Roles for the Private Sector in Public Transportation

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16. Abstract

The public demand for non-fixed-route (para-transit) services can be better met if archaic laws restricting profitable opportunities for private entrepreneurs are eliminated. This is being done in some localities, notably in Knoxville, where a small public body called the "transportation broker" is identifying public demands and dismantling legal and institutional barriers to meeting those demands through both public and private means. The history of American transit is reviewed and the extensive early roles of the private sector are highlighted. The forms, functions, and financing of para-transit modes are discussed.

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CONTENTS

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Michigan State Highway Commission.

Introduction

This report describes the results of a brief study suggested by the Michigan Transportation Research Program Advisory Committee. The study explored potential functions for the private sector in the mass transit industry. This report briefly reviews the extensive traditional involvement of the private sector in transportation, then discusses current patterns of travel demand, problems entrepreneurs encounter, and proposed solutions to those problems.

The market for urban transportation is somewhat complicated. With each trip a transportation consumer makes, he purchases a package of services. This includes times of departure and arrival, accident insurance, scenery, companionship (or privacy), and such vehicular characteristics as interior space, lighting, temperature, sound levels, vibration, and smoothness of the ride. The spatial and temporal distributions of trips he makes depends upon many considerations, including his work schedule, the price of a trip, and his travel needs.

As transportation consumers differ in their needs, tastes, and ability to pay, so suppliers can offer various transportation packages. But transportation suppliers face problems of identifying consumer demands and aggregating them so that the demands can be met with available resources and technology. Suppliers' decisions are further limited by existing industrial and institutional arrangements.

Only if a welfare economist is willing to make an extreme simplifying assumption can he suppose that transportation suppliers might independently organize themselves so as to maximize social benefit. Welfare economists in different ivory towers can reasonably disagree over even so fundamental a question as whether transportation services can best be provided by the public or the private sector. However, they have reached consensus on the following principles concerning market organization.

The first principle is that the private sector will provide only services it perceives to be profitable. When risks are great, or entrepreneurs are short of capital, or "free-riders" are expensive to exclude, the private sector will furnish fewer services than society demands. Similarly, the private sector will not build a transportation facility of socially optimal scale unless it is assured financial returns from the facility that are commensurate with those of other capital investment opportunities. Historically, transportation technology has often dictated that service in a particular market be provided by a single large facility rather than several smaller ones. However, the resulting "natural monopolies" usually extracted what the public considered an unreasonably large profit. That led to public regulation or operation of the systems. For those reasons and others, the public sector has played a significant role in providing highly regulated urban transit. The potential role of the private sector is discussed in later sections of this report.

1.0 A History of Urban Transit in America

A brief look at history can broaden the scope of discussion about currently feasible transit alternatives. When American mercantile centers began to industrialize in 1820, their public transportation facilities amounted to little more than grids of unpaved or cobblestone streets. Pedestrians, wagons, and a few men on horseback competed for road space. Some hackneys operated commercially, but at fares that even the middle class found out of reach. Walking speed limited the size of the city to a radius of two miles.

The Omnibus

In the 1830's the competitive omnibus industry emerged in New York City. As that city's population nearly doubled in size to 203,000, its increasingly crowded and unsanitary conditions created the demand for transportation to more distant neighborhoods. Daily work journeys lengthened with the expansion of the densely settled area of the walking city. Local entrepreneurs met this need for greater accessibility with a modified stagecoach, the omnibus! This box-like vehicle, which could accommodate from twelve to twenty passengers on its two lengthwise benches, traveled at speeds of four or five miles per hour. While drivers could make ten daily round trips between the residential areas and downtown, many of them worked their rigs only during the morning and evening hours of peak demand. Seventy of these vehicles rolled about lower Manhattan in 1830, that number rising to 350 by 1849. Nonetheless, it was not until the early 1860's that the omnibus was at the height of its use nationally.[1]

With each driver working on his own behalf, service was irregular. Poor weather kept some drivers off the roads. Routes, generally fixed, were occasionally changed without notice, as drivers sought out the avenues of highest unmet demand. Pedestrians complained that the horsedrawn buses swerved unpredictably in the streets as they picked up and dropped off passengers. Eventually such complaints brought public regulation, but this was not extensive. Public authority was exercised only to license and inspect the safety of the vehicles.

The omnibus affected the residential organization of the city's population. Since the omnibus was uncomfortable and undependable, it was not used for work journeys by the very rich, who could afford to rent hackneys or own carriages. Laborers, on the other hand, could not pay its five to ten cent fare. As a result, the city became segregated by income. The poor lived in proximity to the downtown factories, shops, and shipping docks that were their workplaces. Land was so scarce in these areas that population densities in some New York city wards reached three hundred people per acre. The managers, merchants, and tradesmen of the middle class traveled by omnibus to their homes in the less crowded band of the city, beyond the slums. The wealthy were able to move a considerable distance from their once fashionable downtown addresses.[2]

1.2 The Horse Railway

Steam railroads were used by some commuters in the largest cities in the three decades prior to the Civil War, but this mode was fairly expensive. Moreover, city residents justifiably considered them unsafe, unhealthy, and too noisy for operation in congested areas. Ordinances were passed in the major cities forbidding railroads to run under steam power within one-half mile of downtown areas. Consequently, this form of commuting became popular only in swamp-ringed Boston, where the locomotive's high speed gave it a comparative advantage over horsedrawn modes in covering the relatively great distances between that city and her suburbs.[3]

Commuting styles were substantially changed by the horse railway.[4] First introduced experimentally in 1832, the horsecar sported flanged wheels guided by iron rails. The horsecar offered a smoother ride than the omnibus, and was capable of speeds of six to eight miles per hour. This system came into extensive use in the 1850's, when investors became less concerned about the mode's high capital requirements. After the horsecar's initial success in New York, other cities quickly adopted the new technology. In 1859 nine major eastern and midwestern cities boasted the service. By 1890, when even one-horse towns could afford the innovation, more than 6600 miles of track were operating.

The horse railway, like the steam railroads, molded the spatial pattern of subsequent urban growth. The laying of iron rail imparted a measure of permanence to the horsecar's route. As a result, service became more dependable, allowing the middle class to move to "streetcar suburbs." The city itself assumed a spidery shape, as development occurred along the railways' radial lines. Noted an 1859 observer in Philadelphia,"...already the great mass of our population lives along the line of a railway; and before the next decade shall have far advanced, every rural vicinage within our corporate limits will be "grappled with hooks of steel' to the steps of the Exchange."[5]

The street alterations entailed in laying track forced a more active government involvement in transit operations. City councils were entrusted with both the authority to grant exclusive operating rights to railway lines and the responsibility to ensure public safety and mobility. Councils required the railway companies to maintain rights of way, pave the street space betweeen the rails, and pay taxes and license fees in exchange for the right to do business over profitable routes.[6] Despite these costly restrictions, prospective horsecar operators often considered the lines sufficiently rewarding to warrant bribery as a means of procuring them. The editor of the American Railway Times, remarking on the high cost of a New York railway built during the reign of Tammany Hall, noted that the costs of "common councils and aldermen are included in the right of way."[7]

The horsecar changed the organization of the transit industry from a competitive to a more monopolistic one. Omnibus operators, seeking not only profits but survival, had quickly responded to changes in consumer tastes and travel patterns. Horsecar companies, insulated from stern market forces by their exclusive franchises, felt no such compulsions to upgrade their services. The complaint most often voiced against the horsecars, ironically, was that cars were overcrowded; patrons traded this condition for relief from overcrowded neighborhoods.[8]

1.3 Refinements of the Streetcar

The trend toward faster and more capital-intensive mass transit facilities continued with the introduction of the cable car to San Francisco in 1873. Twenty-five cities powered their streetcars with cable by 1891, and by the turn of the century the electric street railway, or trolley, had supplanted the cable car. The trolley's average speed was nine to twelve miles per hour.

Coincident with these developments was the building of elevated guideways into the land-scarce city centers. The high construction costs of these "els," first built in New York in 1869, were justified by the speeds they could achieve in the absence of crosstraffic. The elevateds alleviated street level congestion and eliminated the rails that were hazardous to pedestrians and wagoners. But they also blocked out the sun, invaded the privacy of second-story dwellers, and sprinkled ash on pedestrians below.

The socially boorish character of the el led Boston developers in 1897 to find a substitute, in the form of an underground streetcar. Seven years later, New York built its first subway, which utilized the principle of the pneumatic tube.

The electric streetcar dominated commuter transportation for the first two decades of the new century. Its institutional legacy of local monopolies, regulatory bodies, and powerful unions dominates public transit.

The technology of the streetcar involved a significant economy of scale, in that a single powerhouse could operate the lines of an entire city. For this reason, streetcar companies found that they could lower their unit costs of operation by combining into citywide monopolies. When monopolization occurred, the transit unions grew in bargaining power, for under consolidated management they gained the ability to immobilize a city. Concurrently, state and municipal regulatory bodies established or augmented their jurisdictions over the trolley companies, in order to protect the public from monopoly prices. These regulators, however, were

constrained by the ruling in Symth vs. Ames[9] to guarantee that the transit monopolies earned "a fair return on a fair value of investment." Consequently, the regulatory bodies were charged with both setting the rates and protecting the profits of the traction companies.

The trolley was king when Henry Ford first mass produced the automobile in 1908. Automobiles quickly captured a noticeable share of this commuter market from the streetcars. As one traction official exclaimed, each auto meant "an average loss...of from three to five trips a day, because the man who owns the cheap auto not only goes back and forth himself, to and from his employment, but carries one or two of his neighbors."[10]

The loss of ridership and the resulting rise in unit costs increasingly concerned the trolley operators, who were already suffering from the extensions of expensive streetcar lines into the more sparsely settled suburbs. Thus it is understandable that they vigoriously opposed the incipient jitney industry in 1914.

1.4 The Jitney Craze

The jitney industry represented a competitive affront to the streetcar monopolies. Driving their own automobiles, jitney operators solicited up to five or six commuters for short rides at a fare of a nickel (i.e., "jitney"). By running along the streetcars' routes, jitneys directly competed for transit patrons in the most heavily traveled urban corridors. Drivers usually followed a fixed route, but they would occasionally take passengers directly to their destinations for an additional fee.

The jitneys provided less expensive service than taxicabs, because they allowed ridesharing and because they traveled on pre-planned routes. At least on clear days, these open-roofed Model T Fords were more comfortable than the streetcars, for each jitney passenger had a guaranteed seat. Jitneys achieved higher average speeds than the less maneuverable street railways, since they had to make fewer stops to receive and discharge riders.

The size of the jitney bus and the fare structure of the streetcar companies combined to give the jitney a competitive edge in the provision of downtown trips of less than two and a half miles. The jitney could compensate for its relatively high driver-to-passenger ratio by making shorter, more frequent trips than its larger rival. By servicing only the densely traveled downtown routes, the jitney was able to operate at capacity. Even operating at capacity, though, it is not clear that the jitney could provide downtown service at costs as low as those of the streetcar. However, regulators in every major city but Cleveland set streetcar fares at five cents per trip, regardless of distance traveled, with free transfers permitted between lines.[11] City officials felt that the more dispersed settlement which this policy encouraged was desirable, for, among other things, it increased the property tax base. The outcome of the policy was that commuters who lived near the center of the city subsidized the longer streetcar journeys of their counterparts on the periphery. When the jitney presented a faster, more comfortable, and no more expensive alternative means of transportation to the urbanite, it effectively usurped the most profitable part of the street railways' operations.

The jitney industry expanded rapidly. In 1915, only eighteen months after its inception, the industry comprised some 62,000 independently owned vehicles.[12] Not only demand, but also supply conditions were particularly favorable for its ascent. The depression of 1914 left many automobile owners at least temporarily out of work and short of cash. By driving their idle autos for hire, they alleviated both problems simultaneously. The industry was also ideally suited for moonlighting by the under-employed. Like their precursors in the omnibus trade, many jitney operators drove for only an hour or two either before or after their regular downtown jobs. This practice allowed them to both capture the markets of peak demand and minimize empty backhauls. The industry experienced rapid entry and exit, as its practitioners found better jobs or lost their autos to accidents or depreciation.

The traction interests were quick to point out the safety hazards of jitney travel. Noting the industry's high turnover rate, streetcar representatives cautioned that accident victims (of which there seem to have been many[13]) would have a difficult time receiving compensation from uninsured and irresponsible jitney operators. Adding weight to the streetcar spokesmen's concerns about safety were the sensational reports of kidnapping and rape occurring in vehicles that posed as jitneys. The streetcar companies exercised their considerable political clout in demanding that jitneys be regulated as a common carrier. Their campaign was remarkably successful. By the end of 1915, jitneys faced legal restrictions in 125 of the 175 cities in which they had competed with streetcar lines.[14] In October of 1918 only 5878 jitneys remained, and by the early 1920's they were virtually extinct.[15]

Jitney regulations took several forms, varying from state to state and from city to city. Franchise and license fees were generally adopted. The most devasting requirement, however, was that jitneymen purchase liability bonds of from $2500 to $10,000. These bonds cost about $150 to $300 per year, an amount equal to two to four month's wages.[16] Those jitney operators who lacked cash, worked only part time, or expected to work only temporarily-that is, most jitneymen-were forced to leave the industry.

Other regulations, ostensibly aimed at increasing the availability of jitney service or improving its safety, had the effect of removing the jitney's com-

parative advantage. Jitneymen were often required to cruise for a minimum number of hours daily, serve long or unprofitable routes, and operate on fixed time schedules. Some governments enacted special jitney speed limits, while others required them to stop at every intersection. Whether enacted singly or in combination, such ordinances were sufficient to eliminate an industry that had formerly earned minimal profits.

With the passing of the jitneys went the sole commuter alternative to the transit monopolies. While some jitneys became premium service taxicabs, the high labor costs of this mode made it prohibitively expensive for commuter use on a mass basis. Coincident with the enactment of jitney regulations were the prohibition of shared-ride taxi service and limitations on the number of licensed taxicabs. Such regulations, still nearly universal today, made the taxicab all the more inappropriate for regular commuter traffic.

1.5 Modern Transit

The twenties were marked by sharp increases in the numbers of newly formed, affluent, and urban families. Booms in the housing and automobile markets accompanied these demographic changes. 1925 automobile sales reached 3.7 million, a level four times that of 1915 sales.[17] In 1927 23.3 million motor vehicles were registered to serve a U.S. population of about 117 million.[18] The dissemination of the automobile freed workers from the necessity to live near the transit lines. Urban settlement became more uniform, trip patterns more diverse. Rail transit became increasingly incapable of meeting transit needs at low costs as its ridership declined.

The pace of automobile purchases slowed during the Depression, increasing transit's share of the commuter market. At this time the transit companies, many of them publicly owned, began to replace their electric trolleys with rubber-tired trolley coaches and motor buses. These new modes, less capital-intensive than the electric streetcar, were much easier to reroute to meet changing traffic patterns. The more rapid depreciation of the new cars allowed the companies to continously upgrade their equipment as new technology became available. In the decade after 1935 the share of annual transit passengers carried by motor bus doubled to 42%.

Annual transit ridership reached its highest level in 1945 at 23.3 billion. Wartime rationing of tires and gasoline made it impossible for automobile owners to use their vehicles as extensively as previously. However, in the first postwar period the preference for automobile ownership again revealed itself. Average vehicle registrations in the years 1946-52 were 44.6 million annually.[19] The decline in transit patronage is recorded below.

Table 1: Trend in Revenue Passengers, Five-year Intervals, 1940-1975(Billions)

YEAR	Streetcar	Rapid Transit	Bus	Total Revenue Passengers*
1940	4.2	2.3	3.6	10.5
1945	7.1	2.6	8.3	19.0
1950	2.8	2.1	7.7	13.8
1955	0.8	1.7	5.7	9.2
1960	0.3	1.7	5.1	7.5
1965	0.2	1.7	4.7	6.8
1970	0.2	1.6	4.1	5.9
1975	0.1	1.4	4.0	5.6

*total includes trolleybus.

Source: American Public Transit Association '76-77 Transit Fact Book (Washington, D.C., APTA, 1977) p.17

FOOTNOTES

1. Holt, Glen E. "The Changing Perception of Urban Pathology: An Essay on the Development of Mass Transit in the United States." in Cities in American History, ed. by Kenneth T. Jackson and Stanley K. Schultz (Knopf, N.Y., 1972) pp. 324-327.

2. Taylor, George Rogers, "The Beginnings of Mass Transportation in Urban American: Part I," The Smithsonian Journal of History, Vol. I, #2(1966), pp. 39-40.

3. Taylor, Part II, Vol. I, #3 (1966), pp. 33-4.

4. Holt, pp. 327-30.

5. The Stranger's Guide in Philadelphia, (Philadelphia, 1859), p.270, quoted in Taylor, Part I. p. 40.

6. Holt, p. 328.

7. XII (June 30, 1860), p. 259, quoted in Taylor, Part II, p. 49.

8. Holt, p 329.

9. Smyth vs. Ames, 169 U.S. 466 (1898).

10. Holt, p. 337.

11. Echert, Ross D. & Hilton, George W., "The Jitneys," Journal of Law and Economics, XV, #2 (Chicago, 1972), p. 294.

12. "Retrospect and Forecast," Motor Bus, Vol. 1, p. 284 (Jan., 1916).

13. By March 1915, 26 percent of the traffic accidents in Los Angeles involved jitneys. Eckert & Hilton, p. 307.

14. Ibid. p. 319.

15. Ibid. p. 322.

16. Ibid. p. 310.

17. Davis, Lance E., Easterlin, et al., American Economic Growth: An Economists' History Of the United States, (New York, 1972). p. 259.

18. Meyer, J.R.; Kain, J.F.; and Wohl, M., The Urban Transportation Problem (Cambridge 1965), p. 59.

19. Ibid., pp. 47-79.

Current Patterns of Urban Travel

ıteresting picture of the urban travel of modern Americans has emerged the Nationwide Personal Transportation Survey of the Federal Highway nistration.[1] The survey documents in great detail the modes, frequencies, purposes of daily travel by people of various incomes in cities of erent sizes.

concentration of trips during the morning and evening "rush hours" is ent from Figure 1. During the hours of 6-9 a.m. and 4-6 p.m. as many s are begun as are throughout the remaining daylight hours. The single of greatest commuter travel occurs in the morning, but early evening fic tends to be heavier because of its greater portion of non-commuter s. The distribution of non-commuter trips is nearly uniform between the s of 9 a.m. and 10 p.m.

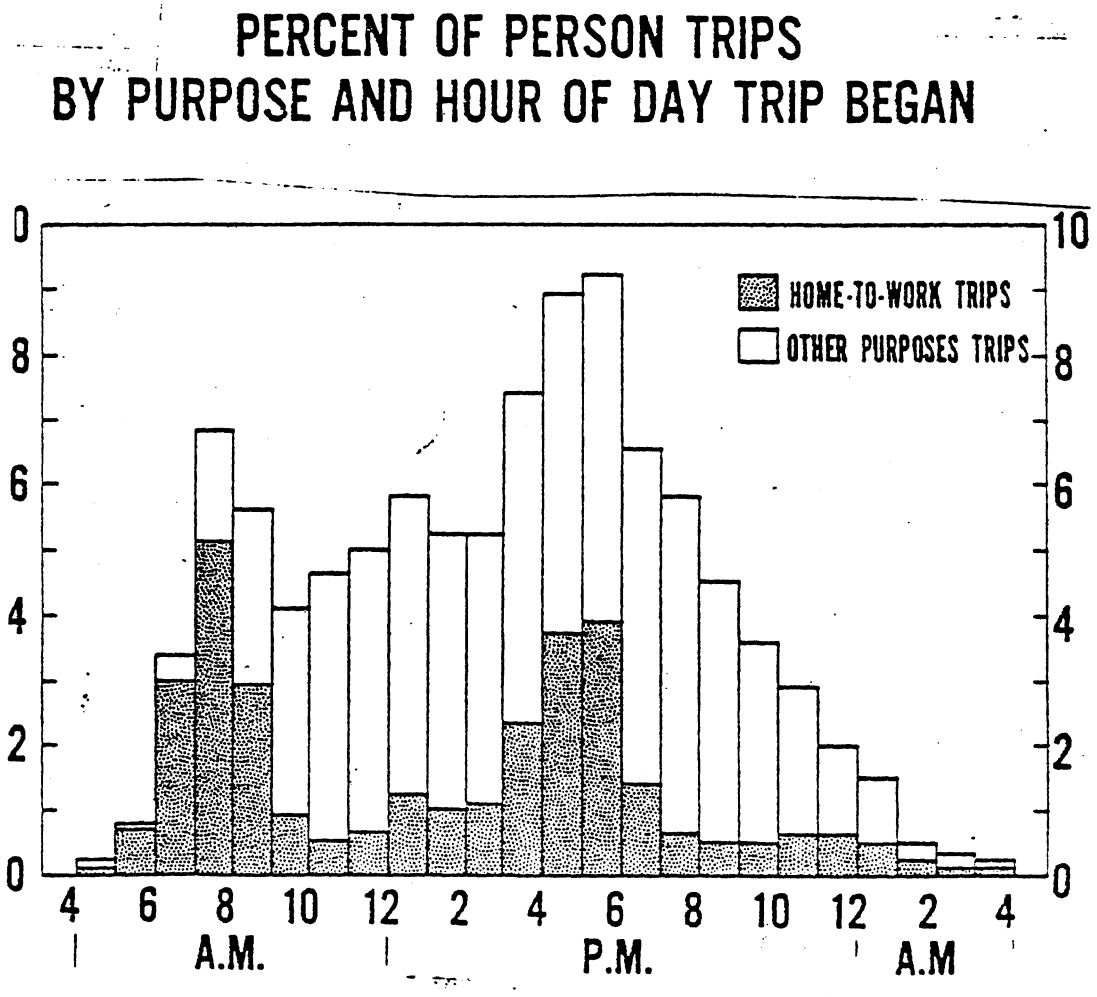


FIGURE 1

2.1 The Work Trip

Travel between home and work is the largest and most regular component of urban travel. Approximately 26% of all person miles and person trips are devoted to the home-to-work journey, the average length of which is 9.9 miles. The vast majority of commuters make this weekday trek by automobile (see Table 2). In the largest cities, however, a significant number of commuters use some form of public transit. In 1970, 37.6% of the people who traveled to work from central cities with at least one million inhabitants did so via public means.[3]

2.1.1 The Automobile Commuter

Critics of the automobile as a commuter mode make much of the fact that the average automobile o-cupancy for the journey to work, in both large and small cities, is 1.4 persons per vehicle, and that nearly three-quarters of such trips are made in cars with only one occupant.[4] It is argued that if such commuters would switch to public transportation for the work journey, then the pollution and congestion effects of excessive peak-hour automobile usage would be reduced.

There is some evidence, however, that automobile drivers suffer from a lack of alternatives. In the nationwide survey, over half of all commuters and 58.8% of all users of private transportation did not consider public transportation available to them for the journey to work.[5] While nearly 87% of all SMSA households have access of public transit to the business districts of their respective central cities and 52% of them live within two blocks of a public transit facility , many wage-earners are employed in areas or at times not served by public transportation.

Table 2 - Percent of employed persons/[1] home-to-work trips, person miles of travel, by major mode of home-to-work transportation and SMSA population groups.

SMSA Population	Public Transportation/[2]						Private Motor Vehicles						
	School Bus	Other bus & Streetcar	Subway	Train	Taxi	Subtotal	Automobile Driver	Automobile Passenger	Motor-cycle	Truck	All Other	Subtotal	Total
Under 250,000	0.2	3.0	NA	*	0.3	3.6	67.6	18.7	0.2	9.3	0.6	96.4	100.0
250,000 - 499,999	0.3	4.5	NA	*	0.1	5.1	68.8	20.5	0.1	5.3	0.2	94.9	100.0
500,000 - 999,999	0.2	7.4	NA	*	0.2	7.8	64.3	21.2	0.6	6.1	*	92.2	100.0
1,000,000 - 1,999,999	0.8	10.9	NA	0.3	0.2	12.5	65.8	17.6	0.1	3.8	0.2	87.5	100.0
2,000,000 - 2,999,999	1.3	10.0	NA	1.1	0.2	12.6	65.5	19.2	*	2.7	*	87.4	100.0
3,000,000 and over	0.9	7.7	9.0	1.4	0.8	19.8	63.4	13.5	0.1	3.2	*	80.2	100.0
ALL SMSA's	0.6	7.2	2.5	0.5	0.4	11.3	65.6	17.8	0.2	4.9	0.2	88.7	100.0

*Statistically insginficant. NA - Not Applicable

1/Excludes persons who work at home or at no fixed address.

2/Approximately 0.1 percent of person trips and 1.4 percent of person miles of travel were made by airplane; These percent probably include some trips made by private plane.

SOURCE: Data from unpublished table P-6 of the Nationwide Personal Transportation Survey conducted by the Bureau of the Census for the Federal Highway Administration, 1969-70

Source: NPTX, *8, Table A-12, p.63.

The ongoing shift of jobs to the suburbs (illustrated by Table 3) has created many home-to-work trips that cannot be performed by traditional means of transit. An increasing number of suburban commuters are traveling to suburban jobs not accessible by typically radial transit routes. The low density of these suburb-to-suburb commuter trips makes circumferential bus service presently impractical.

Table 3: Changes in the Location of Jobs, by Census Region, 1960-70.

Change in Number of Workers

Region*	Central City		Outside Central City	
	Thousands	%	Thousands	%
Northeast	-513	-10	738	24
North Central	-464	-11	1712	79
South	332	14	1016	100
West	359	12	1063	51

*Data are for the 33 largest metropolitan areas by regions.

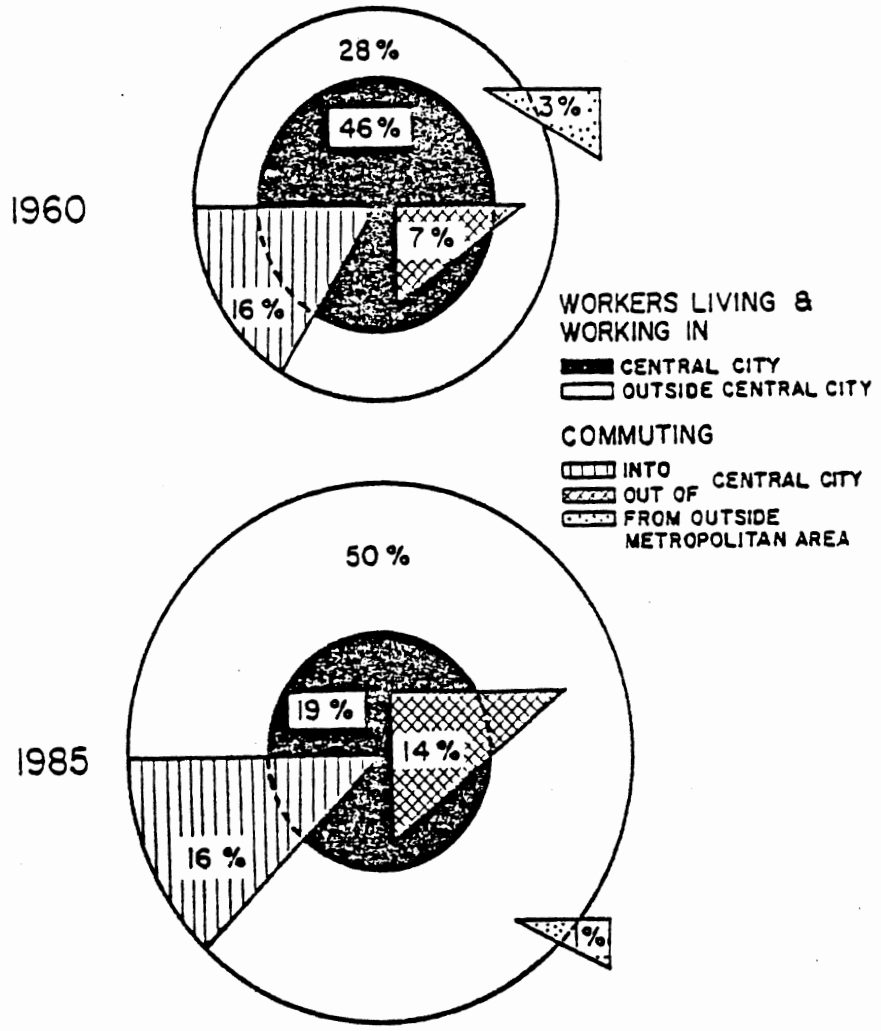
Source: American Institute of Planners and Motor Vehicle Association of the U.S., Urban Transportation Fact Book (Detroit MVMA, 1974), pp. I-16, I-17, printed in Owens, Wilfred, Transportation for Cities: The Role of Federal Policy (Brookings Institution, Washington, D.C., 1976), Table 1-2, p. 12.

Ganz has predicted that this export of jobs from the central city will continue into 1985, at which time 50% of all metropolitan commuter trips will take place outside of the central city. (see Figure 2). The dispersion of trips and workplaces that is implicit in his prediction suggests a limited role for line-haul mass transit in the future.

FIGURE 2

URBAN TRAVEL PATTERNS 1960 & 1985

PERCENTAGE DISTRIBUTION OF JOURNEY-TO-WORK TRAVEL PATTERNS IN METROPOLITAN AREAS



Source: Ganz, Alexander, Emerging Patterns of Urban Growth and Travel (MIT, Cambridge, Mass., 1968). p.82.

An important and often overlooked minority of automobile commuters are those whose households do not own cars. Some 3.5% of all automobile home-to-work trips were made by persons in this category. That some of these trips were made by low-income commuters in taxicabs points up the need for alternative modes of transportation.

An idea of the number of "captive" taxi passengers comes from Weiner. He notes that 52% of all taxicab passengers in 1970 came from households which did not own cars, and 17.7% had annual incomes of less than $3000.[8] Commuter trips accounted for about a third of all taxi trips in SMSA's. (see Table 8).

2.1.2 Other Commuters

In general, commuters who use public transit have low incomes, limited access to automobiles, and/or no licenses to drive. In 1970, 27.4% of the driving age population and nearly 40% of the women of driving age were not licensed drivers.[9] The incidence of licensed drivers fell with the size of the incorporated areas in which they resided. More than half of the population over 16 years of age who lived in incorporated places of more than a million residents were not licensed drivers in 1970, including more than two-thirds of the women.[10]

Not surprisingly, the pattern of automobile ownership follows that of licensed drivers. Whereas 20.6% of all households had no automobiles at the time of the survey, nearly half of those who resided in cities of at least one million population had none.[11] Autoless households were not only predominately urban, they were more often poor as well. Fully 52.4% of them had annual incomes of less than $3000. Perhaps even more striking, 48.6% of the households who had incomes of less than $5000 lacked automobiles, compared with only 8.2% of those with higher incomes.[12]

More than half of all commuter trips taken by households without automobiles were by public transportation. (see Table 4) For all but the highest income group of autoless households (which made up less than 1% of the sample[13]), a larger percentage of public transit commuters was associated with a higher level of income. This suggests that public transportation is not an economically inferior good for autoless households.

Table 4 - Distribution of home-to-work trips by persons having no automobile available by annual household income and major mode of transportation[1] used.

Household income group	Major mode of home-to-work transportation						
	Public transportation			Private transportation			All modes
	Bus and streetcar	Train and subway	Total	Automobile (passenger) and taxi	Truck	Other	
Under $3,000	33.6	7.3	40.9	41.1	16.9	1.1	100.0
$3,000 - $3,999	28.6	4.2	32.8	42.9	18.8	5.5	100.0
$4,000 - $4,999	35.7	19.6	55.3	30.2	11.4	3.1	100.0
$5,000 - $5,999	54.5	6.9	61.4	34.2	4.0	0.4	100.0
$6,000 - $7,499	50.3	8.1	58.4	36.8	3.2	1.6	100.0
$7,500 - $9,999	41.3	29.0	70.3	10.2	10.9	8.6	100.0
$10,000 - $14,999	49.5	29.6	79.1	*	20.9	*	100.0
$15,000 - and over	41.6	6.0	47.6	37.5	6.4	8.5	100.0
All income groups	40.4	10.4	50.8	35.1	12.0	2.1	100.0

1/ In addition, no member of the household owns a car.

* Statistically insignificant.

** Represents 5.5 percent (2,057,254,000) of all work-to-home trips (37,638,363,000)

Source: Data from unpublished table P-4 of the Nationwide Personal Transportation Survey, conducted by the Bureau of the Census for the Federal Highway Administration, 1969-70.

Table 6 - Percent of employed persons by mode of home-to-work transportation and annual household income.

Annual household income	Mode of home-to-work transportation															
	Private motor vehicles					Public transportation			Combined modes			All other				
	Truck	Motorcycle	Automobile		Subtotal	Bus or streetcar	Train	Subtotal	Auto and public transportation	Other	Subtotal	Walking	Other including bicycle	Work at no fixed place	Work at home	Not available
			Driver	Passenger												
By mode of transportation																
Less than $3,000	4.4	0.0	3.0	6.0	4.0	12.7	1.2	10.3	1.3	4.3	2.9	13.8	29.6	8.8	14.5	10.9
$3,000- $3,999	4.2	0.0	3.2	5.2	3.8	10.8	2.5	9.1	2.8	4.7	3.8	13.4	5.9	5.6	12.2	11.5
$4,000- $4,999	3.9	0.0	3.6	5.6	4.1	9.2	3.7	8.0	2.8	3.5	3.2	7.1	0.0	8.1	11.4	1.1
$5,000- $5,999	8.6	9.7	7.4	7.7	7.6	8.8	15.5	10.2	0.0	6.9	3.7	8.9	11.0	8.3	10.3	9.8
$6,000- $7,499	15.6	19.8	12.2	13.8	12.9	12.3	11.1	12.0	15.8	12.3	13.9	13.4	16.8	11.3	11.3	10.5
$7,500- $9,999	27.7	32.0	19.4	20.1	20.2	15.4	14.2	15.2	11.9	18.8	15.7	16.7	12.2	17.5	9.4	12.7
$10,000-$14,999	23.3	28.3	27.4	24.3	26.3	16.3	18.2	16.7	35.8	21.3	28.0	14.0	24.5	22.4	13.5	20.2
$15,000 and over	7.3	10.2	14.3	10.0	12.6	7.9	20.2	10.5	18.8	18.9	18.8	7.7	0.0	7.6	6.6	7.0
Not applicable	5.0	0.0	9.5	7.3	8.5	6.6	13.4	8.0	10.8	9.3	10.0	5.0	0.0	10.4	10.8	16.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Within each income group																
Less than $3 000	4.3	0.0	25.6	20.1	50.0	12.5	0.3	12.8	0.3	1.2	1.5	11.9	1.6	8.1	11.2	2.9
$3.000- $3,999	4.4	0.0	29.7	18.8	52.9	11.8	0.7	12.5	0.7	1.4	2.1	12.7	0.3	5.6	10.4	3.5
$4,000- $4,999	4.4	0.0	34.7	21.4	60.5	10.4	1.2	11.6	0.8	1.1	1.9	7.0	0.0	8.5	10.1	0.4
$5,000- $5,999	6.1	0.2	45.2	18.5	70.0	6.4	3.0	9.4	0.0	1.3	1.3	5.5	0.5	5.6	5.8	1.9
$6,000- $7,499	6.9	0.3	46.4	20.8	74.4	5.6	1.3	6.9	1.6	1.5	3.1	5.3	0.4	4.7	3.9	1.3
$7,500- $9,999	8.3	0.3	49.8	20.5	78.9	4.7	1.2	5.9	0.9	1.5	2.4	4.5	0.1	4.9	2.2	1.1
$10,000-$14,999	5.4	0.2	54.9	19.2	79.7	3.9	1.2	5.1	2.0	1.3	3.3	2.9	0.3	4.9	2.5	1.3
$15,000 and over	3.5	0.1	58.8	16.4	78.8	3.8	2.7	6.5	2.0	2.5	4.5	3.3	0.0	3.4	2.5	1.0
Not applicable	3.2	0.0	53.1	7.3	63.6	4.3	2.4	6.7	1.7	9.3	11.0	2.9	0.0	6.3	5.6	3.9
Distribution of users	5.7	0.2	48.4	19.0	73.3	5.7	1.5	7.2	1.3	1.6	2.9	5.0	0.3	5.3	4.4	1.6
Distribution of workers ('000)	4,283	135	36,630	14,467	55,515	4,333	1,166	5,499	1,000	1,162	2,162	3,768	228	4,010	3,376	1,200

Source: Data from unpublished table H-5 of the Nationwide Personal Transportation Survey conducted by the Bureau of the Census for the Federal Highway Administration, 1969-70.

Table 6 gives a complete breakdown of commuter modes by income level for all commuters. The number of automobile commuters in each income group grows from 50% for the lowest income group to nearly 80% for the highest. The percentage of transit passengers from each group tends to decline with increasing income, implying that the more expensive automobile mode is preferred by those who can afford it. Among transit users, train passengers are more often from the middle and upper income households, while bus and streetcar passengers are not. Finally, those passegners who combine public and private modes on the home-to-work trip are most often from the upper income households. These households have a greater tendency to both reside at some distance from a transit station.[15] and to have an automobile at the commuter's disposal.

2.2 Trips for Other Purposes

Table 7 highlights the extreme importance of the automobile as a general means of urban transportation.[16] Over 95% of all trips for social, recreational and family business purposes in SMSA's are made by automobile or truck. However, since all modes do not operate in all SMSA's, these figures underrate the significance of public transit in those communities it serves.

Table 7 - Modal distribution of person trips, by trip purpose, all SMSA's, 1970.

Trip purpose	Private transportation					Public transportation					Other[2]	Total all modes
	Automobile			Motorcycle	Truck	Taxicab	Commercial bus[1]	Elevated or subway	Other train	School bus		
	Total	Driver	Passenger									
Earning a living:												
To and from work	83.4	65.6	17.8	0.2	4.9	0.4	7.2	2.5	0.5	0.6	0.3	100.0
Related business	78.9	58.5	20.4	–	17.0	.5	1.2	–	–	1.3	1.1	100.0
Total	82.9	64.7	18.2	.1	6.5	.4	6.5	2.1	.4	.7	.4	100.0
Family business:												
Medical and dental	88.9	49.7	37.2	–	3.1	2.8	5.6	.8	.4	.4	–	100.0
Shopping	94.4	55.8	38.6	.1	2.2	.3	2.3	.5	–	.2	–	100.0
Other	93.3	57.8	35.5	.2	3.4	.3	1.8	.4	–	.5	.1	100.0
Total	93.5	56.3	37.2	.1	2.8	.5	2.2	.5	.1	.3	–	100.0
Education, civic, religious	67.1	31.2	35.9	2.2	1.0	.1	2.8	.7	–	25.7	.4	100.0
Social and recreational:												
Vacation	95.5	29.4	66.1	–	1.3	–	.7	–	–	–	2.5	100.0
Visit friends and relatives	94.2	49.0	45.2	.2	2.2	.2	1.9	.6	.1	.5	.1	100.0
Pleasure rides	95.9	43.6	52.3	.9	2.1	–	–	.4	–	.5	.2	100.0
Other	94.4	45.0	49.4	.2	1.9	.1	1.7	.3	–	1.3	.1	100.0
Total	94.4	46.3	48.1	.2	2.0	.2	1.7	.4	–	.9	.2	100.0
Total, all purposes	86.6	53.0	33.6	.2	3.5	.3	3.8	1.0	.2	4.2	.2	100.0

[1] Bus trips, other than school bus.
[2] Includes some airplane trips.

Source: U.S. Department of Transportation, Federal Highway Administration, *Nationwide Personal Transportation Study*, unpublished series P-6-1 tables.

Table 8 - Purpose distribution of person trips, by mode, all SMSA's, 1970

Trip purpose	Private transportation				Public transportation					Other	Average, all modes
	Automobile		Motorcycle	Truck	Taxicab	Commercial bus[1]	Elevated or subway	Other train	School bus		
	Driver	Passenger									
Earning a living:											
To and from work	33.4	14.3	27.5	38.3	32.0	51.4	66.2	80.9	3.9	31.4	26.9
Related business	4.4	2.4	–	19.3	5.7	1.2	–	–	1.2	11.2	4.0
Total	37.8	16.7	27.5	57.6	37.7	52.6	66.2	80.9	5.1	42.6	30.9
Family business:											
Medical and dental	1.7	2.0	–	1.6	16.3	2.7	1.4	–	.2	–	1.8
Shopping	16.7	18.2	12.8	9.9	16.3	9.2	7.9	5.4	.9	–	15.9
Other	13.8	13.3	11.0	12.5	12.3	6.0	4.8	2.5	1.4	2.1	12.6
Total	32.2	33.5	23.8	24.0	44.9	17.9	14.1	7.9	2.5	2.1	30.3
Educational, civic, religious	8.4	15.3	16.5	4.6	5.4	18.1	9.5	5.8	87.3	40.7	14.4
Social and recreational:											
Vacation	.1	.5	–	.1	–	.1	–	–	–	–	.3
Visit friends and relatives	8.5	12.3	11.8	5.8	5.9	7.5	5.3	5.4	1.1	1.8	9.2
Pleasure rides	1.2	2.2	7.1	.9	–	–	.6	–	.1	–	1.4
Other	10.6	18.5	12.3	6.7	6.1	5.8	4.0	–	3.7	8.5	12.5
Total	20.4	33.5	31.2	13.5	12.0	13.4	9.9	5.4	4.9	10.3	23.4
Other	1.2	1.0	1.0	.9	–	1.0	.3	–	.2	4.3	1.0
Total, all purposes	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Bus trips other than school bus.

Source: U.S. Department of Transportation, Federal Highway Administration, *Nationwide Personal Transportation Study*, unpublished series P-8-1 tables.

The specialization of public transit is apparent from Table 8.[17] Schoolbuses are employed almost 90% of the time in the task which their name inplies, carrying 36.5% of all primary and secondary students.[18] Of other public transit modes, the more capital intensive are the least versatile. Taxicabs are used more often for family business than for trips of any other purpose, while the bus also performs major non-commuter roles.

The above statistics quantify the successes of modern transit and hint at its failure. Every urban trip taken represents a mutually satisfactory bargain between a supplier and a demander of transportation, often the same person. Unfortunately, we cannot see all of the demanders for whom no supply existed, nor do we know if all transactions were efficient ones. It is quite possible that all transportation markets clear in such a way as to neither maximize consumer satisfaction nor minimize supplier cost.

In the following chapter we discuss situations in which transportation services can be improved by the introduction of innovative systems. It is contended that the carefully coordinated entry of para-transit modes into particular markets will increase social welfare.

FOOTNOTES

1. Commissioned by the U.S. Department of Transportation (Government Printing Office, Washington, D.C., 1974). Hereafter, NPTS.
2. NPTS, #8, p. 47.
3. Ibid, p.23.
4. NPTS, #1, p.3. See also the Department of Transportation's 1974 National Transportation Report: Urban Data Supplement (G.P.O. Washington, D.C. 1976), Table SE-3.
5. NPTS, #8, p. 36.
6. NPTS, #5, p. 3.
7. NPTS, *8, p. 84.
8. Weiner, Edward, "The Characteristics, Uses, and Potentials of Taxicab Transportation," Transportation, Vol. 4, #4 (1975), pp. 351-67.
9. 38.5% of the women. NPTS, #6, p. 14.
10. Ibid., 51.2% of the total, 67.5% of the women. p. 8.
11. 47.6%, NPTS, #8, p. 82.
12. Ibid, derived from Table A-32, p. 83.
13. Ibid.
14. Ibid., Table A-15, p. 66.
15. NPTS, #5, p. 3.
16. 1974 National Transportation Report, Current Performance and Future Prospects, U.S. Department of Transportation (G.P.O., Washington, D.C., 1975). Table IV-4, p. 134.
17. Ibid., Table IV-3, p. 133.
18. NPTS, #4, p. 9.

3.0 Para-Transit Alternatives

Para-transit has been defined as "...those forms of intra-urban passenger transportation which are available to the public, are distinct from conventional transit (scheduled bus and rail), and can operate over the highway and street systems." Typically, forms of para-transit are distinguished by the vehicles each type of service uses. Taxicab, jitney, rental car, dial-a-ride, car pool, van pool, and subscription bus are the para-transit modes most frequently discussed. However, para-transit differs from conventional transit more in the types of service it offers than in the vehicles it utilizes.

Conventional public transit operates along fixed routes at pre-scheduled times so as to carry as many passengers to as many destinations as the budget allows. Conventional private transit, the family automobile, can be used to carry an individual wherever he chooses whenever he chooses. Para-transit modes offer the consumer more time and destination combinations than conventional public transit, but at much lower costs than the single-passenger automobile can achieve.

Para-transit is scarce because existing laws make it difficult to initiate. Taxicab regulations in nearly all municipalities forbid passengers to split the mode's high costs by sharing rides with other parties. Laws that place passenger liability entirely in the hands of operators make transit insurance for all but the largest operators expensive and difficult to obtain. Anti-trust laws prohibit small potential operators from coordinating service schedules in ways that reduce costly duplication. Tax laws make it easier for employers to provide free parking for employees than to subsidize their transportation in other ways. A host of such statutes emanate from all levels of government to discourage innovation.

Some consumers have few transportation modes from which to choose. Unless the consumer has access to an automobile or taxicab, he must reside within walking distance of everywhere he wants to go, or within walking distance of a transit line that can take him there. Transit buses and trains are

becoming increasingly incapable of satisfying travel demands in our decentralizing cities, while automobiles and taxicabs are becoming increasingly expensive. Those who can afford to travel by automobile command scarce fuel supplies away from other uses and release noxious fumes to the public in the process.

Fortunately, automotive vehicles provide the capability of extending mobility to the transportation disadvantaged, reducing the costs of public transit, and lowering the levels of traffic congestion and pollution. Furthermore, this can be done at little or no cost to the public at large. All that is required is the relaxation of political barriers to transit innovation, and public coordination and encouragement of private enterprise in the field.

While a convincing case can be made for government subsidy of new forms of transit, particularly those that further public goals, such aid is not necessary for the fulfillment of certain objectives.[1] Private companies have already been able to establish para-transit where they have received the cooperation of local governments and transit agencies.[2] Motivated by profits, such companies have tried to provide only those services for which riders have been willing to pay. Subsidies to special interest groups at the expense of the general ridership have been avoided, and consumers have been given a wider range of choices.

3.1 The Transportation Broker

A model public body in Knoxville has successfully implemented a range of para-transit services there. Known as the "transportation broker," this body is responsible for identifying local sources of transportation demand and breaking the institutional barriers to both public and private efforts to satisfy it. Among other things, the broker has founded a ridesharing computer matching service, helped to initiate express buses and a company van pool, and submitted legislation to help private companies and individuals pool their transportation resources.[4] By acting as an onbudsman instead of a gendarme, the broker has raised the level of transportation services in the community without endangering the public safety.

Because each metropolis has grown along a different path, constrained by its unique mix of institutions, geography, and history, each has different transit needs. Consequently, it is impossible to spell out which para-transit services a broker should encourage. Particular transportation problems with wide application, however, can be solved with para-transit as circumstances require. The broker's task is to match the potentials of all transportation modes with the needs of his community.

3.2 Commuter Roles for Para-transit

The following sections discuss the capabilities of para-transit, the problems inherent in its implementation, and the roles that the private sector can play in its finance.

3.2.1 Subscription Bus Clubs

The subscription bus is perhaps the simplest para-transit mode to conceptualize and the most difficult to realize.[5] In the most basic subscription system, commuters from a common origin charter a vehicle to take them regularly to a common destination. The vehicle may be as small as a taxicab or as large as a train. The essential element of the mode is that its initial ridership and hence its revenues are guarangeed before it begins operation.

Subscription service is efficient in that it allows its subscribers to realize whatever economics of scale can be derived from their vehicle. In general, the longer the line-haul portion of the trip relative to the pick-up and distribution components, and the larger the vehicle driven, the less the trip will cost per passenger. In Reston, Virginia (a suburb of Washington), Knoxville, and St. Louis County, where these clubs have been most successful, many riders have been able to forego ownership of at least one automobile. In a survey at Reston, for example, 49.4% of the ridership indicated that they would have had to own more automobiles if the service had not been available.[6]

Riders not only save money, but they also pass benefits along to their fellow commuters. By not driving their own automobiles at rush hours, subscribers

lower the demand for road space. This diminution of demand lowers the levels of congestion, allows others to use the road who were dissuaded by the previous level of congestion, and/or postpones the need for highway expansion. Subscribers also tend to use less fuel per capita and emit less pollution per capita than the automobile passengers they replace.

A more subtle advantage of the subscription club organization, noted by Sherman, is that it eliminates a bias towards automobile ownership. He argues that when regular commuters are given the choice of paying average total costs for a mass transit system with declining average costs or paying only the costs that they incur for automobile use, they will favor the automobile by more than they would if they were charged their true costs. This happens because frequent users of a declining cost mode are essentially overcharged by average cost pricing, for they must pay the brunt of the system's fixed costs. Subscription users of mass transit, however, can be charged their proper levels of both fixed and variable costs, thereby eliminating the bias. Sherman's argument, however, does not apply when mass transit is subsidized.

Subscription bus clubs can operate successfully where either origins or destinations are more diffuse, particularly if the line-haul portion of the trip is very long. The Reston buses circle that satellite community in the morning to pick up their passengers, then deposit them some twenty-five miles away at various locations in Washington. Specialty Transit Company, Inc. picks up passengers from a very low density service area that extends from 20 to 100 miles from the destination, a McDonnell Douglas Corporation plant near St. Louis. Many riders on this line must arrive at the system's limited number of bus stops by automobile. Nonetheless, their cost savings are substantial.[8]

Some people who would be unwilling to use other forms of public transit become members of subscription clubs because of their localized service areas. Subscription service lets these people exercise the same choice over fellow riders that they enjoyed in picking their neighbors.

A major disadvantage of subscription service for some riders is that it holds them to a strict schedule. Unless the system is large enough to operate several commuter lines with staggered schedules (as, e.g., the Reston system does), commuters cannot linger at their work sites to put in overtime, shop, or handle personal business. The irregularity of workers' hours was a factor in the demise of subscription service in Flint, Michigan.[9]

Subscription clubs have been financed by both public transit agencies and private entrepreneurs. Private companies, such as Speciality Transit, can sometimes provide less expensive service because they can hire part-time drivers to work during the hours of heaviest commuter traffic. Further savings can be achieved if one of the commuters drives the bus and parks it all day at the work site, thereby minimizing empty backhauls.

Public transit companies are usually required by their labor contracts to hire full-time drivers, which doubles or triples the wage bill of subscription commuter service. These agencies, however, are eligible for UMTA grants that pay up to 80% of the cost of new equipment. Thus, federal taxpayers, rather than local passengers, pay a substantial share of the cost of even those publicly financed subscription services that "break even at the farebox."

Commuters generally pay for subscription service in two stages. First, they must pay a membership fee designed to cover the system's overhead. Payment of dues commits members to use of the service, and so reduces the risk to the transit provider. A user fee is then charged to members on a monthly, weekly, or daily basis to cover the operating costs of the system. Non-members may elect to ride the buses at a higher daily fee that reflects their full costs. Permitting non-members to ride not only directly increases revenues, but also aids in recruiting people who would have been hesitant to join without a few "trial runs."

The organizational problems of subscription clubs are substantial. At least forty persons with nearly common origins, destinations, and working hours must find each other and make a financial commitment to the service before it can even begin. They must find a bus company or an entrepreneur with the legal and administrative ability to start one. Their search is complicated

by the fact that even established transit agencies are reluctant to undertake a system that is founded on the premise that middle class commuters are willing to leave their private automobiles.

Clubs have been successful in areas where commuters could be easily contacted and innovative and knowledgeable managers were present. Apartment complexes, universities, new towns, large work complexes and other locations that feature a common forum are currently necessary for the inception of such clubs. However, the existence of a broker with an expert staff, computer matching facilities, and the advertising resources to reach a great number of potential subscribers offers the hope that this service could be extended into single-family residential communities.

Suburban service becomes all the more likely when low cost parking is available to subscribers at bus stops. Park-and-ride lots greatly expand the service area of the system, aiding patrons in two ways. First, a larger clientele allows the provider to increase his fleet size and his range of arrival and departure times. Second, administrative costs per passenger tend to drop as the number of subscribers increases.

3.2.2 Carpools and Vanpools

Similar in concept to subscription bus clubs are car pools and van pools. A van pool is an organization of commuters who travel by van, while a car pool is a smaller and less formal organization of automobile passengers.

Van pools work well in situations where a moderately dispersed group of commuters requires access to a common site. The 8-15 passenger van outperforms its larger counterpart under such conditions because it must make fewer time-consuming stops to pick up enough patrons to reach capacity.

Most van pools to date have been sponsored by large corporations as commuter modes for their workers. By sponsoring van pools, corporations can reduce their needs for employee parking facilities, reduce absenteeism and tardiness associated with car failure, decrease traffic congestion at plant entrances, and expand their labor market areas to include those without cars. By extending job opportunities to the transportation disadvantaged, firms find it

easier to resist wage increases and meet affirmative action goals. In addition, firms are better able to shift production from the daytime to the evening and early morning hours, when energy is (or soon will be) less expensive and public transportation is unavailable.

Financing schemes for employer-sponsored van pools are numerous. Employers can do so much as to furnish van transportation free to employees as a fringe benefit, or as little as to permit the pool's organization by a private entrepreneur on the firm's premises. At 3M Corporation riders were billed on a monthly basis in accordance with their travel distances. Drivers, who were plant employees, were encouraged to fill their vehicles by an arrangement which allowed them to keep the fares of the ninth through twelfth passengers they had solicited. Drivers were also allowed to use the vans after hours for a small mileage fee.[10]

Firms can subsidize van pools by granting them free and preferred parking places. Special traffic lanes for vans throughout the plant can also encourage van use, by equalizing the total trip times of automobile and van commuters.

A number of legal problems inhibit van pool formation.[11] After a determination is made as to whether the van pool is a "common," "contract," or "private" carrier in the state(s) in questions, the applicable licenses must be obtained. This may require a hearing before a Public Service Commission. Liability insurance must be found which meets generally strict legal specifications. Employers, even those with little or no control over the van pool itself, must determine if they are liable beyond the extent of their van pool insurance. Rates may be publicly regulated, and hearings may be necessary for proposed rate changes.

The decision concerning the best means of finance for a particular system rests on a similar list of legal questions. Would van pool benefits to employees accrue to them as taxable income? Are such payments deductible business expenses for the employer? Can expenses for van pool promotion within the company be counted as business expenses? In some states van pools may be subject to public utility property tax assessments, which may be higher than business tax assessments.[12] Such questions are hardly insoluble, but they require the

kind of expertise that a local broker can provide.

Davis has shown that van pool service need not be limited to employees of large corporations.[13] Vans have been used in Knoxville in place of buses to serve transit routes where patronage has dwindled. City-wide van pools have been established using the computer matching facilities of the transportation broker. Important sources of the revenues that keep this system self-supporting are the reverse commuters who occupy vans that would otherwise have had to deadhead to the beginning of their routes.

A car pool is somewhat more expensive than a van pool, but also more flexible. Its fewer passengers are better able to bargain among themselves to accommodate occasional changes in schedule. Car pools have existed, informally at least, since the first days of the automobile. Two arrangements are most common. In the simplest, several car owners with nearly common origins and destinations take turns driving each other to work or school. Alternatively, several passengers pay a car owner enough to cover the expenses he incurs in driving them to work. The data in Section 2 indicate that these arrangements are quite common.

The greatest barrier to car pool formation is the difficulty potential members have in finding each other. Impersonal matching services only partially address this problem, for they can only help people who are willing to share the privacy of their automobiles with strangers.

The liability problem also threatens car pooling. Unless protection is explicitly written into law, an employer may be liable for damages that arise from company-sponsored or subsidized car pools, even when the pool's vehicles are not owned by the employer.[15] A driver of a car pool whose passengers compensate him for his services is liable for whatever damages they may win against him, should he be found responsible for an accident. Thus, should a drunken driver with $100,000 liability protection injure four passengers, each of whom recover $50,000 against him, the driver's insurance company would probably pay the first two claimants to win their suits. The others would have no recourse but to claim the driver's other assets. On the other hand, members of pools in which passengers share driving responsibilities and automobiles are respon-

sible for their own insurance protection.[16] A transportation broker can advise car pools he helps to form of their insurance needs, based on the requirements of their jurisdiction.

3.2.3 Livery Cabs

A professionally operated car pool is called a subscription taxicab or a livery. This para-transit mode is more costly than the car pool, in that it requires the services of a paid driver, who must travel to the origin of his passengers. The mode is less costly to the extent that it allows savings in parking.

Livery riders enjoy the services of professional managers and dispatchers. They need only notify the dispatcher to alter their schedules either temporarily or permanently. The dispatcher can easily replace a rider who must drop out of an established pool without affecting the other patrons. The dispatcher is also capable of organizing pools that involve complicated travel patterns. For example, the dispatcher can fill an empty seat by locating a potential rider whose trip lies entirely within those of the other customers.

Like other ride-sharing modes, the subscription taxi alleviates peak-hour pressure on both highways and mass transit facilities. In addition, private automobile, it provides door-to-door service to those who do not own cars.

The advent of extensive implementation of this service awaits relaxation of local taxicab regulations. Demand for liveries is so great in New York, where they are legal, that about 15,000 of them operate there, compared with about 12,000 premium service taxicabs. Approximately 300-600 liveries exist in Chicago, where regulations are similarly lenient.[17]

3.2.4 Jitneys

A rebirth of jitneys (see Section 1) could accompany the relaxation of taxicab regulations. These shared-ride taxicabs could ease commuter movement in several ways. Some jitneys could follow the fixed routes of the conventional transit lines at rush hours to mitigate overcrowding. Unconstrained by labor contracts, part-time jitney drivers could relieve the transit agency of the burden of maintaining extra equipment and hiring full-time drivers to cover

the hours of peak demand. Jitneymen could further complement the city's transit system by providing feeder service to the main transit lines from low density areas. By regulating jitney routes, public service commissions could more easily achieve the desired mix of automobile traffic and mass transit.

The jitney is also well suited for circulator service in downtown areas. Its relatively small size makes it much more maneuverable in heavy traffic than city buses, and its low capacity puts a limit on the amount of time that can be lost in accepting and discharging passengers.

Many of the old arguments for jitney regulation still have some merit. Passengers should be protected from irresponsible operators by a provision that guarantees some minimum amount of liability insurance. Where jitneys prove so efficient that they supplant existing bus lines, transit regulators may want to require a minimum spacing between jitneys in order to guarantee a uniform flow of transit service along particular routes. Jitneys should be required to display a license and perhaps a destination sign so that patrons can be protected from imposters with unscrupulous motives. Regular vehicle inspections can also promote public safety.

3.3 Other Functions for Para-Transit

The great majority of urban trips are not commuter trips. Trips for family business, educational, civil, religious, social, and recreational purposes accounted for 58% of all person trips in SMSA's in 1970 (see Table 8). These trips tend to be widely dispersed throughout the urban area,[18] but conventional mass transit typically only operates radially from the central business district. The demand responsive para-transit modes of taxicab, dial-a-ride, and jitney are designed for these diverse trips. They are especially helpful to those who do not have automobiles at their disposal.

3.3.1 Premium Taxicab Service

The characteristics of premium taxicab service are well known and will not be dwelt upon here. In our definition, a premium taxi is one that carries a single party directly to his destination in answer to a telephone dispatch or a street hail. Since the use of a driver, automobile, and dispatching system are required, such service is relatively expensive.

3.3.2 Dial-a-Ride

In the dial-a-ride mode, vehicles are dispatched in answer to phone calls for door-to-door service. Traditionally associated with taxicabs and liveries, dial-a-ride can also be implemented by jitneys and van companies during off-peak hours. Less expensive though slower service is possible if dial-a-ride vehicles are permitted to answer hails.

The basic difference between dial-a-ride and premium taxicab service is that in the former, ride-sharing is arranged by the dispatcher in order to hold down costs. Consequently, dial-a-ride drivers are less able than taxicab operators to wait for clients or help them with their bags, for these services delay other passengers in the system. Ride-sharing results in longer travel times because the additional passengers require time to board, disembark, and reach varying destinations. On the other hand, waiting times may fall when ride-sharing is allowed, because patrons can take rides in occupied cabs.

Methods of dispatching vary among dial-a-ride systems. In Davenport, Iowa, trips are arranged so that patrons do not have to transfer between vehicles. The Ann Arbor, Michigan service area is divided into zones, whose boundaries vans cannot cross. Although this system simplifies dispatching and diminishes deadheading, it forces those making inter-zonal trips to transfer to either a line-haul bus or another dial-a-ride van.

3.3.3 Jitneys

During off-peak hours jitneys can furnish high-quality, low-cost transportation along corridors of moderate traffic density. The mode is especially well-designed for this purpose in that it can make frequent stops and route deviations, while inconveniencing few passengers and carrying little excess capacity.

Depending upon an area's needs, the mode can be as adaptive as dial-a-ride or as inflexible as conventional bus systems. In areas which have good taxicab service for the transportation disadvantaged, jitney trips may be limited to fixed routes. Such jitneys would act as small, fast buses. In other locales where comfort is of greater importance than speed, jitneys may be allowed to

take passengers directly to their destinations for additional fees. In still more flexible operations, jitneys could answer dispatcher-relayed telephone requests for rides, deviate from their routes more extensively, and pass bus stops less frequently. The best jitney system for a particular community depends upon a locale's alternatives, its demands for speed, convenience, and service frequency, and its ability to pay for marginal drivers, extra capacity, and dispatching equipment and personnel.

3.3.4 Financing Demand-Responsive Modes

In general, dial-a-ride operations that have utilized buses or vans have been publicly financed, whereas taxi-based systems have been privately financed.[19] The few extant jitney systems are privately owned.[20]

Only publicly owned systems are directly eligible for UMTA grants. With these grants, however, comes the stipulation that employees of existing systems cannot be disadvantaged by a new system without compensation.[21] The effect of this provision has been that any innovative form of transit that has supplanted the services of an existing system has had to hire whatever drivers would have been laid off. As a result, most publicly operated demand-responsive systems use the high-priced union labor of their forebears, the fixed route bus lines.[22]

Publicly operated demand-responsive systems can achieve economies of scale in dispatching, maintenance, and parking facilities. Their monopoly positions make them well known to potential riders, thereby mitigating the need for costly advertising.

Privately operated companies have been more successful at keeping down drivers' wages. The widespread availablity of sufficiently skilled labor has made employees of private taxicab companies reluctant to organize. The wages of jitney operators are likewise constrained by competition, the level of demand for their services, and publicly regulated jitney rates.

Many forms of taxicab and jitney financial organizations have been spawned by the various mixes of local ordinances and tax laws. Three forms predominate:[23]

Most taxicabs belong to fleets, with a single owner and manager. Drivers are the hired hands of the fleet owners, who use fares to pay all operating expenses and license fees.

Some taxicabs and most jitneys are owned by their operators. These individuals must either do their own maintenance or contract for it. They must also contract for whatever dispatching and insurance they require.

Still another group of drivers lease their vehicles from outside owners on a per diem basis. Owners provide licensing, dispatching, insurance, maintenance, and parking. Drivers in turn are permitted to keep their daily farebox receipts. This arrangement allows drivers and capitalists to specialize their functions, and so increase efficiency. Also, like the owner-operator arrangement, it gives drivers the incentive to be as productive as possible.

Cooperatives of competitive drivers can be formed on a city-wide basis to provide those services that yield substantial economies of scale. Thus, an owner-operator of a single vehicle can achieve the same cost savings as a fleet owner if he is allowed to purchase maintenance, fuel, insurance, legal assistance, and dispatching services from a central efficient supplier.

3.3.5 Charter Buses

Few groups besides commuters have common daily transportation goals. However, many groups have less frequent needs for transportation to particular events and facilities. Clubs and organizations require buses or vans for occasional field trips or more regular trips to shopping, religious, or medical facilities. Sports fans and concert-goers can benefit from transportation to special events that do not take place along established transit routes.

Such groups, allied formally by membership or informally by need, have solved their transportation problems either internally or by charter. Groups that have chosen to operate their own transportation systems have often lacked the managerial skills for such enterprises. Aside from the aforementioned concerns of complying with the regulations protecting their passengers and drivers, these small-scale operations have had to cope with maintaining and storing

vehicles, which have usually been idle. Where charter buses have been available to such groups, their rates have often reflected the high costs of underutilized capacity.

The existence of para-transit, however, allows commuters and charters to pool their resources. Subscription bus clubs, jitneys, and van pools can all rent out their vehicles and personnel during non-peak hours for charter trips. The overhead costs incurred by both peak and non-peak-hour travelers are thus lower than they would be in the absense of this symbiotic relationship.

The transportation broker in Knoxville has fostered the development of a private para-transit industry by insisting that the school board charter its school buses. He has encouraged competition among charters by limiting the number of buses for which any one company can contract. The result has been an increased supply of private buses, which can be used at other times for subscription, jitney, and charter service.[24]

3.3.6 Rental Cars

An old form of para-transit experiencing renewed interest is the rental car. Formerly the solution to the short-term needs of the out-of-town traveler, the rental car is now envisioned as an economical form of high-quality transportation for the urban dweller.[25]

Apartment and condominium complexes and college campuses are the logical sites for rental car innovation. In such places, many persons with good credit and little capital need automobiles only occasionally. By renting rather than owning their cars, they can realize substantial personal savings on parking, maintenance, and insurance costs.

On the other hand, renters incur some costs that automobile owners do not. In a rental system, each mile and/or minute of use must be accounted for. The administrative costs of bill collection must be charged to the users. Renters can neither store personal belongings in their vehicles nor alter their vehicles to suit their personal tastes. Rental cars must be cleaned to meet the

standards of the general public, which may be more or less stringent than those of the individual driver. Finally, individuals who rent cars are unable to benefit from their own abilities to manage their vehicles and finances, for each must pay the costs of the average rider.

The neighborhood of the rental car facility benefits from the more efficient use of land generated by the arrangement. Neighborhood externalities are mitigated when rental cars supplant unreliable used cars, which are apt to cause excessive pollution, waste gasoline, and break down in traffic.

3.4 Subsidies for Para-Transit

Should the political climate be appropriate, para-transit can be subsidized in a number of ways. Public bodies could provide either direct monetary assistance or services to para-transit operators. Among services that could be efficiently publicly provided are brokerage, parking, and dispatching. It may be possible for local governments to purchase para-transit vehicles with UMTA grants and then lease them at low rates to para-transit operators. This issue must still be resolved by the courts. Governments can also directly subsidize para-transit companies by exempting them from property and business taxes.

Social service agencies can aid target groups in the population by issuing them transportation stamps. These could then be redeemed by para-transit and public transit providers at the social service agencies as they are used.

Governments can encourage para-transit without spending public money by granting para-transit vehicles exclusive or preferential use of highway lanes during rush hours. Such measures would increase the passenger-carrying capacities of main arteries because under-utilized vehicles would have to compete for the remaining lanes. Single-passenger automobiles would become more expensive to operate relative to ride-sharing modes.

3.5 Comparison of Modes

Kirby, Bhatt, Kemp, McGillivray, and Wohl have compared the performance and cost characteristics of para-transit modes.[26] Their results are presented in Table 9.

The most costly modes are those that offer the most service, namely taxicab, dial-a-ride, and daily rental car. The least expensive modes are those that offer the least personalized service, like the conventional bus, or that have the least widespread application, like the subscription bus. The jitney mode, which combines the potentials and shortcomings of all the others, scores moderately well by all criteria.

TABLE 9

Categorizing para-transit modes by cost and performance characteristics

		Hire and drive services	Hail or phone services			Prearranged ride-sharing services		
	Private auto	Daily rental car	Taxi	Dial-a-ride	Jitney	Car pool	Sub-scrip-tion bus	Conven-tional bus
Vehicle potential	M	M	L	M	M	M	H	H
Output	L	L	L	L	M	M	M-H	M-H
Utilization	L-M	L	L	L	M	H	M-H	M
Cost/passenger trip mile	M	M	H	H	M	L	L-M	M

Definition of Terms:

	Low (L)	Medium (M)	High (H)
Vehicle potential (V) (seat miles/vehicle-hour)	$V < 100$	$100 \leq V \leq 500$	$V > 500$
Output (Q) (Passenger trip miles/ vehicle-hour)	$Q < 50$	$50 \leq Q \leq 250$	$Q > 250$
Utilization (U) $\left(\frac{100 \times \text{output}}{\text{vehicle potential}}\right)$	$U < 25$	$25 \leq U \leq 50$	$U > 50$
Cost/passenger trip mile (C) (cents)	$C < 5$	$5 \leq C \leq 25$	$C > 25$

Footnotes

1. An interesting discussion of the merits of subsidizing public transportation is by Michael A. Kemp and Melvyn D. Cheslow. See "Transportation" in The Urban Predicament, ed. by William Gorham and Nathan Glazer (Urban Institute, Washington, D.C., 1976) pp. 328-35 and 340-3.

2. For case studies, see Kirby, Ronald F., Kiran U. Bhatt, Michael A. Kemp, Robert G. McGillivray and Martin Wohl, Para-Transit: Neglected Options For Urban Mobility (Urban Institute, Washington, D.C., 1974).

3. Ibid., p.9.

4. See Frank Davis' papers "Legal and Institutional Considerations in Paratransit Innovations," with David Burkhalter: "A Marketing Approach to Transportation Planning" (TC77-012); "Will the Reaction of the Auto Transportation System to the Energy Crisis be Technological or Institutional"? (1977), with Lawrence F. Cunningham; and "Management and Organization for Promoting the Utilization of Paratransit", (1977), with Robert P. Alex. (Transportation Center, University of Tennessee, Knoxville). Greyson, Murray and Rosenstock, Lawrence D., "Preliminary Analyses of the Potential Legal Issues Associated with Car and Van Pooling in Michigan", (for the Michigan Transportation Research Program) Highway Safety Research Institute, The University of Michigan, Ann Arbor, Michigan, September, 1978.

5. Good reviews of subscription service are by James A. Bautz, "Subscription Service in the U.S., "Transportation, Vol. 4, #4(1975), pp. 387-402; Richard Yukubousky and Donn Fletcher. "Mobility Club: A Grass-Roots Small-Town Transport Concept"; Transportation Research Record, No. 559, pp. 89-100; and Kirby, et al., Para-Transit, op.cit., pp. 215-78.

6. Kirby et al., op. cit., p. 230.

7. Sherman, Roger, "Club Subscriptions for Public Transport Passengers", Journal of Transport Economics and Policy (September, 1967), pp. 237-42.

8. Kirby et al., op cit., pp. 224-45.

9. Ibid., pp. 241-2.

10. Ibid., pp. 235-6.

11. "Legal and Institutional Considerations in Paratransit Innovations", op.cit

12. Ibid., p. 27.

13. "A Marketing Approach to Transportation Planning", op. cit.

14. Kirby et al., op. cit., p. 250.

15. "Legal and Institutional Consideratons....", op. cit., pp. 24, 33.

16. Conversation with Michigan AAA insurance agent.

17. Kirby et al., op. cit., p. 60.

18. The Nationwide Personal Transportation Act of 1964, Section 13(c). SMSA households shop in the main business district of the Central city. NPTS, #5, p. 33.

19. Kirby et a., op. cit., p. 149.

20. Ibid., pp. 167-82.

21. Urban Mass Transportation Act of 1964, Section 13(c)

22. The only exception that we know of is the dial-a-ride system of Batavia, New York. Kirby et al., op. cit., pp. 149-50.

23. Ibid., pp. 60-3.

24. "A Marketing Approach to Transportation Planning", op. cit., pp. 25-7.

25. See Kirby et al., op. cit., pp. 187-214 and Brian Richards' review of Cars for Cities: Reports by a Steering Group and a Working Group, (British Ministry of Transport, published in the Journal of Transport Economics and Policy (September, 1967), pp. 367-9.

26. Kirby et al.,op. cit., p. 273.

4.0 Conclusions

The history of urban transportation belies the necessity of a sharp dichotomy between publicly provided mass transit and privately financed individual transit. Only in the past century has public transportation been the exclusive domain of the public transit monopolies.

The monopolies have gradually given up their riderships and service areas to the automobile. The diffusion of trips made possible by the automobile has speeded the decline of fixed-route mass transit.

The automobile offers consumers greater travel flexibility, but many consumers cannot afford the costs of auto owner-ship. More adaptable means of public transportation are needed, but innovations are hindered by an archaic set of public rules. A transportation brokers, who appreciates the needs of consumers and the limitations imposed by the law, can help the private sector re-enter the public transportation market.

Bibliography

An extensive general bibliography for urban transportation can be found in Gorham and Glazer, eds., The Urban Predicament (The Urban Institute, Washington, D.C., 1976).

A fine bibliography on para-transit is in Kirby et al., Para-Transit: Neglected Options for Urban Mobility (The Urban Institute, Washington, D.C., 1974).