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Abridgment

Free-Fare Transit: Some Empirical Findings

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This paper presents comparative results from two free transit demonstrations funded by the Urban Mass Transportation Administration. In Denver and Trenton, one-year experiments with off-peak free transit began early in 1977. The analysis here is based on survey and ridership-count data collected as part of the demonstration evaluation process. Aggregate ridership increases of about 50 percent were observed at both sites following the elimination of fares. The majority of the additional trips would have otherwise been made by non-bus modes, though roughly 15-25 percent would not have been made at all without free fare. Transit-dependent groups, including the elderly, the poor, and the carless, were less responsive to fare elimination than were nondependent groups. Neither demonstration had a measurable impact on automobile use. At both sites increased ridership led to modest and generally localized deteriorations in service quality.

This paper summarizes the results of two off-peak free-fare demonstrations sponsored by the Office of Service and Methods Demonstrations, Urban Mass Transportation Administration (UMTA). One took place in Denver and the other in Trenton. Each lasted for one year. Restriction of free fare to off-peak periods served to reduce the overall cost of the demonstrations since peak-period ridership continued to generate revenue. Furthermore, continued collection of peak-period fares focused ridership gains on the excess capacity of the off-peak periods.

Although the basic approach to fare elimination was identical in Denver and Trenton, the two demonstrations had several important contextual differences. These included predemonstration site-and-transit service characteristics, underlying local objectives for the demonstration, the manner in which fare elimination was implemented, and external events that influenced the observed impacts of the demonstrations. Perhaps the most significant differences between the two demonstrations were in the circumstances under which they originated. Whereas the Trenton demonstration was planned from the beginning as a one-year experiment, the Denver demonstration evolved out of what was initially planned as a one-month, locally sponsored transit promotion effort. One consequence of the more spontaneous origin of the Denver demonstration is that there was little opportunity to develop either a comprehensive implementation procedure or an evaluation plan.

Also, during the course of the demonstration Denver restructured its bus routes from a radial pattern, focused on Denver's central business district (CBD), to a grid pattern. The route restructuring probably had both temporary and longer-term negative impacts on free-fare ridership levels (1).

AGGREGATE CHANGES IN TRANSIT RIDERSHIP

With the introduction of off-peak free fares, each site experienced a large increase in aggregate system ridership that was sustained throughout the demonstration period. In Trenton, average weekly off-peak ridership rose by 46 percent; in Denver, the increase was 52 percent. Figure 1 presents monthly ridership estimates for the two sites from January 1977 through June 1979.

Although ridership peaked early in each demonstration, it is evident from the figures that much of these ridership gains were sustained throughout the year of free fare. This suggests that even after the novelty of free bus service wore off, free fare continued to make transit an attractive travel alternative. Following the reinstitution of off-peak fares early in 1979, ridership remained above projections based on predemonstration levels, suggesting that some of the ridership induced by the free fares was retained after fares were reimposed. However, several exogenous events also influenced post-demonstration ridership in ways that were probably significant but cannot be easily quantified. Perhaps the most significant influence came from the nationwide gasoline crisis that occurred in 1979. The long-term impacts of the free-fare promotion are therefore uncertain at best, but are probably not of sufficient magnitude to offset the revenue loss associated with the year-long free-fare promotion.

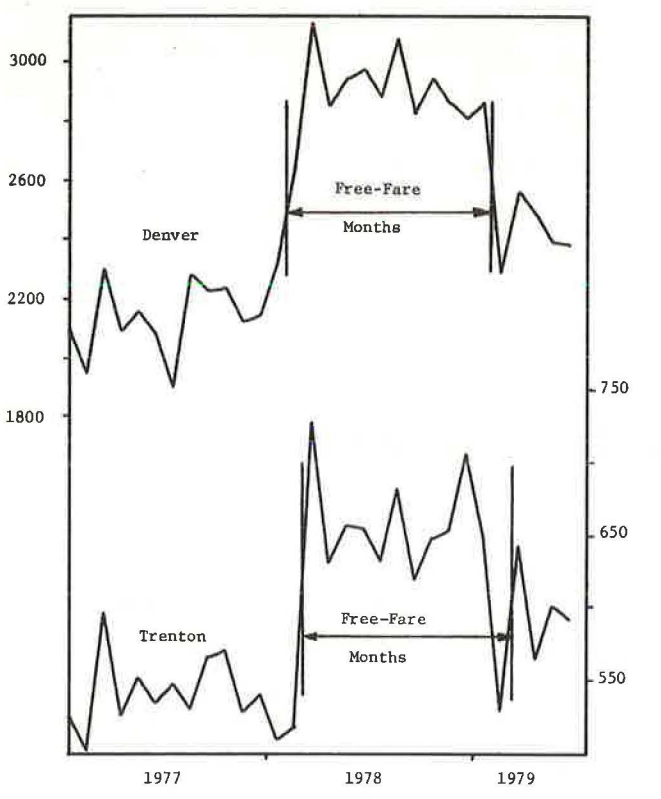
TRAVEL-RELATED BENEFITS

The benefits ascribed to free-fare-induced transit derive from three sources: (a) increased mobility for transit dependents, (b) reduction of car travel through diversion of car trips to transit, and (c) economic stimulation of commercial areas through increased trip making for shopping.

One of the principal benefits attributed to free-fare transit is an increase in the mobility of transit-dependent segments of the population. By eliminating cost as a barrier to travel, proponents argue (2,3) that such groups as the poor, the elderly, or the young will have greater access to activities and opportunities throughout the urban area.

It was found that 12 percent of all free-fare trips in Trenton and 7 percent of those in Denver

Figure 1. Monthly ridership (000s).



would not have been made had fares been charged, according to the trip makers. At each site, a major share of the free-fare-induced trips was made by people with household incomes below $10 000, and by people in the 17-to-24 age group. Note, however, that these age and income groups were heavy bus users prior to free fare. As a consequence, despite large absolute shares of all induced trips, their induced trips were relatively few in comparison to their total bus trips prior to free fare. In Trenton, the share of free-fare-induced trips relative to base-period trips was greatest among people in the $10 000-$15 000 income bracket, while in Denver, people with incomes of more than $15 000 were most readily induced to take new trips by free fare. Among age groups, young people at both sites were most induced to make trips during free fare. In Denver, however, the single greatest increase occurred among people in the 17-24 age group. The share of induced trips among the elderly was low relative to their prior level of trip making at both sites.

Together, these findings suggest that no particular sociodemographic group can be identified as an overwhelming beneficiary of off-peak, systemwide free fare. Young people in general seemed to take advantage of free fare to make more trips, while the elderly took fewer free-fare-induced trips than might have been expected. Beyond these observations, the relative increases or decreases among sociodemographic groups and trip purposes were site specific.

Because of the importance of impacts on transit dependents in assessing free fare, the full set of travel changes, including not only induced travel but modal shifts as well, was separately evaluated for the poor, the elderly, and the carless. The shares of off-peak transit trips attributable to each of these groups declined during the free-fare demonstration at each site. Because of the overall increases in system ridership, these lower shares do translate into modest absolute increases in the number of trips made by these groups. However, it would appear that transit dependents were generally less responsive to the free-fare incentive than were other segments of the population. One explanation for this phenomenon is that transit dependents have fewer travel alternatives from which to switch, and are therefore less responsive in terms of mode change.

Free fare had relatively little impact on the trip purposes of the three groups. There were small decreases in the shares of home-based trips and shopping trips among the nonelderly. These were offset by small increases in the shares of social-recreational and other trip purposes. Free fare also seemed to result in modest increases in the share of work trips by the low-income and the carless groups.

In considering the travel behavior changes of these three groups, free fare did not significantly improve the overall mobility of the transit-dependent rider relative to that of other transit travelers. Based on the above findings, it does not appear that systemwide free fare represents a well-focused policy tool for the provision of mobility to specific population segments.

IMPACTS OF FREE FARE ON VMT

A considerable volume of the general press literature advocating free-fare transit focused on its potential for diverting car trips to transit with consequent reductions in car-based vehicle miles of travel (VMT) and the traffic congestion, air and noise pollution, and energy consumption associated with car VMT (4-6). Realistically, transit's relatively small share of total urban travel leaves it underleveraged for substantially reducing car use. In a city with a 5 percent transit mode share, for example, doubling transit use, even if all additional trips were diverted from the car, would induce slightly more than a 5 percent reduction in car travel.

Indeed, the findings from Denver and Trenton confirm the relative ineffectiveness of free fare in reducing car VMT. Approximately 9 percent of the free-fare trips in Trenton and 15 percent of the Denver trips would have been made by car. At the outside, free fare reduced weekly car VMT in Denver by less than 0.5 of 1 percent and in Trenton by slightly more than 0.1 of 1 percent. These changes are so small as to be unobservable within total VMT.

Although the impact of free fare on car travel seems insignificant in the aggregate, it is still useful to examine the sociodemographic characteristics of those individuals who switched from car to transit. In both Denver and Trenton, those who were diverted from the car were younger and had higher incomes than the typical transit user. The association between income and car use is not unexpected. However, the fact that these people switched to transit suggests that price sensitivity exists at all income levels. More importantly, it appears that a potential market of transit riders exists among the younger, middle- to upper-middle income car traveler.

IMPACTS OF FREE FARE ON CBD VITALITY

The ability of free fare to improve the economic health of a city's CBD depends on its influence on CBD attractiveness and accessibility relative to that of alternative destinations. Free fare enhances mobility within the CBD. Moreover, system-

wide free fare, in contrast to CBD free-fare zones, reduces the cost of travel to the CBD. However, as systemwide free fare similarly reduces the cost of travel to alternative destinations, the CBD's relative gain is less than it would be with a geographically restricted free-fare policy.

Neither demonstration site provides very strong evidence of the impacts of free fare on CBD commercial activity. In Trenton, inbound bus trips with a shopping destination and outbound trips with a shopping origin showed greater increase than did the reverse travel. In Denver, between 0.5 and 1 percent of free-fare travel involved additional shopping trips to the CBD. This represents approximately 0.5 percent of all CBD shopping travel. On the other hand, roughly equal shares of respondents reported decreasing their CBD travel due to free fare as reported increasing their trips.

FINANCIAL IMPACTS OF FREE FARE

Financial consequences are free fare's greatest disadvantage. The major impact is the direct loss of revenue from previous fare-paying riders. With off-peak free fare there is also loss of revenues as patrons are drawn from peak to off-peak ridership. There may as well be an increase in operating cost if additional service is required to accommodate the new ridership. The revenue loss and cost increase contribute to an increase in the required operating subsidy.

In Trenton, the combined revenue losses both from off-peak trips that would have been made even if a fare had been charged and from diverted peak period trips amounted to $343 000. Additional operating costs attributable to free-fare service added another $22 500 for a total increase in transit subsidy of $365 500. In Denver, the lost revenues from off-peak trips were partially offset by an increase in fare-paying peak trips. Estimated net revenue losses during 1978 amounted to $3.94 million. Increased operating costs attributable to free fare added another $407 000, bringing the total cost of free fare in Denver to $4.347 million. At each site, free fare required about an 11 percent increase in operating subsidy.

IMPACTS ON TRANSIT OPERATIONS

Two aspects of service quality were adversely affected by free fare: onboard crowding and the level of schedule adherence. Both impacts occurred as the direct result of very sharp increases in ridership.

With little increase in the number of buses serving off-peak free-fare trips, all buses became more crowded. In Denver, load counts conducted at the CBD fringe in August 1978 showed the average load for the 51-seat buses to be 45 passengers, an increase of roughly 50 percent during the period prior to free fare. CBD boundary load counts were made in Trenton both before and during the fare-free period. For off-peak vehicles alone, the average load increased by nearly 60 percent. Furthermore, the share of off-peak buses arriving downtown with standees rose from 1 or 2 percent to between 15 and 20 percent. At both sites, the most severe crowding was concentrated in or near the downtown.

Schedule adherence can be influenced by increased demand in at least three ways: (a) Larger numbers of boardings and alightings will increase dwell times; (b) a higher overall level of ridership increases the average number of boarding and alighting stops made per run; and (c) as on-board crowding becomes more severe, more time is typically required during each boarding or alighting. At both sites, schedule checks of buses arriving at the boundaries of the CBD were conducted during the demonstrations in accordance with normal transit administrative procedures. The share of buses arriving ahead of schedule declined in both Denver and Trenton, although the change was more dramatic in Denver. On-time arrivals (buses arriving less than 5 min behind schedule) declined in Trenton but increased slightly in Denver. Late arrivals increased significantly at both sites. Free fare thus appears to have resulted in a fairly distinct pattern of vehicle delay, although the average amount of delay was modest.

CONCLUSION

Off-peak systemwide free fare will probably not be an attractive long-term pricing policy for local transit operators. Because of a substantial overflow of benefits to untargeted groups, it would appear that more restrictive pricing policies such as targeted transit subsidies could achieve similar social benefits at less cost than systemwide free fares.

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