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# Equity In Urban Transportation

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## FINAL REPORT

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UNIVERSITY RESEARCH

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16. Abstract What follows is the eighth chapter of a book by Alan Altshuler, with James Womack and John Pucher, entitled <u>The Urban Transportation System: Politics and Policy Innovation</u> (Cambridge: M.I.T. Press, 1979).  This chapter, authored by Pucher and Altshuler, examines the various aspects of the equity issue in urban transportation, an issue which has become increasingly controversial in recent years. A number of data sets are analyzed to determine the extent to which poor, elderly, or handicapped persons suffer from substandard levels of mobility. The authors then assess the cost-effectiveness and political feasibility of a range of alternative policy measures designed to increase the mobility of these disadvantaged groups.  The overall study of which this report is a part was financed by the Office of University Research, Research and Special Programs Administration. The central aim of this study is to provide a broad framework for evaluating proposed change strategies, here labeled "policy innovations," during the years immediately ahead.					
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## METRIC CONVERSION FACTORS

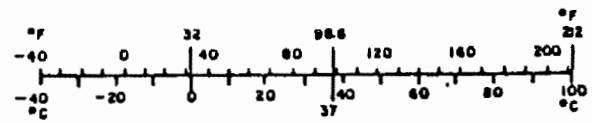
### Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
<b>LENGTH</b>				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
<b>AREA</b>				
in <sup>2</sup>	square inches	6.5	square centimeters	cm <sup>2</sup>
ft <sup>2</sup>	square feet	0.09	square meters	m <sup>2</sup>
yd <sup>2</sup>	square yards	0.8	square meters	m <sup>2</sup>
mi <sup>2</sup>	square miles	2.6	square kilometers	km <sup>2</sup>
	acres	0.4	hectares	ha
<b>MASS (weight)</b>				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
<b>VOLUME</b>				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.96	liters	l
gal	gallons	3.8	liters	l
ft <sup>3</sup>	cubic feet	0.03	cubic meters	m <sup>3</sup>
yd <sup>3</sup>	cubic yards	0.76	cubic meters	m <sup>3</sup>
<b>TEMPERATURE (exact)</b>				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

\* 1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price \$2.25, SO Catalog No. C13.10.286.

### Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
<b>LENGTH</b>				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
<b>AREA</b>				
cm <sup>2</sup>	square centimeters	0.16	square inches	in <sup>2</sup>
m <sup>2</sup>	square meters	1.2	square yards	yd <sup>2</sup>
km <sup>2</sup>	square kilometers	0.4	square miles	mi <sup>2</sup>
ha	hectares (10,000 m <sup>2</sup> )	2.5	acres	
<b>MASS (weight)</b>				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
<b>VOLUME</b>				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m <sup>3</sup>	cubic meters	35	cubic feet	ft <sup>3</sup>
m <sup>3</sup>	cubic meters	1.3	cubic yards	yd <sup>3</sup>
<b>TEMPERATURE (exact)</b>				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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## EXECUTIVE SUMMARY

What follows is the eighth chapter of a book by Alan Altshuler, with James Womack and John Pucher, entitled The Urban Transportation System: Politics and Policy Innovation (Cambridge: M.I.T. Press, 1979). This chapter, authored by Pucher and Altshuler, examines the various aspects of the equity issue in urban transportation, an issue which has become increasingly controversial in recent years. A number of data sets are analyzed to determine the extent to which poor, elderly, or handicapped persons suffer from substandard levels of mobility. The authors then assess the cost-effectiveness and political feasibility of a range of alternative policy measures designed to increase the mobility of these disadvantaged groups.

The overall study of which this report is a part was financed primarily by the University Research Program, Research and Special Programs Administration, U. S. Department of Transportation, (Contract DOT-OS-50240). The central aim of this study is to provide a broad framework for evaluating proposed change strategies, here labeled "policy innovations," during the years immediately ahead. It is organized in three parts. Part I (3 chapters) reviews the political history of urban transportation policy evolution since World War II, and concludes with an effort to delineate the attributes of potential (apart from their likely cost-effectiveness if implemented) that tend to bear most significantly on their political acceptability. Part II (7 chapters) examines the main substantive problems, actual and alleged, associated with the American system of urban transportation, and seeks to appraise (insofar as available evidence permits) the cost-effectiveness of eight broad types of policy innovation as instruments for their amelioration. These eight include: highway capacity expansion, fixed route transit service expansion, demand responsive transit, private ride-sharing, traffic management techniques giving preference to high occupancy vehicles, business regulatory measures concerned with product performance characteristics (such as automobile fuel economy), regulatory measures aimed directly at consumers

(e.g., seat belt use laws), and price disincentives intended to bring about reductions in motor vehicle travel and/or gasoline consumption. Part III (one chapter) ventures summary appraisals of these policy innovative options with reference to the full range of considerations explored in the preceding chapters.

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## Nature of the Problem

The auto-dominant system of urban transportation has provided unprecedented levels of mobility for those able to take full advantage of it. A larger and larger proportion of the American people, moreover, are able to do so. From 1950 to 1975, the proportion of American households owning at least one car rose from 52 percent to 83 percent; the proportion of multiple-car households rose from 7 percent to 33 percent; and from 1950 to 1975 the percentage of adult Americans licensed to drive increased from 43 percent to 83 percent.[1]

For those without ready access to automobiles, however, the trend has been far less favorable. The majority shift from transit to motor vehicle travel has compelled sharp curtailments of transit service. From 1950 to 1970, vehicle miles of transit service nationally declined by 37 percent.<sup>1</sup>[2] During the same period, urbanized area population grew by 71 percent, and urbanized land area increased by 176 percent.<sup>2</sup> In consequence, there was a 77 percent decline in the density of transit service over two decades, from 236 transit vehicle miles per square mile of urbanized area in 1950 to only 54 in 1970. Moreover, the nation's older, denser central cities, the places with the most fully developed transit services, have generally experienced both population and employment declines since 1950. All but one of the ten U.S. cities with the greatest transit ridership lost population between 1950 and 1973; several declined by as much as one-fifth.[5] Urban population growth was concentrated almost entirely in suburbs and in the newer central cities of the South and West that were characterized by low-density suburban life-styles.<sup>3</sup>

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Chris Hendrickson provided research assistance in preparation of this report.

<sup>1</sup> This trend has been reversed since 1970. From 1970 to 1976, transit vehicle mileage increased by 7.6 percent.[3]

<sup>2</sup> Urbanized area population increased from 69.2 to 118.4 million. Urbanized land area increased from 12,733 square miles to 35,981.[4]

<sup>3</sup> Thus, among the twenty largest U.S. cities in 1973, those that had grown fastest since 1950 were Phoenix (495 percent increase from 1950 to 1973), San Diego (127 percent), Houston (121 percent), Dallas (88 percent), and Los Angeles (which grew by the largest absolute amount--770,000 people--but by only 39 percent).

Mobility is most usefully conceived in terms of the ease with which desired destinations can be reached. In the typical American city of 1850, almost all destinations were within walking distance for the average able-bodied adult. For example, the radius of settlement was only about two miles in Boston, then the fourth largest U.S. city. By 1900, electrified streetcars and commuter railroads had extended the outer boundaries of settlement by at least eight additional miles.[6] Though some urban workers lived as far as ten miles from the core, suburban development was almost entirely residential and was tightly clustered around rail stations and streetcar lines. Those insufficiently affluent to live in the suburbs had little reason to go there. It was still quite feasible--indeed the norm for all but the affluent--to make the vast majority of personal trips on foot. By contrast, those without ready access to automobiles today find themselves cut off from numerous destinations to which they may urgently desire access.

Most campaigns for improved equity in modern America focus on alleged failures to improve the relative circumstances of disadvantaged groups at sufficiently rapid rates. It is unusual to come across a situation in which the circumstances of the disadvantaged have deteriorated absolutely over a sustained period of time. For many Americans without cars and/or driver's licenses, however, the absolute level of mobility has fallen sharply over the past several decades. Given the dramatic mobility improvements experienced by most Americans in this same period, it follows that the relative deprivation of those left behind has worsened acutely.

### Concepts of Equity

An equitable arrangement may be understood as one that is just and fair. In modern America, where justice and fairness tend to be defined with reference to equality--of rights, opportunities, and claims to public service if not of income, employment, and status--perceptions of inequity generally focus on degrees of inequality. In evaluating calls for government action on equity grounds, however, public officials consider much more than the simple degree to which inequality is present. Most notably, they weigh: the significance of the item with

reference to which inequality exists (access to medical facilities, for instance, by comparison with access to national parks); the extent to which the claimants are "deserving" of public assistance (the elderly, for example, versus those disabled by alcoholism); the degree to which they constitute a well-organized, intensely committed bloc of voters (veterans, for example, by comparison with welfare recipients); the risk that a favorable response would antagonize other groups; and the extent to which such a response would open the floodgates to massive new expenditure requirements.

Not surprisingly, they tend to respond most generously to groups that are well-organized, single-minded, widely viewed as deserving, and small. The preeminent such group in American society is veterans with severe service-connected disabilities. Thus the Veterans Administration stands ready to pay the full cost of any vehicle modifications that disabled veterans require in order to drive, and indeed to do so repeatedly as they buy new cars throughout their lives. The cost per car modified for quadriplegic veterans may run at times as high as \$25,000.

Three main concepts of equity uneasily coexist and compete for priority within the field of urban transportation: ✓

1. Fee for service: to each according to his or her financial contribution.
2. Equality in service distribution: to each an equal share of public expenditure or an equal level of public service, regardless of need or financial contribution.
3. Distribution according to need: to each a share of public expenditure or service based on need as government has chosen to define it, preferably with the revenues drawn (by progressive taxation) predominantly from those in least financial need.

The first of these concepts is central to the private market system. It permeates a wide variety of government programs as well, but the trend of recent decades has been for government to act with increasing consistency to offset inequalities arising in the marketplace. Thus

most government programs enacted since 1960 involve distribution in accord with equity concepts 2 and/or 3, and numerous older programs have also undergone adaptation in their distributional patterns to render them less sharply at odds with the ideologies of egalitarianism.[8]

Local governments still derive 15 to 20 percent of their revenues from user charges.[9] Until the 1960s the predominant view in this country was that mass transit should be financed entirely on the basis of user charges, and even today the contrary view remains controversial in some metropolitan areas with little dependence on transit and a conservative bent.

The fee-for-service concept continues to predominate in government highway programs, though there are numerous cross-subsidies within the highway revenue-expenditure system. Light vehicle users subsidize heavy-vehicle, off-peak users subsidize peak users, users of older streets and highways subsidize users of expensive new urban expressways, and so on.[10] Though efforts to measure these cross-subsidies are inevitably controversial (because joint costs constitute an estimated 85 percent of total costs), some of them appear to be sizable. An Urban Institute study for the U.S. Department of Transportation has recently concluded, for example, that autos and light-weight trucks together bore 98 percent of the highway user tax burden for joint costs during the two decades 1956-1975, although they accounted for only 91 percent of vehicle mileage and 80 percent of ton mileage.<sup>4</sup> If common costs are distributed according to vehicle mileage, the implicit cross-subsidy to heavier vehicles was \$18 billion; if they are distributed according to ton-mileage, the cross-subsidy was \$46 billion.[13] Similarly, rural highway users enjoyed subsidies adding up to \$67.5 billion more in user taxes than they

<sup>4</sup> User tax payments by heavy and medium vehicles were, however, sufficient to cover fully the incremental costs occasioned by their special characteristics. The Urban Institute study estimates that such "occasioned" expenditures amounted to \$62.1 billion, whereas user payments from heavy and medium vehicles totaled \$68 billion.[12]

received in highway construction outlays.[14] Combined federal and state subsidies to rural highways users during these two decades were about five-fold those to urban mass transit users.<sup>5</sup>

These refer only to the direct flow of user tax payments and government expenditures. Additionally there has been a great deal of controversy in recent years about the indirect costs of the highway system. These include the health effects of air, noise, and water pollution attributable to motor vehicle travel, the disruption of neighborhoods and ecological resources by highway construction, and the value (over and above their market prices) of nonrenewable resources such as oil and prime agricultural land consumed for highway transportation purposes.

The distributional impacts of the highway finance system have also come in for increasing criticism. Lower-income groups are somewhat less likely to own cars than higher-income groups, and lower-income households with cars drive fewer miles per year. Thus they tend to contribute less in absolute terms to highway trust fund coffers than higher-income households. At the same time, they contribute more in relative terms--and the latter is central to the contemporary economic definition of tax regressivity.

Suggestions for reforming the system of highway finance may be classified as falling within the fee-for-service ideological framework or the distribution-according-to-need framework. Critics in the former group desire to perfect the system of user charges so that cross-subsidization will be reduced and external costs internalized. That is, they would like peak-hour users to pay more and off-peak users less; they would like the social costs of air pollution to be reflected in highway user charges; and so on. There are severe methodological obstacles to achieving a high degree of precision in the user charge system, but these have been far overshadowed by the political. While the alleged victims of the current system have displayed little concern, each proposal for change has evoked intense resistance from those fearing that it would harm them.

<sup>5</sup> Federal and state transit expenditures in this period totaled about \$14 billion.[15]

Critics in the egalitarian tradition are primarily oriented toward making the highway finance system more progressive. Their predominant objective in recent years has been to secure allocations of highway revenues for transit purposes, but they have also opposed increases in gasoline taxes (on the ground that revenue needs should be met with more progressive taxes), and they have argued that any gasoline tax increases should be offset by full cash rebates to low-income households.<sup>6</sup>

In the transit field, public debate has focused primarily on the distribution of benefits rather than costs, because public revenues for transit subsidization have been drawn from general funds that are typically fed by a wide variety of tax sources. Until the 1970s, most critics of transit distribution were content to argue that service within each metropolitan area should be distributed equally to sectors of like market potential-- and, in particular, that low-income sectors should obtain their "fair share" of service. In recent years, however, they have increasingly pressed for service distribution according to need, focusing specifically on the mobility deficits of the physically handicapped, the elderly, and the poor.

#### Establishing the Extent of Deprivation

The mere fact that a group averages fewer trips per capita than the national norm by no means provides adequate evidence that its members suffer from mobility deprivation. Older and handicapped people, for example, may be more sedentary in their life-styles and less inclined than

<sup>6</sup> Thus, when the House of Representatives voted down a proposed five-percent increase in the gas tax as part of President Carter's energy bill in August 1977, the opposition consisted of Republicans, rural Democrats, and spokesmen for the poor. (The specific proposal that came to a vote differed substantially from that originally recommended by the President. Whereas he had recommended that the revenues be rebated to the public, the proposal voted on would have allocated half for mass transit and half for highway maintenance.) Congressman Ronald V. Dellums (Democrat of California), in leading that portion of the opposition concerned primarily about the poor, emphasized that any gas tax increase would entail great hardship for low-income workers needing to commute by automobile.[16]



average to make trips even under conditions of equal travel opportunity. Both groups, moreover, have low rates of labor force participation and thus of trip making for work-related purposes.

If measurement of travel behavior alone provides an inadequate test, one may adopt the view that individuals are deprived if they are unable to make some of the trips that they would like. Travel desire not currently realized in behavior is generally termed latent travel demand. While undeniably of central importance, however, the concept of latent travel demand is extremely difficult to operationalize. Desire is largely a function of opportunity, and it adapts to altered opportunities over time. Even if one seeks merely a snapshot of desire at one moment in time, the problem is how to obtain it. Asked by a pollster what trips they would like to make, some people will engage in flights of fancy, others will propose to emulate their more fortunate neighbors, and still others will respond in terms of their most basic needs. One can probe their implicit criteria (at substantial expense) with batteries of follow-up questions, but the result is to eliminate only part of the uncertainty. In fact, thorough studies based on such direct evidence of perceived deprivation are almost entirely lacking.[17]

A third approach is to equate low utilization of social services with transportation deficiencies.[18] The 1971 White House Conference on Aging, for example, concluded that inadequate transportation was a major cause of poor service utilization.[19] In fact, however, there is negligible evidence on this point, and some of that which is available runs counter to the thesis. For example, in the only survey dealing with this question, fewer than 5 percent of the elderly reported that they had ever foregone medical treatment due to lack of transportation.[20]

A fourth and extremely attractive approach, if adequate data were available, would be to analyze the results of experiments in which selected members of allegedly deprived groups had been afforded dramatically improved mobility opportunities--for example, taxi vouchers or new demand-responsive transit systems with low fares. While new services and subsidies have been provided to numerous groups in a wide

variety of settings over the past dozen years, however, rigorous studies of their effects on personal travel behavior are almost entirely lacking.[21]

Finally, one may focus on the ease with which selected groups can utilize existing public transportation services. This approach, most notably as applied to the design of fixed-route transit systems, has been central to the claims of elderly and handicapped spokesmen in recent years, and it has been incorporated into numerous pieces of federal legislation. If relatively consensual and easy to operationalize, however, this final approach begs all the key questions. What is their overall degree to which those affected currently experience mobility deprivation? How relevant are fixed-route services, even if fully accessible, to alleviation of their mobility deficits? And how might alternative means of assisting them compare with design modifications of fixed-route transit systems in cost-effectiveness?

We shall return to these questions below. Let us now turn, however, to a review of available data on the current travel patterns of handicapped, elderly, and low income urban residents.

#### Mobility Problems of the Physically Handicapped

The most compelling claims for special mobility assistance are those made on behalf of the physically handicapped. There are major uncertainties, however, even about the number of Americans with mobility-related handicaps, let alone the severity of their mobility deprivation and the most cost-effective means of aiding them.

The Transportation Systems Center (TSC) of the U.S. Department of Transportation has estimated on the basis of national survey data that, as of 1970, 13.4 million individuals, 7 percent of the U.S. population, were handicapped in ways that rendered them "unable to use conventional transit or to use it only with difficulty." Of these 53 percent were also elderly. Presumably a good many were also poor, though data were not presented on this point.

Of the total handicapped group, 11 percent (1.4 million) were institutionalized and/or suffered from "acute" conditions; 17 percent (2.3 million) suffered from visual or hearing rather than motor impair-

ments; and 6 percent (0.8 million) were confined to wheelchairs or walkers. The remaining two-thirds (8.8 million) were categorized under two very broad headings: "uses special aids" and "other mobility limitations." [22]

The National Center for Health Statistics (NCHS) of the Department of Health, Education and Welfare has estimated, on the other hand, that as of 1972, the number of individuals with "chronic mobility limitations" was 6.9 million--or roughly half the number judged by TSC to be handicapped in ways that impaired their ability to use mass transit.<sup>7</sup> NCHS found that 58 percent of those with chronic mobility limitations were elderly. Of the total group, 39 percent (2.7 million) were institutionalized or confined to their homes. These included roughly half the elderly handicapped and one-quarter of the nonelderly handicapped. Another 25 percent (1.7 million) utilized special aids or required help from another person in getting around. The remaining 36 percent (2.5 million) simply reported that they had "trouble getting around alone." [23]

The best study available on the trip-making patterns of physically handicapped people was conducted by Abt Associates in Greater Boston during 1968. [24] It may have been atypical with reference to national conditions, however, because the Boston area is characterized by relatively high density and extensive transit service. Moreover the sample consisted only of persons who were in fact active (rather than confined to institutions or their homes). The Abt respondents made only about one-half as many trips per capita as the general population. Of the trips they did make, 60 percent were by automobile and half of these were made as auto drivers; 24 percent were made by public transportation; and 14 percent were made by taxi. The most striking difference between the handicapped and the general population was in use of the taxi mode. The handicapped relied on taxicabs more than eight times as heavily (13.7 percent of all trips versus 1.6 percent), and made

<sup>7</sup> The most important difference between the NCHS and TSC data bases was that NCHS asked whether respondents had trouble getting around, whereas TSC asked about objective (though very broadly defined) physical conditions and then made its own estimates of which were likely to impair mobility.

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four times as many taxi trips per capita in absolute terms. Transit, on the other hand, accounted for virtually the same proportion of trips among the active handicapped as among the general population (24.6 percent versus 24.4 percent). (See table 1.) Those who said that they rarely or never used transit were asked why not. The principal reasons cited were structural obstacles and fear for safety. In contrast, the main reason cited by those who rarely or never traveled by taxi was cost.

The handicapped made only about one-third as many trips for commutation purposes as the general population, whereas they made almost two-thirds as many nonwork trips.[25] To some extent their lower labor force participation rate may have been transportation related. But one-third were elderly, and many of the others were doubtless kept from working by other than mobility factors. The Census Bureau has estimated that 11.2 million nonelderly individuals were handicapped with respect to employment in 1970, nearly four times the number that NCHS estimated to suffer from chronic mobility limitations.[26]

#### Mobility Problems of the Elderly

Ten percent of Americans in 1970 were over the age of sixty-five. According to the Nationwide Personal Transportation Study (NPTS), 66 percent of households with elderly members had automobiles available as of 1970, by comparison with 83 percent of all households, and 43 percent of the elderly were licensed to drive, by comparison with 74 percent of the general population sixteen years of age and older.[27] Of all trips made by the elderly, 94 percent were made by motor vehicle, just one percentage point below the national average for persons sixteen and older.

Overall trip making by the elderly was much less frequent than for other adults, however. Whereas the average American over the age of sixteen made 849 trips a year, the elderly averaged only 377 trips, less than half as many. (See table 2.) A fairly steady decline in trip making appears to set in after about the age of fifty. Those aged fifty to sixty-four in 1970 made about three-quarters as many trips as those

Table 1 Distribution of Trips by Mode, Greater Boston, 1970  
(Excluding Walking)

<u>Mode</u>	<u>Percentage of Total Trips</u>	
	<u>Handicapped</u>	<u>General Population</u>
Auto Driver	30.5%	46.0%
Auto Passenger	29.9%	19.6%
Taxi	13.6%	1.6%
Specialized Taxi	1.0%	--
Bus	14.5%	13.1%
Subway	9.1%	10.1%
Train	0.6%	1.2%
School bus and truck	1.9%	8.4%
Total Daily Trips Per Capita (All Modes)	1.13	2.23

Source: Abt Associates, "Transportation Needs of the Handicapped: Travel Barriers, Cambridge, Massachusetts" (NTIS, PB-187-327 1969), 80-90.

thirty to forty-nine; those aged sixty-five to sixty-nine made about three-fifths as many trips as those fifty to sixty-four; those seventy and over made about two-thirds as many trips as those sixty-five to sixty-nine (and fewer than one-third as many trips as those thirty to forty-nine).[28]

Nationwide the elderly rely more heavily on transit and taxi travel than the general population does, but they do not account for a disproportionate share of transit and taxi patronage. Indeed they make fewer transit trips per capita than the national average. Their rate of taxi usage is just about average. (See table 3 and 4.)

The falloff in travel with age seems attributable mainly to two factors: retirement from the labor force and deteriorating health. The latter is extremely resistant to measurement in the middle ranges, but it is clear at the extreme that numerous older persons are simply unable to travel. Nearly two million people over the age of sixty-five reported chronic disabilities in 1972 that confined them to their homes or to institutions.[29] This was roughly one-tenth of the elderly population, and it excluded those laid up at the time of the survey with non-chronic disabilities.

J.K. Markovitz has reported in detail on trip-making patterns of the elderly (disaggregated by income) in New York metropolitan region as of 1963. Her data base was the Tri-State Home Interview Travel Survey conducted in that year. The tri-state elderly respondents averaged only 44 percent as many trips per capita as the total population. They made 76 percent as many noncommutation trips, however. Noncommutation trip making increased sharply as household income passed \$3,000 a year, but only negligibly as it rose further. Even in the higher-income categories, total trip making among the elderly barely exceeded half that of the general population on a per capita basis.[30]

Elderly households were significantly smaller than the regional average (1.95 persons per household versus 3.09). Thus at any given household income level, elderly per-capita income was 58 percent higher. Yet elderly households in the over \$10,000 income category

Table 2 Trips Per Capita and by Mode for Persons 65 and Over,  
Compared with All Persons 16 and Over, U.S., 1970

Mode	Percentage of All Trips		Annual Trips per Capita	
	Persons 65 & Over	All Per- sons 16 & Over	Persons 65 & Over	All Per- sons 16 & Over
Auto Driver	53.4	62.6	201	531
Auto Passenger	35.9	25.7	135	218
Motorcycle	-	.2	-	2
Truck (Driver or Passenger)	4.2	6.0	16	51
Subtotal - Private Vehicle	93.5	94.5	352	802
Transit Bus	4.3	2.8	16	24
Rapid Transit	.5	.9	2	8
Commuter Rail	.1	.2	-	2
School Bus	.6	1.2	2	10
Taxi	.6	.3	2	2
Subtotal - Public Transportation	6.1	5.4	22	46
Other (airplanes, etc.)	.4	.1	1	1
Total	100.0	100.0	375	849

Source: Federal Highway Administration, Nationwide Personal Transportation Study, report 6, "Characteristics of Licensed Drivers," (Washington, 1973), pp. 12-14, and FHWA, NPTS, report 9, "Modes of Transportation and Personal Characteristics of Tripmakers," (Washington, 1973), p. 31.

Table 3 Comparison of Transit Use by Age Groups, U.S., 1970

Age Group	Group as % of U.S. Population	Percent of Age Group's Trips by Mode			Percent of Modal Trips by Age Group*			Percent of All Trips by Age Group	Annual Trips Per Capita by Age Group
		Bus	Rapid Transit	Total Transit	Bus	Rapid Transit	Total Transit		
5-65	81.8	2.7	.7	3.4	92.0	96.0	92.8	94.8	830
> 65	9.8	4.3	.5	4.8	8.0	4.0	7.2	5.2	377
					100.0	100.0	100.0	100.0	

Source: Federal Highway Administration, NPTS report 6, "Characteristics of Licensed Drivers," p.31.

\*NPTS did not count trips by children under the age of five. Thus transit patronage percentages have been adjusted as if all transit riders were five years of age or older.



made only about as many trips per capita as the regional average for households in the \$3,000-\$6,000 income range.

By far the most significant indicator of mobility among the tri-state elderly was possession of a driver's license. Drivers made four times as many trips as nondrivers. They even made about as many trips by mass transit as nondrivers, and drivers with household incomes over \$10,000 made 44 percent more transit trips per capita than the average for nondrivers.<sup>8</sup> The four-to-one ratio of total trip making by drivers held even in the over \$10,000 income category. Moreover the elderly drivers in this affluent income group made twice as many "taxi and other" trips as the non-drivers.[32]

These data suggest that a high proportion of the nondrivers were simply not in the market for significant amounts of travel. Without knowing how many were wholly or largely in this category, it is impossible even to begin to estimate the amount of deprivation that may have been felt by the nondrivers who did wish to travel more.

#### Mobility Problems of the Poor

There is no consensual definition of poverty, and it is in any event a matter of degree. Thus we shall speak mainly of relationships between income and mobility rather than of poverty per se. References to poor or low-income households without further qualification, however, shall denote those with incomes below \$5,000 in 1970 or below \$7,500 in 1975. Personal income per capita rose by about one-half (51.2 percent) between 1970 and 1975, so these are roughly equivalent figures.[33]

<sup>8</sup> In aggregate, the elderly made exactly the same proportion of their trips by transit as the general population (33 percent). Because of their lower absolute rates of trip making, however, the elderly made only 44 percent as many transit trips per capita as the general population.[31]

Table 4 Proportion of Taxi Trips Made by Population Age Groups

<u>Age Group</u>	<u>Percent of All Trips Made by Taxi</u>	<u>Total Personal Trips (millions)</u>	<u>Total Taxi Trips (millions)</u>	<u>Percent of Total Taxi Trips by Age Group</u>
5-13	.2	21,020	42	11
14-15	.2	5,271	11	3
16-20	.05	15,527	--	--
21-25	.3	14,652	44	11
26-29	.4	10,046	40	10
30-39	.3	23,905	72	18
40-49	.2	24,070	48	12
50-59	.3	16,685	50	13
60-64	.7	6,391	45	11
65-69	.8	3,236	26	7
70 and over	.4	4,263	17	4
Overall	.3	145,066	395	100

Source: Federal Highway Administration, Nationwide Personal Transportation Study, report 9, "Mode of Transportation and Personal Characteristics of Tripmakers," appendix C, table 1.

Note: In aggregate, 89.3 percent of the population was between the ages of 5 and 65 and made 89.1 percent taxi trips; 10.7 percent of the population was 65 or over and made 10.9 percent of taxi trips. NPTS did not count trips by children under the age of 5.

Inequalities over the human life cycle and on a per-capita basis tend to be much smaller than inequalities among households at any given moment, it should be emphasized. Young people and old people, for example, generally earn less than those in the prime of life. The young are buoyed by their high expectations, however; they tend to have low child care costs and medical expenses; and they frequently have unreported income in the form of gifts and scholarships. The elderly have negligible child care expenses; they benefit from Medicare and other government programs; they live in small households; and they frequently have substantial accumulated capital (some of which, like equity in their homes, directly reduces their need for income).[34]

Utilizing U.S. government definitions of poverty (changing over time, and varying with family size and region of the country), researchers at the University of Michigan have recently reported on the experience of poverty among 16,000 representative Americans during the nine-year period 1967-1976. They found that whereas 12 percent of the sample had a poverty-level income during 1975, under 3 percent were poor in every one of the nine survey years; these were predominantly members of households headed by persons with one or more of the following characteristics: over sixty-five, little formal education, black, female, disabled.[35]

Finally, some of those who appear to be poor on the basis of reported cash incomes have substantial unreported incomes, receive thousands of dollars worth of benefits in kind (ranging from food stamps to free medical care), or live in rural circumstances which permit them to grow much of their own food and cut their own wood fuel.

Unfortunately, no studies seeking to relate travel patterns to income have ever adjusted for such factors, even the most obvious such as household size and regional variations in the cost of living. Thus there is considerable disagreement about what to make of the data that are available. What does emerge clearly, however, is that trip making tends to increase as a function of both income and automobile ownership. Within the same income categories, members of households that own automobiles make two or three times as many trips as the members without

them. Within each category of automobile ownership (0-1-2-3 cars), there is a further tendency for trip making to increase with income, but it is significantly less pronounced.

Automobile ownership increases with income, so part of the increase in trip making associated with the former is reasonably attributed to the latter.<sup>9</sup> Equally striking, however, most households above the very lowest income levels do own automobiles and achieve rates of trip making at least four-fifths the national average. As of 1974, only 43 percent of households with incomes under \$3,000 owned cars, but 61 percent of those in the \$3,000-\$5,000 category and 76 percent of those in the \$5,000-7,500 category did so. (See table 5.)

Notably, about 3 percent of households in the over \$20,000 categories also had no cars. Applying this proportion to the total share of U.S. households without cars, one may reasonably estimate that about one-sixth of all carless households are so for reasons wholly unrelated to income. This approach also suggests, however, that income constraints account for 95 percent of carlessness among households with incomes below \$3,000, and for 92 percent of that among households in the \$3,000-5,000 income range.

Table 6 presents national data on household travel by automobile for all purposes, adjusted for both income and automobile ownership. As of 1970, households with incomes under \$3,000 averaged roughly one-third as many auto trips as the population generally and one-fourth the average for households with incomes over \$10,000. Such low-income households, if they did not own a car, averaged only one-sixth as many trips as the overall population. If they did own a car, however, they achieved a trip-making rate more than half the national average, and they made more trips than carless households with incomes over \$10,000. Households with incomes of \$3,000 to \$5,000 that owned a car achieved a trip-making rate four-fifths the national average, and those with incomes of \$4,000 to \$5,000 achieved a rate nine-tenths the national

<sup>9</sup> The other side of the coin is that rates of car ownership are highly correlated with the number of adults, and particularly with the number of employed adults, per household. Thus one may view both income and car ownership as attributable to demographic characteristics and employment.

Table 5 Automobile Ownership by Household Income, U.S., 1974

<u>Household Income</u>	<u>No Car</u>	<u>One or More Cars</u>	<u>One Car</u>	<u>Two Cars</u>	<u>Three or More Cars</u>	<u>One or More Light Trucks</u>	<u>One or More Motor Vehicles</u>
Under \$3,000	56.8%	43.2%	37.0%	5.5%	.7%	7.8%	46.2%
\$3,000-4,999	39.3	60.7	51.9	8.0	.8	11.0	64.2
\$5,000-7,499	24.0	76.0	60.4	13.6	2.0	14.3	79.4
\$7,500-9,999	15.0	85.0	61.9	20.9	2.2	16.8	88.3
\$10,000-14,999	8.3	91.7	54.9	32.4	4.4	22.2	93.9
\$15,000-19,999	4.5	95.5	45.4	42.3	7.8	22.7	96.7
\$20,000-24,999	3.1	96.9	36.8	46.9	13.2	19.2	97.4
\$25,000 and over	3.3	96.7	29.5	45.7	21.5	17.2	97.2

Source: U.S. Department of Commerce, Bureau of the Census, Consumer Buying Indicators, 1974 Survey of Purchases and Ownership, in Motor Vehicle Facts and Figures (1977), p. 38.

Table 6 Auto Travel Per Household by Income and Auto Ownership

Auto Ownership	Under \$3,000	\$3,000- 3,999	\$4,000- 4,999	\$5,000- 5,999	\$6,000- 7,499	\$7,500- 9,999	\$10,000- 14,999	Over \$15,000	All
Daily Person Trips									
None	1.1	2.2	2.2	2.4	2.9	3.2	2.8	3.3	1.7
One	3.5	4.8	5.8	5.3	6.5	7.3	7.0	6.1	5.9
Two	5.5	8.9	9.3	7.8	8.0	9.3	8.7	10.5	9.1
Three or more	NA	NA	12.0	12.3	10.6	12.8	12.1	13.0	12.4
Total	2.2	4.2	5.4	5.2	6.6	8.0	8.1	9.5	6.2
Daily Person Miles									
None	9.2	19.4	14.6	22.3	14.3	15.8	22.5	43.2	13.4
One	27.9	43.2	40.2	44.2	61.5	70.8	68.2	71.0	54.2
Two	64.9	82.8	93.3	79.5	68.3	102.2	98.1	113.0	96.6
Three or more	NA	NA	88.1	108.0	84.9	137.2	109.5	129.5	123.8
Total	17.8	34.0	41.3	46.6	55.8	81.0	84.2	102.9	60.6

Source: Federal Highway Administration, Nationwide Personal Transportation Study, report 11, "Auto Ownership," (Washington, 1973), table 26.

average.

As both low-income households and carless households consist disproportionately of those with few adult members, with heads over the age of sixty-five, and with heads who suffer from chronic mobility limitations, it seems reasonable to judge that a very large proportion of the low-income households are also in one or more of these other categories. We estimate, for example, that between one-quarter and two-fifths of carless households with incomes under \$5,000 were headed by persons over the age of sixty-five.<sup>10</sup>

Households without cars tend to live disproportionately in central cities and to be relatively well served by mass transit. In 1974, 29 percent of central city households lacked cars, by comparison with 12 percent of suburban households.[38] In 1970, 82 percent of all SMSA households with incomes under \$5,000 lived within six blocks of public transportation, by comparison with 58 percent of those with incomes over \$15,000. (See table 7.) Given the more central locations of the poor, moreover, it seems probable that their nearby transit routes were more numerous and operated more frequently than those easily accessible to more affluent urbanites. In practice, individuals from low-income households relied on transit for 14 percent of their trips, whereas those with incomes over \$7,500 used it for only 4 percent. Notably transit reliance did not decline as incomes increased beyond the \$7,500-10,000 range. Indeed households with incomes above \$15,000 relied on transit for 5.0 percent of their trips, by comparison with a 3.6 percent modal split for those in the \$10,000-15,000 range. (See table 8.)

<sup>10</sup> Roughly 15 percent of all U.S. households in 1970 were both in this income range and without cars.[36] About 9 percent of U.S. households were both headed by individuals over sixty-five and did not own a car.[37] Given that elderly-headed households are represented disproportionately among those with low incomes, and that on average the elderly without cars have considerably lower incomes than those who do own cars, it seems reasonable to assume that half to three-quarters of the elderly households without cars (comprising 4-6 percent of all U.S. households) also had incomes below \$5,000.

Table 7 Transit Accessibility by Income, 1970

Annual Household Income Group	Distance to Nearest Public Transportation (in Blocks)				
	Less than 1	1 - 2	3 - 6	Over Six	None Available
Under \$5,000	30.3%	34.5%	17.4%	9.2%	8.4%
\$5,000-9,999	20.9	33.2	18.3	15.5	11.7
\$10,000-14,999	15.5	29.3	18.3	20.6	16.3
Over \$15,000	13.3	23.7	20.6	25.5	15.9
All Households	21.3	30.8	18.6	16.6	12.4

Source: Adapted from Federal Highway Administration, Nationwide Personal Transportation Study, report 5, "Availability of Public Transportation and Shopping Characteristics at SMSA Households," (Washington, 1972), p. 11.



Table 8 Modal Distribution for Urban Travel by Income Class, 1970

Income Class	Mode						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 made by each income group accounted for by the indicated mode.

Source: John Pucher, "Equity in Transit Financing" (Ph.D. diss., MIT, 1978), p. 28. The distributions were calculated from a computer tape of the 1970 Nationwide Personal Transportation Study supplied by the Federal Highway Administration, U.S. Department of Transportation.

Table 9 The Composition of Each Urban Transportation Mode's Riders by Income Class (U.S. Aggregate, All Purposes, 1970)\*

Group	Income Class				All incomes
	Below \$5,000	\$5,000-\$9,999	\$10,000-\$14,999	\$15,000 or more	
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%	42.8%	21.2%	21.1%	100%
Commuter Rail Riders	0%	35.1%	39.6%	25.2%	100%
Taxi Passengers	28.5%	42.3%	16.0%	13.3%	100%
Public Transportation Users (Total, All Modes)	27.6%	37.1%	18.0%	17.7%	100%

\*The first line displays the percentage of all U.S. households in each income group. Other lines display the percentage of the total riders of each mode accounted for by each income group.

Source: Pucher, "Equity in Transit Financing," p. 24. The figures on 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 NPTS by the FHWA and reported in Jose Gomez-Ibanez, "Federal Assistance for Urban Mass Transportation" (Ph.D. diss., John F. Kennedy School of Government, 1975), p. 210. The remaining statistics in the table were calculated by John Pucher from a NPTS computer tape supplied by the Federal Highway Administration. Local trips were defined as those of fifty miles or less. Overnight trips and school bus trips were excluded regardless of length.

Although low-income travelers were much more dependent on mass transit than other groups, they also traveled much less frequently. In consequence, households with incomes under \$5,000, which constituted 28 percent of all U.S. households, accounted for only 29 percent of transit patronage.

Although the aggregate income profile of transit users was almost identical to that of the general population, this was far from the case on a mode-by-mode basis. Low-income households accounted for 34 percent of bus and streetcar ridership, 15 percent of rail rapid transit ridership, and zero percent of commuter rail ridership.

Since low-income households made fewer trips in aggregate than others, the income profile of all travelers was considerably above average. By comparison with the income profile of all travelers, that of rapid transit riders was just about average, that of bus riders was dramatically below average, and that of commuter rail riders remained far above average. (See table 9.)

The figures come into particularly sharp focus as one considers the proportion of all trips in each category made by each mode. Low-income households made 12.2 percent of all their trips by bus or streetcar, whereas those with incomes over \$7,500 made 2.6 percent of their trips by this mode. Low-income households made 1.5 percent of their trips by rapid transit, exceeding the 1 percent level that prevailed in the middle-income categories but about equal to that in the over \$15,000 category. Low-income households made vanishingly few trips by commuter rail (0.0 percent with rounding), while those with incomes over \$10,000 made 0.3 percent of their trips by this mode. (See table 8.) Low-income households relied on automobiles for 85 percent of all trips, by comparison with a 95 percent automobile modal split for those with incomes above \$15,000. They were more likely to travel as passengers (44 percent of auto trips versus 36 percent), but the difference was considerably less than might have been anticipated. (See table 8.)

The distinctions were considerably sharper for commutation trips only. Fifty-four percent of low-income employees traveled to work by

automobile, nearly two-fifths of them (20 percent) as passengers. By comparison 75 percent of those with incomes over \$15,000 commuted by automobile, approximately one-fifth (16 percent) as passengers.[39]

Surprisingly the very poor--those with incomes under \$3,000--relied on taxis for five times as high a proportion of their trips as the general population (1.6 percent versus 0.3 percent). Moreover travelers from households with incomes under \$5,000 accounted for 29 percent of taxi usage. Only bus and streetcar riders had a lower income profile than taxi riders. (See table 9.)

#### Transport Deprivation as a Cause of Poverty

The idea that transport deprivation is a major cause of unemployment, and thus of poverty, enjoyed a brief vogue in the late 1960s. The McCone Commission on the Watts riots expressed the thesis most clearly: "Our investigation has brought into clear focus the fact that the inadequate and costly public transportation currently existing throughout the Los Angeles area seriously restricts the residents of the disadvantaged areas such as south central Los Angeles. The lack of adequate transportation handicaps them in seeking and holding jobs, attending schools, and fulfilling other needs." [40] There seemed reason to believe that the commission's diagnosis might have wide applicability. Many of the nation's central cities were declining absolutely as employment centers. Those that were not tended to be the newer cities of the South and West, characterized by low density, extreme automobile dominance, and minimal transit service.<sup>11</sup> In short, the vast majority of urban

<sup>11</sup> Between 1960 and 1970, the central cities of the nation's thirty-three largest metropolitan areas (all those with 1970 populations exceeding one million) declined overall by 2 percent. Those in the Northeast declined by 10 percent and those in the North Central region declined by 11 percent. By contrast, those in the South grew by 14 percent and those in the West by 12 percent.[41]

employment growth, whether central city or suburban, was at locations served poorly or not at all by mass transportation. It appeared, further, that blacks were particularly disadvantaged by the flight of employment from central locations, because discrimination tended to keep them confined to central residential locations.

During the several years following the McCone Commission report, the federal government sponsored fifteen demonstration projects intended to assist low-income (especially minority) urban residents to obtain employment at suburban locations. Eighty-three new transit routes were established, mainly on corridors between central city ghettos and very large suburban employment centers (or corridors).[42] Several attracted substantial patronage, but the vast majority did not.

The most striking successes were in Chicago and Los Angeles. The Chicago service was an express bus route from the end of a rapid transit line to O'Hare International Airport, where about 19,000 people were employed. The line, which provided the only transit link between the airport and downtown Chicago, was also of potential benefit to air travelers. As it turned out, the air travel market was essential to the success of the service. Seventy percent of the 1,100 daily passengers on the line were noncommuters. Of the commuters, 40 percent said that they had been hired subsequent to commencement of the service, and two-thirds of these claimed that they were dependent on the service for their jobs. In the year following the survey, however, half of this group stopped using the service. It was unknown what proportion of the lost riders had shifted to automobiles, as opposed to changing jobs.[43]

The Los Angeles experience was varied, but one route in particular (along Century Boulevard) attracted considerable patronage. It connected Watts with a large General Motors plant at one end of the line and with Los Angeles International Airport at the other, as well as numerous other employment sites at points along the way. The line attracted over 3,000 passengers a day, was estimated to have helped 1,200 people find jobs during the three-year project life, and was retained as a regular transit route at the end of the demonstration.[44]

More typical, however, were the experiences in Boston, East Los Angeles, and Sacramento. The Boston service was designed to assist ghetto residents in seeking employment and commuting to jobs around circumferential Route 128, which had been a magnet for Boston area employment growth since its completion in the early 1950s. Accompanied by an intense publicity campaign, the service was offered for six months. Patronage was meager, and the operating deficit was \$3.72 per trip. Only 42 responses were obtained to the customer survey, of which twelve indicated that the respondents would have to seek other employment if the service were discontinued.[45] The East Los Angeles service sought to connect its low-income population with the City of Commerce, an industrial enclave. In its second year, the service had a patronage of 130 per day and entailed an estimated operating subsidy per passenger of \$1.45. Fares covered only 10 percent of total cost.[46] The Sacramento project sought to connect two low-income neighborhoods with a variety of human service facilities, shopping centers, colleges, and (via transfers) all of the employment locations served by other routes in the system. After two years, the line carried 600 passengers a day but less than one per bus mile.[47]

By 1970, the Urban Mass Transportation Administration (UMTA) had lost interest in funding special employment services for the poor. There seemed little more to demonstrate and UMTA had no authority to provide routine operating subsidies. A shift in national mood with reference to poverty issues was also occurring at this time, symbolized by the election of President Nixon. Primarily, however, UMTA's loss of interest seems to have been attributable to its sense that these demonstrations had produced only meager benefits. They may have helped several thousand people obtain jobs, but it was uncertain that the beneficiaries would have been unable to find jobs in the absence of the projects. A typical pattern, moreover, was that riders who used the special transit services to obtain jobs used some of their first earnings to purchase cars. Thus rider turnover tended to be high.

Labor market economists never attached much credence to the thesis that poor transit service was a significant cause of ghetto unemployment. At the height of UMTA's interest in special employment services (1968), the American Academy of Arts and Sciences sponsored a conference on poverty and transportation, the proceedings of which remain the single most important source on the subject. The task of reviewing available evidence on the causes of high ghetto unemployment fell to economist Peter Doeringer. He barely mentioned transportation. Instead he maintained that the primary causes were lack of education and training, poor and often disruptive work habits, deficiencies in labor market information, and employer unwillingness to hire low-productivity workers at wage rates prevailing for other employees.[48]

Bennett Harrison has noted more recently that the central cities, while losing both population and jobs in the postwar period, have been losing the former more rapidly. Thus although employment growth has been predominantly suburban, central city ratios of jobs to population have actually been rising. Like Doeringer, Harrison concludes that lack of job accessibility does not appear to be a significant cause of high ghetto unemployment.[49]

Finally, large numbers of inner-city poor people currently work at suburban locations. Most probably got to their original job interviews, if they did not already own a car, by borrowing one or obtaining a lift. The others probably took taxis or utilized the poor transit connections that were available. Once employed, presumably, the vast majority purchased cars or joined carpools. The serious policy question is how much, and at what expense, public policy can substantially improve upon this pattern.

#### Transit Subsidies/Who Benefits?

The beneficiaries of government transit expenditures include many others in addition to transit patrons. To the extent, for example, that transit services facilitate the achievement of desired land-use patterns or reduced fuel demand and vehicle emissions, benefits are diffused widely among the general population. To the extent that they improve the

relative accessibility of core areas, they enable downtown real estate owners and businesses to reap more concentrated benefits in the forms of higher rents and more sales. And to the extent that subsidies enable transit agencies to spend money they would not otherwise have, they entail direct financial transfers to transit employees and suppliers.

Between 1970 and 1976, as transit subsidies increased seven-fold, the average real (inflation-adjusted) wages of transit workers rose at three times the average rate for the U.S. economy as a whole (13 versus 4 percent).[50] Including fringe benefits, the average U.S. transit worker earned \$18,934 in 1976.[51] The recent gains of transit employees have been achieved, moreover, in the face of declining consumer demand for their output and of declining productivity on their own part. Passengers carried per employee fell by 18 percent from 1970 to 1976, and vehicle miles of service per employee declined by 9 percent.[52] By contrast, labor productivity in the rest of the urban economy rose by an estimated 10 percent over the same period.[53] Transit labor unions, fully cognizant of the benefits their members derive from public transit subsidization, have been among the most vigorous advocates of increased spending for this purpose.

Because the main nonrider beneficiaries of transit subsidies have substantially higher incomes on average than do riders, the overall distribution of transit subsidy benefits is less favorable to the poor than the distribution among riders alone. Available data permit quantification only of the latter distribution however, and thus we shall focus on it in the following discussion.

If all transit trips were equally subsidized, low-income households would receive approximately average shares of transit expenditure benefits. In practice, however, they do considerably less well. There is a sharp inverse correlation between the level of subsidy per trip received by each transit mode and the degree of its usage by low-income people. As table 10 indicates, average per trip subsidies (nationwide) in 1975 were: bus and streetcar \$0.21; rapid transit, \$0.36; and commuter rail, \$1.11. Low-income travelers utilized buses and streetcars for 89 percent of their transit trips, rapid transit for 11 percent, and



commuter rail for 0 percent. The comparable distribution for households with incomes above \$22,500 was: bus and streetcar, 62 percent; rapid transit, 32 percent; and commuter rail, 6 percent. (See table 8.) Overall, if one assumes that all trips within each transit category were equally subsidized, low-income households received transit subsidy benefits about one-sixth lower than the average for all households. Accounting for 28.4 percent of all urban households (and for 27.6 percent of transit trips), they received 23.5 percent of transit operating subsidy benefits. Households in the next higher income category (\$7,500-15,000) were the principal gainers. Accounting for 30.9 percent of all urban households, they received 38.9 percent of the operating subsidy. (See table 11.)

Insofar as trips within each mode were subsidized unequally, the net effects seem likely to have been to the disadvantage of the poor. Similarly recent trends in the expansion of fixed-route transit service appear likely to reduce the share of subsidy benefits received by low-income households. Specifically:

- With few exceptions, American transit systems charge flat fares or variable fares that fail to cover the full additional cost of longer trips (bearing in mind both the additional vehicle mileage required to serve them and the reduced load factors at the outer ends of routes). Because distance from the core tends to be associated with higher income in American urban areas, it has been widely hypothesized that the benefit of this practice accrues primarily to higher-income groups.

- Most recent transit service expansion appears to have been designed to serve peak-period travelers between CBDs and low-density residential neighborhoods developed since 1945 at considerable distances from the core. New services of this type tend to be regressive in their subsidy impact--as both CBD commuters and the residents of fringe areas tend to have above-average incomes. Peak-period service expansion tends more generally toward regressivity because transit usage by low-income people (who have relatively low rates of labor force participation and high rates of transit utilization for nonwork trips) is much less concentrated in peak periods than that of other groups.

Table 10 U.S. Aggregate Transit Operating Statistics by Mode, 1973-1975  
(In Thousands, Except for Ratios and Fares)

	MODE								
	bus and streetcar			subway and elevated			commuter rail		
	1973	1974	1975	1973	1974	1975	1973	1974	1975
Operating Expense (\$)*	1,698,749	2,290,461	2,621,004	837,390	948,912	1,084,892	413,161	495,350	571,256
Operating Revenue (\$)	1,283,532	1,437,899	1,510,910	514,108	501,801	491,460	250,364	262,584	283,389
Operating Deficit (\$)	415,217	852,562	1,110,094	323,282	447,111	593,432	162,797	232,766	287,867
Operating Revenue/ Operating Expense	.76	.63	.58	.61	.53	.45	.61	.53	.50
Total Passengers	4,946,000	5,209,000	5,269,000	1,714,000	1,726,000	1,668,000	238,766	254,417	260,476
Operating Expense per Passenger (\$)	.34	.44	.50	.49	.55	.65	1.73	1.95	2.20
Average Fare (\$)	.26	.28	.29	.30	.29	.29	1.05	1.05	1.09
Operating Deficit per Passenger (\$)	.08	.16	.21	.19	.26	.36	.68	.92	1.11

\*Includes taxes, excludes depreciation

Source: Pucher, "Equity in Transit Financing" table 3.1, p. 40. The bus and streetcar figures were derived from APTA, Transit Fact Book (1976), pp. 28, 32. Trolley coaches are included in this category. The statistics for commuter rail and rapid transit were collected by Pucher from individual transit agencies in the twenty-six largest U.S. metropolitan areas. APTA's rapid transit passenger statistics, which differed by about 10 percent from those collected by Pucher, were used in the table to achieve comparability with the bus figures.

Table 11 The Distribution of Transit Operating Subsidies Among Income Classes, 1975

Type of Subsidy	Income Classes				Total, All Income Classes**
	Below \$5,000 <sup>a</sup>	\$5,000-\$9,999 <sup>a</sup>	\$10,000-\$14,999 <sup>a</sup>	\$15,000 or more <sup>a</sup>	
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	326,467	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 that 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.

Source: Pucher, "Equity in Transit Financing," p. 49. The distributions were calculated on the basis of the deficit data of table 10 and the income data of table 9.

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

Only fragmentary evidence bearing on these propositions is available, but on the whole it strongly supports them.

- A recent study of alternatives for the Washington Metro rapid transit system estimated that, at 1976 costs and currently projected fares, completion of the forty-one mile core of the system would entail an operating deficit of \$0.13 per passenger trip. The next twenty-seven miles of planned expansion would entail, for each additional passenger attracted, a deficit of \$0.73 per trip, and the remaining thirty miles of the planned system would entail a deficit per trip of \$1.23.<sup>12</sup>

- A May 1975 survey revealed that whereas households with incomes under \$7,000 comprised 33 percent of the population of the San Francisco BART district in 1970, they accounted for only 17 percent of BART ridership. By contrast, households with incomes above \$15,000 accounted for 25 percent of population but 48 percent of ridership.[55]

- From 1972 to 1975 transit vehicle mileage increased nationwide by 13.3 percent. Total patronage rose in this period by only 5.8 percent. [56] While it by no means follows necessarily that the new vehicle mileage entailed longer trips and lower load factors than the old (perhaps patronage was dropping on old and new lines alike), most observers believe that this was in fact at least one significant cause of the load factor decline.

- As of 1970, the average employed person in U.S. metropolitan areas enjoyed an earned income of \$7,557. Employees who lived in suburbs and worked in CBDs, however, had average incomes nearly two-fifths higher. And suburban commuters to CBDs by transit enjoyed even higher

<sup>12</sup> The ninety-eight mile system was the plan officially adopted by Congress in 1969. The three stages were defined by the study team rather than in the plan itself. Its method was to identify three plausible ways to round out the system (which had originally been projected as more than self-supporting with reference to operations). Overall, though by no means in every specific route mile, each successive stage involved substantial increases in distance from the CBD. The capital costs of the system per incremental trip served were also expected to rise sharply with each successive stage (and to be borne entirely by the taxpayers).[54]

earnings than those who commuted by automobile: \$10,589 versus \$10,432. (See table 12.)

• Low-income households account for a much higher proportion of off-peak than rush-period transit patronage. As of 1970, low-income households accounted for 25 percent of peak-period bus patronage but for 41 percent of off-peak patronage; they accounted for 9 percent of peak-period rapid transit patronage and for 23 percent of off-peak patronage. At the other end of the spectrum, households with incomes above \$15,000 accounted for 16 percent of peak-period bus patronage and 9 percent of off-peak patronage; and they accounted for 26 percent of peak versus 15 percent of off-peak rapid transit patronage.[57]

Let us turn now to the distribution of capital subsidy benefits.

From the commencement of the federal transit program through fiscal year 1977, capital grants totaled \$9.2 billion. State and local governments contributed an additional \$4.0 billion, bringing the grand total to \$13.2 billion. (See table 13.) The total includes \$2.0 billion in special grants for the Washington, D.C. Metro system, appropriated by Congress separately from the national program of mass transit assistance).

Seventy-six percent of the cumulative total was earmarked for rail rapid transit and commuter rail improvements. (In 1975 the proportion was 68 percent. See table 14.) Because rail rapid transit and commuter rail account for only about one-quarter of aggregate transit patronage (table 10), and because the income profiles of their riders are considerably higher than those of bus and streetcar patrons (table 9), the resulting distribution of capital subsidy expenditures has been even less favorable to the poor than the distribution of operating subsidies. It is more difficult, however, to apportion capital subsidies among income groups than it is to apportion operating subsidies. Whereas the benefits of operating expenditures are realized during the year of subsidization, capital investments yield their benefits over many years; thus the relevant income distribution for capital subsidy assignment is that of future rather than current users.

The incomes of future transit riders cannot, of course, be forecast with an certainty. It seems most likely, however, that the

Table 12 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

Principal Mode Used on Journey-to-Work	All Workers Who Live in SMSAs	Workers Who Live inside CC and				Workers Who Live outside CC and			
		Work inside CC		Work in SMSA outside CC	Work outside SMSA of Residence <sup>a</sup>	Work inside CC		Work in SMSA outside CC	Work outside SMSA of Residence <sup>a</sup>
		in CBD	Elsewhere			In CBD	Elsewhere		
All Modes (\$) <sup>b</sup>	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

Source: Adapted from Jose Gomez-Ibanez, "Federal Assistance for Urban Mass Transit," p. 218. Gomez-Ibanez based his calculations on 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.

Note: CC=Central City; CBD=central business district.

<sup>a</sup> 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, Stamford, or Norwalk SMSAs and work outside their SMSA of residence work in the New York City SMSA.

<sup>b</sup> Other modes besides private automobiles and mass transport include taxi, walking, and work at home.

Table 13 Transit Capital Commitments by Mode, Cumulative from 1965 to 1977 (in Millions of Dollars)

	Federal	State and Local <sup>a</sup>	Total
<u>Rapid transit<sup>b</sup></u>			
Section 3	3,378.7	975.3	
Section 5	.7	.2	
Urban systems	69.9	17.5	
Interstate transfer	922.0	230.5	
Special D.C. Metro program	1,231.0	804.5	
Local BART funds (prior to federal match)	0	976.0 <sup>c</sup>	
Total rapid transit	5,602.3	3,004.0	8,606.3 (65.3%)
<u>Commuter rail</u>			
Section 3	1,017.3	288.5	
Urban systems	11.9	3.0	
Interstate transfers	116.0	29.0	
Total commuter rail	1,145.2	320.5	1,465.7 (11.1%)
<u>Bus<sup>d</sup></u>			
Section 3	2,332.5	641.2	
Section 5	79.8	20.0	
Urban systems	33.9	8.5	
Total bus	2,446.2	669.7	3,115.9 (23.6%)
<u>Total, all modes<sup>e</sup></u>	9,193.7	3,994.2	13,187.9 (100%)

Source: John Pucher, "Equity in Transit Financing," p. 58. Calculated from: Urban Mass Transportation Administration, "Cumulative Capital Grants by Fiscal Year and Category, 2/1/65 through 9/30/77" (Washington, 1977); UMTA, "Multi-mode Capital Grant Commitments to Urbanized Areas, 2/1/65 through 9/30/77" (Washington, 1977); UMTA, "Transit Operating Performance and the Impact of the Section 5 Program" (Washington, 1977), p. 25. The Policy Analysis and Washington Metrorail Grant divisions of UMTA provided a considerable amount of additional, unpublished information.

a. In general, the state and local amounts were estimated by assuming a one-third share until 1974 and one-fifth since then. Different matching shares were in effect for the special Washington Metrorail program and the pre-1964 BART program.

b. Includes light-rail lines.

c. Some of the unmatched BART funds were assembled prior to 1965.

d. Includes trolley coaches but not light rail lines

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

relative incomes of bus and commuter rail patrons will remain about constant, because capital investments in these modes have focused mainly on the modernization of existing services. Approximately half of the rapid transit subsidy, on the other hand, has been devoted to the construction of new systems or lines, intended primarily to serve CBD employees who live in suburban or central city fringe areas. There has been considerable speculation that the patrons of these services will have higher incomes than the riders of older rapid transit systems.

Notwithstanding these complications, we have sought to apportion the benefits of 1975 capital subsidy expenditures by income class. In doing so we have utilized the income profiles of current riders, except that we have apportioned half of the rapid transit subsidy in accord with the income profile of BART riders in recognition of the portion of capital subsidy expenditures that has been utilized for the construction of new rapid transit lines. (We were suprised to discover that BART carries a greater proportion of low-income patrons than the older systems and that its overall ridership income profile differs only slightly from theirs.)<sup>13</sup>

<sup>13</sup> Survey data are available on 1975 BART rider incomes. We have estimated the income distribution of riders on older systems by adjusting the 1970 NPTS findings to account for personal income growth between 1970 and 1975.[58] The ridership income profiles are as follows:

Income Class	Percentage of BART Riders	Riders on Older Rapid Transit Systems
Less than \$7,500	19.4	14.9
\$7,500-\$14,999	32.1	42.8
\$15,000-\$22,499	23.0	21.2
\$22,500 and over	25.4	21.1



Table 14 Transit Capital Grants by Mode, Federal Fiscal Year 1975  
(in Millions of Dollars)

	Federal	State and Local <sup>a</sup>	Total
<u>Rapid transit<sup>b</sup></u>			
Section 3	532.6	133.2	
Urban systems	10.0	2.5	
Interstate transfers	65.7	16.4	
Special D. C. Metro program <sup>c</sup>	126.9	106.3	
Total rapid transit	735.2	258.4	993.6 (57.3%)
<u>Commuter rail</u>			
Section 3	147.6	36.9	
Interstate transfers	0	0	
Total commuter rail	147.6	36.9	184.5 (10.6%)
<u>Bus<sup>d</sup></u>			
Section 3	430.3	107.6	
Section 5	9.1	2.3	
Urban systems	5.7	1.4	
Total	445.1	111.3	556.4 (32.1%)
<u>Total, all modes<sup>e</sup></u>	1,327.9	406.6	1,734.5 (100%)

Source: John Pucher, "Equity in Transit Financing," p. 58. Calculated from: Urban Mass Transportation Administration, "Cumulative Capital Grants by Fiscal Year and Category, 2/1/65 through 9/30/77" (Washington, 1977); UMTA, "Multi-mode Capital Grant Commitments to Urbanized Areas, 2/1/65 through 9/30/77" (Washington, 1977); UMTA, "Transit Operating Performance and the Impact of the Section 5 Program" (Washington, 1977), p. 25. The Policy Analysis and Washington Metrorail Grant divisions of UMTA provided a considerable amount of additional, unpublished information.

a. Except for the Metrorail program, state and local amounts were estimated by assuming a one-fifth share, as provided by the Urban Mass Transportation Act of 1964 as amended.

b. Includes light-rail lines.

c. The special Metro category is in addition to section 3 and interstate transfer funds used for construction of this system.

d. Includes trolley coaches but not light rail lines.

e. This total does not include capital subsidies to ferries, personal rapid transit (Morgantown, W. Va.), inclines, or cable cars.

Table 15 presents our estimated distribution. Low-income households (those with incomes below \$7,500) obtained average benefits smaller than those received by any other income group and about one-fourth less than the nationwide average. Households in the \$7,500-15,000 category, on the other hand, received the greatest average subsidy, about one-fifth higher than the nationwide average.

A different pattern may be emerging in the face of rapidly rising transit costs and growing public resistance to increases in transit expenditure levels. UMTA's policy since about 1973 has been that new rapid transit systems must be developed in gradual stages. Whereas BART and the D.C. Metro were authorized from the start as large regional systems (71 and 98 miles respectively in length), recent UMTA approvals have been for much more modest first stages. The projected Atlanta, Baltimore, Miami, and Buffalo first-stage systems, for example, entail 14, 8, 21, and 6 route miles, respectively. (A \$600 million commitment has also been made toward rapid transit in Detroit, but the precise system configuration has not been established.) Moreover, in a move to discourage the choice of high-cost heavy rail systems, UMTA has permitted the option of "trading down" on the committed heavy-rail funds for the construction of downtown shuttle systems and light-rail rapid transit instead.[59] The other key current pressure is to ensure that ghetto areas, conspicuously neglected in the initial planning of BART and Metro, receive substantial benefits. It bears mention, finally, that whereas suburban commuters to CBDs enjoy well above average earnings, central city residents employed in CBDs do not. Those commuting by transit, in particular, reported average earnings in 1970 15 percent lower than the average for all metropolitan workers and 40 percent lower than the average for transit commuters from suburbs to CBDs. (See table 12.)

In short, the distributive impact of transit capital expenditures must be determined with respect to the precise mix of investments undertaken. Whereas BART and Metro provide the poor with less than average benefits per household, some of the first-stage systems currently

Table 15 The Distribution of Transit Capital Subsidies among Income Classes, 1975

Type of Subsidy	Below \$7,500 <sup>a</sup>	\$7,500-\$14,999 <sup>a</sup>	\$15,000-\$22,499 <sup>a</sup>	\$25,000 or More <sup>a</sup>	All Incomes <sup>b</sup>
Bus and streetcar (\$000) <sup>c</sup>	189,700	210,300	91,200	64,500	566,400
Rail rapid transit (\$000) <sup>c</sup>	170,402	367,135	219,089	231,012	993,600
Commuter rail (\$000) <sup>c</sup>	0	64,760	73,062	46,494	184,500
Total capital subsidy, all transit modes (\$000)	360,102	642,195	383,351	342,006	1,744,500
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

Source: John Pucher, "Equity in Transit Financing," p. 63. The distributions were calculated on the basis of the capital grant data of table 14 and the income data of table 9 and footnote 13.

a. 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.

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

c. The amount of 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.

under design appear likely to provide low-income households with considerably greater benefits.<sup>14</sup> As most bus expenditures involve replacement and modernization rather than service expansion, it must be also assumed that low-income households, receive more than equal shares of the benefits associated with this portion of the capital program.

#### Transit Subsidies: Who Pays?

It is widely believed that local governments--afflicted with declining tax bases, regressive tax structures, and large numbers of dependent residents--bear most of the transit subsidy burden. In fact, however, local governments bear only about one-third of the overall transit tax burden, and their share has been rapidly declining in recent years. Our bases for this estimate are as follows:

1. We have examined in detail the sources of operating subsidy funds as of 1975 in the twenty-six largest U.S. metropolitan areas, which accounted for 73 percent of national transit patronage in that year and for 82 percent of the national operating deficit. Transit operating subsidies in these areas totaled \$1.69 billion in 1975, including \$0.85 billion (50 percent) raised locally. (See table 16.) The recent trend has been toward sharply increased participation by higher levels of government. Between 1973 and 1975, for example, while the overall operating deficit increased 90 percent, the local contribution rose by only 24 percent whereas the combined federal-state contribution grew by 267 percent.<sup>15</sup>[60]

<sup>14</sup> This does not deal with the question of whether these systems will represent cost-effective ways of assisting them or even of dealing with their most serious problems of mobility deprivation. Our concern in this section is simply to identify the broad distributional pattern with respect to whatever benefits are produced, at whatever cost.

<sup>15</sup> This statement refers to the twenty-three areas for which both 1973 and 1975 data could be obtained. Adequate 1973 data were unavailable from the District of Columbia, Denver, and San Francisco.

2. As a rough approximation, we have estimated that operating subsidies in the nation's remaining metropolitan areas totaled \$300 million and that these were financed similarly to those in the largest twenty-six.

3. We have estimated that transit capital obligations nationwide totaled \$1.73 billion in 1975. (See table 14. Because no comprehensive data were available on state-local expenditures, we have included only those required to match federal grants and assumed that these were split equally between the two levels of government. Additionally we have assumed that all three levels financed their respective capital subsidy contributions from the same sources utilized to finance operating subsidies.)

4. Combining these estimates, we find that transit obligations totaled \$3.72 billion in 1975, financed 46 percent by the federal government, (\$1.71 billion), 32 percent by localities (\$1.119 billion), 18 percent by states (\$0.67 billion), and 4 percent from other sources (\$0.15 billion).

We have not been able to estimate the precise distribution of the tax burden among income classes by metropolitan area because the same taxes may have considerably different distributional consequences, depending on their specific provisions and geographic coverage in given local settings. We have made nationwide tax incidence estimates, however, based on national studies of the distributional effects of each type of tax at each level of government. These indicate that the transit subsidy tax burden was roughly proportional in 1975 at household incomes of up to \$30,000 and significantly progressive above that level. Taxes for this purpose absorbed 0.36 percent of incomes up to \$15,000, 0.33 percent of incomes between \$15,000 and \$30,000, and 0.51 percent of incomes over \$30,000. (See table 17.) These figures indicate, of course, that high-income households paid much more than low-income households in absolute terms. For example, the average \$6,000 household paid about \$22 whereas the average \$40,000 household paid \$204.

Table 16 Sources of Transit Operating Subsidy Funds in the 26 Largest U.S. Metropolitan Areas, 1975\*

Level of Government/Type of Tax	Amount (thou- sands of dollars)	Percentage of total
Federal	\$280,222	16.6
State	435,142	25.7
Gasoline and motor vehicle taxes	12,776	
Unidentified excise taxes	62,647	
General Sales Taxes	209,018	
Business Taxes	12,776	
Individual Income Taxes	114,024	
Local (including regional)	848,151	50.1
Gasoline and Motor Vehicle Excise Taxes	30,349	
General Sales Taxes	328,148	
Business Taxes	45,322	
Individual Income Taxes	29,136	
Property Taxes	345,363	
Payroll Taxes	14,799	
Unidentified Non-Property Taxes	54,833	
Bridge and Tunnel Tolls	105,853	6.3
Utility Cross-subsidies	10,858	0.6
Freight Cross-subsidies	11,156	0.7
Total, All Sources	\$1,691,392	100.0

\*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. Significantly, the state-local figures do not include 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.

Source: Pucher, "Equity in Transit Financing," (Ph.D. dissertation, MIT, 1978). Figures on the composition of state and local government revenues were obtained from the 1972 Census of Governments, Government Finances, vol. 4, no. 5, talbe 46, p. 122, and from the 1972 Census of Governments, Local Government in Metropolitan Areas, vol. 5 table 12, p. 263. A detailed listing of transit subsidies in the twenty-six largest U.S. metropolitan areas disaggregated by type of tax and level of government can be found in Pucher, "Transit Operating Subsidies," MIT Center for Transportation Studies, 1976, table 2.

As indicated in table 18, low-income households receive lower average transit subsidies than those in any other income category. Their disadvantage on the benefit side of the ledger, however, is considerably more than offset by their advantage on the tax side. Because the data bases for the benefit and tax analyses utilize different income categories, we have been unable to calculate the overall dollar flows among income classes associated with transit subsidization. By assuming that households were typical of their income categories in both tables, however, we have been able to estimate approximate dollar flows per household at specific income levels. As reported in table 19, these calculations suggest that the overall effect of transit subsidization has been significantly redistributive in absolute terms, though only because the overall tax system is redistributive.

As a whole the, the transit finance system is redistributive but inefficiently so. Although the poor are more subsidized than taxed, they received less than average per-household shares of the total transit subsidy. The poor make only about one-seventh of their urban trips by transit, they comprise only about two-sevenths of all transit patrons, and they receive less than one-quarter of transit subsidy benefits. By contrast, numerous programs designed explicitly for redistributive purposes concentrate virtually all of their benefits on the poor and near poor. It follows that the current transit subsidy program cannot be justified solely, or even primarily, as an instrument of redistribution.

### Goals

Though advocacy groups call frequently for a national commitment to such goals as equal mobility for all Americans at a price that each can afford, Congress and most transportation analysts have taken a far more cautious approach to the determination of equity objectives.

Equity, like energy efficiency and clean air, has emerged as a significant objective of public policy in the field of urban transportation only since the mid-1960s. The federal highway program has never had improved mobility for the handicapped, elderly, and poor as a distinct policy objective, and its financing structure is still premised

Table 17 The Distribution of the Tax Burden for Transit Capital and Operating Subsidies, 1975 (Taxes as Percentages of Total Money Income)

Level of Government	Under \$8,000	\$8,000-\$14,999	\$15,000-\$29,999	\$30,000 and Over	All Incomes
<u>Operating Subsidies<sup>a</sup></u>					
Federal	0.028	0.034	0.036	0.077	0.038
State and local	0.190	0.164	0.131	0.131	0.162
Total, all levels	0.218	0.198	0.167	0.208	0.200
<u>Capital subsidies</u>					
Federal	0.098	0.119	0.125	0.268	0.132
State and local	0.048	0.041	0.033	0.033	0.041
Total, all levels	0.146	0.160	0.158	0.301	0.173
<u>Total transit subsidy</u>					
Federal	0.126	0.153	0.161	0.345	0.170
State and local	0.238	0.205	0.164	0.164	0.203
Total, all levels	0.364	0.358	0.325	0.509	0.373

Sources: Adapted from Pucher, "Equity in Transit Financing," p. 89. The operating subsidy distributions are based on the financing data of table 17 and unpublished estimates of nationwide tax burden incidence (on a money income basis) in 1968 provided by Karl Case of Wellesley College. These tax estimates were part of a larger study he undertook with Richard Musgrave and Herman Leonard; related results of this study appear in "The Distribution of Fiscal Burdens and Benefits," Public Finance Quarterly 2 (July 1974). The capital subsidy distributions were calculated on the basis of the capital grant data of table 14 and the same tax incidence distributions as for operating subsidies.

Note: The operating distributions were calculated by weighting the general tax incidence distributions by the percentage of the total operating subsidy derived from each tax at each level of government and by adjusting the distributions to reflect the percentage of total money income in the United States devoted to subsidizing transit operations in 1975. The corresponding capital subsidy distributions were obtained in approximately the same manner. Because data on capital subsidy financing were not available by specific tax type, the weighting of these distributions was according to level of government only, necessarily assuming that the specific mix of state and local taxes was the same as for operating subsidies. Due to the unavailability of more recent nationwide tax incidence estimates, it was also necessary to assume that the relative distribution of the tax burden did not change significantly from 1968 to 1975. Moreover the estimates are nationwide aggregates, which do not take into account the specific geographic coverage of state and local transit taxes. Finally, even as national estimates, the general tax distributions of Case, Musgrave, and Leonard, on which this table is based, depend crucially on a number of reasonable, although quite controversial, theoretical assumptions about the incidence of each type of tax.

a. The nationwide operating subsidy (\$1.99 billion) has been distributed in accord with the funding composition in the 26 largest metropolitan areas as reported in table 16.



Table 18 The Distribution of Operating and Capital Transit Subsidies among Income Classes, 1975 (Subsidy Amounts in Millions of Dollars)

Type of Subsidy	Below \$7,500 <sup>a</sup>	\$7,500-\$14,999 <sup>a</sup>	\$15,000-\$22,499 <sup>a</sup>	\$22,500 and More <sup>a</sup>	All Incomes <sup>b</sup>
Operating subsidy, total	467	775	421	327	1,991
Bus and streetcar	379	420	182	129	1,110
Rail rapid transit	88	254	125	125	593
Commuter rail	0	101	114	73	288
Capital subsidy, total	360	642	383	342	1,735
Bus and streetcar	190	210	91	65	556
Rail rapid transit	170	367	219	231	994
Commuter rail	0	65	73	46	185
Total transit subsidy	827	1,417	804	669	3,726
Bus and streetcar	569	630	273	194	1,666
Rail rapid transit	258	621	344	356	1,587
Commuter rail	0	166	187	119	473
Percentage distribution of total subsidy	22.2	38.0	21.6	18.0	100
Percentage distribution of all households	28.4	30.9	23.0	17.6	100
Average subsidy per household (\$)	65.43	99.08	70.58	71.68	78.15

Source: Tables 11 and 15.

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

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

mainly on the fee for service concept of equity. Similarly the federal transit program commenced in 1964 with no specific commitment to the transportation disadvantaged. It attracted some support on the ground that transit was the mode of the poor, but its active political constituents--transit operators and labor unions, downtown business interests, transit suppliers--were motivated by other objectives than improving the mobility of the poor. They believed that the main concern should be service expansion to the lower-density areas to which so many former transit patrons had moved. They viewed transit as a means of generating downtown revival. They were anxious to attract support from the auto-reliant majority by demonstrating that improved transit could reduce traffic congestion. They were much taken with the analogy of new rapid transit systems to the interstate highway system--both high-capacity new travel arteries imposed on preexisting patterns of urban development. They were attracted by the idea that modern, preferably automated, new systems might provide a means of offsetting spiraling labor costs. And, after all, the federal program was exclusively one of capital assistance (until November 1974). Thus it was only natural to focus on capital-intensive improvements. As it happened, though no one quite realized it at the time, there was a strong inverse correlation between degree of capital intensiveness and degree of benefit to the handicapped, elderly, and poor.

As reported previously, transit program administrators did give high priority in awarding demonstration grants during the late 1960s to projects designed to improve employment access to outlying areas by the central city poor. But the demonstration projects undertaken for this purpose absorbed less than 1.5 percent of transit program spending up to 1970 (and much less thereafter).<sup>16</sup> The special problems of the transportation-disadvantaged were probably given even less priority at the local level.

<sup>16</sup> George Hilton reports that the poverty demonstrations cost a total of \$10.2 million.[61]

Table 19 Sample Calculations of Per-Household Transit Subsidies, Net of Tax Costs, for Selected Income Levels, 1975

Household Income	Transit Subsidy per Household (\$)	Transit Tax per Household (\$)	Net Impact per Household (\$)
\$5,000	65	18	+47
\$12,000	99	42	+57
\$20,000	71	65	+6
\$35,000	72	178	-106

Source: Tables 17 and 18.

Note: The tables from which this table has been calculated report average experiences per household within fairly broad income categories. Considerable variations in average experience per household doubtless exist at various income levels within each category. Thus in developing this table, we have utilized income levels approximately in the mid-range of each category for which estimates are presented in tables 17 and 18.

Since about 1973, however, a new wave of concern for the transportation-disadvantaged has emerged--focused on the needs of elderly and handicapped people, mainly for noncommutation purposes, rather than on the commutation problems of the poor. The impact of this new concern has extended beyond the transit demonstration program to the capital grant program; Congress has mandated equal accessibility by the elderly and the handicapped as a key design objective for federally aided transit facilities. (As noted earlier, however, the reference is to the physical accessibility of the systems themselves rather than access by the elderly and handicapped to their most desired destinations.)

The Department of Health, Education and Welfare (HEW), moreover, has become a significant source of financial support for transportation of the disadvantaged to medical and social service centers. Though intended to assist with only one category of trip purpose, the HEW programs may potentially provide a core patronage base for services designed more generally to serve the elderly, handicapped, and poor.

In mandating these programs, Congress has explicitly or effectively adopted the following objectives with respect to the mobility of transportation-disadvantaged groups:

1. Handicapped people, including the elderly who suffer from physical enfeeblement, shall be provided mass transit service opportunities at least comparable to those available to other urban residents.
2. Eligible federal aid recipients shall be afforded all necessary assistance in securing access to federally supported medical and social services.
3. Some special efforts of a more general nature shall be made to facilitate the mobility of the elderly and handicapped.

Notably the poor receive mention in this set of objectives only with reference to the special problem of access to medical and social services.

The objective of comparable transit service opportunity may be met in principle either by designing conventional transit facilities to be fully accessible by those with physical disabilities or by providing alternative, demand-responsive services. The debate about which

approach is preferable has become particularly intense since Congress, in the 1973 Federal-Aid Highway Act, mandated that transit facilities built with highway program assistance be fully accessible to the elderly and handicapped.<sup>17</sup>[62]

Spokesmen for handicapped groups, led particularly by Vietnam War veterans who have not been handicapped all their lives and who are determined to resist all forms of segregation based on their disabilities, have pressed hard for full accessibility rather than alternative service. Critics of this position have argued that the full-accessibility strategy is characterized by extremely high cost per trip served and distinctly limited value to the elderly and handicapped. The costs are particularly high insofar as the objective is wheelchair accessibility, which entails elevators at rail stations, special lifts on buses, and substantial delays whenever a wheelchair passenger boards or alights from a bus. The value is limited by two considerations: most of the trips that elderly and handicapped people wish to make are served poorly or not at all by conventional transit; and even where the service is quite good, potential handicapped patrons are likely to be deterred by the problems of getting to it from their origins and from it to their ultimate destinations. At any given cost, in this view, it is possible to provide the elderly and the handicapped with substantially greater mobility benefits by subsidizing taxi service or providing demand-responsive transit service in specially modified small vehicles (vans and minibuses). Transit operators and UMTA officials concerned with this issue maintain that most of the elderly and handicapped themselves seem to prefer this alternative service approach even though the most vocal

<sup>17</sup> The Architectural Barrier Act of 1968 (PL 90-480) clearly set forth the policy that all public facilities constructed with federal funds should be available to the handicapped. Since 1973, Congress has been firm in extending this policy to new fixed-rail systems. The debate has now shifted to the advisability of requiring that older rapid transit systems and all new transit vehicles be fully accessible.

spokesmen for handicapped interests reject it.<sup>18</sup>

The commitment to ensure access to medical and social services appears in numerous HEW statutes. For example, the Medicaid program requires that each state have a Medicaid plan, which must include provision for ensuring "necessary transportation of recipients to and from providers of (medical) services."<sup>[63]</sup> The eligible forms of transportation range from ambulance and taxi to private automobile and transit common carrier. The only requirement is that the mode be appropriate in each case. Similarly the Rehabilitation Act of 1973 provides that no handicapped person can be excluded from participation in any program receiving federal financial assistance.<sup>[64]</sup> Other HEW programs lack such ringing guarantees but do provide funding for transportation services. For example, the Older Americans Act, as amended in 1973, authorizes expenditures for "transportation services where necessary to facilitate access to social services." Similarly the Social Service Amendments of 1974, which consolidated numerous federal grant programs for state-administered social services, included provisions for the support of transportation to and from social service facilities.<sup>[65]</sup>

Without committing itself to the support of a specific level of mobility for the elderly and the handicapped, Congress has taken a number of explicit measures in recent years to authorize special transportation services for them. Several provisions of particular note were enacted in 1973 and 1974. Section 16 (b)(2) of the Urban Mass Transportation Act of 1964, as amended in 1973, authorizes capital grants to private, nonprofit organizations to assist them in providing special transportation services for the elderly and handicapped.<sup>[66]</sup> The Federal-Aid Highway Amendments of 1974 authorized a new program of rural public

<sup>18</sup> Legal suits have been brought by handicapped individuals to force the purchase of fully accessible buses in a number of cities. To date the only case decided on the merits has been in Birmingham, Alabama. The federal district court found in this case that no fully accessible bus was reasonably available and that UMTA had carried on a good faith program of technical studies and demonstration projects to improve the state of the art with respect to bus design. Injunctive relief was denied.

transportation demonstration projects, intended primarily for the benefit of the transit dependent.[67] This program is administered by the Federal Highway Administration (its first venture into the direct subsidization of mass transportation) and is financed primarily out of the Highway Trust Fund. The National Mass Transportation Assistance Act of 1974, which authorized federal transit operating assistance for the first time, set as a condition for the receipt of such assistance the establishment of reduced fares for the elderly and the handicapped during off-peak hours.[68]

In brief, then, the priority of equity as a transportation policy objective appears to have increased significantly in recent years. Congress has limited its goal articulation, however, to specific guarantees of access to public facilities and services and to more general probes in the direction of "doing something" to improve the mobility of elderly and handicapped individuals. The special mobility problems of the non-elderly, nonhandicapped poor have not received prominent attention during the 1970s.

One final point. Although it has not been reflected in specific statutory language, there has in practice been a substantial recent growth of awareness on the part of transit officials of the distributional consequences of their actions. Impassioned spokespersons for the elderly, the handicapped, and low-income neighborhoods have become highly visible figures during the 1970s in the transit policy arena. There are numerous divisions among the claimants, however, and their demands tend to carry high price tags. Moreover transit officials remain under pressure to provide improved service for suburban commuters, to relieve traffic congestion to help revitalize CBD economies, and now to demonstrate that transit can save energy and reduce air pollution as well. At the same time, they are faced with spiraling costs and intense public resistance to fare and tax increases on the one hand, to service cutbacks on the other. In this setting, most transit operators see little near-term opportunity for a significant reorientation of service patterns to benefit the handicapped, the elderly, and the poor. As and when new services are added, however, the interests of these groups appear to command considerably more attention today than they did a decade ago.

## Innovations

Three policy measures seem particularly relevant to the interests of the handicapped, the elderly, and the poor: demand responsive transit, fixed-route transit improvement, and private ride sharing. Additionally we shall comment briefly on the transportation voucher concept, taxi deregulation, and subsidized car ownership.

### Demand Responsive Transit (DRT)

Insofar as the able-bodied, the nonelderly, and the nonpoor use public transportation, they do so primarily for commutation purposes during peak periods in high-density radial corridors. Their overwhelming priorities are reliability and speed in these hours and corridors. At other times and for other trip purposes, they rely on their cars. The handicapped, the elderly, and the poor, by contrast, are far more reliant on transit for nonwork purposes. Being captive riders, they do not demand great speed, nor do their trips tend to be highly peaked. But their travel patterns are highly diverse, resembling those associated normally with automobile and taxi usage much more than those associated with fixed-route transit. And many of them find it difficult or impossible to get to fixed-route transit stops on their own (and from such stops to their final destinations), even when these access trips involve only a few blocks.

The transit industry has traditionally concentrated on meeting the demands of its commutation patrons. They are important economically; they are articulate politically; they generate high load factors, even if for only brief periods; and they can most efficiently be served by the types of service the industry feels best able to provide. By contrast the mobility-deprived tend to be unimportant from the standpoint of the regional economy; they have until recently been all but invisible politically; those who are spread out geographically and/or who are physically infirm generate very low load factors; and the cost of serving them is high.

It is scarcely surprising then, that transit administrators, hard pressed to hold down their rates of spending growth, have been slow to



embrace the cause of DRT, or that the DRT pioneers have predominantly been human service agencies and small communities with little conventional transit service.[69]

Human service agencies have become involved in transportation as a means of ensuring access by clients to their facilities, and almost invariably their assistance is confined to trips for this purpose. Transportation expenditures incidental to the carrying out of health and social service missions are authorized under at least fifty federal programs.[70] Although these funds are utilized largely in support of transit and taxi travel (by user reimbursement or contracts with taxi companies), it seems apparent on the basis of state and local studies that several thousand agencies are providing special transportation services nationwide. Extreme fragmentation is the norm, with each agency endeavoring separately to meet the needs of its own clients, often operating only one or two vans and relying for driving services on volunteers or employees who also perform nontransportation duties.

No official or current estimate of transportation expenditures by human service agencies nationwide is available. Arthur Saltzman has projected on the basis of detailed local studies, however, that as of about 1973, expenditures were in the range of \$340-564 million.[71] Because his high projection was based on findings in a region characterized generally by high social service expenditure rates (the San Francisco Bay area) and his low on findings in a part of a state noted for the opposite (Texas), a mid-range estimate of the number of vehicles operated by human service agencies would be about 25,000. By way of comparison, the U.S. transit industry operated 49,000 buses in 1973.[72] for the opposite (Texas), a mid-range estimate would seem more plausible. A similar mid-range estimate of the number of vehicles operated by human service agencies would be about 25,000. By way of comparison, the U.S. transit industry operated 49,000 buses in 1973.[72]

Additionally Congress has authorized several new transportation programs for the elderly and handicapped in recent years. Notably (and reflecting the widespread view that conventional transit operators cannot or will not perform aggressively in this field), section 16(b)(2) of the Urban Mass Transportation Act, enacted in 1973, provides 80 percent federal funding of the capital cost of vehicles purchased by private non-profit agencies to transport elderly and handicapped clients. Expenditures under this program in fiscal 1977 totalled \$22 million.[73]

While it is obvious that special services confer nearly all of their benefits on mobility-deprived individuals, there is substantial evidence as well that DRT services offered to the general public are disproportionately utilized by the mobility-deprived. It is easy to understand why. The trips best served are of the types that most people are accustomed to making by automobile. Because of scheduling and route diversion complexities, moreover, the service tends to be quite slow. Reid Ewing, in a study of sixteen such systems, has recently found that their average door-to-door trip times (wait plus ride) ranged from three to ten times those attainable by private automobile, with a median DRT/auto ratio of six.[74] Thus the patrons tend to be those without ready alternatives. Ewing's findings on user characteristics, reported in table 20, indicate that nondrivers, members of households without cars, and the elderly have generally been represented far in excess of their population shares<sup>19</sup>--with the degree of such overrepresentation varying widely, however, in accord with the demographic characteristics of the areas served. The Columbus system, illustratively, was operated by the local Model Cities agency in an inner-city ghetto. The result: 69 percent of users were from households without automobiles and 82 percent were nondrivers. By comparison, in Ann Arbor, a relatively affluent university community, 26 percent were from households without cars (many of them presumably students) and 45 percent (nearly half of them under the age of sixteen) were nondrivers.

If DRT is potentially of great significance as an equity mode, clearly its potential achilles heel is high cost. Ewing found that DRT services operated by transit agencies typically cost far more than exclusive-ride taxi services in the same communities (for trips of equal length and occupancy). DRT fares were invariably well below taxi fares, but this was simply because the former were heavily subsidized.

<sup>19</sup> These are overlapping categories. Unfortunately precise data on their population shares in these specific communities were unavailable, so our reference is to the comparison with national figures. It bears emphasis, however, that except in Columbus and Beverly-Fairfax (a section of Los Angeles) the service areas were all within small cities or suburbs. Thus one may reasonably assume that only 10-15 percent of households in them were carless.

Table 20 Characteristics of Demand-Responsive Transit Riders

	Date of Survey	Auto Ownership			Youth (% of users under 16)	Elderly (% of users over 64)	Handi- capped* (% of users)
		(% of users from households with no auto)	(% of users from households with one auto)	Non-drivers (% of users)			
Ann Arbor	2/75	26	35	45	20	4	0.6
Benton Harbor-St. Joseph	11/74	41	38	64	9	17	unknown
Beverly-Fairfax	2/76	unknown	unknown	unknown	unknown	89	2.0
Columbus	8/72	69	15	82	15	22	unknown
El Cajon		unknown	unknown	unknown	unknown	33	0.6
La Habra	10/75	unknown	unknown	unknown	unknown	19	0.4
Ludington	9/74	54	27	68	7	41	2.9
Merced				unknown			
Midland	10/74	22	37	50	18	9	0.8
Niles	5/75	58	28	unknown	13**	30	1.7
Oneonta	11/74	unknown	unknown	unknown	13	21	unknown
Rochester	6/75	23	41	57	11	7	0.7
Santa Clara County	2/75	unknown	unknown	unknown	55***	3	unknown
Xenia	7/75	unknown	unknown	65	33***	22	unknown

\*Figures refer to the non-ambulatory handicapped.

\*\*No attempt was made to compensate for "no responses."

\*\*\*Figures were obtained through interpolation.

Source: Reid Ewing, "Demand-Responsive Transit: Problems and Possibilities," (Ph.D. dissertation, MIT, 1977), chapter 5.

Potential strategies for reducing DRT costs include the following. Taxi rather than transit operators and employees can be utilized to provide service. Vehicles can be utilized to provide commuter subscription and/or school bus services during the hours when it is possible thereby to generate high productivities. Able-bodied passengers can be asked to walk to pickup points. Evening service can be avoided or limited to one or two nights a week. Service can be confined to weekdays. And notice of trip requests can be required from an hour to a day in advance.[75] But these strategies are often politically unfeasible, and even in the best of circumstances DRT will normally entail a much higher cost per passenger mile than fixed-route bus service in high-density corridors. This will often be decisive as elected officials consider proposals that DRT be made widely available to the general public. When the beneficiaries are clearly identified as needy, on the other hand, high costs per passenger mile are likely to be viewed as far more tolerable. Thus human service agency expenditures for transportation have been growing rapidly with virtually no public comment. (If, as estimated above, these expenditures were in the range of \$450 million as of 1973, this was equivalent to about one-half of the nationwide operating deficit incurred by conventional transit services in that year.)

It bears note, moreover, that the costs per trip of DRT are often modest by comparison with the costs of some of the more expensive transit services offered the general public and some of the alternatives being promoted as means of assisting the elderly and handicapped. In fiscal 1976, for example, the average BART patron received a subsidy of \$3.75 per trip.[76] And the U.S. Department of Transportation has recently estimated that full adaptation of the nation's fixed route transit systems for use by the handicapped would entail a capital cost of \$1.7 billion and additional operating costs totaling \$69 million a year at 1977 prices.[77] Local officials have charged that actual costs would be several times higher and that the beneficiaries would be few. The New York and Chicago transit authorities have estimated, for example, that their combined capital costs would be about \$3 billion and their additional operating costs in the range of \$250 million per year. And

they have noted that the Washington Metrorail system, which does meet full accessibility standards, carries only six wheelchair users per 100,000 patrons.

Recognizing that equity-related transportation expenditures--particularly for the elderly, the handicapped, and human service agency clients, even if not necessarily for the able-bodied poor--are almost certain to grow rapidly in the years ahead, urban transportation officials and analysts have become increasingly concerned since about 1975 with evaluating the cost-effectiveness of the options available. All require large amounts of money, at least relative to the number of trips served; it seems apparent that if these markets are to be served effectively at all, the costs per trip are bound to be very high by comparison with the costs of fixed route service for able-bodied commuters. Specifically, the main options appear to be:

- Making conventional transit vehicles and stations physically accessible to all, including those in wheelchairs.
- Expanding the current fragmented services provided by public and private nonprofit human service agencies for their clients.
- Developing integrated special service systems.
- Developing demand-responsive shared-ride systems (whether operated by transit agencies or taxi companies) that are open to the general public but with the largest subsidies reserved for those in specific eligible categories.<sup>20</sup>
- Transportation vouchers, which eligible recipients would be free to utilize for the purchase of taxi or transit services.

These are not, of course, mutually exclusive options, but they are competitors for resources. And while there is room for considerable disagreement about which of the four latter options is most cost-effective, all look quite attractive by comparison with the strategy of making conventional transit systems fully accessible.

<sup>20</sup> General use systems might be rendered fiscally feasible in some circumstances by enabling them to piggy-back on services justified in the first instance by their relevance to special service needs. In such circumstances, joint costs might be borne as a human service expense.

## Fixed Route Transit Service

Fixed route transit service improvements represent the primary instrument available for enhancing the mobility of the carless poor who live clustered in relatively high-density neighborhoods. Low-income travelers might themselves prefer DRT service, but the electorate is likely in most circumstances to oppose underwriting the high per-trip costs of DRT for the able-bodied poor.

Fixed route subsidies are likely to benefit the poor disproportionately only if they are carefully targeted to do so. It will be recalled, for example, that the members of low-income households are slightly over-represented among bus patrons nationwide, that they are considerably under-represented among rapid transit patrons, and that they are scarcely represented at all among commuter rail patrons (table 9). Yet bus patrons currently receive much lower per-trip subsidies than commuter rail and rapid transit users. A gradual reallocation of transit expenditures toward equalizing per-trip subsidies among the several transit modes would thus be of enormous benefit to low-income users in aggregate. The poor also make a greater proportion of their transit trips during off-peak hours and for relatively shorter distances than other groups. Thus a concentration of available funds on the maintenance of low off-peak fares and on low base fares within a zonal structure will normally provide them with greater benefits than utilization of the same dollar amount in support of an undifferentiated fare structure. (Time-of-day pricing would tend as well to improve transit efficiency by alleviating pressure for peak period service expansion and permitting greater utilization of existing off-peak capacity.) Finally, if obviously, the proportion of benefits received by the poor tends to vary with their population share along any particular route. Effective targeting for equity purposes therefore must be rooted first and foremost in a corridor-by-corridor understanding of local demography.

Single-minded efforts to target subsidy expenditures at the poor are likely to conflict with other objectives of the transit program. The effectiveness of transit subsidy dollars in conserving energy, reducing air pollution, and strengthening central city economies is probably greatest, for example, when they are utilized to attract nonpoor

weekday travelers to CBDs. This market includes large numbers of patrons with the option to drive, and it can generate higher vehicle load factors than any other. Per dollar expended, service improvements designed specifically for the poor are likely to attract fewer passengers than comparable expenditures in the service for core-bound travelers, and a much higher proportion of those attracted are likely to represent new trips with little or no effect on the central city economy rather than trips diverted from automobiles and/or from suburban centers of economic activity.

This is by no means to suggest, however, that the current allocation of transit expenditures represents a well-calculated effort to get the most return from each subsidy dollar. Some core-bound travelers (most notably commuter rail patrons) receive extremely high per trip subsidies. In general, moreover, since the elasticity of demand for rush hour transit service in high-density corridors is extremely low, fares for such service could be considerably increased (as a means of obtaining funds for equity reallocation) with little risk of substantial patronage loss. Finally the cessation of new rail rapid transit construction would free up about a billion dollars a year for reallocation at negligible cost in terms of other stated transit program objectives. In estimating the subsidies associated with new rapid transit systems and lines, it is essential to include capital as well as operating costs, because the former are not yet sunk. Projected on this basis, the per trip subsidies--predominantly to able-bodied, nonpoor commuters--are almost invariably in the DRT range or higher. Such an allocation of available subsidy funds is virtually impossible to justify even if one accepts the most optimistic estimates of the benefits accruing from rapid transit construction.

#### Increased Private Ride Sharing

Although most current ride sharing involves noncommutation travel,<sup>21</sup>

<sup>21</sup> As of 1970 auto vehicle occupancies average 1.4 for commuter trips and 2.2 for nonwork trips. Three-quarters of all commuter vehicle trips involved only the driver. But those who commuted as automobile passengers were far more numerous than those who (continued on next page)

it is generally agreed that increases in ride sharing brought about by government and/or employer efforts are likely to involve only commutation. In practice, such efforts are unlikely to be undertaken on a wide scale for equity reasons,<sup>22</sup> but where they do emerge in response to other stimuli, low income employees are likely to participate and benefit disproportionately. (As of 1970 automobile commuters with household incomes under \$5,000 were twice as likely to be passengers as those from households with incomes above \$10,000. With the drivers included, average vehicle occupancies were 1.6 for the former group and 1.3 for the latter.[79]) It is not possible on the basis of current evidence to say much more than this.

<sup>21</sup> (continued from previous page) did so by public transportation. Nationwide 18.3 percent commuted as auto passengers, 7.5 percent as transit (including commuter rail) passengers. As the following table indicates, only the residents of cities larger than one million were more prone to commute by transit than as auto passengers.[78]

Place of Residence	Percentage of Commutation by Transit (All Forms)	Percentage of Commutation as Auto Passengers
Unincorporated areas and incorporated places under 100,000 (75% of all commuters)	3.3	18.7
Incorporated places 100,000-999,000 (16% of all commuters)	12.8	19.8
Incorporated places over one million (8% of all commuters)	35.0	11.5

<sup>22</sup> Recent government efforts to promote ride sharing have been stimulated by concerns about fuel demand and air pollution, while employer programs initiated independently of these public efforts have been stimulated by parking shortages at work sites and severe congestion problems on access roads to them.



## Other Measures

The other potential instruments for relieving mobility deprivation are transportation vouchers, taxi deregulation, and subsidized car ownership.

Insofar as the problem of mobility deprivation arises from an inability to afford available transportation services, clearly the most straightforward solution is to augment the purchasing power of the poor. Economists tend to prefer unrestricted cash grants as the best method of alleviating deprivation that stems from inadequate purchasing power, but American governments in practice pursue a mixed strategy, supplementing unrestricted transfer payments with some restricted to use for the purchase of "merit" goods and services (such as food, medical care, and higher education) and also subsidizing many service providers on the ground that the benefits of their activities flow largely to the needy.

There are two obvious means available for increasing the share of government transportation subsidies received by the elderly, handicapped and the poor. The first is to target public transportation services for their benefit. The second, far more precise and certain (in view of all the other pressures on transit providers as they allocate service), is to distribute subsidies directly to members of target groups in the form of vouchers for the purchase of service.

In considering vouchers, the first question that typically arises is whether they should be good only for the purchase of transit rides usable as well for the purchase of private taxi services (and possibly even of vanpool services within the framework of organized ride-sharing programs). Many people are offended by the idea of vouchers being used to purchase "luxurious" door-to-door service, but it will be recalled that the poor already account for a much greater proportion of taxi patronage (29 percent) than of rapid transit or commuter rail patronage (15 percent and 0 percent respectively). Yet whereas rapid transit and commuter rail services are heavily subsidized, taxi operators are heavily taxed; and taxis are able to serve many of the nonradial and off-peak trips that the mobility-deprived are anxious to make far better than existing or prospective transit systems.

If a voucher program operated like the current food stamp program, recipients would presumably be eligible to purchase a given dollar value of vouchers at a price discount determined on the basis of such eligibility criteria as age, physical disability, and income. Alternatively (as President Carter has proposed with reference to the food stamp program itself), they might simply be given limited numbers of vouchers and left to pay market rates for additional purchases after these were exhausted each month. In either case recipients would have a strong price incentive to patronize cheaper services, but they would also be empowered to determine when higher price options were more cost-effective from the standpoint of their own objectives.

One final note: although voucher programs might legitimately be justified on human service rather than transportation grounds, they would provide an important source of subsidization for transportation providers as well. Agricultural interests clearly recognize this in the case of the food stamp program, and indeed it has become relatively invulnerable politically because it so well unites agricultural with urban liberal interests in Congress.[80]

Virtually all analysts of taxi economic (as opposed to safety) regulation have concluded that its primary function is to protect current permit holders from increased competition and from threats to the resale value of their permits (originally acquired from the government at nominal cost). Where entry is free, low-income people reap a double benefit. As patrons, they benefit from lower fares and increased taxi availability. As relatively unskilled participants in the labor market, they benefit from increased job opportunities. Even without price decontrol, moreover, entry decontrol would tend to hold down fares by eliminating the need to earn a rate of return on inflated permit values, by forcing current operators to think about the extent to which successful fare increase petitions might draw in new competitors, and by encouraging disputes among the operators about fare strategy that would provide regulatory officials with good excuses for denying many increase petitions. (The other side of the coin is that price decontrol alone would often have little or no impact on fares.) In practice these benefits of free entry have long

been readily observable in Washington, D.C., but its political history is unique. Elsewhere the militant resistance of current permit holders tends to make entry decontrol an untouchable issue politically.

A potentially valuable change that does not threaten the economic interests of current taxi operators is authorization for shared-ride services (already permitted in a small minority of jurisdictions). Current prohibitions of shared-ride service date to the 1920s and 1930s, when the transit industry was striving successfully to stamp out jitney competition.[81] Today shared-ride restrictions are typically justified with reference to customer fear of crime, but in fact they seem largely to be sustained by inertia. Where permitted, ride sharing appears both to increase taxi service availability during rush hours and to curtail pressure for general fare increases. Patrons can be offered the option of specifying exclusive-ride service, moreover, in return for a higher fare.

Finally some observers have maintained that it would be cheaper as well as more helpful in many circumstances to assist mobility-deprived people in acquiring auto mobility than to provide them with public transportation services. In considering subsidized car ownership, it seems essential to distinguish between the poor and the handicapped as potential beneficiaries. Political opposition to such aid for the able-bodied poor would be overwhelming; and even if not, the task of detailed program design would be extremely forbidding. It would be impossible to determine who would lack cars in the absence of a subsidy program, so eligibility would have to be extended to all households with incomes below specified levels. Because the subsidies would themselves raise some recipients above the eligibility cutoff level, a sliding scale of allowances for those in the near-poor category would doubtless be necessary. Low-income households without licensed drivers would reasonably contend that they should be eligible for equivalent allowances to be used for the purchase of mobility by other modes, including taxi. The result would be an expensive program similar in most respects to a general increase in income assistance levels, and virtually impossible to justify as an alternative to such unrestricted aid.

We have previously noted, on the other hand, that veterans with service-connected disabilities are eligible for 100 percent assistance by the Veterans Administration in purchasing special equipment required to enable them to drive. Similar assistance, if perhaps with a lower matching ratio, might well be extended to some others among the handicapped. One format for the introduction of such aid might be to provide local governments with grants for the general purpose of mobility assistance to the handicapped, leaving them discretion to utilize the funds in any of several ways: to pay for transportation vouchers, to subsidize special DRT services for the handicapped, and/or to assist some eligible recipients in achieving independent automobility. Particularly in fringe areas and rural locales characterized by low density and great distances, the last might often be adjudged the most cost-effective method of assisting handicapped recipients who are (or can be rendered with mechanical aids) physically able to drive. Even in some higher-density communities, the aim of assisting handicapped recipients to become as independent as possible might dictate making transportation vouchers usable to cover certain automobile costs as well as for the purchase of transit, taxi, and vanpool services.

#### Summary

The auto-dominant system simultaneously affords the adult driving majority with unprecedented mobility while actually reducing the effective mobility of those without ready access to cars. In contemporary urban regions most destinations are virtually unreachable, even by able-bodied adults, without a car. For those unable to walk substantial distances to and from transit stops, effective mobility is particularly limited. Moreover, current welfare standards are higher than in previous eras. And mobility-deprived groups, especially the elderly and handicapped, have become organized and outspoken in their pursuit of government assistance.

There are great uncertainties, however, as to the precise degrees of mobility deprivation suffered by the several main claimant groups. Older and handicapped people, for example, tend to have low rates of

labor force participation and to be relatively sedentary in their lifestyles even under conditions of equal travel opportunity. Significant numbers of them, moreover, are confined to their homes or to institutions and would be unable to travel in the best of transportation system circumstances. Finally, a large proportion of the elderly and poor do have cars and driver's licenses and seem to achieve mobility rates similar to those of other urban residents.

Clearly, however, there are substantial numbers of elderly, handicapped, and low-income people who suffer from acute mobility-deprivation that might be alleviated by transportation measures. And there is widespread agreement that their needs merit high priority in the allocation of government resources for urban transportation purposes. Prior to the 1970s, this agreement tended to be ritualistic, but it has taken on greatly increased significance during the past several years. No overall minimum mobility standards have been adopted, nor have comprehensive programs been undertaken to deal with the mobility-deprivation problem. Rather, government efforts have striven toward the limited objectives of making fixed route transit services fully accessible to those with physical handicaps and of enabling those eligible for publicly supported medical and social services to make all necessary trips incidental to the receipt of such services.

General transit subsidies as currently allocated do not confer disproportionate benefits on the handicapped, elderly, and poor. Indeed the members of these groups, on average, receive less than average benefits per household (though because they pay much lower than average taxes, the net effects of government transit involvement have been redistributive in their favor). The implication is that, insofar as enhancing their mobility is a prime objective, careful targeting of transit subsidy expenditures is essential. Effective methods for achieving this purpose include the following: payment of subsidies directly to eligible individuals in the form of transportation vouchers or transit fare discounts; increasing the expenditure share devoted to DRT, particularly services restricted to usage by target groups and those serving low-income areas; assignment of priority in fixed route service

design to serving the needs of low-income travelers; equalizing per trip subsidies as between bus and rail transit patrons; and structuring transit fares to favor short-trip and off-peak users.

## Notes

1. U.S. Bureau of the Census, Statistical Abstract of the United States (1976), p. 27; Motor Vehicle Manufacturers Association, Motor Vehicle Facts and Figures, 1978 (Detroit 1978), p. 39; Motor Vehicle Manufacturers Association, Automobile Facts and Figures, 1952 (Detroit, 1953), p. 15.
2. American Public Transit Association, Transit Fact Book, 1976-1977 Edition (Washington, D.C.: American Public Transit Association, 1977), p. 30.
3. Ibid., p.36.
4. U.S. Bureau of the Census, Statistical Abstract of the United States (1975), p. 17; U.S. Bureau of the Census, County and City Data Book (1972), table 4.
5. U.S. Census, Statistical Abstract (1976), pp.22-24.
6. Sam Bass Warner, Streetcar Suburbs (New York: Atheneum; 1974), p. 14.
7. Sandra Rosenbloom and Alan Altshuler, "Equity Issues in Urban Transportation" Policy Studies Journal (Fall 1977): 37.
8. Ibid., p. 36.
9. J. R. Aronson and Eli Schwartz, eds., Management Policies in Local Governments (Washington, D.C.: International City Managers Association, 1975), p. 146.
10. Kiran Bhatt et al., An Analysis of Road Expenditures and Payments by Vehicle Class (1956-1975) (Washington, D.C.: The Urban Institute, 1977); J.R. Meyer et al., The Urban Transportation Problem (Cambridge: Harvard University Press, 1965), pp. 60-74.
11. Bhatt et al., Analysis of Road Expenditures, table 18.
12. Ibid., tables 18, 19.
13. The total cross-subsidy figures were derived by Pucher from ibid. and from table 13 of Bhatt et al., Congressional Intent and Road User Payments (Washington, D.C.: The Urban Institute, 1977), p. 66
14. Bhatt et al., Analysis of Road Expenditures, table 2.
15. APTA, Transit Fact Book, 1976-1977 Edition, pp. 20, 22, 23; Urban Mass Transportation Administration (UMTA), "Cumulative Capital Grants by Fiscal Year and Category, February 1, 1965 Through September 30, 1977" (unpublished memorandum, 1977); John Pucher, "Equity in Transit Financing," (Ph.D. diss., Massachusetts Institute of Technology, 1978), figure 4.1, table 6.3. Of the \$14 billion total, \$10 billion was for

capital and \$4 billion for operations. In making these calculations, we assumed that states and localities split the nonfederal share of federally aided capital projects equally. State operating assistance was calculated on the basis of actual amounts after 1972 and an assumed equivalent proportion of the total operating subsidy prior to 1973.

16. Steven Rattner, "House Rejects Efforts to Raise Tax on Gasoline," New York Times, August 5, 1977, pp. A-1, D-13.

17. Several of the most useful, though still very partial and preliminary, studies that have been carried out are: J. A. Miller, "Identification and Definition of the Mobility Requirements of the Handicapped and the Elderly" (Ph.D. diss., Northwestern University, 1975); J. Gillan and M. Wachs, "Life-styles and Transportation Needs Among the Elderly of Los Angeles County" (paper presented at the Transportation Research Board meeting, January 1976); F. Carp, "Transportation and Retirement," Transportation Engineering Journal (November 1972).

18. Rosenbloom and Altshuler, "Equity Issues," pp. 34-35.

19. 1971 White House Conference on Aging, Recommended Action: Transportation (Washington, D.C.: U.S. Government Printing Office, 1971).

20. Frances Carp, testimony before the U.S. Senate Special Committee on Aging, Hearings: Transportation and the Elderly, Part I, February 25, 1974 (Washington, D.C.: U.S. Government Printing Office, 1974), p. 68; Marjorie H. Cantor et al., "Dial-a-Ride: The New York City Experience" (New York: Office of the Aging, May 1975).

21. Rosenbloom and Altshuler, "Equity Issues," p. 35.

22. U.S. Department of Transportation, Transportation Systems Center, The Handicapped and Elderly Market for Urban Mass Transit, PB-224-821 (Washington, D.C.: National Technical Information Service, 1973).

23. National Center for Health Statistics, Limitation of Activity and Mobility Due to Chronic Conditions, series 10, no. 96 (November 1972), table 2.

24. Abt Associates, "Transportation Needs of the Handicapped: Travel Barriers, Cambridge, Massachusetts," PB-187-327 (Washington, DC: National Technical Information Service, 1969).

25. Ibid., table VI-1, p. 80.

26. U.S. Bureau of the Census, General Characteristics of the Population 1970, U.S. Summary, vol. 2 (Washington, DC: U.S. Government Printing Office, 1973), table 220.

27. Federal Highway Administration, Nationwide Personal Transportation Study, report 6, "Characteristics of Licensed Drivers" (Washington, DC, 1973), p. 14.



28. Federal Highway Administration, Nationwide Personal Transportation Study, report 9, "Mode of Transportation and Personal Characteristics of Trip Makers" (Washington, DC, 1973), p. 31.
29. National Center for Health Statistics, Limitations of Activity, table 2.
30. J. K. Markovitz, "Transportation Needs of the Elderly," Traffic Quarterly 24 (1971): 240.
31. Ibid., p. 245; Tri-State Regional Planning Commission, Measure of a Region (New York: Tri State Regional Planning Commission, 1967), p. 21.
32. Markovitz, "Transportation Needs of the Elderly," table 4, p. 250.
33. U.S. Bureau of the Census, Statistical Abstract of the U.S. (1977), table 694, p. 431.
34. Irving Kristol, "Taxes, Poverty, and Inequality," The Public Interest (Fall 1974): 3-28.
35. Survey Research Center, Institute for Social Research, University of Michigan, unpublished estimates cited by Robert Reinhold, "Poverty Is Found Less Persistent but Wider Spread Than Thought," New York Times July 17, 1977, pp. 1, 36. The estimates are tentative and are currently being revised.
36. Federal Highway Administration, Nationwide Personal Transportation Study, report 11, "Auto Ownership" (Washington, DC, 1973), table 3.
37. Automobile Manufacturers Association, Automobile Facts and Figures, 1972 (Detroit, 1973), p. 30; U.S. Bureau of the Census, Statistical Abstract of the U.S. (1976), p. 27.
38. Motor Vehicle Manufacturers Association, Motor Vehicle Facts and Figures, 1977, p. 38.
39. Federal Highway Administration, Nationwide Personal Transportation Study, report 8, "Home-to-Work Trips and Travel" (Washington, DC 1973).
40. John Kain and John Meyer, "Transportation and Poverty," in American Academy of Arts and Sciences, Conference on Poverty and Transportation (Boston, 1968), p. 1.
41. American Institute of Planners and Motor Vehicle Manufacturers Association, Urban Transportation Factbook (Washington, DC: American Institute of Planners, 1974), table 1-10.
42. George Hilton, Federal Transit Subsidies (Washington, DC: American Enterprise Institute for Public Policy Research, 1974), pp. 25-30.

43. Ibid., pp. 29-30; Committee for Economic and Cultural Development, The O'Hare Express: An Employment Access Demonstration Project, PB-212-677 (Washington, DC: National Technical Information Service, 1972).
44. Hilton, Federal Transit Subsidies, pp. 26-27.
45. Ibid., pp. 25-26.
46. State of California, Business and Transportation Agency, "Transportation Employment Project, South Central and East Los Angeles," Project CAL-MTD 12 (Washington, DC: U.S. Department of Transportation, 1971), p. 18.
47. Hilton, Federal Transit Subsidies, pp. 29-29.
48. Peter Doeringer, "Ghetto Labor Markets--Problems and Programs" (paper presented at the Conference on Transportation and Poverty, American Academy of Arts and Sciences, Boston, June 1968).
49. Bennett Harrison, Urban Economic Development (Washington, DC: The Urban Institute, 1974), pp. 42-46.
50. John Pucher, "Equity in Transit Financing," p. 14. Pucher's calculations are based on data in APTA, Transit Fact Book, 1976-1977 Edition, p. 34; U.S. Bureau of the Census, Statistical Abstract of the U.S. (1977), tables 667, 771; and U.S. Department of Commerce, Bureau of Economic Analysis, Survey of Current Business (July 1977), table 6.9.
51. APTA, Transit Fact Book, 1976-1977 Edition, p. 34.
52. Ibid., pp. 26, 30, 34.
53. U.S. Bureau of the Census, Statistical Abstract of the U.S. (1977), table 658.
54. Jack Faucett Associates, "Washington Area Metro Rail System: A Current Perspective and a Preliminary Appraisal of Alternatives," prepared for the Congressional Research Service of the Library of Congress (Washington, DC 1976), p. 82.
55. Melvin M. Webber, "BART's Outcomes: An Early Appraisal," monograph 26 (Institute of Urban and Regional Development and Institute of Transportation Studies, University of California, Berkeley, October 1976), table V. A somewhat shorter version, without the table, appeared in The Public Interest (Fall 1976): 79-108.
56. APTA, Transit Fact Book, 1975-1976 Edition, tables 6, 10.
57. John Pucher, "Equity in Transit Financing," p. 33.
58. Ibid., pp. 60, 61.

59. This information was obtained from Cynthia Burbank, Policy Analysis Division of UMTA, U.S. Department of Transportation.
60. John Pucher, "Equity in Transit Financing," table 6.1, as revised by excluding Denver, San Francisco, and Washington from the 1975 total.
61. Hilton, Federal Transit Subsidies, p. 28
62. PL 93-87, sec. 165.
63. Social Security Amendments of 1967 (PL 90-248), Title XIX: the specific requirements and authorizations cited derive from the regulations established by HEW, the department responsible for administering the act.
64. PL 93-112, sec. 504.
65. Older American Act, PL 89-73, sec. 101 as amended by sec. 102 of the 1973 Comprehensive Services Amendments (PL 93-29); and the Social Services Amendments of 1974 (PL 93-647), sec. 2002.
66. The Federal-Aid Highway Act of 1973 (PL 93-87) contained Title III, "The Urban Mass Transportation Act of 1974 Amendments." Sec. 301(g) amended sec. 16(b) of the 1964 Act by adding paragraph 2, which allowed grants to nonprofit agencies.
67. PL 93-643, sec. 103 amended sec. 147 of the Federal-Aid Highway Act of 1973 (PL 93-87).
68. PL 93-503, sec. 103 revised sec. 5 of the Urban Mass Transportation Act of 1964.
69. APTA Task Force on Paratransit, "Paratransit in the Family of Transit Services," Transit Journal (May 1976): 5-26; Roger Teal, "Paratransit in Urban Transportation: A Political-Organizational Approach" (Ph.D. diss., Tufts University, 1977); Arthur Saltzman, "Special Service Transportation Systems Which Serve the Transportation Disadvantaged: Current Operations and Future Projects" (unpublished draft report, Alan M. Voorhees and Associates, 1977); U.S. Department of Transportation, Urban Mass Transportation Administration, Demand-Responsive Transportation: State-of-the-Art Overview (Washington, DC: UMTA, 1975), appendix A.
70. U.S. Department of Health, Education and Welfare, Transportation Authorities in Federal Human Service Programs, SIIR-0000739 (Washington, DC: National Technical Information Service, 1976).
71. Saltzman, "Special Service Transportation," pp. 5-13.
72. APTA, Transit Fact Book, 1975-1976 Edition, table 12, estimate includes trolley coaches.

73. The figure was obtained from Cynthia Burbank, Policy Analysis Division of UMTA, U.S. Department of Transportation.
74. Reid Ewing and Nigel Wilson, "Innovations in Demand-Responsive Transit" (Center for Transportation Studies, MIT, October 1976), p. 62.
75. Reid Ewing, "Demand-Responsive Transit: Problems and Possibilities" (Ph.D. diss., MIT, 1977), chap. 5.
76. Calculated on the basis of tables 2 and 7 of Webber, "BART Outcomes."
77. U.S. Department of Transportation, Transportation Systems Center, The Handicapped and Elderly Market for Urban Mass Transit, PB 224-821 (Washington, DC: National Technical Information Service, 1973), p. 69.
78. Auto occupancy data are from U.S. Department of Transportation, Nationwide Personal Transportation Study, report 1, "Automobile Occupancy" (Washington, DC: U.S. DOT, 1972), table 3; percentage of commutation by transit and as auto passengers has been calculated from Federal Highway Administration, Nationwide Personal Transportation Study, report 8, "Home-to-Work Trips and Travel" (Washington, DC, 1973), table A-10.
79. Calculated from FHWA, NPTS, report 8, "Home-to-Work Trips and Travel," table A-14.
80. Congressional Quarterly Almanac 32 (1976): 607-619; Congressional Quarterly Weekly Reports 35 (July 16, 1977): 1447-1451, (July 30, 1977): 1565-1566.
81. E.W. Kitch, M. Isaccson, and D. Kasper: "The Regulation of Taxicabs in Chicago," Journal of Law and Economics 14 (1971): 285-350. This article provides the best history of taxi and antijitney regulation nationwide as well as in Chicago.







