FLAT VERSUS DIFFERENTIATED TRANSIT PRICING: WHAT'S A FAIR FARE?

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Over the past decade, most transit operators in the United States have switched from various forms of differentiated pricing to predominantly flat fare structures. Ironically, graduated and zonal pricing were superseded by flat fares during a period when trip lengths increased, the peak period's share of ridership grew, and operating costs skyrocketed. The insensitivity of flat fares to changing travel patterns and rising costs has contributed directly to the financial deterioration of the American transit industry. With the nationwide cost of transit services growing at nearly twice the rate of inflation and with average fares actually declining in real dollar terms, operators must begin to question the propriety of current pricing practices.

This paper examines several alternative fare policies in terms of two principal criteria: efficiency and equity. Initially, current pricing policies of three California transit operators are evaluated by comparing differences between users' fares and the costs of their trips. Several scenarios which differentiate fares by distance and time-of-day are then explored in terms of their promise for reducing the maldistributive effects of current pricing practices. The paper concludes that differentiated fare structures could greatly improve transit's financial performance as well as its distributional consequences.

EVALUATING FAIRNESS IN TRANSIT PRICING

What are fair fares? This paper considers fares which efficiently and equitably distribute the costs of transit services among users to be fair. Economists sometime distinquish efficiency from equity in terms of the "benefit" and "ability to pay" concepts. Efficiency is achieved when users contribute to the

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ABSTRACT

Virtually every U.S. bus system today charges its customers flat fares. However, recent trends suggest that passengers are traveling farther and proportionally more during peak hours, factors which have contributed toward transit's cost spiral. As deficits continue to soar, current pricing rationales must be questioned. This article assesses the efficiency and equity impacts of three California transit agencies' fare structures. Short distance, off-peak patrons are found to heavily cross-subsidize long haul commuters. Fares differentiated by distance and time-of-day, in contrast, could improve the transit industry's fiscal posture while eliminating maldistributive impacts, although barriers to their implementation remain formidable.

costs of their services in line with the benefits they receive. Prices can be considered equitable, on the other hand, when users pay according to their income capacities. At minimum, the ability to pay criterion suggests that any redistributive effects of transit pricing should not be advantageous to those most affluent and least dependent upon services. One way to guard against inequities would be to eliminate redistributive impacts altogether. It follows that a fair fare would assess each patron the true cost of his or her trip thereby removing all transfer effects.

Many have argued that contemporary transit fare policies are neither effient nor equitable (Altshuler, 1979; Rock, 1976). Flat fares charge the same price regardless of when or how far one travels. Yet, transit costs are markedly higher during peak periods and for long trips because additional employees must be hired to accommodate rush hour loads and driver tours must be extended to serve outlying areas. Thus, flat fares possibly result in short distance, off-peak patrons subsidizing the costs of serving long haul commuters. Since those with lower incomes are commonly thought to travel shorter distances and more often during non-rush hours, some argue that flat fares are regressive -- that is, poor users subsidize rich ones. Not only do flat fares benefit the rich, some hypothesize, but they also potentially deprive certain users the opportunity to even make a trip; some lower income persons may have to forego journeys because they can't afford to pay the cost of their trip plus the cost of subsidizing others (Lisco, 1970). To transit operators, foregone trips often translate into lost revenues and empty off-peak buses.

FARES AND FISCAL PERFORMANCE

The financial hardships plaguing many transit operators in the United States can partly be attributed to today's fare policies. Between 1968 and 1978, the nationwide cost of transit services nearly tripled, from $1.7 billion to a staggering $4.7 billion (American Public Transit Association, 1979). During the same period, farebox revenues increased a mere fifty-three percent -- about one-half as much as the rate of inflation. In constant 1978 dollars, average fares actually decreased 12 percent since 1968, from 42.5¢ to 38.1¢. In consequence, the industry's deficit grew by an astounding 1,447 percent, from $161 million in 1968 to over $2.33 billion in 1978(American Public Transit Association, 1979).

Transit revenues faltered during the seventies not only because fare levels dropped in real terms but also because fare structures changed dramatically. In a study of seven western American cities, the Urban Mass Transportation Administration (1976) reported that all had switched from zonal pricing to essentially flat fare structures in the early seventies. By 1975, San Diego, Portland, and Los Angeles had eliminated 7, 11, and 318 zones respectively. The movement toward flat fares has also gained momentum in other countries. In a study of ninety international cities, Gutknecht (1973) found that 55 percent employed graduated pricing in 1961. By 1972, the proportion fell to 25 percent.

Oddly enough, the changeover to uniform pricing occurred at a time when many operators began expanding routes into outlying areas and increasing peak service levels. Nationally, the average miles covered by individual bus routes more than doubled between 1960 and 1974, yet total bus mileage actually declined during this period (Sale and Green 1979). This suggests that suburbanization has not only led to the expansion of bus routes but also to the curtailment of inner-city coverage and service frequencies. Moreover, Oram (1979) reports that operators have generally intensified peak hour services during this period. In a comprehensive study of American operators, he found the ratio of buses operating during the peak to those in the off-peak rose from 1.80 in 1960 to 2.04 in 1974.

Together, these trends suggest that transit pricing policies are fostering increasing levels of inefficiency and inequity. Uniform pricing exacerbates the widening gap between transit costs and revenues, since longer, peak period trips place greater service requirements on operators. Fares varied by the distance or time period of travel, in contrast, would appear capable of improving the financial posture of the industry. The relative efficiency and equity implications of alternative fare systems are explored next for three case study sites.

STUDY SITES AND RESEARCH METHODOLOGY

Revenue and cost data from the period 1977-79 were gathered to examine current pricing practices of the following three California transit operators: the Southern California Rapid Transit District (SCRTD) serving the Los Angeles area, the Alameda-Contra Costa Transit District (AC Transit) serving the Oakland area, and the San Diego Transit Corporation (SDTC). During 1979, SCRTD served 334 million passengers compared with AC Transit's 52.6 million and SDTC's 36.6 million. AC Transit and SDTC recovered approximately one-third of their operating costs through the farebox during the 1977-79 period whereas SCRTD enjoyed a slightly higher recovery rate of 40 percent. During the early seventies, all three systems converted to flat fare structures, collecting distance surcharges on only a few freeway express routes. Both AC Transit and SDTC priced basic services at 35¢ per ride between 1977 and 1979 while SCRTD charged most users 45¢ a trip.

The criterion variable used in evaluating these operators' current price structures was a ratio of users' fares to their trip costs, factored on the basis of passenger-miles traveled (hereafter abbreviated RPM/CPM). The RPM/CPM index can be thought of as a farebox recovery ratio computed for each transit user -- that is, a measure of the share of each user's trip cost covered by his or her fare. Information on users' fare payments, distances and times of travel, and demographic characteristics were gathered from on-board survey responses. To ensure a representative sample of patrons, responses from the very young, elderly, minority, and short haul passengers were generally weighted upward.[1]

On-board survey data allowed differences in rates of fare payment to be analyzed at the level of the individual rider. Breaking costs down at the user level, however, proved to be much more difficult. Initially, models were developed for each study site which allocated systemwide operating costs among bus routes based primarily on a route's vehicle miles and hours of service. Each route's daily costs were then factored into peak and off-peak components using labor productivity indices.[2] This refinement served to attribute the cost impacts of restrictive labor contracts (which prohibit the hiring of part-time workers, split shift duties, etc.) to peak hours. Cost per passenger-mile estimates were then computed for each system's bus routes by time-of-day. Based on a particular sampled user's route and time period of travel, the cost per passenger-mile estimated for his or her trip was merged with fare data to produce the RPM/CPM index. This process essentially allowed each system's farebox recovery ratio to be factored among its patrons, accounting for differences in users' fares, trip costs, and travel characteristics.

ASSESSING THE FAIRNESS OF CURRENT FARE POLICIES

The predominantly flat fare structures of the three study sites were found to embody considerable inefficiencies with respect to passengers' distance and time periods of travel. However, redistributive effects appeared to be only slightly regressive, suggesting that cross-subsidies have a stronger bearing on efficiency than equity objectives.

Trip Distance Analysis

Disparities between users' fares and trip costs were quite severe with respect to travel distance. This is clearly revealed in Figure 1 where mean RPM/CPM estimates of various trip distance categories are expressed as proportions of each operator's systemwide recovery ratio.[3] The horizontal dashed line in Figure 1 functions as a "subsidy threshold" -- those traveling distances with RPM/CPM estimates above it were, in effect, cross-subsidizing riders from distance categories

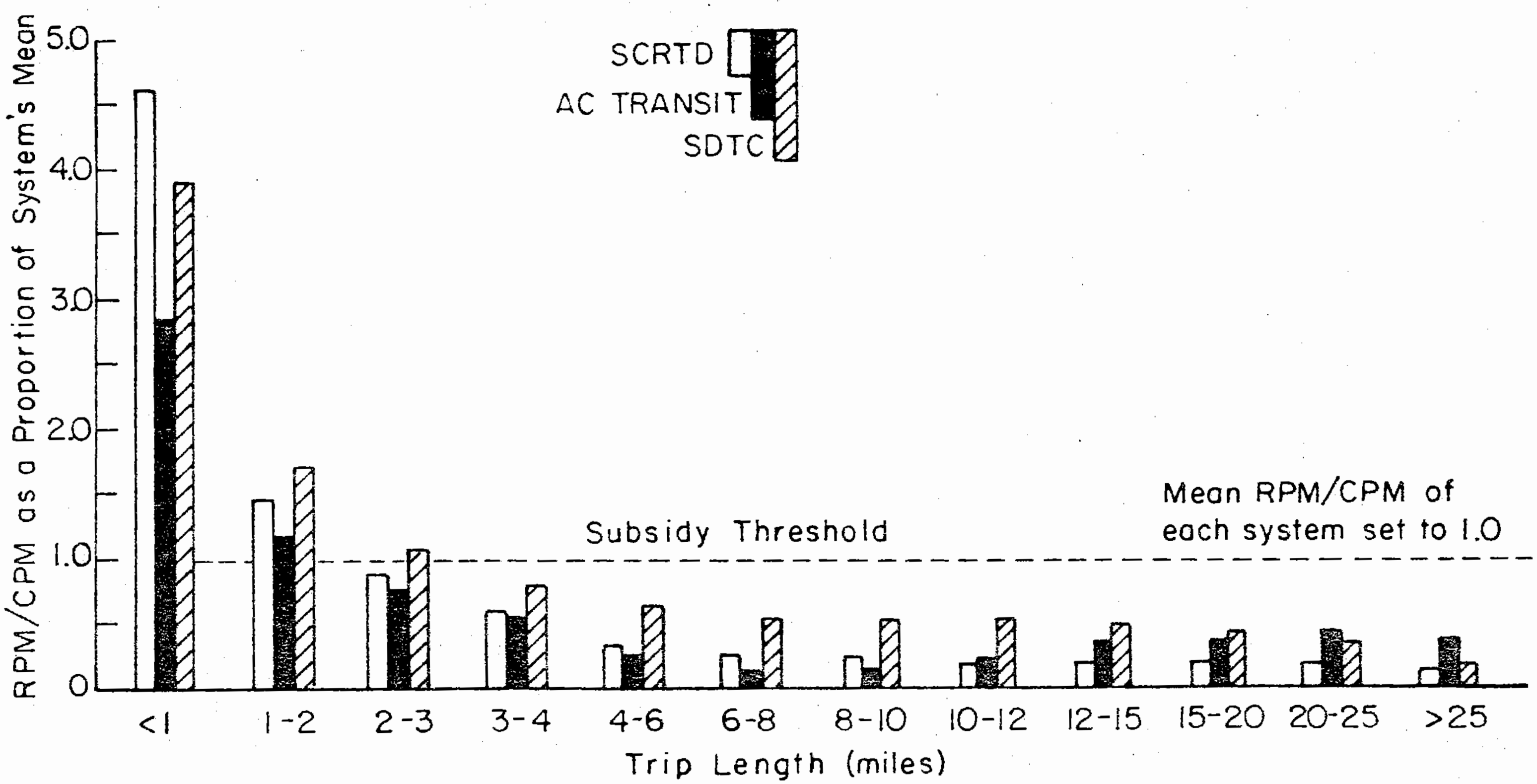


Figure 1. Price Disparities Among Trip Distance Categories.

below the line. For SCRTD and AC Transit, the breakeven mark was around two miles, while SDTC's threshold was slightly longer -- about three miles. Thus, only those traveling less than the two to three mile threshold met their costs through the farebox; all others were effectively being cross-subsidized.

Price disparities were particularly prominent between trips of less than one mile and all others. For the three operators, those riding less than a mile appeared to pay over twice as much for each unit of service as those traveling two miles. The most striking differential was among SCRTD trips, where the mean RPM/CPM of the shortest trips was thirty-five times that of the longest ones. Since trips under one mile accounted for between 6 and 14 percent of each system's total journeys, an enormous cost burden was being shouldered by a small yet significant population of riders.

From Figure 1, the relationship between RPM/CPM and distance appears to follow a distinct non-linear pattern for all three systems. Mathematically, these relationships can be expressed in terms of either exponential decay or hyperbolic functions. Least squares estimation produced fairly good fits between RPM/CPM and trip length as shown in equations 1 through 3. These expressions indicate that price discrepancies were far greater between short and mid-distance travelers than between mid-distance and long-haul patrons. Thus, a six mile user generally received as high a subsidy as a twenty-six mile user. These relationships suggest that fare systems with very low basic prices and surcharges tapered logarithmically with distance could possibly eliminate disparities.

$$\text{SCRTD: } \text{RPM/CPM} = .539e^{-.095(TL)} \qquad r^2 = .66 \qquad (1)$$

$$\text{AC Transit: } \text{RPM/CPM} = .072 + 1.31\,(TL)^{-1} \qquad r^2 = .46 \qquad (2)$$

$$\text{SDTC: } \text{RPM/CPM} = .512e^{-.079(TL)} \qquad r^2 = .72 \qquad (3)$$

where: TL = Trip length (in miles).

Time-of-Day Analysis

There is considerable controversy within the public transit industry as to which services return a higher portion of costs through the farebox -- peak or off-peak. Some argue that peak services incur costs which exceed those of comparable off-peak services by as much as 100 percent (Parker and Blackledge, 1975, Oram, 1979). Yet, since rush hour buses often carry capacity loads, other contend that peak services operate more in the black (Reilly, 1977). This latter view, however, ignores the peak's true cost impacts and implicitly endorses pricing on the basis of average rather than marginal costs. When the peak's influence on the size of transit's work force, labor contract stipulations, and the overall scale of operations is accounted for, its financial performance begins to appear far less favorable.

The break down of recovery ratios by time-of-day clearly revealed that off-peak users cross-subsidized their rush hour counterparts. Figure 2 indicates that midday services, which generally accounted for 40-45 percent of each operator's total trips, were by far the most profitable. In contrast, the morning and evening peak operations, which served approximately half of all trips, produced comparatively low RPM/CPM estimates. On average, peak period subsidies were between 17 and 20 percent higher than each system's average recovery rate. Evening and owl services, with the exception of AC Transit's late-night operations, generally matched each system's overall recovery rate. These periods accommodated less than six percent of each system's daily ridership, however, and therefore played a small part in the overall cross-subsidy picture.

Equity Analysis

Comparisons of revenue and cost disparities among various socio-economic groups failed to produce conclusive results. Only in the cases of AC Transit and SDTC were flat fares found to be regressive. Disparities, however, were rather

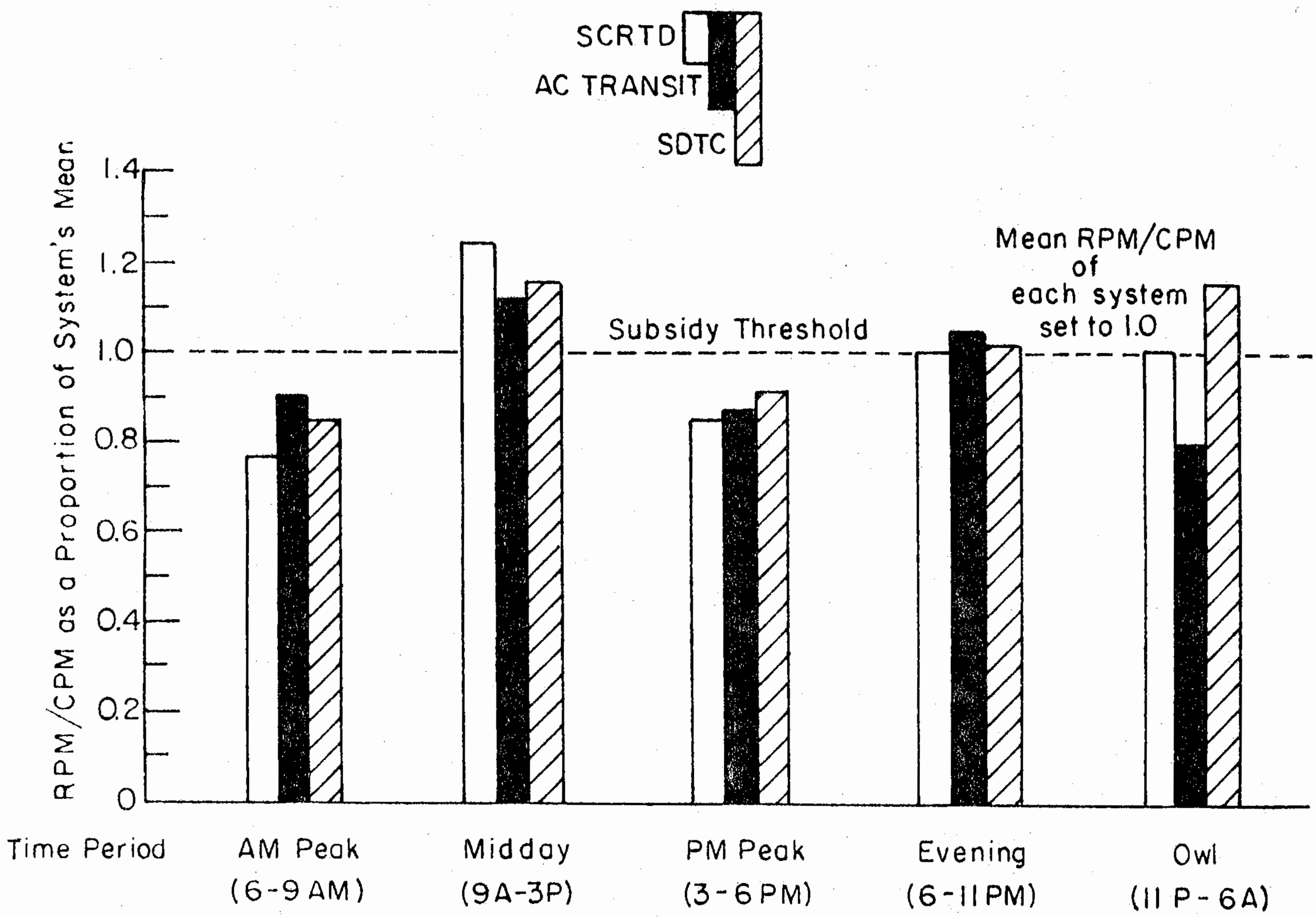


Figure 2. Price Disparities Among Time Periods.

small in these instances. AC Transit riders with annual family incomes above $15,000 covered 37.0 percent of their trip costs compared to a 40.4 percent recovery rate for those in the under $15,000 category. For SDTC, the recovery differential between those above and below the $15,000 mark was comparable -- 32.7 percent versus 36.5 percent. Surprisingly, the net transfer effect of SCRTD's fares was found to be mildly progressive, although the RPM/CPM differential between riders with family incomes above and below $15,000 was less than three percent.

Those without access to an automobile were found to cross-subsidize users with other travel options under both SCRTD and SDTC operations. In the case of SDTC, carless passengers returned 40.1 percent of their costs through the farebox compared with a recovery rate of 33.5 percent for those with auto access. Disproportionately high fares were also paid by AC Transit's Hispanic and Asian passengers. On average, these groups covered twenty-two percent more of their trip costs than whites. Conversely, RPM/CPM differentials were insignificant among SCRTD's and SDTC's ethnic classes. In general, cross-subsidization also hurt those who were college-age, female, unemployed, and making non-work trips (particularly medical journeys). However, the fare penalties imposed on these groups were generally modest and varied somewhat among study sites.

Overview of Current Fare Policy Impacts

Discrepancies in cost recovery ratios were found to be much more closely related to the characteristics of trips than the characteristics of travelers. This is revealed in Figures 3 through 5, where various efficiency and equity factors are ordered on the basis of relative differentials in RPM/CPM. Clearly, the two efficiency indicators -- trip distance and time-of-day -- dominate these figures. Disparities in RPM/CPM were generally over three times as great when expressed in terms of trip distance as any of the other factors. On the whole, equity impacts appeared incidental to the larger problem of inefficient pricing. Indeed, there

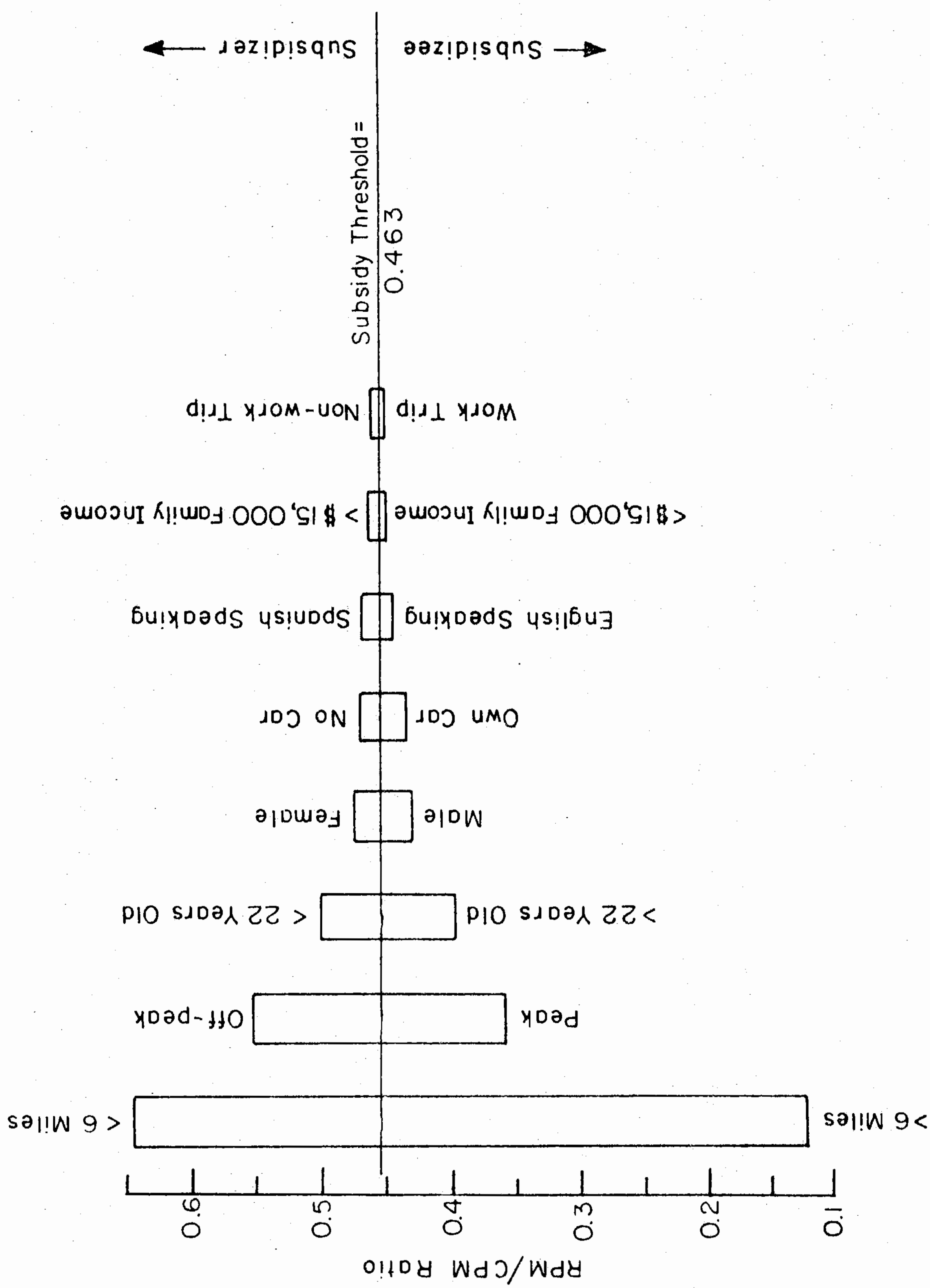


Figure 3. Ordering of SCRTD Efficiency and Equity Factors.

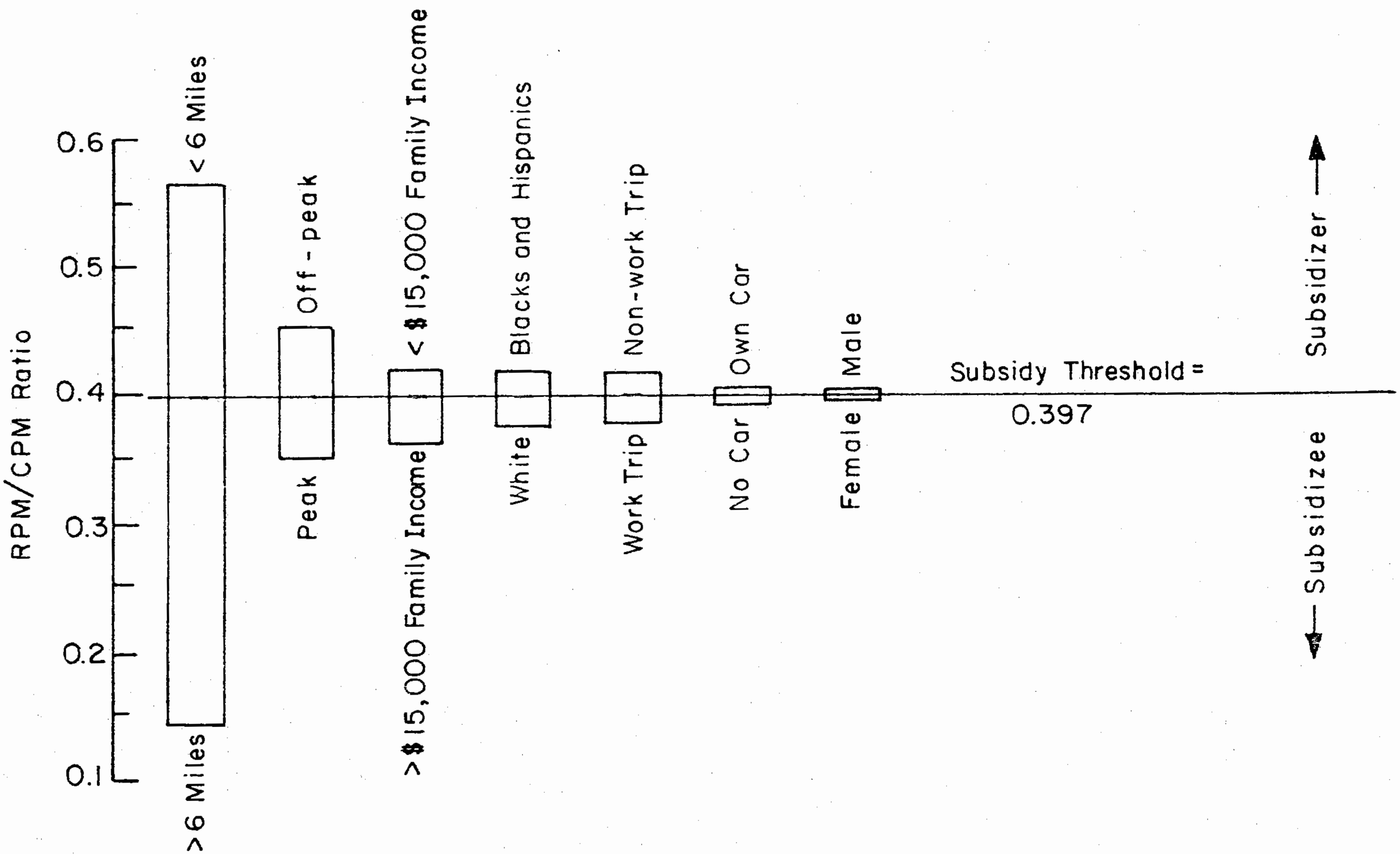


Figure 4 . Ordering of AC Transit Efficiency and Equity Factors.

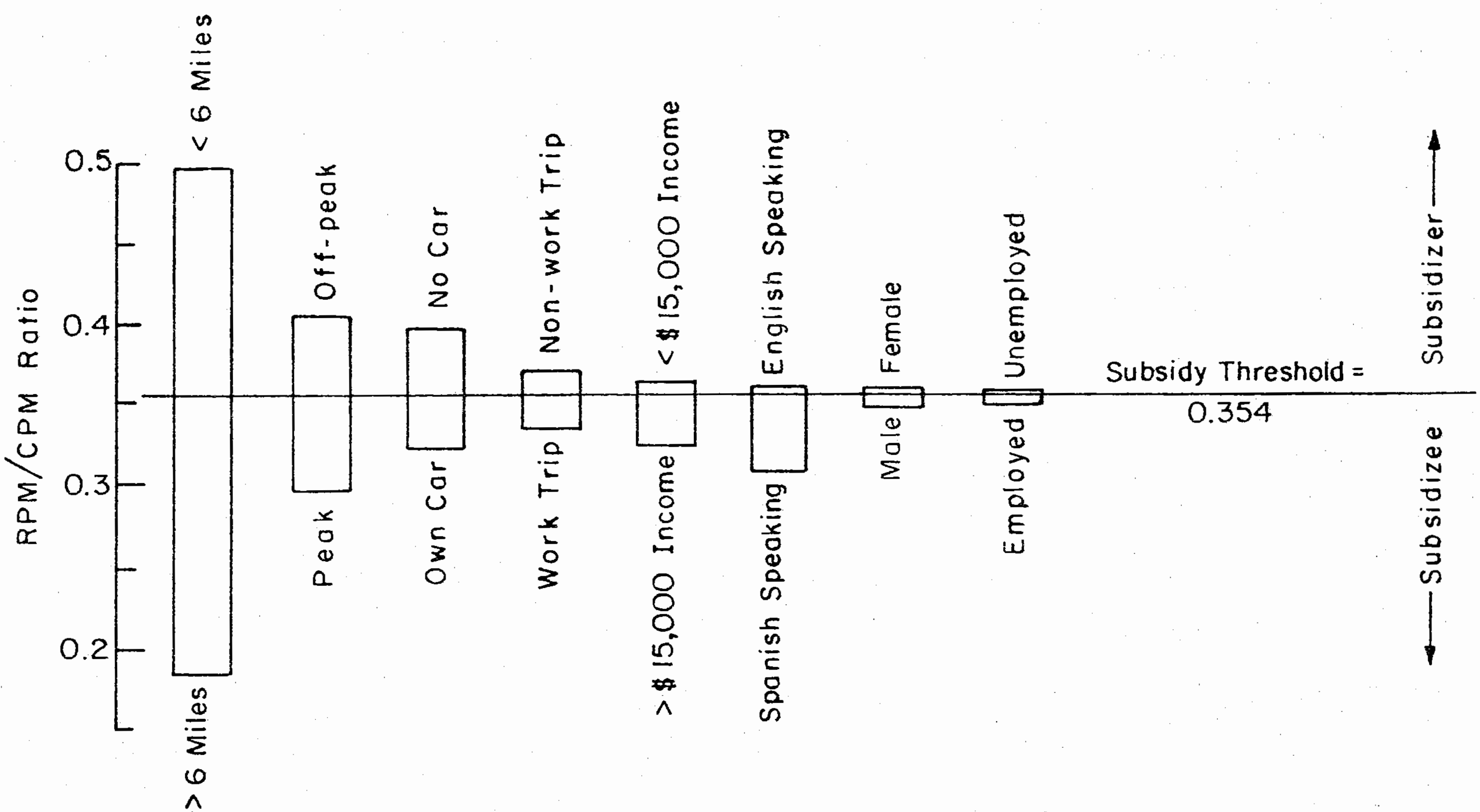


Figure 5. Ordering of SDTC Efficiency and Equity Factors.

actually seemed to be a progressive side to some of the fare transfers. Still, those most dependent upon transit were found to lose more under current pricing than other user groups, though cross-subsidies tended to be rather modest.

ASSESSING THE FAIRNESS OF ALTERNATIVE FARE POLICIES

Given the disparities associated with current transit pricing, several alternative fare policy scenarios were developed. To simulate possible efficiency and equity ramifications of these alternatives, a pricing evaluation model was designed.[4] The model relied on three major inputs. One, pricing scenarios were specified in terms of fares which would be levied for various distances or time periods of travel. Also, price elasticities were estimated to account for the probable ridership impacts of varying charges upon different user groups. Elasticity estimates were generally quite low, supporting the conventional view that most riders are insensitive to price changes. Finally, fare collection costs associated with more complex, graduated pricing structures were projected and incorporated into the model. The scenarios assumed that fairly advanced distance and time monitoring fare collection equipment would be installed aboard most buses in order to implement differentiated pricing. Automated collection technologies were projected to increase each operator's annual collection costs by 300 to 500 percent.[5] Combining these inputs, the evaluation model was then employed for comparing the ridership, revenue, efficiency, and distributional impacts of various pricing options. All estimates relied upon cost and user data gathered for the 1977-79 period, thereby providing a common time frame for contrasting fare options with current policies.

Stage Pricing Scenarios

The first scenario tested involved tapering fares on the basis of one to five mile steps, sometimes referred to as stage pricing. This approach aims to capture some of the costs incurred in serving long-haul journeys, yet without the expense burden of precise distance-monitoring collection equipment.

The stage structures used in this analysis called for 15¢ basic fares for all travel under one mile, and ten to twenty cents surcharges for extra steps crossed during a journey. Hypothetical stage structures differed slightly among the three operators, collecting anywhere from 75 to 90 cents for an eight mile journey compared with $1.50 to $1.90 for a twenty-five mile trip. All scenarios also allowed for senior citizen, youth, and, in certain cases, pass discounts.

Employing the pricing evaluation model, ridership and revenue impacts of stage pricing were estimated. Each operator could be expected to lose a margin of riders under stage pricing (Table 1). However, significant revenue gains could also be anticipated. Merging the collection costs of stage pricing into the analysis, RPM/CPM estimates increased appreciably for all three systems, generally rising between 15 and 30 percent.

Stage pricing's potential for reducing RPM/CPM disparities with respect to trip distance appears even more impressive. In comparison with current flat fares, Figure 6 reveals that RPM/CPM levels would converge toward the subsidy threshold (i.e., 1.00) under the stage scenario. Though stage pricing seems to offer appreciable efficiency gains, the incidence of cross-subsidization would probably continue to favor longer distance trips. Those traveling under one mile would likely still subsidize long-haul users, although the threshold distinguishing gainers from losers would be expected to increase from two to four miles for SCRTD and AC Transit. Though SDTC's subsidy threshold remains unchanged under this scenario, stage pricing nonetheless seems capable of equalizing RPM/CPM levels considerably among its distance categories.

Finally, stage pricing also appears to offer some promise for reducing or eliminating current maldistributive impacts. No socio-economic groups emerged as cross-subsidy losers under the stage scenarios. Stage pricing seemed particularly advantageous to carless, minority, and female patrons, groups which

Table 1. Ridership and Revenue Impacts of Stage Pricing Scenarios

	SCRTD	AC Transit	SDTC
% Change in Ridership	-2.4	-2.6	-6.2
% Change in Revenue	+30.8	+14.6	+24.4
Mean RPM/CPM	.60	.46	.46
% Change in Recovery Ratio	+29.7	+16.2	+30.9

were previously identified as cross-subsidy losers.

Finely Graduated Pricing Scenarios

Next, distance-based structures with constant eight cents mileage increments were tested. Under these scenarios, services would be priced as pure linear functions of distance. With an 8¢ per mile surcharge and a 5¢ basic fare, an eight mile trip would cost around seventy cents while a twenty-five mile one would run as high as $2.10. Of course, these scenarios would incur very high fare collection costs because of their sophisticated distance-monitoring requirements.

From Table 2, the potential ridership impacts of pure distance-based price systems seem modest, except for SDTC. In contrast to stage pricing, there could be a minute increase in patronage for two of the systems and a small loss for the other. Moreover, the revenue productivity of the graduated approach appears high, although less than that of the more coarsely designed stage systems. Significant increases in each operator's recovery rate could also be expected, however because of the relatively high collection costs associated with finely graduated structures, these gains would again be less than that of stage pricing.

It is apparent from Figure 7 that pure distance-based pricing could virtually eliminate current disparities. In fact, no subsidy threshold is discernable among distance groups; long-haul journeys appear as financially productive as short distance ones. In the case of SCRTD, pure distance pricing could reduce the

Figure 6. RPM/CPM Levels By Trip Distance Under Stage Pricing Scenarios

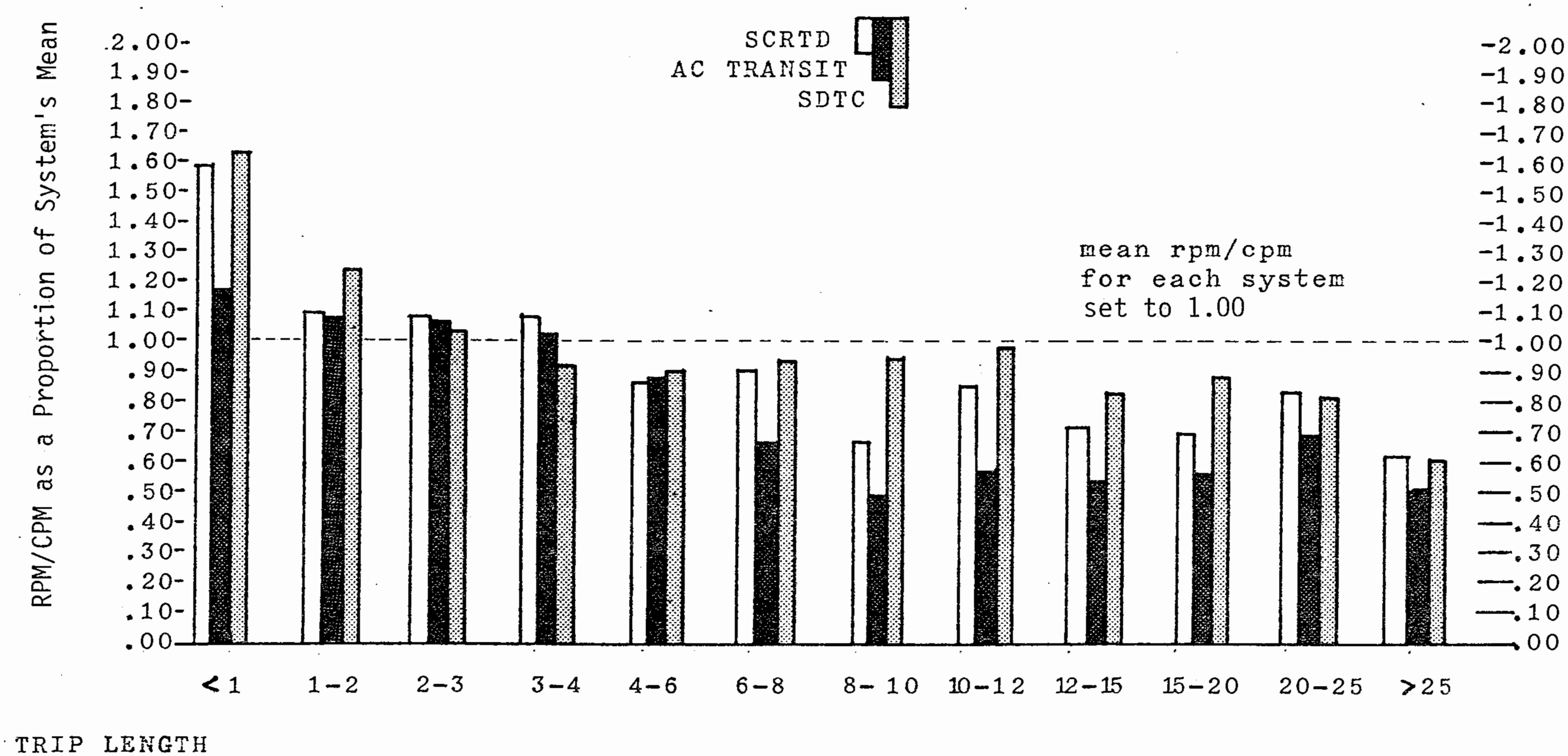


Table 2. Ridership and Revenue Impacts of Finely Graduated Pricing Scenarios

	SCRTD	AC Transit	SDTC
% Change in Ridership	+0.1	+0.3	-5.2
% Change in Revenue	+11.3	+16.8	+24.8
Mean RPM/CPM	.50	.45	.43
% Change in Recovery Ratio	+8.7	+13.7	+24.8

RPM/CPM ratio of trips below one mile by 275 percent while increasing it over 700 percent for trips exceeding 25 miles -- a differential of nearly 1000 percent.

The anticipated equity impacts of finely graduated fare scenarios generally parallel those of stage pricing. Again, inequities would likely be eliminated, and in some cases the incidence of cross-subsidization would be reversed in favor transit-dependent and lower-income patrons. With SDTC, pure distance-based fares could potentially transform the agency's price system from a mildly regressive to a mildly progressive one.

Time-Dependent Pricing Scenarios

Under this approach, fares would be differentiated by time-of-day, with peak period riders paying an added surcharge for their services. The scenarios tested called for a peak/off-peak differential of 55¢ to 25¢ for SCRTD, 40¢ to 30¢ for AC Transit, and 45¢ to 30¢ for SDTC, and also retained features of each system's current senior and student discount programs.

From Table 3, time-of-day fares are estimated to increase operators' overall ridership levels slightly. Generally, lower base fares could be expected to increase off-peak patronage so as to more than compensate for peak period ridership losses. Higher revenue yields could also be anticipated, although time-based fares appear less revenue-productive than distance-based pricing. Yet, when collection costs are merged into the analysis, the financial performance of time-

Figure 7. RPM/CPM Levels By Trip Distance Under Finely

Finely Graduated Pricing Scenarios

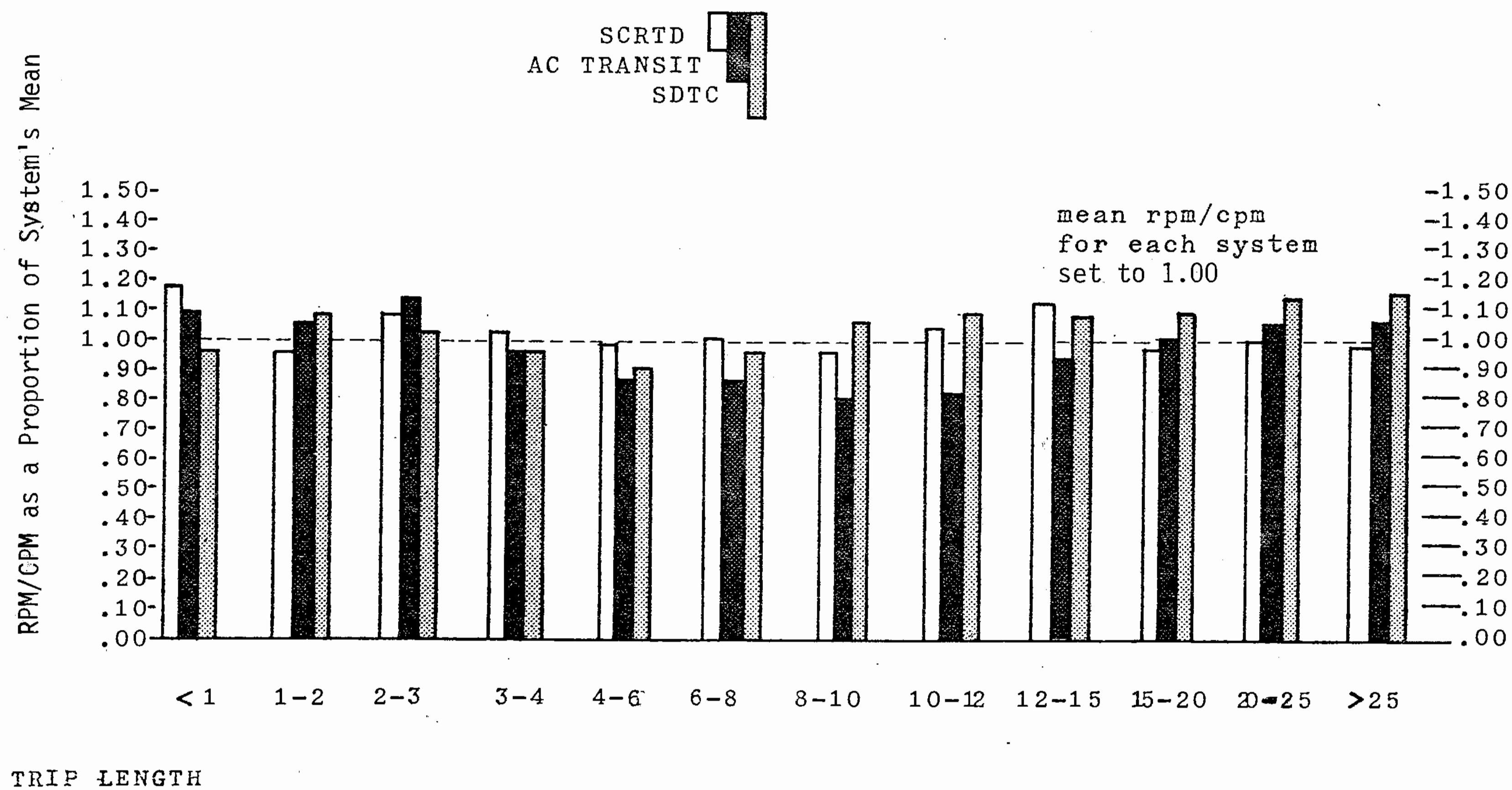


Table 3. Ridership and Revenue Impacts of Time-Dependent Pricing Scenarios

	SCRTD	AC Transit	SDTC
% Change in Ridership	+0.4	+1.0	+1.3
% Change in Revenue	+13.5	+11.6	+3.0
Mean RPM/CPM	.53	.44	.36
% Change in Recovery Ratio	+14.3	+11.5	+2.7

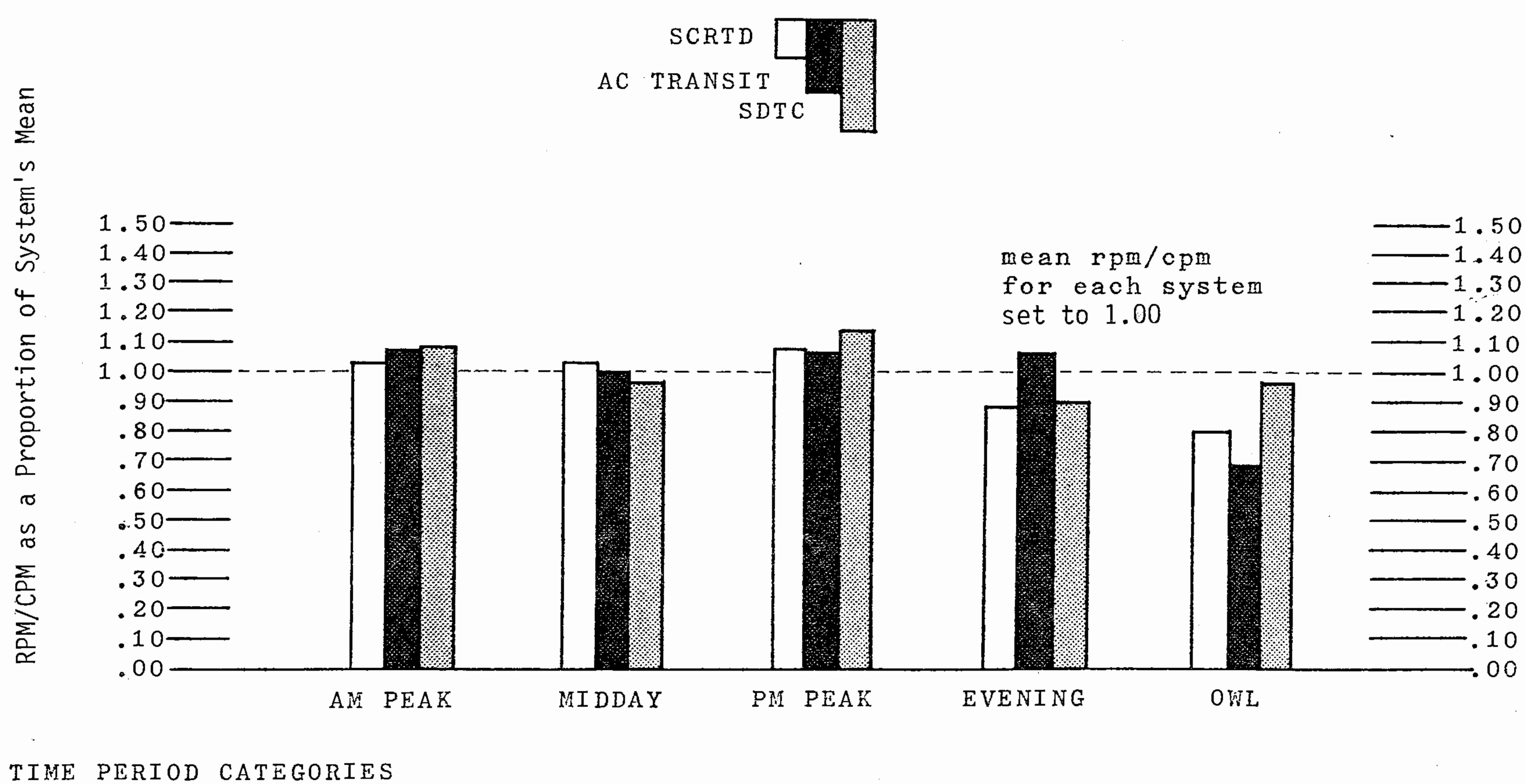
dependent pricing seems on a par with the graduated scenarios. In the case of the two larger operators, peak/off-peak differentials could be expected to raise recovery ratios above those of graduated pricing. However, stages pricing appears financially more solvent than time-of-day pricing in all three study cases.

In terms of efficiency criteria, Figure 8 indicates that time-dependent fares could probably equalize current price discrepancies by time period. In all study cases, peak period RPM/CPM ratios lie slightly above the subsidy threshold. Although evening and owl period patrons could be expected to reap excess benefits from these scenarios, they constitute such a small proportion of total ridership that overall redistributive effects between peak and off-peak users would be essentially neutral.

In contrast to the previous scenarios, time-differentiated fares were found to be less responsive to current maldistributive impacts. In the cases of both AC Transit and SDTC, peak/off-peak fare differentials seemed to retain the regressive features of flat fares. In particular, it was estimated that minorities and females would continue to subsidize trips made by whites and males. The only perceptible equity improvement projected under time-of-day pricing involved an equalization of RPM/CPM rates among work and non-work trips. This, of course, would occur due to the concentration of commute trips during higher-priced rush hours.

Figure 8. RPM/CPM Levels By Time Period Under

Time-Dependent Pricing Scenarios



POLICY IMPLICATIONS OF DIFFERENTIATED FARES

Differentiated price structures seem to offer considerable promise for correcting problems linked with flat fares. Clearly, as fare structures more closely approximate marginal cost pricing, efficiency improvements could be anticipated. Fares finely graduated by distance seem particularly responsive to current pricing deficiencies. They also offer potential equity benefits; by setting fares in line with the true costs of users' trips, those most in need of transit stand to gain. Highly differentiated fares could also improve transit's overall financial performance -- an important factor during periods of soaring costs and tight-fisted budgets. Moreover, the ridership impacts of finely differentiated fares would probably be minimal; patronage losses due to higher long-haul prices would generally be counter-balanced by gains in short-distance usage. Collectively, these findings compel one to argue in favor of distance-based and time-dependent fare policies as preferred pricing approaches.

The choice of either a flat, stage, distance-based, or time-dependent fare structure should logically be based upon specific goals and objectives set by transit policy-makers. Whenever goals such as "rider convenience" and "fare comprehension" predominate, flat fares hold obvious advantages. Given a policy mandate to reduce deficits, on the other hand, stage or time-dependent structures emerge as attractive pricing options. In general, the relatively low collection costs of coarse fare structures could be expected to raise the overall financial performance of these approaches above that of graduate pricing. In contrast, where economic efficiency and distributional equity are primary objectives, finely graduated pricing appears preferrable. Graduated fares, in particular, seem to strike a balance among objectives -- modest patronage losses combined with appreciable revenue, efficiency, and equity gains.

Although differentiated pricing structures emerge as viable alternatives to flat fares, the decision to implement them is ultimately a political one. In the cases of SCRTD and AC Transit, distance-based pricing of previous years was eliminated because of union pressures. Labor has historically voiced a dislike for differentiated pricing because of disputes which often arise between passengers and drivers. Politicians are also keenly sensitive to the riding public's demand for simple, comprehensible services. It follows that a tremendous barrier to differentiated transit pricing is the unwillingness of labor, elected officials, and the public to give up the convenience and simplicity of flat fares in favor of more complex pricing mechanisms.

In an attempt to gauge the political pulse of transit pricing issues, events which transpired during recent SCRTD public hearings on proposed fare changes were observed.[6] The SCRTD Board generally took the most politically expedient path toward the deliberation of pricing issues. On the whole, fare decisions were both myopic and stop-gap in nature. Pricing policy was largely viewed within a short range context, and was strongly shaped by the apparent goal of alienating as few consituents as possible. Formal discussions tended to focus on increasing fares across-the-board regardless of which types of trips and services were most responsible for escalating costs. Equity emerged primarily as a parochial issue. In particular, there was an overriding concern for the potential impact of any fare changes on the elderly and handicapped. Other special interest groups, such as labor unions and student associations, also seemed to exert strong influence on fare decisions. Labor representatives, for example, argued for fare reforms which would reduce the complexity and increase the safety of drivers' duties. Student leaders,on the other hand, seemed most concerned with the impact of rising fares on captive users and argued forcefully for stronger public support of services. The SCRTD Board of Directors' decision to increase basic fares, maintain senior discount programs, and retain a predominantly flat structure resulted directly from a brokerage process of appeasing certain political factions and special interests. This fare program, however, offered little consolation to SCRTD's short distance and off-peak users.

In summary, the political environment surrounding public transit pricing issues is a stormy one. Although the theoretical arguments in favor of differentiated pricing appear quite convincing, political barriers remain formidable.

CONCLUSIONS

The three case studies' current pricing policies foster significant inefficiencies and modest inequities. They generally ignore the effects of changing travel behavior on costs, thereby contributing directly to fare cross-subsidization and rising deficits. By assessing uniform charges against all riders, today's fare systems operate on compensatory principles: short distance, off-peak users pay disproportionately high fares to offset losses incurred in serving long-haul, peak hour passengers. On the whole, those highly dependent on transit and least able to pay lose the most when cross-subsidization occurs.

Finely differentiated fare structures represent attractive alternatives. Fares differentiated by distance and time-of-day could reduce inequities and improve transit's financial performance while essentially retaining current patronage levels. Local decision-makers, however, must balance these goals against those related to passenger convenience and fare simplification. Conflicting objectives should be confronted through informed public discussions.

A successful transit fare policy will require a clear statement of transportation goals and objectives at the local, state, and national level. Recent events suggest that efficiency goals will gain added importance in coming years. Government transportation policies and programs should embrace efficiency objectives, particularly with respect to federal and state subsidy policies. Financial assistance programs which awarded operators for introducing efficient pricing structures, for example, could serve to stimulate a new generation of fare innovations. Finally, the success of any transit fare reform rests to a large extent on pricing improvements made in other competing transport sectors. As long as highway usage is underpriced or parking is subsidized by employers, for example, efficiency-based fare policies could prove counter-productive. Therefore, transit fare innovations should be part of a larger effort to correct pricing distortions found throughout the transportation system. Through aggressive policy promotion and informed public debates, transit fare systems which are both fair and financially viable can begin to replace today's simple pricing rationales.

ACKNOWLEDGMENTS

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NOTES

1. Response rates among disadvantaged users were relatively low. Biases were reduced by weighting the responses of users from undersampled groups. By adjusting response rates, over 10,000 sample cases were obtained for each study site.
2. Labor productivity was measured by comparing hours of pay to actual hours of service between peak and off-peak periods for all bus routes studied. For discussions on this approach, see Cherwony and Mundle (1978), Levinson (1978), and Cervero (1980).
3. For the time periods of this analysis, the average farebox recovery ratios of the three operators were: SCRTD - .463; AC Transit - .397; and SDTC - .354. Thus, the value of 1.5 shown in Figure 1 for SCRTD journeys of 1-2 miles corresponds to a RPM/CPM of $1.5 \cdot .463 = .695$, a recovery ratio of nearly seventy percent.
4. For a detailed discussion of this model, see Cervero, 1980, pp. 206-11.

5. The full cost of implementing automated collection technology on systems comparable to the three study sites is difficult to estimate with certainty because of limited precedents in this country. For finely graduated fare systems, it is assumed that a ticket issuing machine and two cancellers would by required aboard each vehicle. Curbside automats would also be necessary as well as roving inspectors to enforce payment schedules. Using recent manufacturer cost data and allowing for contingency expenses, annual collection costs of graduated pricing were estimated to vary from $1.1 million for SDTC to $6.2 million for SCRTD. Stage and time-of-day price systems were projected to incur less than one-half the annual collection costs of graduated structures. These estimated savings would result from the elimination of automats and inspectors from more coarsely designed fare systems. For a complete discussion of procedures and assumptions employed in estimating collection costs, see Cervero, et al. 1980, pp. 125-132.
6. This discussion is based on the observed proceedings of the October, 1979 and April, 1980 public hearings held by the SCRTD Board of Directors in Los Angeles.

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