, indirect cost of transit service cutbacks, therefore, would probably be much less significant for them.

Comparative Progressivity

Moreover, the distributional impacts of transit subsidies should be evaluated relative to the redistributive efficiency of alternative uses of those funds. But what is the appropriate comparison? Relative to an ideal negative income tax, virtually any other government program is likely to appear unsatisfactory. Pure income transfers may represent the best alternative redistributive use of the funds, but they certainly are not the most likely alternative use.* Rather, public resources withheld from transit might have been used for urban highway construction.

As shown in Table 2.1, the income profile of urban auto users is considerably higher than that of transit riders in aggregate. Moreover, low-income auto users travel snorter distances than affluent users,[2] they make a higher percentage of their trips during off-peak hours[3]; and they travel at considerably higher vehicle occupancies.[4] Low-income groups, therefore, impose disproportionately low costs on the urban highway network and reap substantially less direct benefit from it than do more affluent groups. Because low-income neighborhoods have been, by far, the most popular routes for expressways, low-income individuals may also be impacted more severely than other groups by the social and economic disruption of highway construction as well as by the air pollution, noise, safety hazards, and other externalities of auto use. Thus, relative to highway expenditures, transit subsidies compare favorably in terms of redistributive impact.

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*Similarly, government housing programs, education programs, and conventional welfare programs are probably more cost-effective in their redistributive impact than are transit subsidies. It is not at all clear, however, that withdrawn transit funds would be channeled into these types of programs.

Variations in Redistributive Impact

The net distributional impact of transit subsidization varies, of course, from one metropolitan area to another. Indeed, there are considerable differences both in the overall magnitude of the transit subsidy and in the incidence pattern among income groups.

The differences in overall magnitude are, perhaps, most striking. In the Boston metropolitan area, for example, the average operating subsidy per 4-person household in 1975 was $208, whereas it was only $16 in Houston and undoubtedly was even less in smaller, lower-density areas.[5] Moreover, capital subsidies are even more concentrated in the largest urban areas than are operating subsidies. The 26 largest U.S. metropolitan areas accounted for 85% of the national transit operating subsidy in 1975;[6] 84% of the total cumulative capital subsidy up to 1976 was spent in only 8 urban areas.[7] For practical purposes, therefore, transit subsidies have negligible overall benefit impact except in large, dense cities.

The incidence pattern of transit subsidies among income classes also varies significantly from one type of metropolitan area to another. As documented in Chapter 6, there are considerable differences among cities in the mix of local, regional, state, and Federal funding to support transit. And non-Federal funding varies with respect to the specific types of tax mechanisms used and the extent of their jurisdictional coverage. These differences in funding arrangements, which affect the incidence of subsidy costs, are paralleled by differences that influence the distribution of subsidy benefits. Metropolitan areas differ significantly from one another in the income characteristics of transit riders, the geographic extent and range of transit services, the cost of each

type of service, and the spatial distributions of workplaces and residences of the various income groups.

Most of this variation cannot be conveniently generalized. Nevertheless, transit financing tends to be most progressive in small metropolitan areas although the total transit subsidy in such areas is usually negligible. Rider incomes also tend to be significantly lower in smaller cities, but such a small percentage of the poor use transit in such areas that the resulting impact on the mobility of low-income travelers is virtually imperceptible. In contrast, the highest rider incomes are in large, dense metropolitan areas with rail rapid transit. Transit financing in these areas is probably more regressive (due to the lower percentage of Federal funding), and a higher proportion of the total transit subsidy accrues to affluent riders. Nevertheless, a much higher percentage of the poor use transit in such areas, and the elimination of transit service would cause much more severe hardships for big-city poor than it would for small-town poor. Thus, it is likely that the absolute level of redistribution from high-income to low-income groups is much greater in large, transit-oriented cities than in smaller cities, in spite of the lower rider incomes and more progressive financing pattern in the smaller areas.

Finally, it should be obvious from the analysis of the foregoing chapters that the distributional impact varies substantially from one portion of the transit subsidy program to another. The commuter rail program, for example, almost exclusively benefits high-income riders, whereas the bus subsidy program primarily benefits low-income riders. Although the capital subsidy program is much more progressively financed than the operating subsidy, a higher percentage of the capital subsidy is

devoted to transit services used by riders with incomes exceeding $15,000 (42% vs. 30%). Moreover, there is variation within each of these broad categories. Short-haul inner-city bus service, for example, is used primarily by low-income riders, whereas long-haul radial bus service from the suburbs to downtown is patronized mostly by affluent commuters.

In evaluating the distributional impact of the transit subsidy program, therefore, it is important to keep in mind that, regardless of the overall impact, portions of the program are certainly progressive, and modifications in its composition could render the program as a whole much more progressive.

CHAPTER 9: POLICY IMPLICATIONS

It has been estimated that the transit subsidy program as a whole has indeed redistributed income from high-income classes to low-income classes. Although the poor have received less than their per-household share of the total transit subsidy, they nevertheless have been more subsidized than they have been taxed. Moreover, as discussed in Chapter 1, the distribution of true benefits (utility impacts) has been substantially more favorable to low-income households than is suggested by the distribution of subsidy expenditures.

The current transit subsidy program, therefore, does not exacerbate inequality in the distribution of income; but neither does it redistribute income very efficiently in comparison with other types of government programs designed explicitly to aid the poor. This relative inefficiency in redistribution arises from the very nature of transit services. Less than a fifth of the nation's urban poor use any form of conventional transit, and the vast majority of transit riders are not poor. Thus, transit subsidization provides virtually no benefits to 80% of the poor, and most of the transit subsidy (91%) is spent to serve the non-poor. In contrast, general income assistance programs reach a much higher percentage of the poor and can altogether exclude the affluent. Even welfare assistance in-kind, such as the provision of housing, medical care, and food, is more efficient in this respect. The current transit subsidy program, therefore, is not justifiable solely, or even primarily, on the basis of its benefits to the poor.

Increasing the Progressity of Transit Subsidization

In theory, of course, the subsidy program could be modified to improve its redistributive efficiency. Discount transit passes for the poor and improved service in low-income neighborhoods, for example, would increase benefits to the poor. Sharp reductions in general subsidies to commuter rail and rail rapid transit services would diminish the benefits to affluent riders. Moreover, peak-load pricing and surcharges for longer trips would eliminate much of the adverse intramodal cross-subsidization of affluent riders by low-income riders and would increase the efficiency of transit use as well. Congestion of transit vehicles and rights-of-way during rush-hours would be reduced, and off-peak capacity would be less under-utilized.

To some extent, however, the goal of increased equity may be inconsistent with other objectives of the transit program. The degree of energy conservation, road congestion reduction, downtown revitalization, and pollution reduction achieved by transit depends primarily on the number of riders (especially former auto drivers) it can attract. Revisions in the program that increase fares or decrease service levels for non-poor riders might significantly discourage their patronage. The elasticity of demand for transit use almost certainly increases with income due to higher rates of auto ownership.* Thus, fare decreases and service improvements for the poor would probably attract far fewer passengers than corresponding fare

*Quantitative estimates of fare elasticity differences among income groups are not available. Economic theory suggests, however, that degree of elasticity is significantly influenced by the extent to which substitutes are available. In the case of transit use, therefore, elasticity would be determined primarily by the level of auto ownership.

increases and service cutbacks would discourage among the non-poor. Moreover, patronage declines on rapid transit and commuter rail lines would be particularly detrimental. Because economies of scale are much more pronounced for these rail modes than for bus transit, passenger losses would entail considerably larger increases in cost per passenger served.

Indeed, given the goal of ridership maximization, the current pattern of subsidization is hardly accidental. On the contrary, it has arisen as the logical response to differential demand elasticity among income groups and modal variation in economies of scale. Whereas poor riders are generally considered by transit operators a captive market to be taken for granted, significant efforts have been made to attract the affluent, and these efforts have entailed large subsidy expenditures.* Poor riders have suffered the additional misfortune of patronizing a type of transit that is characterized by roughly constant returns to scale and for which operating subsidies are thus less warranted on efficiency grounds.

It probably would not be advisable to eliminate all subsidies to non-poor riders in an attempt to improve the redistributive effectiveness of the transit program. Nevertheless, subsidies to affluent riders might be reduced somewhat by raising fares for rush-hour service in dense corridors (for which demand is very inelastic) or by curtailing services that produce few social benefits. Such cutbacks would reduce the total transit

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*BART in San Francisco and Metrorail in Washington, for example, have been designed primarily to attract suburban riders. On a smaller scale, express bus routes to the suburbs have been set up in most large metropolitan areas, and parking at suburban stops is sometimes provided to commuters free of charge or at artifically low rates as extra inducement not to drive. Finally, most improvements in transit vehicle quality have been intended to increase transit use among middle-income groups. Low-income riders are not nearly as sensitive to amenities such as air conditioning, carpeting, padded seats, and modern design.

subsidy without significantly disrupting the urban transportation system or the urban economy.

Conversely, benefits to the economically disadvantaged could be increased with moderate additional funding by improving bus service in low-income neighborhoods and by providing discount passes to the poor for use on all transit modes. Of course, even this approach is likely to enhance the mobility of only those poor clustered in relatively high-density neighborhoods. For the majority of the poor, who live in small or low-density urban areas (or low-density portions of urban areas), something much closer to auto-type service appears to be appropriate. Indeed, in spite of the considerable financial burden of auto ownership and operation, 44% of all urban travelers with incomes less than $3,000 in 1970 were auto drivers, and 39% were auto passengers.[1] The significant public policy issue with respect to these low-income auto users is to what extent they should be relieved of high automobile costs. Although a widespread program of subsidizing auto use among low-income households would undoubtedly be effective in enhancing their mobility, it would probably entail very high public costs and arouse considerable political opposition from taxpayers who might resent the prospect of supporting relatively expensive, high-quality transportation for the poor.

Even as the potential for increasing the proportion of transit subsidy expenditures accruing to the poor is limited, so is the potential for increasing the progressivity of transit financing. 100% Federal financing would indeed be more progressive than the current mix, but would introduce strong incentives for inefficiency and overexpansion. Similarly, it is not likely that relatively affluent suburbanites would be willing

to increase their contributions for regional support of transit without corresonding increases in transit service to the suburbs in return. Increased state subsidies for transit are regularly opposed by rural and small-town residents, and sometimes by suburbanites as well, unless such state financing will significantly reduce their local tax contributions. Similar to Federal funding, moreover, state financing also introduces incentives for cost inflation, although to a lesser extent, because taxpayers in any given urban area bear a larger proportion of the total state budget than of the total Federal budget.

Prospects for Transit Funding

Although the growth in government subsidization of transit was very rapid from 1970 to 1975, recent growth has been much slower, and it is conceivable that even the absolute level of subsidization will decrease in coming years. Compared to an annual, inflation-adjusted rate of increase of 38% between 1970 and 1975, transit subsidies grew by only 4% between 1975 and 1976, and preliminary reports indicate that growth was even slower between 1976 and 1977.[2] Moreover, the transit program has been increasingly attacked at all levels of government for its burgeoning public costs. Indeed, in a recent nationwide address, President Carter cited urban mass transit as one of five programs most responsible for the overall inflationary growth of government expenditures. Pressures for increased Federal transit subsidies, he indicated, would be vigorously resisted.[3] At the state level, the Pennsylvania legislature has enacted a law requiring that farebox revenues cover at least 40% of transit operating costs, and several states are considering implementing similar restrictions.[4]

(Of the 26 largest metropolitan areas in the United States, 9 would have violated this standard in 1976.)[5]

The growing aversion to transit subsidization has developed partly in response to general economic trends beyond the control of transit operators. Stagnation of the American economy has sharply slowed down the growth in personal income per capita. Increases in taxation have been vigorously opposed because such increases represent a greater burden to taxpayers than previously. This growing fiscal austerity has been evident at virtually all government levels, but particularly at the local level in dense, old cities, where most transit service is concentrated and where the burden of transit subsidization, therefore,has been greatest. Tax bases in these cities have been declining, while welfare costs and public service expenditures have continued to grow.

To a significant extent, however, the fading popularity of transit subsidization is a consequence of the striking failure of transit to fulfill expectations. The transit program has increasingly come to be perceived by academics as well as policymakers and voters as producing disappointingly little in the way of either rider benefits or social benefits. Instead, much of the transit subsidy is viewed as having been consumed by rapid increases in the wages of transit employees, by productivity losses, by goldplating in the construction of new transit vehicles and rail rapid transit systems, and by Federal regulations that have inflated capital costs by requiring high minimum wages for transit construction workers, accessibility of systems to even the most severely handicapped, and purchase from American suppliers even when they are not the lowest bidders. Whereas subsidies were once thought to be the solution to transit's fiscal

crisis, they have increasingly come to be viewed as part of the problem, and there is considerable pressure both to reduce the level of subsidization as well as to revise its character so as to minimize incentives for inefficiency.

Alternative Futures for Transit Subsidization

Depending on the nature of subsidy curtailment and the specific operational responses to cutbacks, the overall distributional effect of the transit program may be significantly altered. The shift in equity impact would be substantial if the allocation of the total subsidy among modes were very much changed. Moreover, variation of intramodal subsidy allocations would also produce some degree of benefit shift.

The extent and character of capital funding modificiations will be determined primarily at the Federal level, which currently finances 80% of capital invetment costs. Changes in the level of operating subsidization, although also influenced by Federal guidelines and matching funds, will be formulated mainly at state and local levels. The specific fare and service impacts of operating subsidy changes will, in turn, depend on the decisions of local transit operators and thus may vary considerably from one metropolitan area to another.

Capital Subsidies

Even a substantial cutback in capital subsidization would probably have negligible impact on transit operations. Given the nature of current criticism, it is likely that such a cutback would primarily involve a Federally-imposed moratorium on the construction of expensive new rail

rapid transit systems. Most studies suggest that these, at any rate, would attract few additional passengers and would produce negligible social benefits.[6] Necessary transit vehicle replacement and right-of-way maintenance almost certainly could be financed at less than half of the $2 billion cost of the current program.[7] Since most of the benefits of new rail rapid transit service accrue to affluent users, the distribution of the reduced capital subsidy would be considerably more progressive than the present distribution.

Operating Subsidies

A far more difficult problem is posed by threatened reductions in operating subsidies. Unlike capital investment, operating expenses cannot easily be postponed or eliminated. Fare hikes, service cutbacks, productivity gains, and labor cost controls--the four major options available for reducing the operating deficit--entail significant losses to influential groups. Transit riders, therefore, oppose fare increases and service degradation while transit employees fight wage freezes and work rule changesthat would eliminate jobs or require extra work per employee. However unpopular these austerity measures, transit agencies nevertheless will be forced to implement at least some of them in the event that operating subsidies are, in fact, cut. In choosing among them, transit officials should consider not only the impacts on ridership, revenues, and costs but also the distributional consequences of each measure.

Reducing operating costs. Transit operating expenses can be lowered either by cutting back service or by increasing the productivity of transit operations. Transit service is, in general, most unprofitable

during evenings and weekends, when passenger volumes are lowest. Not only are vehicle occupancies low at these times, but the labor cost per vehicle mile is higher due to overtime wage rates and the hiring of additional full-time shifts that are used only part-time. Many non-radial, crosstown bus services have very low occupancy rates as well. Although eliminating these low-volume services would considerably reduce transit operating costs, doing so might be particularly immobilizing for the poor, who depend on such services more than do affluent riders. Curtailment of commuter rail services, in contrast, would increase the progressivity of the distribution of subsidy benefits; patrons of these services have the highest average income of any modal user group. Except in New York, Chicago, and Philadelphia, commuter rail carries less than 5% of transit users, produces negligible social benefits, requires extremely high operating deficits per passenger, and could easily be replaced by low-cost express bus service.[8] Even some routes in New York, Chicago, and Philadelphia could be eliminated with minimal adverse impact.

Most of the potential for cost reduction, however, lies in cutting overall labor costs, which account for roughly 80% of total operating expense. Labor productivity could be increased by changing work rules to permit split work shifts, use of part-time vehicle operators during rush hours, and use of full-time employees for non-driving tasks during off-peak hours.[9] These measures would minimize the underutilization of transit vehicle operators during off-peak hours and thus would significantly increase the average number of vehicle miles of service produced per employee.* Productivity would also be enhanced by the retraction, in

*Provided, of course, that transit systems are permitted to dismiss employees who are no longer needed as a result of the productivity gains.

a few cities, of union contract clauses that require the deliberate overmanning of transit vehicles. Finally, the establishment and enforcement of strict standards for employee performance, though certain to be unpopular with employees, would increase productivity of workers to whatever extent they currently loaf on the job or perform incompetently. Resistance of transit employees to productivity drives such as those just described would be exceeded only by their opposition to cuts in their wages and fringe benefits, the most obvious means to reduce transit labor costs. It is unlikely that transit workers could be convinced to accept all these changes; on the contrary, they would probably stage disruptive strikes. A less dramatic, though more feasible, approach would be pegging the rate of real wage increases to the rate of productivity gain. This tactic, which has been adopted in New York, appears to have been somewhat successful. Labor costs have not actually been reduced there, but growth in these costs has been much slower than in previous years. To whatever extent labor productivity and wage restraint measures can be implemented, the distributional impact will be a reduction in operating subsidy benefits to the lower middle class and an increase in benefits to classes with lower or higher incomes.

Increasing operating revenues. Transit operating deficits could also be reduced by increasing fares or attracting additional passengers without providing commensurate increases in service. In general, the more inelastic the demand for a commodity, the greater the percentage increase in revenues resulting from a price increase. Since the fare elasticity of demand for transit use is quite low for most types of transit service, the revenue potential of fare increases is considerable,

at least in the short run.[10] The main obstacle to fare increases has been strong political pressure from riders to maintain low fares.

Assuming such political opposition could be overcome, fare increases would not be the same for all types of transit services. To the extent that it is deemed desirable to increase revenues with the minimum loss of patronage, fare increases should be greatest where demand is least elastic (for example, peak-hour subway use) and least where demand is most elastic (off-peak bus use). Such elasticity-related price changes not only would minimize passenger attrition but would also improve the equity of transit financing since off-peak riders have significantly lower incomes than rush-hour riders. For similar reasons, fare increases should be greater for long transit trips than for short trips. Although empirical evidence on demand elasticity differences among modes is contradictory, relatively larger fare hikes on commuter rail and rail rapid transit lines clearly would yield a more progressive distributional impact than would uniform increases on all modes. Moreover, since affluent riders are more sensitive to service changes than are low-income riders, whereas they are less sensitive to fare changes, it may be appropriate to upgrade services used by the affluent and to charge them substantially higher fares but to maintain or lower fares for poor riders while curtailing somewhat the quality of their service.

Revenues, of course, can also be increased by attracting more passengers. By far the most powerful method of diverting travelers to transit is to increase substantially the cost of automobile use. Indeed, empirical studies suggest that the level of transit use is strikingly more sensitive to automobile operating costs than it is to transit fares.[11] Thus,

increasing bridge tolls, gasoline taxes, and auto registration fees and excise taxes; imposing roadway pricing on congested arteries; and reducing the supply of parking (or increasing its cost) could potentially augment transit ridership to virtually any degree desired. Moreover, the proceeds of these taxes and user charges could be made available for use in transit subsidization. However powerful these auto pricing measures are in theory, they are very unpopular among voters, and attempts to implement them have so far been unsuccessful. If perchance these measures were, in fact, implemented, the net distributional impact would probably be progressive because automobile users have higher incomes, on average, than do the transit users who would benefit from such cross-subsidization.

Although transit operating subsidies will surely increase more slowly over the coming years, it is unlikely that they, like capital subsidies, will actually decrease in magnitude. It is also unlikely that the response to this slower growth will be dramatically different from what has been observed in New York. Fares will be revised somewhat, frequency of service will be reduced, and some very unprofitable routes will be eliminated. Labor wages and fringe benefits will continue to grow, but at a reduced rate, and minor gains in productivity will be made. It is also likely that, as in New York, transit operations will remain in a state of fiscal crisis. Improvements in transit financing and operations discussed above would undoubtedly avert such a crisis, but there does not appear to be sufficient political support for their implementation.

Future Progressivity of the Transit Program

The overall distribution of transit subsidy benefits will probably become more progressive as a result of government-imposed fiscal austerity.

Reduced subsidization of capital investment in rail rapid transit systems will certainly diminish benefits to the affluent. Redistributive shifts arising from the slower growth of operating subsidies will probably be less substantial in magnitude but should also increase overall progressivity. Reducing benefits to transit workers, instituting peak-hour pricing and distance-related fares, and curtailing commuter rail service, for example, would all work in this direction.

The progressivity of transit tax financing, however, might diminish unless savings in Federal capital subsidy funds were shifted in some degree to use for operating subsidization. Otherwise, regressive state and local taxation, which currently dominates the financing of operating subsidies, would offset the progressive Federal financing of capital subsidies, which would be significantly reduced in magnitude. Provided that strict and enforceable guidelines on productivity and cost control accompany increased Federal operating subsidies, such a shift from capital subsidization to operating subsidization would significantly increase the overall progressivity of the transit program.

REFERENCE NOTES

Introduction

[1]American Public Transit Association, Transit Fact Book: 1976-77 Edition, Washington, D.C.: American Public Transit Association, 1977, p. 26-30; and Alan Altshuler, et al., Politics, Innovation and Urban Transportation Policy, Cambridge, Ma.: MIT Press, 1978, Chapter 2, Table 2.2.

[2]Transit Fact Book, p. 23, 30.

[3]Transit Fact Book, p. 22, 23; John Pucher, "Losses in the American Transit Industry," MIT Center for Transportation Studies, February, 1978, Table 2-1.

[4]John Meyer, et al., The Urban Transportation Problem, Cambridge, Mass., Harvard University Press, 1965, Ch. 2-6.

[5]The Urban Transportation Problem, ch. 5; Jose Gomez-Ibanez and John Meyer, "Productivity Growth and Labor Relations in Urban Mass Transit," Harvard City Planning, Discussion Paper D76-14, December 1976, p. 1-6.

[6]Henry Aaron, Shelter and Subsidies, Washington, D.C., The Brookings Institution, 1972.

[7]Richard Muth, "Metropolitan Decentralization," in John Crecine, editor, Financing the Metropolis: Urban Affairs Review, Beverly Hills, Ca., Sage Publications, 1970, p. 434-454.

[8]Jerome Rothenberg, "The Impact of Local Government on Intrametropolitan Location," Papers of the Regional Science Association, vol. 24, 1970, p. 47-81.

[9]Alan Altshuler, "The Decision-Making Environment of Urban Transportation," Public Policy, vol. 25, no. 2, Spring, 1977, p. 171-203.

[10]Ibid.

[11]Alan Altshuler, "Transit Finance in Greater Boston," unpublished paper presented at the Conference on Financing Public Transit, sponsored by the Metropolitan Transportation Commission and the Bay Area Council of San Francisco, February 21, 1975, p. 1.

[12]Transit Fact Book, p. 19.

[13]See Figure 4.1 below.

Chapter 1

[1]Calculated on the basis of statistics in the 1975 and 1976 annual reports of the Greater Cleveland Regional Transit Authority; and 1973, 1974, and 1975 operating and financial reports of the Cleveland Transit Authority and the Shaker Heights Rapid Transit Line.

[2]Calculated on the basis of the 1974 and 1975 annual reports of the Port Authority of Allegheny County and corresponding fare and operating statistic pamphlets, also produced by the Authority.

[3]Calculated on the basis of the New York City Transit Authority's August editions of the Transit Record in 1974, 1975, and 1976.

[4]Transit Fact Book, p. 34; Urban Mass Transportation Administration, "Transit Operating Performance and the Impact of the Section 5 Program," November 1976, p. 23-24.

[5]Transit Fact Book, p. 34; Statistical Abstract of the United States, Table 667, p. 413 and Table 771, p. 478; U.S. Department of Commerce, Bureau of Economic Analysis, Survey of Current Business, July 1977, Table 6.9, p. 47.

[6]Transit Fact Book, p. 34.

[7]Annual report of the Massachusetts Bay Transportation Authority, 1976, Financial Summary, Table 1.

[8]Transit Fact Book, p. 26, 30, 34.

[9]Statistical Abstract, Table 658, p. 405.

[10]Section 13c of the Urban Mass Transportation Act of 1964 (P.L. 88-365), as amended through 1975, provides that no employee either directly or indirectly affected by transit projects receiving Federal aid shall be made worse off with respect to his or her employment as a result of the project. In effect, the provision has greatly inflated labor costs by guaranteeing the payment of the highest prevailing wage in each metropolitan area for each category of laborer.

[11]UMTA, "Transit Operating Performance," p. 27.

[12]"Transit Operating Performance," p. 28; U.S. Department of Labor, Handbook of Labor Statistics, Washington, D.C., 1976, Intermediate Household Budgets for Selected Metropolitan Areas.

[13]"Transit Operating Performance," p. 27.

[14]Handbook of Labor Statistics, Intermediate Household Budgets for Selected Metropolitan Areas.

[15]For a fuller discussion of this issue, see Altshuler, Alan et al., Politics, Innovation, and Urban Transportation Policy, Cambridge, MIT Press, 1978, Chapter 12, p. 28-43.

[16]National Safety Council, Accident Facts.

[17]New York City Transit Authority, Transit Record, August, 1975, p. 2 and August, 1976, p. 2.

Chapter 2

[1]The figures on the distribution of all U.S. households by income class were calculated from U.S. Department of Commerce, Bureau of the Census, 1970 Census of Population, Vol. PC(1)-D1: Detailed Characteristics, United States Summary (Washington, D.C.: U.S. Government Printing Office, 1973), Table 258. The aggregate public transportation income distribution was calculated from the Nationwide Personal Transportation Study (NPTS) by the FHWA and reported in Gomez-Ibanez, Jose, Federal Assistance for Urban Mass Transportation, John F. Kennedy School of Government, Ph. D. Thesis, January 1975, Table 4-1, p. 210. The remaining statistics in the table were calculated by John Pucher from a computer tape of the NPTS supplied by the Federal Highway Administration. A disaggregate version of this table appears as Table 1-1 in John Pucher, "Income Characteristics of Transit Users," Technical Report No. 1, MIT Center for Transportation Studies, May 1977. To exclude intercity trips, only trips of fifty miles distance or less were included; overnight trips were also excluded.

[2]Calculated from the 1970 Nationwide Personal Transportation Study (NPTS) computer tapes supplied by the Federal Highway Administration. A disaggregate version of this table may be found as Table 1-2 in John Pucher, "The Income Characteristics of Transit Users."

[3]Pucher, "Income Characteristics," Table 1-2 breaks out the $3,000-or-less category.

[4]Pucher, "Income Characteristics," Tables 1-19, 1-20, 1-26, 1-27.

[5]Calculated from statistics in U.S. Department of Commerce, Bureau of the Census 1970 Census of Population, vols. PC(1)-D(2) to PC(1)-D(53): Detailed Characteristics (Washington, D.C.: U.S. Government Printing Office, 1973), Table 190.

[6]"Income Characteristics," Tables 1-3 through 1-6.

[7]"Income Characteristics" Table 1-11 through 1-13, which were calculated on the basis of the NPTS computer tapes.

[8]"Income Characteristics," Table 1-18, which was calculated on the basis of the NPTS computer tapes.

[9]Gomez-Ibanez, Federal Assistance, p. 215-219.

[10]"Income Characteristics," Table 1-17, which was calculated on the basis of the NPTS computer tapes.

[11]Calculated by Gomez-Ibanez (Federal Assistance, p. 218) from data in U.S. Department of Commerce, Bureau of the Census, 1970 Census of Population, vol. PC(1)-D1: Detailed Characteristics, U.S. Summary (Washington, D.C.: U.S. Government Printing Office, 1973), Table 242.

[12]Tri-State Regional Planning Commission, A Decade of Change in the Journey to Work, Interim Technical Report #4339-1302, January 1973.

Chapter 3

[1]Transit Fact Book, p. 22, 23.

[2]Transit Fact Book, p. 22, 23; Table 3.2 below.

[3]The bus statistics are based primarily on data from the Transit Fact Book, p. 22, 23, 26-29. The bus expense and revenue figures were calculated by the author by subtracting the subway totals (collected by the author) from the Factbook total transit expense and revenue figures, which do not include commuter rail. The subway and commuter rail figures were collected by the author from individual transit systems. For consistency, however, the Factbook subway ridership figures were used in this particular table instead of those collected by the author.

[4]Pucher, "Losses in the American Transit Industry," MIT Center For Transportation Studies, January 1978, Tables 2-3-1 through 2-3-4.

[5]Ibid.

[6]American Public Transit Association, Transit Operating Report, 1975, Washington, D.C., March 1977, p. A-01-A-03; and Pucher "Transit Operating Studies," MIT Center for Transportation Studies, January 1978, Table 3-2.

[7]Transit Operating Report, p. C-01-J-03.

[8]Ibid.

[9]Jack Faucett Associates, "A Study of Alternative Metro Rail Systems," January, 1976.

[10]The distributions at the top of the table were calculated on the basis of the deficit data of Table 3.1 and the income data of Table 2.1.

Unfortunately, the income statistics--which are the most recent available--were collected in 1970 and thus are somewhat dated. In the 8 years since then, inflation and real economic growth have raised the absolute income levels of virtually all classes. The relative income distribution, however, has remained approximately the same. Similarly, it is quite likely that the absolute incomes of all urban travelers have increased considerably but that the relative incomes of travelers using different modes have not changed substantially. Since income comparisons among groups are of primary importance in this study, the use of the 1970 income distribution is a reasonably accurate proxy for the relative distribution of income of transit riders in 1975. In the table, however, the 1970 income bracket figures were multiplied by 1.5 to account for the 50% growth in personal income per capita between 1970 and 1975 (Statistical Abstract of the U.S., 1977, Table 694, p. 431). In short, the income categories are approximate.

[11]Transit Fact Book, Table 13, p. 34. Fringe benefits such as pensions were not included in the salary figure for present purposes because they are not usually reported as current income, and definitely were not in the NPTS travel survey, with which comparaibility was desired.

[12]See footnotes for Table 2.3 and Figure 3.4 for sources of data.

Chapter 4

[1]Subsidy figures were estimated by the author on the basis of statistics in Transit Fact Book, p. 23; Urban Mass Transportation Administration, "Cumulative Capital Grants by Fiscal Year and Category, 2/1/65 through 6/30/77" and "Transit Operating Performance and the Impact of the Section 5 Program," both unpublished reports, 1977, Washington, D.C.; and financial data supplied by transit authorities in the 26 largest U.S. cities.

[2]Calculated from the following data sources: Urban Mass Transportation Administration, Cumulative Capital Grants by Fiscal Year and Category, 2/1/65 Through 6/30/77, unpublished report; UMTA, Multi-Mode Capital Grant Commitments to Urbanized Areas, 2/1/65 Through 9/30/76; UMTA, Transit Operating Performance and the Impact of the Section 5 Program, U.S. DOT, November 1976; Melvin Webber, BART's Outcomes: An Early Appraisal, p. 25. The Policy Analysis and WMATA Grant Divisions of UMTA provided a considerable amount of additional unpublished information. In general, the state and local share was estimated by assuming a one-third share until 1974 and one-fifth since then. (A number of different matching shares were in effect for the various components of the D.C. Metro and BART programs.) Note that the special Metro and BART categories do not include either Section 3 or Interstate Funds which were used for construction of these systems. The cumulative data were the most recent available in each category. The Section 3 and Interstate Transfer figures cover the period ending 6/30/77. The Section 5 capital grant figures are through 3/30/77. The Urban Systems figures are through 9/30/76. And the special

appropriations for the D.C. Metrorail system are through 9/30/77. At least some portion of the unmatched BART funds was assembled prior to 1965, but all other categories of aid relate to the totals since the 1965 Federal Fiscal year.

[3]Ibid.

[4]BART Passenger Profile Survey, Official Bay Area Guide, San Francisco, December 1975 cited in Hoachlander, Bay Area Rapid Transit: Who Pays and Who Benefits? University of California, Institute of Urban and Regional Development, Berkeley, Working Paper 267, July 1976.

[5]Hoachlander, p. 35; Melvin Webber, "The Failure of BART," Public Interest, Fall 1976, p. 79-108.

[6]The income categories of the 1970 NPTS survey, as reported in Table 2.1 above, were adjusted in a very approximate manner to render them comparable with 1975 data on BART rider incomes. Each category endpoint was inflated by 50% to account for the 50% growth in personal income since 1970. This adjustment is valid, of course, only if the relative income distribution of riders remained the same, which fragmentary evidence appears to confirm. (Tristate Planning Commission, "A Decade of Change . . ."). Even with the adjustment, however, the income categories are differently bracketted, so that further manipulation is required. If interpolation is used to readjust the BART distribution--in the simplest manner conceivable--to conform to the NPTS brackets, one obtains the following hypothetical distributions:

Income	Percent of BART Riders	Percent of Old Rapid Transit Riders
Under $4,500	8.4%	6.7%
$4,500- $8,999	17.3	19.8
$9,000-$14,999	25.8	30.2
$15,000-$22,499	23	21.1
$22,500 or more	25.4	21.1

[7]The BART system currently carries less than 3% of the national total, and the other new systems are being built on a considerably smaller scale. Pucher, "Losses in the American Transit Industry," Table 2-3-3.

[8]The figures in this table are based on Tables 4.2 and 2.1 and the adjusted BART distribution in Footnote 6 above.

[9]Transit Operating Report.

Chapter 5

[1]Calculated on the basis of Tables 3.5 and 4.3. The 2 lowest income categories in these tables have been disaggregated here to 3 to provide somewhat finer detail for assessing the impact of the subsidies at the lower end of the income spectrum.

[2]Budget of the U.S. Government, FY 1978, Appendix, p. 281; Melvin Webber, "BART Outcomes: An Early Appraisal," Monograph No. 26, Institute of Urban and Regional Development and Institute of Transportation Studies, University of California, Berkeley, October 1976. Additional, unpublished cost projections were obtained from Russ Scoville of the WMATA Grant Division of UMTA and the WMATA transportation planning department.

[3]Webber, "BART Outcomes"; Jack Faucett Associates, "A Study of Alternative Metrorail Systems"; Andrew Hamer, The Selling of Rail Rapid Transit, Lexington, Mass., Heath-Lexington, 1975.

[4]Hamer, Selling; Martin Wohl, "An Analysis and Evaluation of the Rapid Transit Extension to Cleveland's Airport," Urban Institute, Working Paper No. 704-43, Washington, D.C., January, 1972; Meyer, Kain, and Wohl, The Urban Transportation Problem, Cambridge, Harvard University Press, 1965, p. 171-306.

[5]Motor Vehicle Manufacturer's Association, Motor Vehicle Facts and Figures, 1977, p. 38.

Chapter 6

[1]The 83% figure was roughly calculated on the basis of the relative importance of the Interstate Transfer program, as reflected in Table 4.1.

[2]These aggregate figures are based on funding statistics obtained from transportation agencies in each of the 26 largest U.S. metropolitan areas. Funding statistics for each of these individual cities can be found in Pucher, "Transit Financing," Table 3-1.

[3]Ibid.

[4]Ibid.

[5]UMTA, "Transit Operating Performance," p. 10.

[6]Calculated on the basis of Table 3-2 in Pucher, "Transit Operating Subsidies"; Tables B.1 and B.2. in Appendix B; Crowell, "Financing Mass Transit in New York City," Council on the Environment of New York City, New York, October 1975, pp. 36-56; and Musgrave and Musgrave, Public Finance in Theory and Practice, McGraw-Hill, New York, 1972, p. 366.

Chapter 7

[1]Richard Musgrave, Karl Case, and Herman Leonard, "The Distribution of Fiscal Burdens and Benefits," Public Finance Quarterly, July 1974; a summary of this study appears in Richard Musgrave and Peggy Musgrave, Public Finance in Theory and Practice, New York, McGraw Hill, 1973, p. 365-377.

[2]Musgrave and Musgrave, Public Finance, p. 367.

[3]Musgrave and Musgrave, Public Finance, p. 368.

[4]Musgrave and Musgrave, Public Finance, p. 370.

[5]See text for a description of how this table was constructed.

[6]Pucher, "Transit Subsidies," Table 3-2.

Chapter 8

[1]Based on Table 5.1 and Table 7.3.

[2]Based on calculations made from NPTS computer tape by the author.

[3]See Table 2.6.

[4]Federal Highway Administration, Nationwide Personal Transportation Study, Report No. 8, p. 65.

[5]See Figure 3.4.

[6]See Tables 3.1 and 6.3.

[7]Urban Mass Transportation Administration, "Cuyulative Capital Grants by Mode and Urbanized Area, 2-1-65 Through 9-30-76," unpublished report.

Chapter 9

[1]Pucher, "Income Characteristics," Table 1-2.

[2]Transit Fact Book, p. 22, 23; Figure 4.1 above; and discussions with officials in the Policy Analysis Division of UMTA.

[3]"Transcript of the President's Address on Inflation," New York Times, April 12, 1978, p. 34, col. 2.

[4]Unpublished memorandum from Ralph E. Rechel of the Institute for Public Administration to Bruce McDowell of the Advisory Commission on Intergovernmental Relations and Kenneth Cook of the Transportation Research Board, September 25, 1977.

[5]See Figures 3.3 above.

[6]Meyer, et al., Urban Transportation Problem, esp. Ch. 8-11; Webber, "The BART Experience"; Homer, The Selling of Rail Rapid Transit.

[7]The estimate of 1/2 is based on the current use of capital subsidies and the fact that recent expenditures for vehicle replacement and right-of-way maintenance are abnormally high due to decades of neglect.

[8]Pucher, "Transit Operating Losses," Tables 2-2-1 through 2-2-8.

[9]Meyer and Gomez-Ibanez, "Productivity Growth and Labor Relations in Mass Transit."

[10]Pucher and Rothenberg, "Pricing in Urban Transportation: A Survey of Empirical Evidence on the Elasticity of Travel Demand," MIT Center for Transportation Studies, September, 1976, p. 61.

[11]Pucher and Rothenberg, p. 48-49.

APPENDIX A: MEASURING THE UTILITY IMPACTS OF TRANSIT SUBSIDIES

Measuring utility impacts primarily involves estimating the relevant demand curve and then, on the basis of this curve, calculating consumer surplus as the area under the demand curve less the product of the price actually charged and the quantity purchased.

In the case of transit subsidies, one would proceed in the following manner: First, it would be necessary to determine the actual impacts of transit subsidies in terms of fare reductions or service improvements. For reasons discussed in Chapter 1, it was not possible to decompose the impacts of subsidization comprehensively on a nationwide basis. If such decomposition had been possible, however, the next step would have been to examine the demand for travel.

A demand equation for each mode of transit would be estimated for each income group. Further disaggregation, moreover, would be required to account for the substantial differences in the nature of demand and quality of service at different times of day and on different portions of the system (for example, inner-city vs. suburban). At a minimum, this would involve the estimation of about 30 different equations. Each of these equations, of course, would have to incorporate the effect on demand of fares, service levels (dependability, speed, frequency, comfort, safety--especially from crime) and all other factors that might significantly affect the level of transit use (for example, the level and relative concentration of employment and residence, the quality and extent of the urban highway network, the level of auto ownership, the effective price of auto use--including

insurance costs, parking charges, fuel costs, and roadway tolls). Given this set of estimated equations and the precise fare and service changes that are attributable to subsidization, one could calculate the consumer surpluses that have accrued to each income group as a result of the subsidies.

Of course, data are not available for such an ideal estimation. Nevertheless, at least one study has attempted to use crude elasticity estimates to calculate the aggregate consumer surplus of fare changes in New York City.[1] Average fare elasticities of -.31 for bus use and -.16 for subway use were calculated on the basis of monthly ridership, fare, service, and demographic data from 1950 to 1974. Using these average elasticity figures, very simplifed demand curves for bus and subway use were extrapolated from current base fare and ridership levels.*

On the basis of the estimated demand equations, it was calculcated that in 1975, with fares at 35¢, the total consumer surplus accruing to transit riders in New York was $1.4 billion. The consumer surplus per subway trip was $1.09, almost twice the surplus of a bus trip ($.56). It was projected that increasing fares from 35¢ to 75¢ would have reduced consumer surplus by $430 million but would have increased total fare revenues by $370 million. Conversely, reducing fares to 25¢ would have increased consumer surplus by $150 million and would have reduced revenues by $125 million. Thus, the changes in consumer surplus arising from the hypothetical fare alterations were estimated to be only slightly greater than the corresponding changes in fare revenues.**

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*Transit use was estimated as a function of fare only, assuming that other explanatory variables remained unchanged.

**The consumer surplus associated with any given fare level is approximated by the total area under the demand curve up to the level of ridership at that fare (i.e. the total utility derived from that level of transit use)

Unfortunately, there are a number of theoretical and measurement problems associated with these consumer surplus estimates that detract from their accuracy and usefulness. These limitations are especially significant for the distributional analysis of the present study. First, an average elasticity figure is used although it is quite likely that the actual fare elasticity would vary at different price levels, particularly for substantial fare changes. Second, the consumer surplus calculations assume that the income effect of fare changes is zero--that is, that the change in effective purchasing power resulting from the fare change is insignificant relative to a household's total budget. Clearly, this is not a reasonable assumption for low-income households that depend heavily on mass transit. Finally, the study calculates an aggregate consumer surplus for all income classes; the benefit impact is not decomposed by income class. To do so, a separate demand function must be estimated for each class.

Even assuming that fully disaggregate demand functions could be estimated for each income class, the consumer surplus estimates made on the basis of these functions would not be comparable unless the marginal utility of income across income groups were equal. In fact, society implicitly deems a dollar of income received by a poor household to produce greater utility or benefit than the same dollar received by an affluent household. This presumably is the justification for welfare programs and progressive taxation. The only way out of this morass is to assign arbitrary weights to the consumer surplus figures of different

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less an area equal to fare revenues. The change in consumer surplus attributable to a fare change, therefore, equals the difference in areas under the demand curve arising from different ridership at different prices, less the difference in fare revenues.

income groups. But then, the calculated overall distributional impacts of the program would be the result almost entirely of the arbitrarily chosen weights. In short, aside from the practical problems of measurement, consumer surplus analysis is of almost no use at all in determining the distribution of transit subsidy benefits.

NOTES TO APPENDIX A

[1]William Crowell, An Analysis of Transit Finance and Pricing Options, unpublished Ph.D. dissertation, New York University, 1977, esp. p. 39-51.

APPENDIX B: TAX REVENUE COMPOSITION FOR SELECTED STATE AND LOCAL GOVERNMENTS

Table B.1. Tax Revenue Sources for Local Governments in Selected Metropolitan Areas (Percent of Total Tax Revenue, Excluding Governmental Transfers)[1]

City	% Property Tax	City	% Property Tax
New York	50	Minneapolis-St. Paul	96
Boston	99	Kansas City	78
Philadelphia	69	Atlanta	88
Baltimore	70	Miami	80
Washington, D.C.	54	New Orleans	48
Buffalo	82	Houston	87
Cleveland	82	Dallas	86
Detroit	89	Denver	77
Chicago	87	San Diego	88
Milwaukee	99	Los Angeles	87
Pittsburgh	78	San Francisco	86
Cincinnati	75	Portland	95
St. Louis	76	Seattle	82

Table B.2 Tax Revenue Sources for Selected States (Percent of Total Tax Revenue, Excluding Intergovernmental Transfers)[2]

State	Type of Tax		
	Sales	Personal Income	Property
New York	41	36	0
Massachusetts	38	41	0
New Jersey	67	1	4
Connecticut	70	6	0
Pennsylvania	51	19	0
Maryland	47	36	3
Virginia	39	18	28
District of Columbia	33	30	31
Ohio	69	5	3
Michigan	51	24	3
Illinois	59	25	0
Wisconsin	43	30	5
Minnesota	44	36	0
Missouri	57	24	0
Georgia	67	20	0
Florida	76	0	4
Louisiana	50	10	3
Texas	70	0	2
Colorado	54	29	0
California	50	27	4
Oregon	24	49	0
Washington	79	0	11

NOTES TO APPENDIX B

[1]Calculated on the basis of data in the 1972 Census of Governments, Local Government in Metropolitan Areas, Vol. 5, Table 12, p. 263.

[2]Calculated on the basis of data in the 1972 Census of Governments, Census of Governments, Government Finances, Vol. 4, No. 5, Table 46, p. 122.

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