Title

The High Cost of Flat Fares: An Examination of Ridership Demographics and Fare Policy at the Los Angeles MTA

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Publication Date

1997-08-01

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Working Paper
UCLA Institute of Transportation Studies
August 1997

by

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Abstract

The Los Angeles County Metropolitan Transportation Authority (MTA) currently uses a flat fare structure, with several types of special passes, to collect passenger revenues. The fare structure is termed "flat" because each passenger pays the same base fare regardless of time, direction, or distance of travel. This analysis of MTA's ridership demographics shows that this fare structure is neither efficient, effective, nor equitable, though it does offer some operational simplicity. Typically transit dependents -- riders who are more likely poor, non-white, young or old, and female -- make shorter trips, more non-work trips, and use regular monthly passes less than other comparable passenger groups. As a result, these transit dependent groups, on average, pay relatively more for transit service on a per mile basis, while covering a larger portion of the costs of providing the service, than do choice (or discretionary) riders. This report suggests that switching to a differentiated fare structure, where fares vary by mode, time of day, and/or distance traveled, could improve cost efficiency by more closely matching fares to the actual cost of service provision, increase service effectiveness by increased short distance and off-peak travel, and increase social equity by substantially reducing the cross-subsidy of higher-income riders by lower-income riders.

Keywords:

Transit Ridership Demographics

Transit Fare Structures

Social Equity

Introduction

The Los Angeles County Metropolitan Transportation Authority (MTA), like most other transit agencies in the United States, utilizes a flat fare structure. The main advantages of such a system are "simplicity, understandability, marketability, and ease of collection" (Koski, 1992). Passengers always know exactly what the fare is going to be and drivers never have to make change. But while simple, such fare structures are neither efficient nor equitable.

The Los Angeles County Metropolitan Transportation Authority (MTA) is planning and constructing a regional rail network as the centerpiece of the third largest transit system in the country. The initial phase of this network opened in 1989 with the "Blue Line" light rail transit line connecting downtown Los Angeles and Long Beach. Four years later, the first segment of the downtown Los Angeles subway, known as the "Red Line," opened. Coincident with the opening of these new rail lines, however, the MTA has experienced large losses in total transit ridership. As shown in *Figure 1*, the MTA has lost about 100 million annual unlinked passenger trips, or roughly 25% of its passengers, during the last ten years despite enormous expenditures on rail. The reasons for these ridership losses are varied, but the three most pervasive include: (1) the price of the MTA's base fare has increased faster than the rate of inflation during the 1980s and 1990s, (2) some MTA service has been contracted out to private operators, (3) gradually declining costs of owning and operating automobiles, and (4) the ongoing decentralization of Los Angeles makes getting around by transit increasingly inconvenient because origins and destinations are increasingly dispersed.

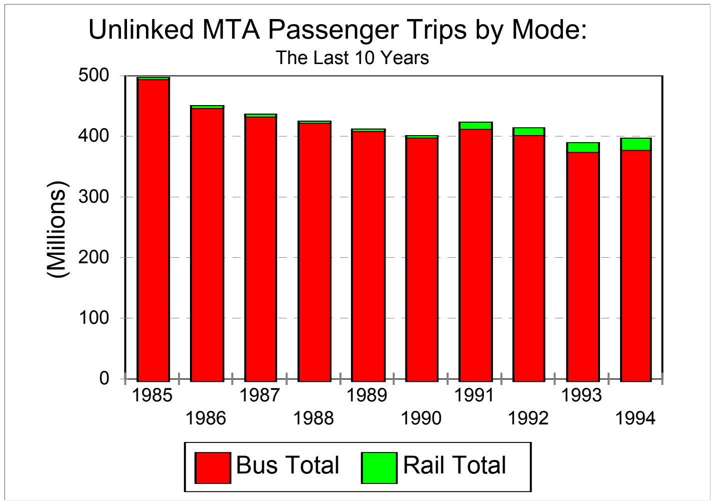
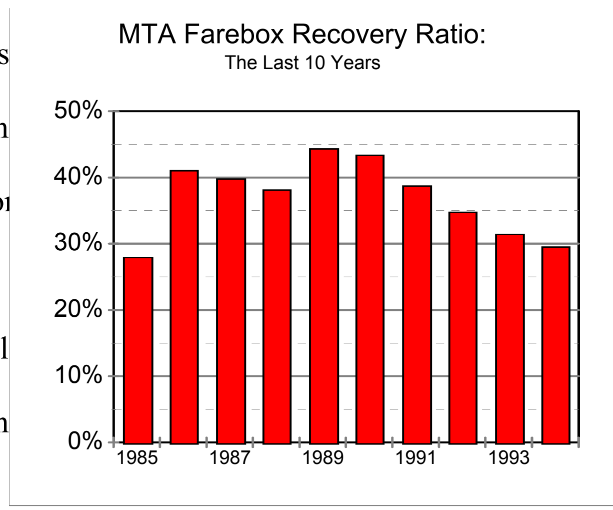


Figure 2 illustrates that fare revenues have stayed relatively constant over the last ten years while operating costs … an be largely attributed to two factors: (1) inflation … line, tires, and labor to rise, and (2) the substitutio… rail, for lower cost service, mostly bus routes. … ing cost increase have resulted in a gradually decl… 89, which is illustrated in *Figure 3*. Sin… rtion of operating



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costs over time, government subsidies from the local, state, and federal levels have had to make up this growing operating deficit.

Over the last two decades, federal operating assistance for transit has been declining. In response, transit systems around the country have (1) turned to increased support from state and local governments, (2) increased fares and/or cut service to reduce

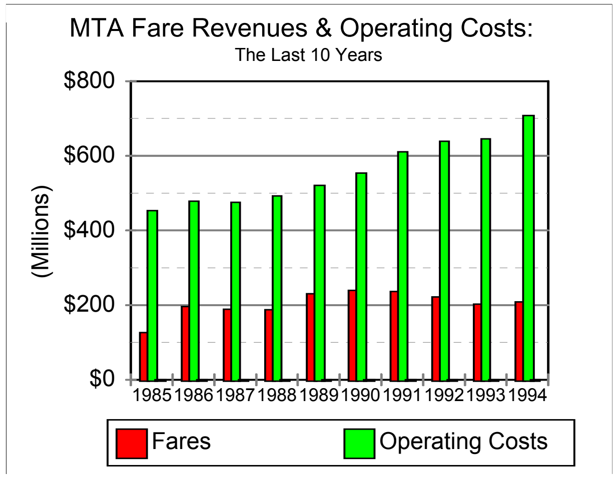

Figure 2

operating deficits, and/or (3) looked for new ways to attract more riders and increase revenues. The first two scenarios have already occurred in California where voters approved two bond measures, Propositions 111 and 116 in 1990[1] to help fund transit improvements, while two local half-cent sales taxes, Proposition A in 1980 and Proposition C in 1990,[2] were passed by Los

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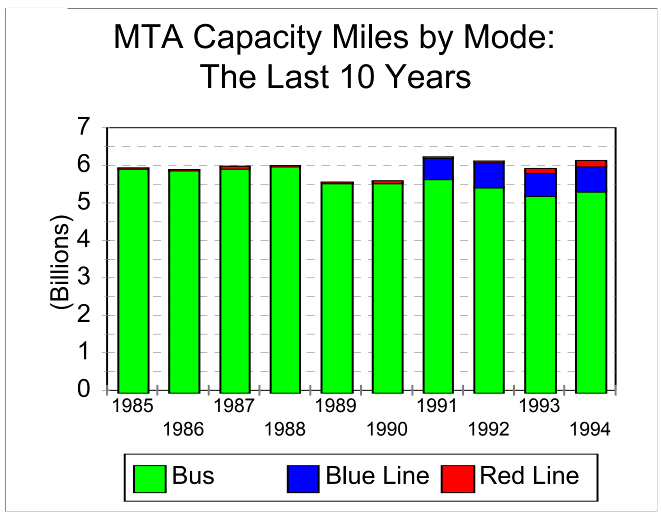
[1] Proposition 111, the Traffic Congestion Relief and Spending Limitation Act of 1990 , authorized the California Legislature to raise truck weight fees and the gasoline fuel tax to help pay for the construction of state highways, local streets and roads, and public mass transit facilities to relieve traffic congestion. Proposition 116, the Rail Transportation Bond Act Initiative Statute of 1990, authorized the issue of nearly two billion dollars in general obligation bonds to help fund primarily passenger and commuter rail services in California.

Figure 3

[2] Proposition A (1980) raised Los Angeles County's sales tax ½ percent to help fund regional transportation projects. Money from this tax went into a trust fund and helped pay for the construction of the region's rail network, while also subsidizing a fare rollback on the SCRTD system from $0.85 to $0.50 for 3 years. In addition, a portion of this fund gets returned to cities within Los Angeles County for use on local street and transit improvements. Proposition C (1990) added another ½ percent to the sales tax in Los

Angeles County voters to help fund transportation improvements. But future tax increases are less likely. Voter concern with traffic congestion has diminished and this translates into less support for such measures. Public officials are increasingly hesitant to be labeled "tax and spend" bureaucrats. The MTA has eliminated over 500 million capacity miles[3] of bus transit over the last ten years while increasing the base fare several times. As illustrated in *Figure 4*, the MTA's reduction of relatively inexpensive-to-operate bus service has been counter balanced in Los Angeles by the addition of relatively more expensive rail service.



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Angeles County to fund similar projects. The notable differences between Propositions A and C were that no fare rollback was included and part of the funds had to be spent on transit security.

[3] Capacity miles measures were calculated by the authors using the following standard formula: revenue capacity miles = revenue vehicle miles * number of seats * maximum loading factor. The number of seats used for buses was 43, the number for the Blue Line was 76, and the number for the Red Line was 59 (these seat numbers were obtained from the LACMTA section 15 Report for 1993). The maximum

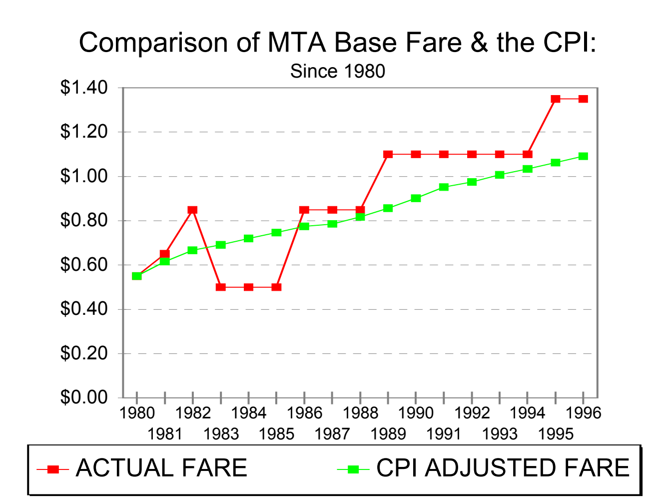

Figure 5

Meanwhile, the MTA base fare has increased from $0.55 in 1980 (Rubin, 1994), to $1.35 in 1996 which is an increase of 145%; while the Consumer Price Index (CPI) has risen 98% over the same time period.[4] The rate of increase in the MTA base fare was below the rate of inflation for only three years since 1980, which was the result of the mandatory fare reduction required by the terms of Proposition A, approved by Los Angeles County voters in 1980 (*Figure 5*).

An additional strategy employed by the MTA to help cover its rising costs has been to borrow against future Proposition A and Proposition C revenues to help pay for current operating and capital costs. This involves financial risk because the amount of annual sales tax revenue generated is a function of local economic activity. Since the recession has lingered in Southern California for much of the 1990's, it is unclear how large or small these future revenues are likely to be. If consumer spending does not rebound in the manner forecast, then the MTA will likely have trouble meeting its debt obligations and/or operating expenses. Such a financial shortfall could force drastic measures to reduce current spending and

loading factor for buses was 1.5, while the number for both rail lines was 3.0.

service levels.

The third scenario presented above -- increasing ridership and fare revenues -- involves accomplishing something very few large transit operators have been able to do in recent years: attract additional riders (Taylor, et.al., 1996), increase fare revenues, and prevent the escalation of transit deficits (Gomez-Ibanez, 1995). This analysis will show, however, that efforts to attract passengers and reduce deficits are severely hampered by the current MTA fare structure. We argue that flat fare structures are likely to contribute to further ridership losses by discouraging short and off-peak transit trips which are relatively less costly to serve, heighten the already problematic peaking of transit service demand, and contribute to the inequitable and possibly discriminatory provision of transit service (Cervero & Wachs, 1982). We illustrate how utilizing distance-based pricing, in concert with the elimination of discount passes, would likely result in a more equitable, efficient, and cost effective system of public transit in Los Angeles.

Methodology

The following five sections describe the demographic characteristics of MTA passengers by mode, trip type, distance, and method of fare payment. Based upon these characteristics, groups of MTA riders are identified who likely benefit from or are disadvantaged by MTA's flat fare policy. The source of all demographic and passenger information contained in this report is the MTA's on-board passenger surveys for 1991, 1992, and 1993, unless otherwise noted. For these three years, the MTA obtained 17,616 onboard surveys from its passengers. In these

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[4] Calculated based on the CPI (all urban users) in January of each year.

surveys, the passengers were asked to identify, among other items, their race/ethnicity, income group, sex, and age. In addition, questions relating to the passengers' origin and destination, trip purpose, fare payment, and MTA route number were solicited. These responses, where appropriate, were then used to classify passengers into the groups analyzed in this report. The MTA's ethnicity[5] and age[6] questions are two examples of data grouped in this way.

Passengers' trip distances were computed from travel origin to destination using a standard geocoding procedure which is described in detail in *Appendix A*. These distances are

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[5] A "minority" rider was defined by this report as a person who responded to the ethnicity question on MTA's 1991, 1992, or 1993 Origin-Destination (OD) Passenger Survey as either a "Hispanic," "Black," "Asian/Pacific Islander," or "American Indian/Aleutian." Similarly, a "white" rider is defined as a person who responded to this same question as "white." For the purposes of these analyses, if a respondent checked "other" for his/her ethnicity, this person is not included as either a "minority" or a "white." Instead, these respondents, who made up about 2.4% of all respondents who answered the ethnicity question. This is why adding many of the percentages for the minority and white groups does not result in a 100% total.

[6] The MTA survey prompted passengers to provide their actual age in years. This report took that ordinal data and transformed it into a categorical variable based upon the response. If a respondent's age was between 1 and 15, their survey was assigned to a "young" category since these individuals are highly transit dependent because they are not old enough to drive. If a respondent's age was between 16 and 64, their survey was assigned to a "middle-age" category because these individuals are old enough to drive and tend to be of working age. If a respondent's age was 65 or above, their survey was assigned to an "elderly" category because these individuals tend to be retired and more likely unable to drive an automobile for health reasons.

reported in miles and are useful in comparing the different demands placed upon transit service by different groups. Trip purpose[7] was also derived from two separate but related survey questions. All other questions were taken as is from the MTA survey responses themselves.[8]

Who Rides Transit?

There are two main groups of people who ride public transit: those who have to and those who choose to (Gray, 1992). Individuals who have no other option than to walk or ride public transit are usually referred to as transit dependents. These people tend to be either too old or young to drive, have a physical or mental disability which prevents them from driving, or simply do not have access to an automobile. Since car ownership is highly correlated with income, these car-less individuals tend to have very low incomes. And, indeed, MTA passengers in general have very low incomes: about 57% of those surveyed in 1991-1993 had annual household incomes below $15,000, while the percentage below $30,000 a year exceeded 80%.

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[7] Trips were assigned as either "work' trips or "non-work" trips based upon the following criteria. If a passenger's origin or destination was identified as work, then the trip was classified as a "work" trip. If neither the origin or destination was work, then the trips was classified as a "non-work" trip.

[8] Additional analysis would have been done on time of day characteristics of trips, as well as on household vehicle availability. Time of day is important because the cost of transit service varies considerably by time of day, with peak period service being much more expensive to provide than off-peak service. Vehicle availability is also important because the lack of an available vehicle is a strong measure of transit dependency. Unfortunately, these questions were either not asked or inappropriately asked by the MTA survey. Future studies of transit ridership and demographics should ensure that such questions are asked so that cost and transit dependency issues can be more accurately addressed.

By comparison, households with incomes below $15,000 a year comprise only 20.3% of the all households in Los Angeles County.[9] *Table 1* presents this breakdown of MTA ridership by annual household income and compares it to Los Angeles County as a whole. Of those passengers with household incomes below $15,000 per year, almost 83% are ethnic minorities and over 60% are female.

TABLE 1: The Household Incomes of MTA Riders (1991-1993) in Comparison with the Los Angeles County General Population (1990).

ANNUAL HOUSEHOLD INCOME	MTA RIDERS	LA COUNTY POPULATION
Less than $15,000	57.1%	20.3%
Between $15,000 and $29,999	23.4%	22.5%
Between $30,000 and $49,999	12.2%	24.5%
Above $50,000	7.3%	32.7%
TOTAL	100%	100%

Individuals who choose to ride public transit, despite having access to an automobile, are typically referred to a choice riders (Gray, 1992). These passengers are more likely to be white, male, and high income, and commuting to and from work, where either high levels of traffic congestion or expensive parking fees make transit attractive. On MTA transit vehicles, of all passengers with annual household incomes above $50,000, about 51% are white, over 54% are male, and nearly 75% are either traveling to or from work. These differences in the demographic characteristics between very low and very high income MTA passengers are summarized in

[9] According to the 1990 U.S. Census Bureau, Summary Tape File 3A (STF-3A).

Table 2.

TABLE 2: MTA Ridership Demographics by Household Income Status

INCOME GROUP	PERCENT WHITE	PERCENT FEMALE	PERCENT ELDERLY
Below $15,000	15 %	60 %	9 %
Above $50,000	51 %	45 %	3 %

What Transit Modes Are Used?

Prior to 1993, the MTA operated three primary modes of transit service: local bus, express bus, and light rail transit (the Blue Line). Local buses carried about 73% of all MTA passengers, while express buses transported almost 20%. But ridership demographics differed greatly by mode. As shown in *Table 3*, express buses (39.6%) and the Blue Line (16.9%) carried nearly twice the system-wide average (19.6% and 7.2% respectively) of high income passengers. Meanwhile, low income riders made 78% of their transit trips on local buses, making them the only income group above the system-wide average (73.2%). Such a concentration of low income passengers on buses is similar to the findings of previous studies of ridership demographics in large U.S. cities (Pucher et al, 1981).

TABLE 3: Crosstabulation of Rider Income Groups by MTA Transit Mode

MTA MODE	INCOME < $15K	INCOME $15-30K	INCOME $30-50K	INCOME > $50K	AVG MODE SHARE
Local Bus	78.0 %	71.4 %	61.3 %	43.5 %	73.2 %
Express Bus	16.1 %	20.4 %	29.8 %	39.6 %	19.6 %

Blue Line	5.9 %	8.1 %	9.0 %	16.9 %	7.2 %
Group Sum[10]	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

Turning to race and ethnicity, *Table 4* shows that minorities tend to make a higher percentage of their trips (74.9%) by local bus than do whites (54.6%). In contrast, white passengers tend to travel more often by express bus (26.5%) than do minorities (18.0%), and by light rail transit (7.9% and 7.1% respectively) as well, although the differences here are not that large.

TABLE 4: Crosstabulation of Racial/Ethnic Patronage by MTA Transit Mode

MTA MODE	NON-WHITES	WHITES	AVG MODE SHARE
Local Bus	74.9 %	65.6 %	73.2 %
Express Bus	18.0 %	26.5 %	19.6 %
Blue Line	7.1 %	7.9 %	7.2 %
Group Sum	100.0 %	100.0 %	100.0 %

Transit mode also varies considerably by age group. *Table 5* shows that the young and the elderly both made higher percentages of their trips by local bus and lower percentages by express bus and light rail transit than the system wide average. This is somewhat expected since children and the elderly make fewer work trips than the rest of the population, and the fact that express buses and the Blue Line both serve the Los Angeles central business district.

[10] The columns do not appear to sum to 100% due to rounding.

TABLE 5: Crosstabulation of Rider Age Groups by MTA Transit Mode

MTA MODE	AGE 1-15	AGE 16-64	AGE 65+	AVG MODE SHARE
Local Bus	79.1 %	71.6 %	78.9 %	73.2 %
Express Bus	14.3 %	20.7 %	18.2 %	19.6 %
Blue Line	6.6 %	7.6 %	2.9 %	7.2 %
Group Sum[17]	100.0 %	100.0 %	100.0 %	100.0 %

What Types of Trips Are Passengers Making?

Early in the twentieth century, transit served a high proportion of all types of trips including work, school, shopping, and leisure trips. But the combination of a growth in real incomes, a rise in car ownership rates, and a dispersal of most metropolitan areas resulted in the decline of the share of all non-work trips served by transit (Saltzman, 1992). Transit has been left to increasingly serve peak period trips, which has significantly increased unit costs.[11]

Transit operators must invest in vehicles based upon the highest demand period (Cervero & Wachs, 1982). Ideally, the demand for transit service, and thus the number of vehicles purchased, would be spread relatively evenly throughout a day. This was the case when "transit

[11] The work trip is used in this analysis as a surrogate measure for time of day, which is the ideal measure for allocating peak and off-peak costs of transit service. Unfortunately, the MTA onboard survey did not ask a question relating to the time of day of the service consumed. Therefore, since most work trips occur during the morning and afternoon rush-hours, trip type was used to assign passengers to the peak (work trips) and off-peak (non-work trips).

functioned as a general-purpose transportation utility, serving the full spectrum of travel purposes: shopping trips, excursion travel, and family recreation travel as well as the journey to work" (Jones, 1985). But as increasing shares of total transit travel are for work trips, which are normally concentrated during a few hours in the morning and afternoon, transit demand became very peaked in nature (Adler, 1987). This peaking results in many vehicles laying idle during off-peak hours. Since many fewer vehicles would have to be purchased, operated, and maintained by a transit agency in the absence of such a peak, the costs of this "extra" peak period service can be attributed directly to peak period riders. Thus, peak period trips, which are typically work trips and longer than off-peak trips, are much more expensive to serve because they require a large expansion of the transit vehicle fleet and the number of coach drivers above what is required to meet demand during all off-peak hours of the day (Cervero & Wachs, 1982).

In Los Angeles, about 56% of all transit trips on MTA vehicles are work related, which suggests that peaking is definitely an issue. A more precise measure of the peaked nature of transit demand is the peak to off-peak bus ratio, which rises with the dominance of the peak period over the off-peak periods. For 1993, this ratio was 1.4 for the MTA,[12] which means that almost 40% of the entire MTA bus fleet was purchased and operated just for peak period service. In order to gain a better understanding of the nature of peaking on MTA vehicles, the rest of this

[12] This peak to off-peak bus ratio was calculated from the MTA's 1993 Section 15 Report, Form 406 for motor buses using the following variables: (1,816 peak period buses operated - 1,298 off-peak period buses operated)/1,298 off-peak buses operated. Calculating this statistic for MTA's rail operations is not meaningful since these modes currently operate at well below capacity.

section is devoted to a description of the trip type breakdown for different MTA passenger groups.

Similar to the rest of the United States (Pucher et al, 1982), both ethnic minorities and whites make a very similar percentage of work trips (56%) and non-work trips (43%) on transit in Los Angeles. However, large variations exist between income groups, as shown in *Table 6*. MTA passengers, like transit riders around the U.S. (Pucher et al, 1982), make more work trips and fewer non-work trips as their incomes rise. This is because higher income individuals tend to own cars and use them much more frequently for three reasons. First, non-work trips are unusually hard for transit to serve well because they tend to occur at irregular intervals, and are not well matched with fixed transit routes and schedules. Second, non-work trips tend to be more spatially dispersed than work trips, so that transit operators have more difficulty providing direct access to these varying sites without numerous transfers. Since most transit passengers seek to minimize transfers, few are likely to choose to make trips that require a transfer if it can be avoided. Third, the automobile generally provides superior point-to-point service with departure flexibility and travel time savings that are attractive in the absence of high parking fees or traffic congestion. Non-work trips are more likely than work trips to be made in the company of family and friends. Increased vehicle occupancy reduces per person trip costs for automobile trips, but not for transit, where each rider must pay a fare. This also makes transit less attractive for non-work travel.

TABLE 6: Variation in Non-Work Travel by Income Group

INCOME GROUP OF MTA RIDERS	WORK TRIPS	NON-WORK TRIPS
Incomes below $15,000	49.8 %	50.2 %
Incomes from $15,000 - $30,000	65.8 %	34.2 %
Incomes from $30,000 - $50,000	68.0 %	32.0 %
Incomes over $50,000	74.9 %	25.1 %
Average Share of All Trips	*56.1 %*	*43.9 %*

As an explanatory variable, sex does not appear to significantly affect the type of trips made on transit. Both men and women make work trips (57%) and non-work trips (43%) in similar proportions. Yet as illustrated in *Table 7*, the age of a rider greatly influences the types of trips one makes. Both the young and elderly make relatively few work trips. This is to be expected since young people tend to be students and older people are more likely to be retired from work.

TABLE 7: Variation in Non-Work Travel by Age Group

INCOME GROUP OF MTA RIDERS	WORK TRIPS	NON-WORK TRIPS
Age 1-15 Years	7.5 %	92.5 %
Age 16-64 Years	60.2 %	39.8 %
Age 65+ Years	25.3 %	74.7 %
Average Share of All Trips	*56.1 %*	*43.9 %*

How Far Do Passengers Travel?

For transit operators, how far each passenger travels has important cost implications. Long transit trips are more expensive to serve than short ones because they consume more fuel and increase vehicle maintenance costs (McLaughlin, 1993). Similarly, short trips are also more attractive to a transit agency because they mean that passenger turnover is quite high, resulting in more fare revenue being collected per service hour or mile. Unfortunately, a flat fare structure discourages short trips because the per mile cost to a potential passenger of such trips tends to be relatively high. The current MTA base cash fare is $1.35, which does not vary whether the passenger travels four blocks or fourteen miles. The relatively high cost for short trips on MTA vehicles likely explains the small overall percentage of MTA trips; just 3.4 percent of all trips are less than 1 mile and only 10.9 percent are under 2 miles.

Trip lengths of MTA passengers vary considerably by all four demographic characteristics examined here, income, race/ethnicity, sex, and age, in ways consistent with previous research (Pucher et al, 1982). The effect of income is clearly the most dramatic. Passengers with annual household incomes above $50,000 have average trip lengths almost twice those of riders below $15,000. In addition, those under 16 years of age, the elderly, and women have shorter average trip lengths than either the working age population or men, respectively. But all these percentages vary by transit mode as well. Trip lengths are broken down by transit mode in *Table 8*. Transit mode choice appears only to accentuate the demographic variations in trip lengths; rail trips are longest and local bus trips are shortest.

TABLE 8: Crosstabulation of Average Trip Distance (in miles) by Income Group, Race/Ethnicity, Age, and Sex.

GROUP OF MTA RIDERS	LOCAL BUS	EXPRESS BUS	LRT (BLUE LINE)	AVG FOR MTA RIDER GROUP
Incomes < $15K	6.3	10.8	11.3	7.2
Incomes from $15K - $30K	6.9	11.6	13.0	8.4
Incomes from $30K $50K	6.8	14.5	15.5	10.0
Incomes > $50K	7.8	17.1	16.6	13.1
Minorities	6.6	12.5	12.3	8.0

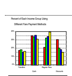
Whites	6.2	13.6	16.7	9.3
Ethnic “Others”	6.7	12.6	13.5	8.6
Age 1-15 Years	4.5	8.5	9.3	5.3
Age 16-64 Years	6.7	13.1	13.6	8.6
Age 65+ Years	4.9	9.8	14.4	6.0
Females	6.3	12.5	13.3	8.0
Males	7.1	13.3	14.0	9.0

Average Modal Distance	*6.6*	*12.8*	*13.5*	*8.3*

How Do Passengers Pay?

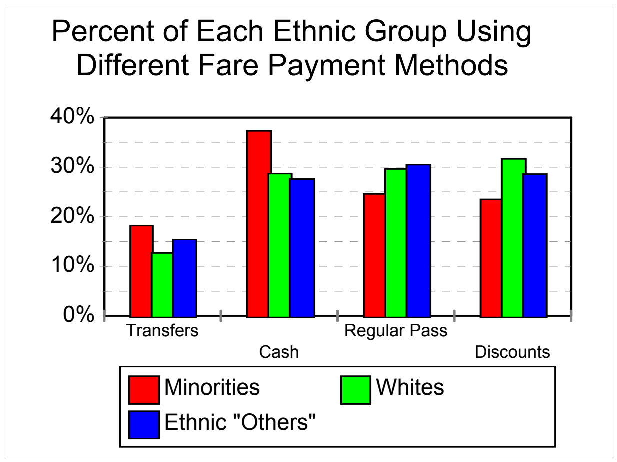
Another important consideration for transit operators is how passengers pay for service. Passengers generally favor pass usage when they can afford this option because it eliminates the need to carry exact change (Smerk, 1992). Likewise, transit operators also prefer prepaid passes and tokens for three reasons: (1) they give transit agencies the fare revenue sooner, (2) reduce vehicle dwell time at stops as fare payment time is reduced (Levinson, 1992), and (3) reduce the time spent emptying and sorting bills and coins at the end of each business day (Koski, 1992).

But prepaid passes and discount tokens have clear disadvantages as well. For passengers, passes require a relatively large up front expenditure of funds. And, as one might expect, regular monthly MTA pass usage increases dramatically with income, as shown in *Figure 6*. Another disadvantage for passengers is the high cost of replacement if the pass is lost or stolen early in the month for which it was issued.



For transit operators like the MTA, prepaid passes and discount tokens would likely result in a substantial amount of lost fare revenue. One analysis conducted by MTA staff concluded that replacing all passes and discounts with a $1.20 base cash fare, $0.25 transfers, and $0.40 express surcharges would net the MTA over $45 million in additional fare revenues per year (Pegg, 1992a). Passengers do not purchase passes or discount tokens unless they intend to make a sufficient number of transit trips to make the up-front investment worthwhile. In 1993, the MTA monthly pass was priced at $42 and the base cash fare was $1.10. Thus, a passenger had to make at least 38 trips on transit to break-even (Hinebaugh & Boyle, 1993). Any trips in excess of 38 by monthly pass holders were essentially free rides because the price of the pass had already been paid for. These free rides bring in no additional revenue for the MTA, and can be very expensive trips if they occur during the peak demand periods when marginal operating costs are highest. Since most high income riders use transit for the work trip (74.9%) and they average 42 trips per month (21 work days per month times two trips each work day), they clearly benefit by purchasing a monthly pass. Thus, it should be no surprise that nearly 40% of all high income riders use a regular monthly pass to pay for their transit service or that 76.3% of pass usage occurs on work-related trips.

Like income, fare payment also varies by ethnicity and age, as seen in *Figures 7 and 8*, but not by sex. Non-whites tend to pay with either cash or a transfer much more frequently than whites. In addition, non-whites utilize monthly and other discounted passes and fares much less frequently than whites; this variance is likely the result of lower average incomes of non-whites relative to whites in Los Angeles County.



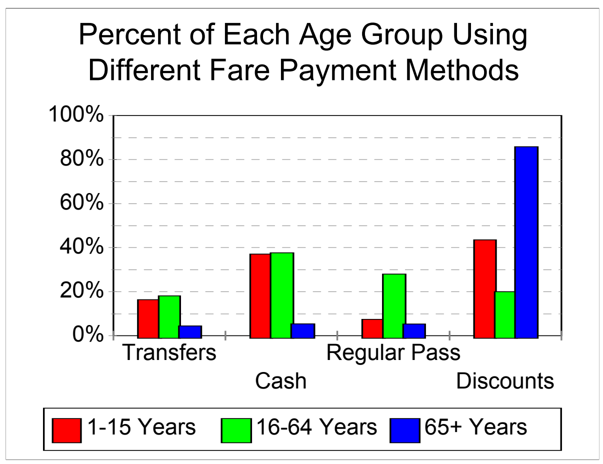


Figure 8

Passengers under the age of sixteen tend to be similar to the typical MTA passenger in terms of fare payment method in most ways except two: (1) they use regular monthly passes much less frequently than average, and (2) they use discounted passes and tokens much more frequently than the average passenger. These findings are not surprising since younger riders typically do not have the money to purchase an expensive regular monthly pass.

Besides, the MTA offers a reduced price student pass[13] for these young riders which provides a cheaper alternative to purchasing a regular monthly pass.

The elderly have very different fare payment patterns from younger MTA passengers. Almost 86% of all transit trips by the elderly are paid for with some type of discount pass or fare. Like all other transit systems, the MTA offer substantial discounts for qualified elderly and disabled passengers.

Figure 7

Summary of Key Findings

Transit dependent riders, who are more likely low income, non-white, female, and young or old, are disproportionally burdened by the MTA's flat fare structure. These groups tend to make shorter trips, more non-work trips, board cheaper-to-operate local buses more often, and use regular monthly passes less frequently than other rider groups. These patterns, in turn, have three important consequences: (1) transit dependents pay more per mile for transit service consumed, (2) transit dependents tend to consume less-expensive-to-provide transit service than choice riders, and (3) transit dependents are not as able to take advantage of the regular monthly pass discount and wind up paying the full cash fare much more frequently than other riders, which results in a cross-subsidization of pass users by cash riders (Pegg, 1992b).

Implications and Recommendations for the MTA

A MTA fare restructuring committee recently explored a number of alternative fare

[13] The student pass was grouped with senior citizen, college/vocational, and handicapped passes,

structures using three evaluation criteria: any fare restructuring should (1) simplify the fare structure, (2) enhance fare revenue, and (3) improve equity (Wilson & Woodbury, 1993). The committee seriously considered five alternatives, which included various combinations of the following measures: reducing the cash fare, eliminating tokens, setting limits on the use of some monthly passes, some peak period pricing, charging higher fares for express services, and pricing monthly passes according to household income. The MTA Board, however, chose not to adopt any of these modified fare schemes, electing instead to keep the current fare structure, despite the fact that several of the proposals were deemed likely to both enhance fare revenues and improve equity. Each of the alternatives considered required some increase in the overall complexity of the fare structure, which the MTA Board generally opposed. In effect, the Board opted for operational simplicity (Levinson, 1992) over improved cost effectiveness and social equity. This situation, whereby transit planners generally favor differentiated fare structures on efficiency and equity grounds, while transit boards generally oppose them on simplicity grounds, is similar to the experience of many transit operators around the U.S. (Markowitz, 1986).

While flat fare structures are clearly popular with transit boards, differentiated fare structures are more common than one might expect. A recent major study of transit fare policies, structures, and technologies by the Transportation Research Board found that 39 percent of U.S. transit systems surveyed engage in distance-based (usually zonal) pricing, 24 percent had some form of service-based differentiation (such as express versus local service), and 7 percent use time-of-day pricing (TCRP, 1996).

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as well as discount tokens, to form the "discounts" method of payment used in this paper.

Other than distance-based pricing, however, the simplicity arguments against differentiated fares are difficult to defend. Service-based fare differentiation is very simple to implement; fares are simply set separately for each mode. In Los Angeles, for example, the MTA charges higher fares for express bus service, which are graduated by distance traveled. This differentiated express bus policy, however, does not extend to rail service, which has the same flat fare as local bus service. And, though less common in practice, peak/off-peak pricing is also relatively simple to implement. Bus runs are simply designated and priced from start to finish as either peak or off-peak, which reduces both confusion and operator/passenger conflicts (Cervero, 1990).

Most common, and most complex, is distance-based pricing. Until recently, most distance based pricing was implemented using zonal systems, which increases operator/passenger interaction and therefore, is less popular with drivers. New technologies, however, significantly increase the feasibility of differential pricing on buses. Prepaid "smart cards" and readers can record the time and location of boarding passengers and deduct the appropriate fare on exit (Black, 1985). While relatively new here in the U.S., transit agencies throughout Europe have utilized some form of smart card technology to charge differentiated fares, either by time of day or by distance, for the last thirty years and implementation opportunities for the near term are quite promising (TCRP, 1996). With respect to differentiated fares, the authors of the recent TRB study conclude, "Although electronic fare collection systems can make it easier to implement and administer a distance-based strategy, the barrier appears to be more perceived than real" (TCRP, 1996, 150).

Perceptions aside, retention of the flat fare structures clearly perpetuate the cost effectiveness and social equity problems revealed in this analysis: flat fares (1) discourage short trips which are relatively inexpensive to provide, (2) encourage relatively more expensive to serve long trips, (3) fail to proportionally recover the higher costs of peak period service, (4) fail to proportionally recover the variable costs between modes, and (5) result in low income transit riders cross-subsidizing higher-income riders. In addition, unlimited ride monthly passes encourage service consumption without regard to the marginal costs of providing service which appears to disproportionally benefit high income riders traveling long distances to and from work during the peak periods. Differentiated fare pricing has the potential to address all of these shortcomings by simultaneously improving cost efficiency, service effectiveness, and social equity.

With respect to cost efficiency, differentiated pricing would lower fares, and thus increase the demand, for less-expensive-to-provide service --on buses (service-based discounts), during the off-peak (time-of-day discounts), and for short trips (distance-based discounts). Off-peak local bus service is generally the cheapest mode of transit the MTA currently provides because capital costs are limited to the purchase of vehicles and the labor costs are typically spread over an entire day. Express bus service is generally more expensive than local bus service because it is only provided during peak periods of weekdays, usually for those commuting to work in downtown Los Angeles. And rail service is generally the most expensive of all transit modes because the relatively long trips taken and the higher costs to purchase fully or partially exclusive rights-of-way and construct tracks, catenary, tunnels, and stations (Kain, 1992).

In contrast to cost efficiency, the cost effectiveness of each of the modes is determined both by costs and the revenue generated. Since passenger serving costs are a function of the marginal cost of service, individual per trip costs vary significantly by the mode used, time of day, and trip distance. Cross-subsidy between rider groups is therefore reduced when the fare charged is systematically related to the marginal cost of providing the service; in other words, when the relative subsidy of each passenger is roughly equal. With respect to the distance traveled, *Table 9* shows the variation in per mile fare payment by mode. Local bus riders tend to pay considerably more per mile for transit service consumed than do users of the other two modes. While costs are not systematically examined in this analysis, total per mile costs by mode in transit are generally inversely related to average distance traveled shown in *Table 9* (Rubin, 1994).

TABLE 9: Fare Paid per Mile Traveled by Mode

TRANSIT MODE	CURRENT FARE	AVERAGE TRIP DISTANCE	FARE/MILE
Local Bus	$1.35	6.6 miles	$0.21/mile
Express Bus	$1.85	12.8 miles	$0.14/mile
LRT (Blue Line)	$1.35	13.5 miles	$0.10/mile

The service effectiveness of transit service is typically measured by riders attracted per unit of service offered. As shown earlier in *Figure 1*, the MTA has lost nearly one-fifth of all its unlinked passenger trips in the last ten years despite spending hundreds of millions in constructing a new regional rail transit system. While there are clearly a number of reasons for these passenger losses, such continued metropolitan dispersion and increasing car ownership rates, the relatively high flat base fare has undoubtedly had a negative effect of ridership. Higher base fares discourage short trips quite simply because the unit costs to the passenger is relatively high. Previous research indicates that potential short trippers often choose to walk or drive instead (Cervero & Wachs, 1982), causing transit systems to lose such trips and any revenue associated with them.

Differentiated fares would reduce this passenger bias against short transit trips because the cost of these trips could be greatly reduced. A graduated fare starting from a lower base would encourage short trips. And research indicates that a higher proportion of short trips is made during off-peak hours when excess capacity usually exists on most transit vehicles and marginal costs are low (Cervero, 1981a). Thus, a distance-based fare could attract additional short-distance riders (and revenues) to MTA buses and trains without having to expand transit capacity or substantially increase operating costs.

Finally, the social equity of transit service would be enhanced in at least three ways by differentiated fares. First, this paper has demonstrated that, compared with “choice” riders, transit dependents tend to make (1) a higher proportion of trips on local buses, (2) shorter trips, and (3) more non-work trips, which are more likely to occur during off-peak hours. Thus, charging a flat fare results in transit dependents paying more per mile of service consumed than most other groups of riders. Properly implemented, differentiated fares could both bring fares in line with the costs of providing service and thereby substantially reduce the cross-subsidy of higher-income riders by lower income riders.

Further, this analysis has shown that the relatively low incomes of most transit dependents prevent many from fully realizing the benefits of regular monthly pass usage. Monthly passes provide, in effect, “deep discounts” to regular riders that increase with usage. While some low income riders surely benefit from such volume discounts, *Figure 6* shows that high income passengers use monthly passes nearly twice as often to pay for their transit trips as low income passengers. Recently, the MTA has introduced discount tokens (for $0.90 per ride) to offer regular riders discounts on a per trip, rather than per month, basis. While discount tokens and other discount passes are likely to be used more often than monthly passes by low income riders, their introduction further complicates the current flat fare structure.

And finally a differentiated fare structure would end the current cross-subsidization of long distance passengers by short distance travelers (Cervero & Wachs, 1982). Under a distance-based fare structure, passengers pay in rough proportion to the amount of transit service consumed, like airline travelers, Amtrak passengers, or telephone customers. Previous research has shown that charging long-distance riders a higher fare would increase MTA revenues and farebox recovery (Cervero, 1982b) by leveling demand between the peak and off-peak periods (Cervero & Wachs, 1982).

This analysis has demonstrated clear demographic patterns in MTA ridership that are at odds with the current flat fare structure. And, in contrast with many public policy questions, there is no tradeoff here between efficiency and equity. Rather, a differentiated fare structure could simultaneously improve the cost efficiency, service effectiveness, and social equity of transit service in Los Angeles. With rapidly advancing fare collection technologies making the arguments against fairer and more efficient fare structures less and less persuasive, the high costs of flat fares -- to the MTA and its passengers -- are becoming increasingly clear.

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