A COMPARISON OF FINDINGS FROM PROJECTS EMPLOYING USER-SIDE SUBSIDIES FOR TAXI AND BUS TRAVEL

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Introduction

Since the early experiments with user-side subsidies that began about 4 years ago, there has been a great deal of interest in the concept. The UMTA Service and Methods Demonstration (SMD) Program has funded a series of projects (Ref.'s 4,6) aimed at determining the viability of user-side subsidies in different settings and applied to different forms of public transportation. In the meantime, there has been a growing number of locally initiated user-subsidized services; some of these are are being monitored by the SMD program (Ref.'s 1-3). Given the substantial amount of accumulated experience and the high level of current interest on the part of planners, cross comparisons of existing results have been underway in an effort to develop transferable findings that will be useful in planning other projects.

This paper presents results from 13 applications of user-side subsidies; in most cases as a means of improving the mobility of transit dependent persons. Examples of public and private providers, paratransit and fixed-route services, small to medium size cities, limited (target market) eligiblity and subsidization of all trips, including a variety of subsidy levels, payment mechanisms, and fare policies are discussed and examined. Where possible, generalizations are made regarding administrative policies, fare-discount strategies, and project impacts.

The analysis of the available data from these projects has focused primarily on six areas:

1. Characteristics of the market segments that elect to participate and the penetration of the eligible market;

2. Tripmaking frequency and mode share of project trips;

3. Findings related to trade-offs among alternative administrative policies;

4. Costs of user-side subsidy projects;

5. Benefits to project users; and

6. Impacts of user-side subsidies on taxi operators.

Background

Subsidies for public transportation have traditionally been provider-side subsidies. These subsidies are made available directly to the transportation provider for offering certain specified services at fares which do not generate sufficient total revenues to cover the cost of providing the service. The user-side subsidy offers an alternative method of subsidizing transportation services (Ref.'s 7,9). A provider accepts tickets or vouchers (or any mechanism used to provide evidence of trips delivered) from users and redeems them from the subsidizing agency for a value established in advance. This value usually represents the difference between the fare paid by the rider and the total cost of the trip. However, it may also be applied in such a way as to permit subsidization of the difference between a discounted fare and the full fare in cases where a transit operator receives a provider subsidy as well.

The feasibility of user-side subsidies for taxi service is evidenced by the results of the first demonstration project in Danville, IL, and is further further reflected in the fact that a number of other cities have already adopted the concept. Therefore, current user-side subsidy demonstrations are aimed at substantiating the Danville results in other cities and testing the effectiveness of a number of variations on the original concept, including the provision of user subsidies for both bus and taxi service. Applicability of user-side subsidies in cities of varying size is still of major interest to the program, since the current set of demonstration projects are located in small to medium size cities, or in communities within a large metropolitan area. Whether the complexities of administration and control of misuse may be much greater in large cities is but one of a number of questions that cannot be answered from the experience to date.

Variations in the Design of Projects Studied

A summary of the basic features of each of the four ongoing demonstration projects; in Danville, IL; Montgomery, AL; Kinston, NC; and Lawrence, MA, is provided in Table 1. A user-side subsidy demonstration project that recently began in Milton township, a suburb of Chicago, IL, is also included. This service is part of a brokerage demonstration project coordinated through the Regional Transportation Authority (RTA), which is allocating funds for paratransit services in communities in the Chicago area.

In addition to the above demonstration projects, the SMD program has been monitoring locally initiated user-side subsidy programs in Kansas City, MO (Ref. 3); the San Francisco Bay area (Ref. 1); Los Angeles, CA; and the State of West Virginia (Ref. 2). Summary information on these projects is also included in Table 1. The amount of data available for comparison with demonstration projects is limited, however, because full-scale evaluations were not conducted at these four sites.

While the user-side subsidy was originally tested by the SMD Program as a means of providing low cost taxi service for transportation handicapped persons, the concept has since been applied to fixed route transit service,and is being tested in a variety of contexts. Because the subsidy is offered only for trips delivered, it offers the potential for selectively subsidizing different markets, and even varying the fare discount for each eligible target market. For instance, in Danville, taxi service for eligible (registered) transportation handicapped persons was discounted about 75% for the first year (12/75-12/76), and 50% for the remainder of the taxi portion of the demonstration (1/77-6/78), while bus service, which began in December 1977, was discounted 50 percent for all persons over 65 and under 18 years of age. Persons eligible to receive discounted service on both modes could make travel choices depending upon the accessibility of each mode to their destination, the desired level of service, and the cost differential involved.

In most cases, user-side subsidies are being applied to existing transportation systems. An administrative staff is required to register eligible persons, issue identification or some proof of eligibility, redeem tickets or vouchers submitted by the provider, conduct marketing and promotional activities, and perform other necessary management and accounting functions. The agency administering the program and subsidizing providers is usually part of the local government and is not directly involved with the provision of service or a part of the institutional structure of any single transit authority. This permits the flexibility to select existing public and private providers, negotiate service agreements, and even encourage new services by offering a guaranteed minimum total subsidy or producing evidence of an untapped demand.

With this flexibility, it is possible to coordinate among a mix of potential carriers, including social service agencies, non-profit providers and taxi operators. The Share-A-Fare transportation brokerage project in Kansas City, MO (Ref. 3) is coordinating travel for elderly and

TABLE 1. SUMMARY OF USER-SIDE SUBSIDY PROJECTS

SITE & PROJECT CHARACTERISTICS	SMD Demonstration Projects: Danville 12/75[5]	Montgomery 8/77	Kinston 9/77	Lawrence 7/78	Milton (Chicago) 8/78	Non-SMD Projects: Kansas City 5/77	San Francisco Bay Area[3] 1974-76	Los Angeles (Harbor Area) 9/78	West Virginia TRIP 6/74
Population	42,600	133,400	22,300	66,900	61,600	500,000	NA	120,000	1,810,000
Area, sq. mi.	12.9	46.4	6.1	6.8	36	NA	NA	23	24,181
Population Density persons/sq. mi.	3,300	2,900	3,800	9,800	1,955	1,600	NA	5,217	75
Population over 65, percent	13	9.3	9.8	14.9	6.2	12	NA	NA	NA
Total Eligible Population	7,500	18,600	2,860	12,500	6,500	75,000	1,250-21.000	NA	122,000
Project Modes	1975-78: Taxi 1978: Bus	Taxi, Bus	Taxi	Taxi, Bus	Taxi	Taxi, Agency Vans[7]	Taxi	Taxi	Taxi, Bus
No. of Taxi Companies in Service Area	2	16	10	10	NA	NA	NA	NA	NA
No. of Participating Taxi Firms	2	3	8	8	2	2	-	1	NA
No. of Taxi Vehicles (Participating)	24	47	33	63	14	90	-	35	NA
Project Taxi Coverage, Veh/Sq. mi.	2.0	1.0	5.5	9.3	0.4	0.3[6]	1-2	.66	NA
Taxi Fare Structure	Zone	Zone[1]	Zone	Zone	NA	Zone[1]	Meter	Meter	Meter
Shared Ride Service	Y	Y	Y	Y	Y	Y	N	Y	N
Taxi Subsidy Mechanism	Vouchers	Vouchers	Tickets	Tickets	Tickets	Tickets	Scrip, Tickets, Vouchers	Tickets	Tickets
Fare Discount, percent	50[12]	50	50	50	NA	75	50-100	>90	88
Ave. User Fare	$.62	1.30	.76	.75	.50[2]	.50	0-.63	.15[2]	.38[4]
Monthly Travel Limit (Total Undiscounted Fares)	$20	30	25	20	None	NA	NA	None	8
Ave. Vehicle Trip Length, Mi.	2.0	2.50[6]	1.3	2.0	2.0	NA	1.7-5.4	1.7	NA
Fixed Route Transit:									
Standard Fare	$.40	.30, .15[9]	-	.15	--	-	-	-	NA
Project Fare per Trip	$.20	.15, .0[9]	-	.01	-	-	-	-	NA
RESULTS									
No. of Persons Registered	3,500	5,500	700	3,200	-	10,710	140-2,000	NA	NA
Percent of Eligibles Registered	47	30	25	26	-	14	4-32	NA	NA
Project Taxi Ridership per Mo.	4,500[10]	3,290[11]	3,200[11]	7,000[11]	NA	10,000/mo.	413-1,650/mo.	3,500/mo.	NA
Project Transit Ridership per Mo.	10,660[8]	21,100[11]	-	15,000[11]	-	-	-	-	NA

NA = Not Available

[1] Zone fares for project trips only.
[2] Flat Fare.
[3] 6 Programs in 6 Regions of San Francisco Bay Area; Range of values for the programs is shown.
[4] Estimated average total fare is $3.00.
[5] Date Project began Operation.
[6] Estimated.
[7] 8 agency vans; 3 city owned Vans.
[8] H&E Ridership only; transit discounts are also available to youth (under 18 years of age).
[9] Peak and off-peak fares, respectively.
[10] Ridership level after introduction of bus service.
[11] Average over a stable six month period 1978-79
[12] Fare discount was 73% during first year of project.

handicapped citizens by enlisting providers, scheduling trips, and administering user-side subsidies. The transportation suppliers include two taxi companies, three social service agencies with vehicles, an ambulette service, and three city owned and operated vans. Agency clients can travel on taxis or on a van operated by their agency; non-affiliated persons can travel on taxis or a lift equipped van (either a city or ambulette company vehicle). Taxi and agency carriers are reimbursed on a fixed cost per trip basis and users pay a 50¢ flat fare. Subsidy funds come from revenues generated by a 1/2 percent city sales tax allocated for public transportation purposes.

Fare Polices and Payment Mechanisms

User-side subsidy projects have utilized either tickets or vouchers as instruments for fare and subsidy transactions. With vouchers, the rider presents his ID card at the time of the trip and the driver completes a standard form with user's name, information about the trip, and the total fare. Then the user signs the voucher, pays his share of the fare, and the voucher is subsequently submitted to the project for reimbursement of the difference between the user's share and the total fare. The essential difference between tickets and vouchers is that tickets are purchased in advance, with the user paying a discounted fraction of their face value. No cash transaction is required at the time of the trip, since tickets are accepted at their face value for the full fare and redeemed at a later date by the provider.

Observations of locally initiated user-side subsidy programs reveal a wide variety of fare policies, using some form of tickets or vouchers. In West Virginia (Ref. 2), the statewide TRIP program sells an $8 book of tickets to eligible users for $1.00. These tickets are used for either bus or taxi travel. Three of the programs in San Francisco Bay Area communities (San Leandro, Sunnyvale, Fremont) sell coupons (tickets) for 50¢ which are good for one trip each; the balance of the fare is paid by the city after processing vouchers submitted by the operator (Ref. 1). Two other Bay Area cities (Palo Alto and Lafayette) purchase scrip or coupons from the taxi companies and sell them at a discount to eligible riders; in Lafayette the taxi company is paid at the end of the month for the coupon books sold during the month. In Palo Alto, the books of scrip are prepurchased from cab operators and sold at discounts ranging from 50 to 90 percent of the face value, depending on family income.

The Kansas City project (Ref. 3) has adopted a somewhat different mechanism for fare subsidization and payment. Registrants are given up to 25 tickets per month and riders submit one ticket and pay a 50¢ fare each time they use a taxi. If the trip distance is greater than four miles, the rider pays the excess at the established meter rate. Then the taxi operator is reimbursed at a rate of $1.50 per trip, regardless of the meter fare.[1] With this system, the city pays a fixed subsidy of $1.50 per trip. A similar approach was adopted by the Los Angeles Harbor Area Program; each rider pays a flat fare of 15¢ and each trip is subsidized up to $3.00 meter fare.

Tickets vs. Vouchers

The decision as to whether to use tickets or vouchers would seem to depend upon the application. Tickets require less processing at the time of the trip, and hence are being used for the public bus services to minimize the driver time spent in fare collection activities. Other advantages of tickets include the following: (1) when tickets are purchased in advance, the city benefits from a cash flow representing the total discounted value of unredeemed tickets; (2) the number of discount trips taken by an individual can be limited by the number of tickets sold to him during a given time period; and (3) the redemption process is straightforward, permitting prompt reimbursement. These advantages must be weighted against the necessity of establishing a ticket distribution system (through one or more outlets) and the potential for misuse and fraud resulting from the transferability of tickets. This latter problem is minimized if an ID must be shown when tickets are used.

Vouchers are a somewhat more complex mechanism in terms of administrative requirements. Drivers must fill them out and have them signed by the passenger, and mistakes are not infrequent. In Montgomery, a 20¢ bonus is paid for each correctly filled out voucher. Vouchers must be checked and verified by the project staff, resulting in delayed reimbursement, which has been a major factor in the decision of some taxi drivers in Montgomery to withdraw from the project. The Montgomery project staff responded to this problem by offering a $50 cash advance for each new driver participating, and reducing the time required to process

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[1]Zone fares with shared riding have recently been introduced for project trips only, and the fixed subsidy has been increased to $1.75 per trip.

vouchers and issue the checks. Six new drivers have been recruited since these changes went into effect.

These disadvantages of the voucher mechanisms are offset to a degree by the following: (1) no ticket sales and distribution system are required; (2) vouchers permit third party billing to agencies sponsoring client travel; and (3) trip information available from vouchers is useful for project monitoring and agency accounting.

Considering all of these factors, there is no overall advantage for the selection of either vouchers or tickets for taxi programs. Because the vouchers require comparatively more complex processing, they would seem to be a more expensive method. However, the comparison of administrative costs (in the Project Costs section of this paper) does not support this, and it may be that efficiencies introduced in the administration of either method could offset the apparent difference in staff time required. A more detailed analysis of voucher and ticket processing schemes and associated costs, including the computerized voucher processing system currently being implemented in Montgomery, will permit more definitive conclusions about the relative costs of these approaches.

The potential for fraud, misuse or overuse (users exceeding their monthly budget) has been noted in connection with user-side subisdies. So far, there is no evidence of widespread misuse of tickets by ineligible persons; however, the budgets have not been strictly enforced in cases where registered taxi users have exceeded their monthly limit for essential travel purposes. Regarding provider-side fraud, the only instance reported thus far involved alterations to fares on completed vouchers that occurred in the early stages of the Montgomery project. After ample warning to drivers that this practice was unacceptable, subsequent vouchers that showed signs of being altered were not paid, and the problem has not persisted. Apparently, fraud, misuse and overuse do not constitute a major problem if proper monitoring procedures are followed and measures are taken to counteract any unacceptable practice when it occurs.

Taxi Service Policies

Shared-ride policies generally permit a taxi operator to collect one fare for each passenger, regardless of whether they are part of a group travelling to the same destination or have different origins and/or destinations. This is difficult to implement in cities with meter-based

rather than zone fare policies. Changes in city ordinances were introduced in Kinston and Lawrence, allowing shared riding for all taxi trips, project or otherwise.[2] Consequently, all of the sites studied that permit shared-riding have zonal fare structures, except for the Los Angeles Harbor Area project. In Los Angeles, successive riders in a shared ride trip do not get charged for the "flag drop"; however, the meter cost of deviations necessitated by pick-ups and drop-offs is included in their fare.

Group riding is a different policy than shared-ride taxi service. If two to five people are travelling to the same destination, under a group ride policy they would all be allowed to travel for one fare. This provides an incentive for the riders to travel together, thus increasing the efficiency of the subsidized service. It is employed in cases where meter fares are used and shared riding would necessitate a complicated method of determining each individual's portion of the total meter fare. No more dispatching effort is required than if a person were traveling alone, and the taxi operator is only reimbursed for one trip (in most cases). This policy has been adopted in all projects that do not employ shared riding (San Francisco Bay Area programs and W. Virginia TRIP).

User-Side Subsidies for Fixed Route Transit

Three SMD projects are testing the potential of user-side subsidies for fixed route transit. In Montgomery and Lawerence, project subsidies are available for trips by taxi or on the public transit system. Danville, which pioneered the user-side subsidies for taxis, has replaced the Reduced Taxi Rate (RTR) program with a demonstration of fixed-route bus service. It began in December 1977; six months before termination of the RTR program.

Danville had no public transit; the city decided to employ the user-side subsidies as a means of compensating a private carrier for all trips provided, and thus test the market for fixed route transit without purchasing vehicles and operating a transit system. The transit provider operates under a four month renewable contract with the City. The City sells books of 40¢ tickets to the general public and half-fare tickets to the elderly, handicapped and

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[2]Montomgery has recently decided to revise their taxi ordinances to permit shared-riding. This seems to be an important impact of user-side subsidy projects.

young. Tickets are sold in a number of banks and stores in Danville. Every week the tickets collected are redeemed by the transit operator for a value specified by the contract. Passengers without tickets pay a cash fare of $.50 for which the provider receives a match to cover the remainder of the specified cost of a trip.

The responsibilities of the city include contract administration, marketing, monitoring the service, and ticket distribution and redemption. Transit operators are required to provide vehicles and personnel, garage and maintain the vehicles, operate service as specified, collect operating information, and collect tickets and transfers (batched by route and by day), submitting them weekly to the city for processing.

Transit operators bid to provide the required coverage, proposing a total cost per passenger trip. Every four months the competitive bidding process is repeated, and one or more providers are selected. Currently, the American Transit Company (ATC) is under contract to serve routes covering most of the City at a total cost per ride of $1.65. ATC, which also operates a school bus service in Danville, has been awarded a service contract for every period since the beginning.

During the first two contract periods, ATC was guaranteed a minimum payment based upon total vehicle miles of service. This guarantee was intended to protect the provider from losses during the early stages of growth in demand. Subsequent contracts have not included any minimum subsidy guarantee.

Red-Top Cab Company, which had been the major taxi operator during the Reduced Taxi Rate (RTR) demonstration, successfully bid on a contract to operate taxis and minibuses on routes where the demand density is not sufficient to require large vehicles. Red Top serves two routes with a 26 passenger minibus and two other routes with taxicabs. Fares are the same as on the ATC routes, but the per-passenger payment (fare plus subsidy) is $1.50 instead of $1.65. The taxi company's decision to bid was based, at least in part, on the fact that the Runaround buses were drawing passengers from taxis.

In contrast to Danville, user-side subsidies for the public transit system in Lawrence and Montgomery are limited to registered elderly and handicapped persons. The fixed-route transit system is publicly operated in Montgomery and privately owned and operated in Lawrence; both systems receive provider side subsidies to cover operating deficits.

Tickets are issued to project participants and redeemed by the transit operator for the face value, which is the standard fare charged elderly and handicapped persons. In essence, the city is subsidizing project riders for the fare they would have paid before the project. Tickets cost project users 1¢ each in Lawrence and are free in Montgomery. Project users in these cities can choose between riding taxis at a 50 percent discount or travelling free on the buses (except that in Montgomery, project riders pay 15¢ with a ticket for trips during the peak period).

Project Demand

Registration

Project registration is usually required before eligible persons can begin taking trips at a discounted fare. The percent of the estimated eligible market who have registered is 47% in Danville and 25-30 percent for the other three demonstration sites. For the non-demonstration projects, registration rates vary widely, from 4 to 32 per cent, with most programs experiencing a 15 to 30 percent penetration of the eligible market.

Comparing socioeconomic characteristics of registrants in general (Table 2) reveals that they are predominantly over 65 years of age, unemployed, have very low incomes, and live in households without autos. Only 10-18 percent of the registrants are under 65 years of age, and 5-10 percent work full or part time. The size of the non-elderly handicapped, elderly handicapped, and able-bodied elderly segments of the registered population are also similar across projects. About 30-50 percent of registrants require some form of mobility aid (crutches, cane, walker, or wheelchair) to get around.

Eligible persons who do not register seem to be more self-sufficient, having higher incomes and acceptable transportation alternatives. In this respect, there is a distinct difference between registered and non-registered eligible persons. For instance, in Danville, 73% of registrants live in households with annual incomes under $5000, compared with only 41% of non-registrants. Similarly, 61% of non-registrants were either drivers or could easily obtain rides, while only 25% of registrants fell in this category. These differences between registered and eligible non-registered persons are an important indication that the subsidies are being used by those who need them most.

TABLE 2. CHARACTERISTICS OF DEMONSTRATION PROJECT PARTICIPANTS

	DANVILLE		MONTGOMERY		KINGSTON		LAWRENCE	
	Registered Population	Users[1]	Registered Population	Users	Registered Population	Users	Registered Population	Users
Percent of registrants/users:								
Under 65, Handicapped	18	20	10	22	18	18	NA	NA
Over 65, Handicapped	19	18	17	21	21	21	NA	NA
Over 65, able-bodied	63	62	73	57	61	61	NA	NA
Employed, full or part-time	7	NA	6	NA	5	NA	NA	NA
Percent of Households without Auto	75	NA	75	NA	91	NA	NA	NA
Transportation Alternatives Available								
Auto Driver	25	22	15	NA	6.6	30	NA	NA
Not Driver, Receives Rides	59	60	85	NA	25.4		NA	NA
Not Driver, Rides Not Available	16	18		NA	68	70	NA	NA
Household Income:								
Under $5000	73	75	82	NA	92	92	NA	NA
$5000-10000	24	25	14	NA	6	6	NA	NA
$10000+	3		4	NA	2	2	NA	NA
Percent Using Project[1]	36	-	15	-	63	-	40	NA
Trip Frequency:								
Monthly Project Taxi Trips	2.0[2]	5.5	.60[2]	5.1	5.0	7.9	2.2	4.3
Monthly Trips by Subgroup:								
Under 65, Handicapped	NA	6.1	NA	8.7	NA	11.9	NA	NA
Over 65, Handicapped	NA	3.7	NA	4.3	NA	2.5	NA	NA
Over 65, not Handicapped	NA	3.1	NA	4.4	NA	7.0	NA	NA

NA = Not Available

[1]Users are defined as persons taking 1 or more project trips during a given month.
[2]Usage data reflects conditions in Danville in 1977 prior to beginning of bus service, and in Montgomery after the beginning of bus service in 11/78.

The rate of growth of project registration suggests that most of the outreach was achieved during the first six months, as shown in Figure 1. After that, registration leveled off to a small but steady growth each month. Although new people continue to register every month, the cumulative total is deceptive because the registration files are not updated to reflect those who have died, moved away, or no longer need the service. When the user-side subsidy for public fixed route bus service was introduced in Montgomery, there was a pronounced increase in registration. Part of this surge is probably attributable to the fact that 10% discounts at a shopping mall were offered to registrants beginning the same month that the bus subsidies were initiated. Registration continues to increase at a higher rate than before the bus and shopping discounts were provided. Lawrence has offered project bus and taxi discounts from the beginning, which may account for the steeper rise in registration during the first 3 months.

The fact that many eligible persons did not register until user discounts were offered for public transit implies that there is a market segment who either were not well served by taxis or chose not to register for taxi discounts because of other reasons, such as cost. In Montgomery, it was found that very few of those who registered before the availability of bus discounts were travelling on buses with any degree of regularity. Therefore, it appears that the surge in new registrations after initiating bus discounts represents a different market, composed of people who had been using buses or were not interested in participating when fare discounts only applied to taxi service. In any case, offering discounts for more than one mode does seem to extend the penetration of the eligible target market.

Frequency of Taxi Usage

Trip rates reported here for different projects represent frequency of use by registrants making one or more trips per month. This group will be referred to as project users, or simply users, in the discussion of tripmaking that follows. Comparing trip rates of all registrants is less enlightening, because the varying proportion of non-users at the different sites tend to mask variations in trip rates among users.

A frequency distribution of project taxi trips per month (Figure 2) shows that about 66%, 40% and 85% of registrants in Danville, Kinston, and Montgomery, respectively, do not use taxis during a given month. The registered non-user segment in Danville and Kinston is

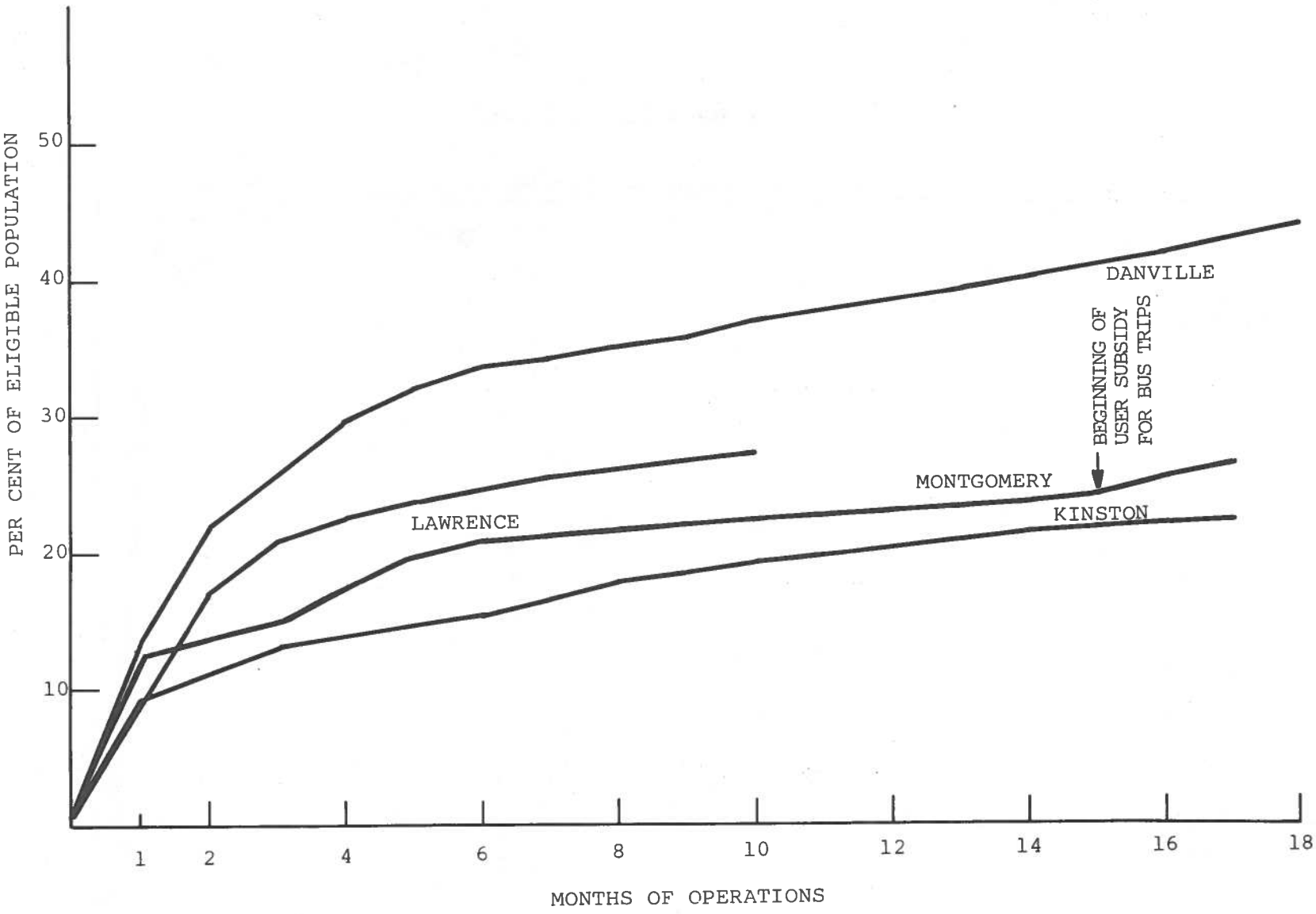

FIGURE 1 USER-SIDE SUBSIDY DEMONSTRATIONS PROJECT REGISTRATION

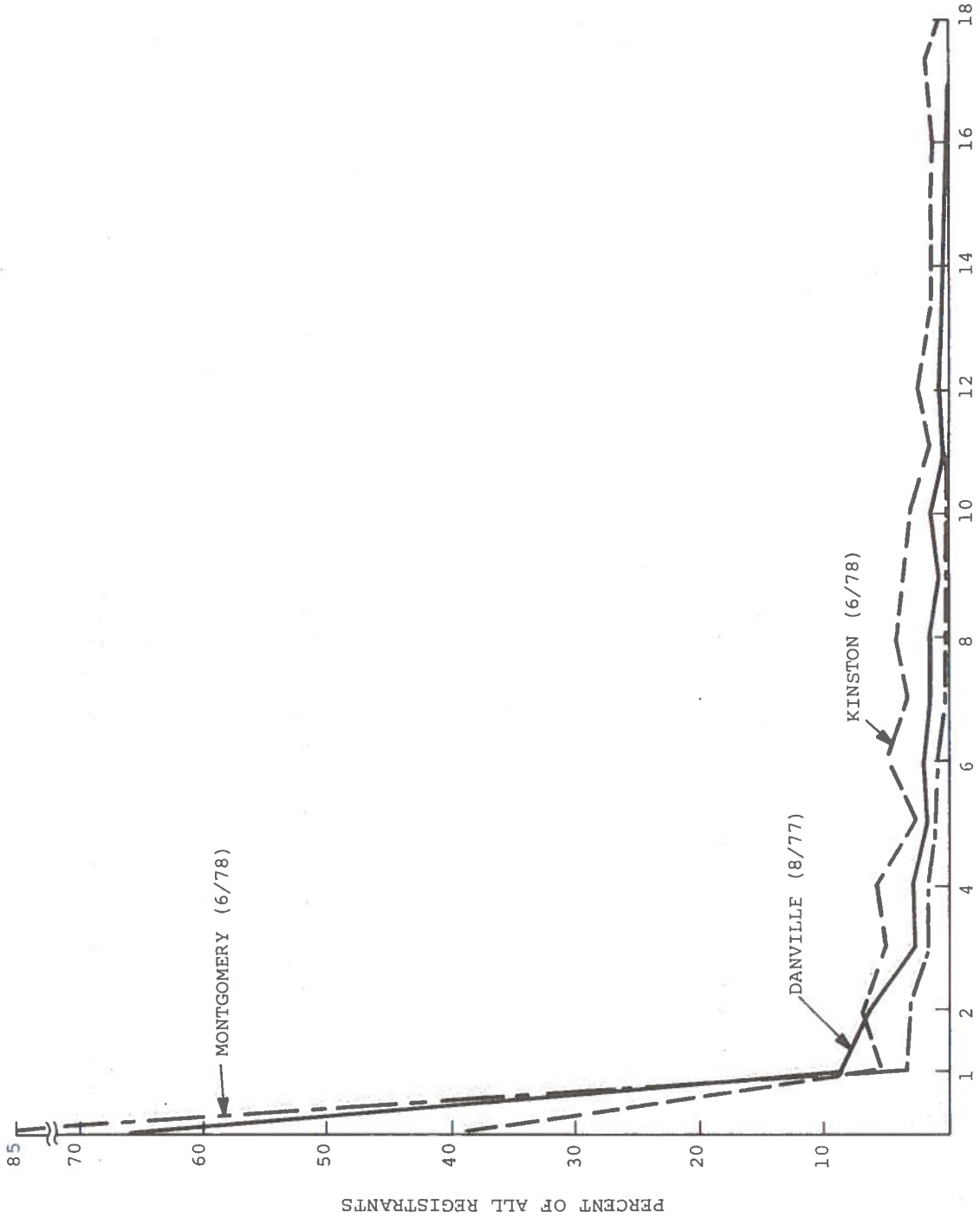

FIGURE 2 PERCENT OF REGISTRANTS TAKING PROJECT TAXI TRIPS IN A GIVEN MONTH

comprised primarily of persons who already have adequate alternatives and registered in order to have transportation on occasions when their usual modes are unavailable. The much lower percentage of registered persons taking project trips in Montgomery probably reflects lower taxi coverage there. Only a few minority drivers are participating in the program, and white drivers are reluctant to serve trips to and from minority neighborhoods. Consequently, although black people comprise almost half of the registrants, they account for only about 16% of the project taxi trips.

The demographic profiles of Danville and Kinston registrants who travel by project mode during a month are similar to those who don't. However, project trip frequency, (in trips per month) for those who do use the service, is clearly related to age and health, as shown in Table 2. Trip rates decrease with age; handicapped (ambulatory) persons 45 years and under averaged almost twice as many project trips per month as those between 45 and 65 years of age.

The mean trip rates for those who use the project at least once in a month are 5.5, 5.1, and 7.9 for Danville, Montgomery, and Kinston, respectively[3] (trip frequency breakdowns are not yet available for Lawrence). About 25 to 30% of users in Danville and Montgomery took more than 5 trips per month, and the fraction who reach or exceed their monthly limit (which corresponds to about 12-14 trips) is usually less than 10%. The higher rate of project tripmaking in Kinston compared with Danville and Montgomery may reflect better taxi availability and coverage and a more taxi dependent market. Kinston has no public transit, and auto availability is much lower than Danville and Montgomery; less than 10 percent of Kinston registrants have ready access to an auto (Table 2).

These monthly trip rates seem to be quite stable. In the absence of changes in fare and service levels, fluctuations in the mean usage rate have been minimal, at least for the periods observed in Danville and Montgomery. While the monthly project ridership in Montgomery increased over 30 percent during a recent twelve month period, the mean trip rate per user remained constant, fluctuating between 5.0 and 5.4. Therefore, the increases in ridership

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[3]The above rates represent conditions before the Danville public bus service was introduced in December 1977 and after user-side subsidies were applied to the Montgomery public transit system in November 1978.

that occurred are indicative of more users rather than increased frequency of project tripmaking.

Total vehicular trip making rates reported for elderly and handicapped persons have been found to range from 1 to 2 one-way trips per day. Total project trip frequencies discussed above indicate that most users are relying on the project mode for less than one fifth of all their trips, in spite of the general shortage of alternative modes reported in the registration interviews. The small percentage of registrants taking more than a few trips per month indicate that, for most participants, the projects provide a "backup" mode of transportation. However, there is a small group of registrants at each site that are relying heavily on the system.

Fare Elasticity of Demand for Project Taxi Trips

Judging from the predominatly low income of project registrants, cost per trip should be an important factor in the decision as to which mode to use. This sensitivity to cost is expressed as fare elasticity of demand. An opportunity to measure this elasticity occurred in Danville (Ref. 5) when the fare discount was reduced from an average of 73 to 51 percent, coincident with a general taxi fare increase of 12%. Project demand dropped substantially, and the resulting average fare increase of about 100% caused a 28% decrease in usage. The aggregate price elasticity of demand was therefore -.28, which is in the range of the demand elasticity exhibited for the transit industry in general of -.2 to -.4. Over the year following the fare increase, the gradual climb in project ridership (see Fig. 3) is attributable to continued growth in the population of registrants, which buffered the long term aggregate impact of the price change.

Although the average taxi fare currently paid by users of demonstration project service falls within a fairly narrow range, from $.70 to $1.25 per trip, an example of the influence of much lower fare levels on taxi usage is available from the Los Angeles Harbor Area project. The user fare is only 15 cents regardless of trip length, up to a meter fare of $3.00 (riders pay the excess meter fare above $3.00, which corresponds to about a 2.5 mile trip length). In a recent month, 507 persons taking project trips averaged 8.2 trips each, which is only slightly higher than the average rate for Kinston users. However, this trip frequency might be greater without a $3.00 limit on the subsidy per trip. Only 20 percent of all trips in one month

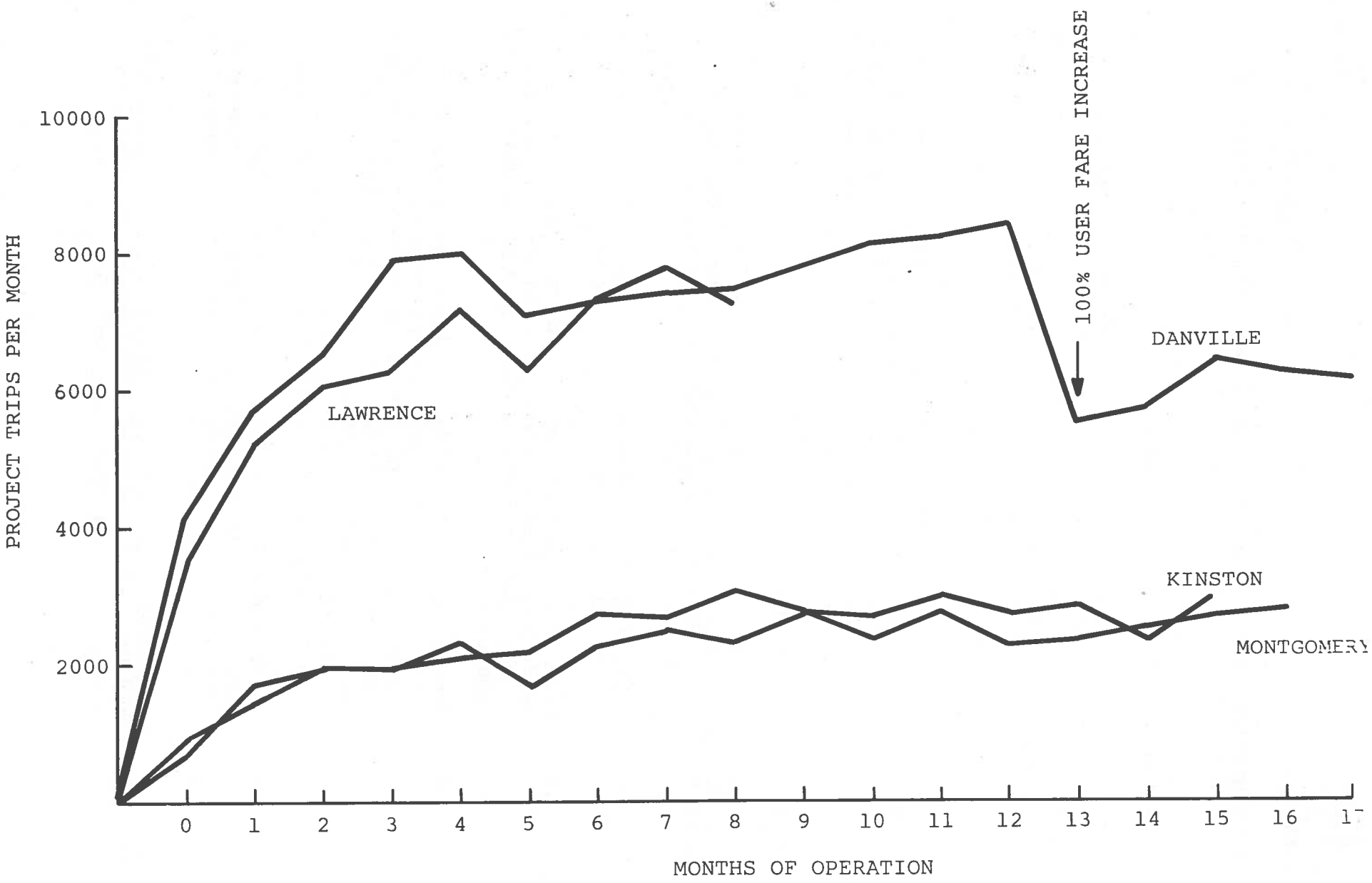

FIGURE 3 USER-SIDE SUBSIDY DEMONSTRATIONS MONTHLY PROJECT TAXI RIDERSHIP

were greater than 2.5 miles, and 11 percent were greater than 3 miles.

Mode Share of Project Taxi and Bus Trips

Fixed route bus service was introduced in Danville seven months before the Reduced Taxi Rates (RTR) program terminated. With both modes available, the user could trade off cost and level of service in deciding which mode to use. Fixed route buses cost 20¢ per trip and operated at 30 and 60 minute headways. Immediate request, door-to-door travel by RTR taxis cost an average of 62¢ per person trip.

Total ridership on the Danville fixed route transit system has grown from 450 passengers per day at the start up to a current level of around 950. Riders eligible for half-fare tickets (youth, elderly and handicapped) comprise about 69% of the total trips. Demand from this market has steadily increased while full fare ridership has stabilized at about 300 per day.

An analysis of mode shifts and the overall impact of the Runaround on RTR demand during the seven month period when both modes were available (Ref. 8) has revealed a number of interesting findings:

- Total RTR demand decreased by over 30% as a result of the bus service.
- Most of the registered people who began riding buses continued to ride taxis as well. Very few, if any, switched all trips from RTR to the Runaround.
- Two-thirds of RTR riders did not use the bus, because of health, age, or inaccessibility to bus routes. Only 12% of RTR trips surveyed would have been made by bus if there was no taxi discount - some riders would have had to find another way to travel or forego the trip. About one-half reported they would still take a cab at full fare.
- After the RTR Program was discontinued, bus ridership by persons eligible for RTR continued to increase, but at about the same rate as before the termination of taxi discounts.
- Attitudes regarding the choice between Runaround and RTR indicated that cost, general convenience, distance to the bus route, and the physical

condition of the traveller were more important determinants of mode choice than the difference in level of service (wait time and travel time) between the two modes.

In sum, it appears that taxis served a broader market, and that conventional buses were not an acceptable alternative for many of those who were riding taxis. However, the more able-bodied elderly persons appear to be using the bus more often than they were riding taxis.

Preliminary comparisons can be made between bus usage in Danville and findings to date in Lawrence and Montgomery, where user-side subsidies are available for taxi and bus trips. Registered elderly and handicapped residents of Lawrence and Montgomery can purchase bus tickets for 15¢ less than the pre-project fare and purchase tickets for taxi rides at a 50% discount. Therefore, bus trips for this group cost one cent in Lawrence and are free in Montgomery (15¢ during the peak period), hence the cost differential between taxi and bus modes averages $.74 in Lawrence, $1.10 in Montgomery, and $.42 ($.62-.20) in Danville).

Bus ridership trends for Lawrence and Montgomery are shown in Figure 4. Demand for bus trips has grown steadily in both projects during the first year of the discounts. Project registrants in Montgomery currently account for more than twice than twice the number of bus trips that were taken by the total handicapped and elderly population before the project. There is still insufficient data from Lawrence and Montgomery to determine to what extent the increase in transit demand is due to more people riding buses versus an increase in their frequency of bus trips. Records of ticket sales will provide a means of linking registrant's identification numbers with serial numbers of tickets, permitting analysis of bus trip rates, mode shares of bus and taxi usage by market segment, and disaggregate modeling of bus and taxi demand.

Registrants are averaging 4.7 and 4.3 bus trips per month in Lawrence and Montgomery, respectively (registration is not required to ride buses in Danville, and the number of persons taking half-fare trips is unknown). A frequency distribution of project bus trips in Lawrence for the month of January, 1979 indicates that users took a mean of 9.3 trips and a median value of 5 trips. During that month, about 44 percent of all registrants took bus trips.

When both taxi and bus discounts were available in Danville the ratio of project bus trips to taxi trips was 2.4. This ratio is curently about 2.1 for Lawrence and 7.0

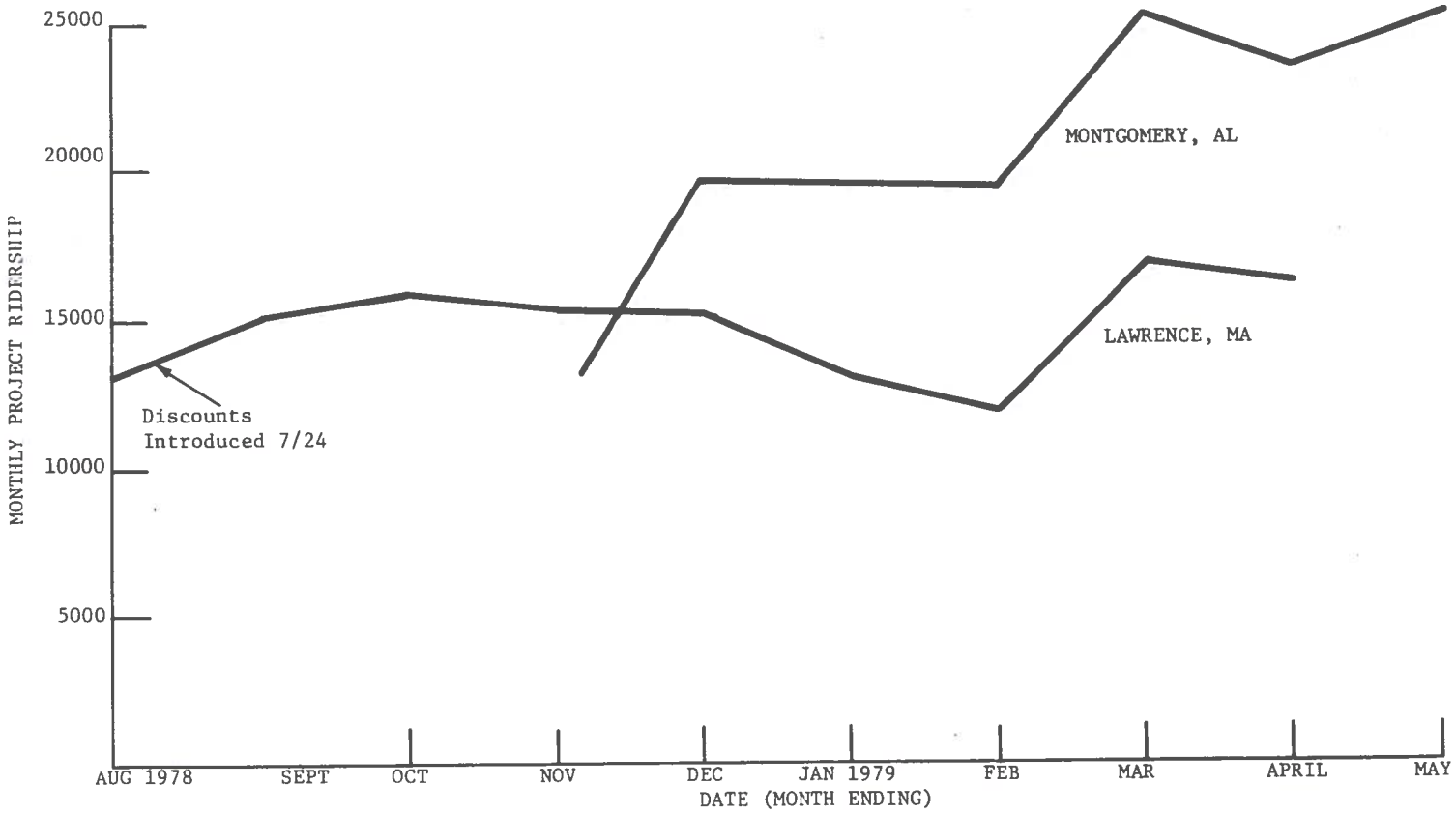

FIGURE 4. USER-SIDE SUBSIDIZED RIDERSHIP ON THE PUBLIC TRANSIT SYSTEM

for Montgomery. The much higher ratio of bus to taxi trips in Montgomery reflects the higher average cost of taxi trips and the limited project taxi coverage. These aggregate ratios should not be taken as an indicator of mode choice, since some registrants may use one mode almost exclusively.

The introduction of discounts for bus service in Montgomery did not precipitate a decrease in project taxi ridership; in fact, monthly taxi ridership grew from 2600 to 3200 over a six month period following initiation of the bus discounts. An important distinction to make in comparing this experience with Danville, where taxi demand decreased, is that there was already bus service in Montgomery and the project discount only reduced the cost of transit trips, whereas in Danville a new public transit mode was introduced.

Project Costs

For user-side subsidy projects, the total cost to the public includes subsidies paid to the provider plus the cost of administering the program. There are two categories of administrative costs: (1) Initial planning and implementation and (2) monthly management and administration. Monthly costs can be further broken down into direct costs, which are related to voucher/ticket processing, registration and reimbursement, and indirect expenses for marketing, coordinating, and project management.

Cost breakdowns are available for taxi service in Kinston, Montgomery and Danville. Table 3 permits a comparison of total subsidies, subsidy related administrative costs, and total annual costs for these projects. All project costs are included except staff expenditures connected with demonstration project requirements (special surveys, reports, etc.) The total annual project cost for Danville was $76,010, representing a total of 74,520 trips delivered. This cost is based on the average monthly ridership during a stable period prior to introduction of the bus service. For Kinston and Montgomery, the total annual costs of $52,608 and $77,350, respectively, are projected from the current monthly ridership levels.

Monthly administrative costs do not increase in direct proportion to ridership, at least up to the capacity of the administrative staff to process additional vouchers or tickets. Hence, as ridership increases, monthly administrative costs are spread over more trips. Project

TABLE 3. COMPARISON OF PROJECT COSTS FOR USER-SUBSIDIZED TAXI SERVICE

	Danville, IL	Kinston, NC	Montgomery, AL
BASIS: FARE TRIPS/YEAR	74,520	38,400	39,192
SUBSIDY COST:			
Ave. Fare/Trip	$1.52	$1.52	$2.60
Ave. Subsidy/Trip	.78	.76	1.30
Annual Total Subsidies	58,125	29,184	50,950
ADMINISTRATIVE COSTS:[1]			
Startup Cost	14,000	2,914	NA
Direct Monthly Cost	}	1,079	1,665
Indirect Monthly Cost	} 1,500	868	535
Total Annual Administrative Cost	$18,000	23,364	26,400
Administrative Cost/Trip	0.24	.61	.67
TOTAL PROJECT COST:			
Ave. Total Cost/Trip	1.76	2.13	3.27
Ave. User Share	.74	.76	1.30
Ave. Project Cost/Trip	1.02	1.37	1.97
Total Annual Project Cost	$76,010.	$52,608	$77,350

NA - Not Available

[1] Average cost and ridership data used for Danville and Kinston; recent month (4/79) of data used for Montgomery (costs associated with bus subsidies are excluded).

startup costs, which include system design, initial planning and registration, advertising, and office supplies, were $14,000 in Danville and $2,914 in Kinston. Startup cost is not included in the total annual cost or cost per trip.

Danville was the first user-side subsidy demonstration project; consequently a major portion of the start-up cost was spent on the design and development of administrative mechanisms and policies. The difference between Danville and Kinston project startup costs implies a similar savings for other cities that are able to utilize this experience and adopt the administrative systems already in use.

The administrative costs per trip for Kinston and Montgomery, $.61 and $.67, respectively, are much higher than for Danville ($.24/trip). A large part of this difference is explained by the higher ridership in Danville. The total annual administrative costs are $18,000, $23,364, and $26,400 for Danville, Kinston, and Montgomery, respectively. Inflation undoubtedly accounts for some of the difference, since the Danville data reflects conditions over two years prior to when costs for Kinston and Montgomery were examined. Furthermore, the fact that the Danville taxi program was dealing primarily with only one taxi company[4] must have greatly reduced the time required for reimbursements, coordinating policies with drivers and owners, etc.

A comparison of direct costs for Kinston (tickets) and Montgomery (vouchers) reveals that Montgomery's cost is about $600/mo. higher. Part of the difference stems from the time required for certification and registration; these activities account for twenty five percent of the direct costs in the Montgomery project, which has over 7 times as many registrants as Kinston. It appears that direct costs are otherwise fairly comparable (monthly ridership is about equal), suggesting that the time allocated to ticket sales is offset by voucher processing tasks that are unnecessary when tickets are used. Therefore, the main determinant of potential cost advantages of tickets over vouchers depends on the labor required for ticket sales. In a city as large as Montgomery this could be much more costly than Kinston, unless ticket sales were centralized, or tickets were sold by employees of stores, banks or other outlets.

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[4]Three firms participated, but one went out of business early in the demonstration, and another provided less than 5% of all trips.

Administrative costs stabilized early in the Kinston project, but have been decreasing steadily in Montgomery as a result of improvements in procedures and the recent implementation of a computerized voucher and bus ticket processing system, which may reduce costs further from the April 1979 level reported in Table 3. Table 4 shows this downward trend in administrative costs, with a breakdown of direct and indirect cost components for three periods, from July 1978 to April 1979. The breakdown for the latter two periods includes the cost of administering user-side subsidies for the public transit system. Costs associated with distributing bus tickets, processing them, and reimbursing the transit operator amount to only 2¢ per bus trip, or about 19 percent of the total administrative costs of the bus/taxi program. This does not, however, reflect marketing and promotion of the bus discounts, or costs associated with registering persons who are only using the bus service (registration has increased over 20 percent since the introduction of discounts for bus service). Nevertheless, it is evident that providing subsidies for bus travel involves a marginal increase of perhaps 20-25% in the administrative cost of operating a taxi discount program.

The total cost of user subsidized bus service depends, of course, on the contribution of the user-side portion to the total bus subsidy. In Lawrence and Montgomery, the per-trip reimbursement is based on the differential between pre-project and current (discounted) fares paid by elderly and handicapped persons. The bulk of the cost of the trip is still paid in the form of a provider-side subsidy. Consequently, the project subsidy is only $0.15 per trip, compared with the full user-side subsidy of $1.45 per trip in Danville.

Factors Influencing Cost

At fare levels and trip distances similar to Danville and Kinston, a user-side subsidy program delivering 100,000 taxi trips per year would cost the city about one dollar per trip (including administrative costs). This compares favorably with the cost of publicly provided demand responsive services in similar size cities. User and project costs per trip will generally increase with city size because cities with larger area and population have higher average trip lengths and, very possibly, higher labor rates. For instance, in Montgomery, with an area four times that of Danville, the average fare is about $2.60, reflecting a 25% greater average trip length and a 30% higher cost per mile for taxi service.

TABLE 4. MONTHLY ADMINISTRATIVE COST BREAKDOWNS FOR MONTGOMERY, AL. USER-SIDE SUBSIDY DEMONSTRATION PROJECT

	JULY 1978			DECEMBER 1978			APRIL 1979		
	HOURS	COST	% OF TOTAL	HOURS	COST	%	HOURS	COST	%
SUBSIDY DIRECT									
Registration and Registration File Maint.	32	$122	4.9	111	$442	16.6	102	$546	20.1
Taxi Service:									
Ticket/Voucher Processing and Reimbursement	132	658		69	579		135	895	
Monitoring for Excess Usage	25	143		0	0		1	9	
Voucher Data Reduction - Trip Records	193	736		59	213		0	0	
Subsidy Management (includes Coordination with Taxi Operators)	36	298		36	299		25	215	
TOTAL TAXI COST		1,835	73.9		1,091	40.9		1,119	41.3
Transit Service:									
Ticket Handling and Reimbursement	-	-	-	44	381		71	449	
Data Reduction	-	-	-	0			6	62	
TOTAL TRANSIT COST	-	-			381	14.3		511	18.8
TOTAL DIRECT COST		1,957	78.8		1,914	71.7		2,176	80.2
SUBSIDY INDIRECT									
Ongoing Planning and Policymaking	30	248		33	338		0	0	
Coordination with City Government	5	42		0	0		12	123	
Marketing	10	59		45	239		37	202	
Clerical	42	117		42	177		50	210	
TOTAL INDIRECT COST		526	21.2		754	28.3		535	19.7
TOTAL COST		$2,483			$2,668			$2,711	
PROJECT TAXI RIDERSHIP		2,598			3,124			3,266	
ADMINISTRATIVE COST/TAXI TRIP		$0.96			$0.73			.67	
PROJECT TRANSIT RIDERSHIP		-			19,272			23,835	
MARGINAL COST/BUS TRIP[1]		-			.02			.02	

NOTE: Non-transferable costs associated with demonstration grant requirements are not included.

[1] Does not include marketing or registration costs associated with the bus program.

Figure 5 shows how average trip length increases with service area for taxi trips made by elderly and handicapped persons. Data points are included for project taxi trips in eight cities, with service areas ranging from 6 to 46 square miles. Project trip lengths are, of course, dependent on other variables as well, including fare structure and limits on the dollar amount of the total fare or maximum trip length that will be subsidized. The Kansas City and Los Angeles projects are limiting the subsidy per trip by these criteria.

With user-side subsidies, the inherent flexiblility of taxi supply can be exploited. This is a distinct cost advantage with respect to alternatives which involve a fixed capacity, such as a publicly operated fleet of minibuses or a contract with a private operator to provide a fixed or guaranteed minimum number of vehicle hours of service. Since demand varies over a day and total demand is difficult to estimate a-priori, the per-trip reimbursement approach protects the program from insufficient or excess capacity resulting from purchase of a given number of vehicle-hours of per day.

Benefits to Project Users

It has already been shown that the regular users of discount taxi services are the more transit dependent (and economically disadvantaged) segment of the eligible market. With a reduction in cost of taxi travel, people who have to rely on taxis because of the lack of other suitable alternatives can take more trips or spend a smaller portion of their income on transportation.

It is evident from the analysis of project tripmaking rates discussed above that most project registrants have benefitted primarily from a reduction in their expenditures for bus and taxi travel. There has not been an overall increase in the frequency of taxi trips, or a greater reliance on taxis, except where the fare reduction was sufficient to make the cost of taxi travel comparable to that of bus or private auto. Where this is the case, the most prominent change in travel behavior has been a mode shift from walk to taxi for short trips.

Bus ridership has increased as a result of the program discounts of about 15¢ per trip, although data is not yet available to determine whether this increase is primarily a result of more bus users, increased reliance on buses, or a combination of both.

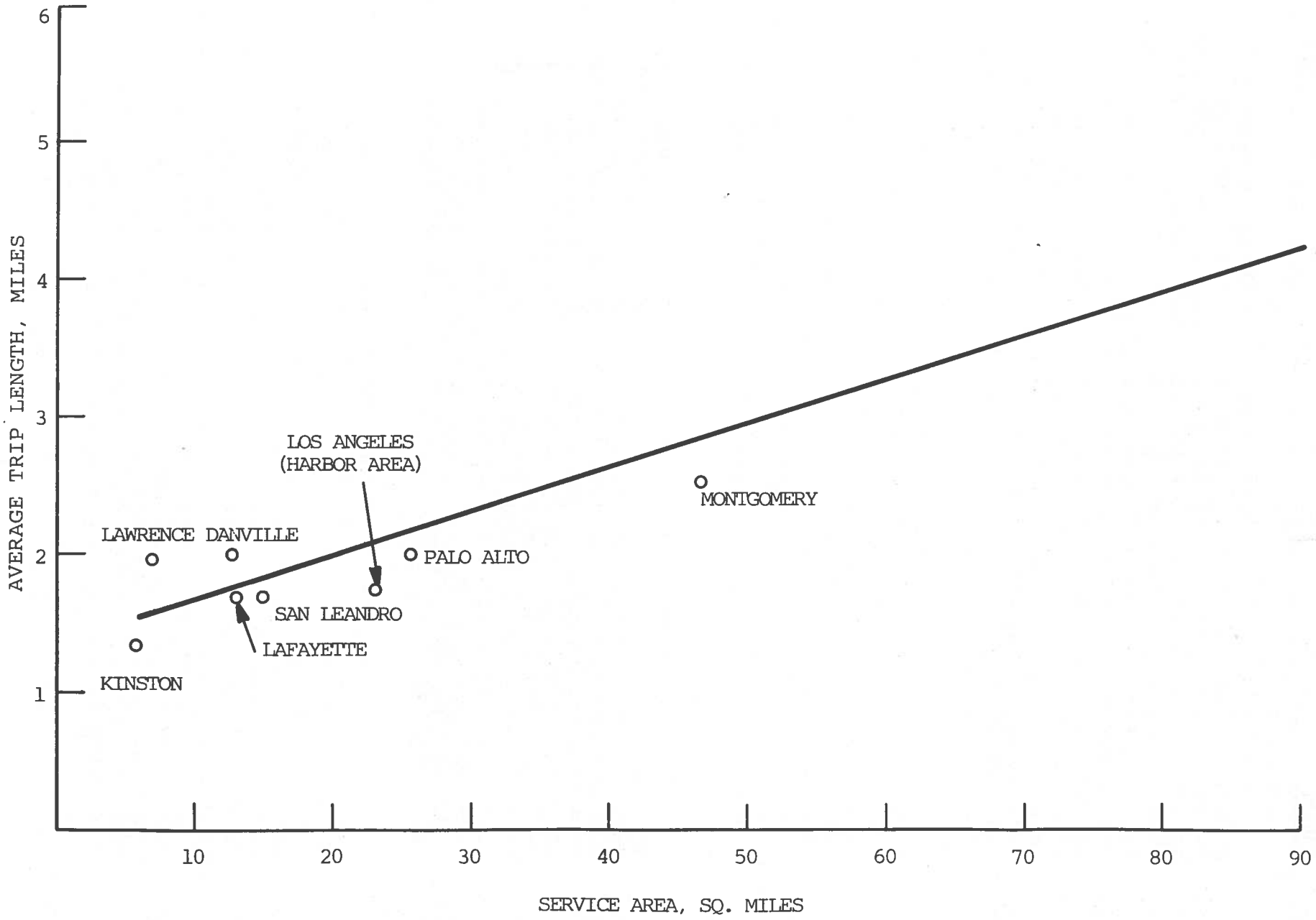

FIGURE 5 AVERAGE PROJECT TRIP LENGTH VS. SERVICE AREA SIZE

A 50% reduction in taxi fares is certainly a help for people on limited incomes. However, at user round trip fares of $1.00-$2.50, cost is still a significant constraint on the extent to which these projects can enable increases in tripmaking that lead to improved health, quality of life, etc. At mean taxi trip frequencies of 5 to 8 trips per month, demonstration project users are saving between $4 to $6 per month. Apparently, the cost of taking more taxi trips, even at a 50 percent discount, has deterred most participants from approaching their monthly maximum taxi budget, which corresponds to anywhere from 12 to 18 trips, based on the average fare per trip and maximum dollar amount of accumulated fares.

The limit on the maximum total of fares subsidized per month has not been rigidly enforced. For instance, exceptions are made in Kinston and Montomery for persons who need to regularly take taxis to work, school, or therapy. About 20 people in Montgomery and 13 in Kinston are being permitted to exceed their limit for these reasons. This policy of permitting overruns is not advertised, and only those who request a waiver or were exceeding the limit because of essential trips are being exempted from the monthly budget.

Other findings regarding benefits to project users are qualitative in nature and come primarily from surveys of users who were asked questions about whether and how the project impacted their travel habits. In Danville, follow-up surveys of registrants were conducted to investigate impacts of the taxi discount project on travel behavior (Ref. 4). Forty-one percent claimed they traveled more often because of the project, 43% said they were able to take trips they couldn't take before, 58% said they were less dependent on others for transportation, and 30% reported that they were able to take more trips during a particular part of the day.

A survey of persons using TRIP discount tickets in West Virginia (Ref. 2) revealed that taxis have become the primary mode for 45% of users, compared with 20% before the program. The percentage of users for whom auto trips were the primary mode declined from 19 to 9.5 percent. Similarly, the portion whose primary mode was walking declined from 13.5 to 5 percent. Taxi use grew as a secondary mode from 19 to 29 percent for these users. Buses (tickets can be used for buses or taxis) continued to be the primary mode for about 35 percent of TRIP users. About 87% of participants in the TRIP program claimed that their mobility had increased. When asked what additional trips were being taken, the purposes most frequently mentioned

were visits to a doctor's office or clinic, shopping, and visits with family and friends.

These responses are user perceptions rather than objective measurements of increases in aggregate tripmaking or mobility. There is always the possibility that users will tend to exaggerate in reporting changes in travel beavior because of their interest in seeing the program continued. Quantitative impacts on mobility are thus difficult to assess on a dissagregate level and require controlled measurements of project and non-project travel. An attempt is being made to measure changes in travel behavior in Lawrence, using a travel diary kept by a panel of registrants and eligible non-registrants for a period of one month, both before and after initiation of project discounts.

Impacts on Taxi Operators

This section addresses some of the general questions regarding the impact of user-side subsidies on taxi operations, including whether taxi revenues increase, the extent of participation by taxi companies in the user-side subsidy projects, and their attitudes towards the project.

It has been postulated that competition among providers for project trips will stimulate better service. However, this assumes that providers have an incentive to increase their share of the project-based demand. Any such interest on the part of taxi operators would depend on the economics of serving project trips, that is, whether project trips: increase total revenues; permit more efficient utilization of vehicles and drivers by spreading the demand over the day; or are at least as profitable as other business.

Impact on Taxi Revenues

Whether taxi revenues have increased as a result of the demand created by project discounts is difficult to establish in most projects because of the lack of reliable taxi operating data and the tendency of exogenous factors that affect supply and demand to mask the impact of project trips on total taxi revenues. Nevertheless, some project data and estimates based on observed changes in travel behavior merit discussion here. Taxi ridership data from Danville indicate that the maximum increase in taxi demand attributable to the subsidized taxi service (at a time when the fare discount was 73%) was about 4000 trips per month, representing about a 15 percent increase from pre-project

conditions (Ref. 4). This growth, which was not sustained after the discount was reduced to 50%, reflects increased use of taxis and new customers that were not riding taxis before the project.

An estimate of the increase in taxi demand generated by the project discounts can be made for Kinston. Registration data and trip records from February and June, 1978 indicate that about 50% of all project users reported that they did not take any trips by taxi during the week before registering. This implies that as many as 160 persons in Kinston have began to use taxis as a result of the project. The computed average taxi trip rate of this group was 4 trips per month (about half of the average trip rate for all users). Hence, this apparent growth in the taxi market amounts to an increase in demand of about 640 trips each month. At the average fare per trip of $1.40, these new riders represent about $900 per month in new revenues. Assuming that those who were using taxis are continuing to do so at the same frequency (taxi trip rates reported in the registration interviews are approximately equal to the current average user trip rates) the net increase in monthly taxi revenues is only $900; probably not a measurable increase when distributed over the 8 taxi operators participating in the program.

The impact of increases in demand by the target market depends, of course, on the share of the total taxi business represented by these users. Trips made by elderly and handicapped persons account for about 10 percent of the ridership of the operators in Lawrence and Montgomery that are serving the bulk of the project trips. Project demand comprised 24 percent of all trips in Danville, where only one provider was involved.[5] Increases in taxi demand generated by project discounts will therefore have less of an impact in Lawrence and Montgomery than in Danville.

Relative Profitability of Project Trips

Of comparable importance to the question of whether total taxi demand increased as a result of project subsidies is whether project trips are as profitable as non-project trips. In other words, is the revenue per taxi mile greater, equal to or less than it would be for regular service? The characteristics of project trips may differ in

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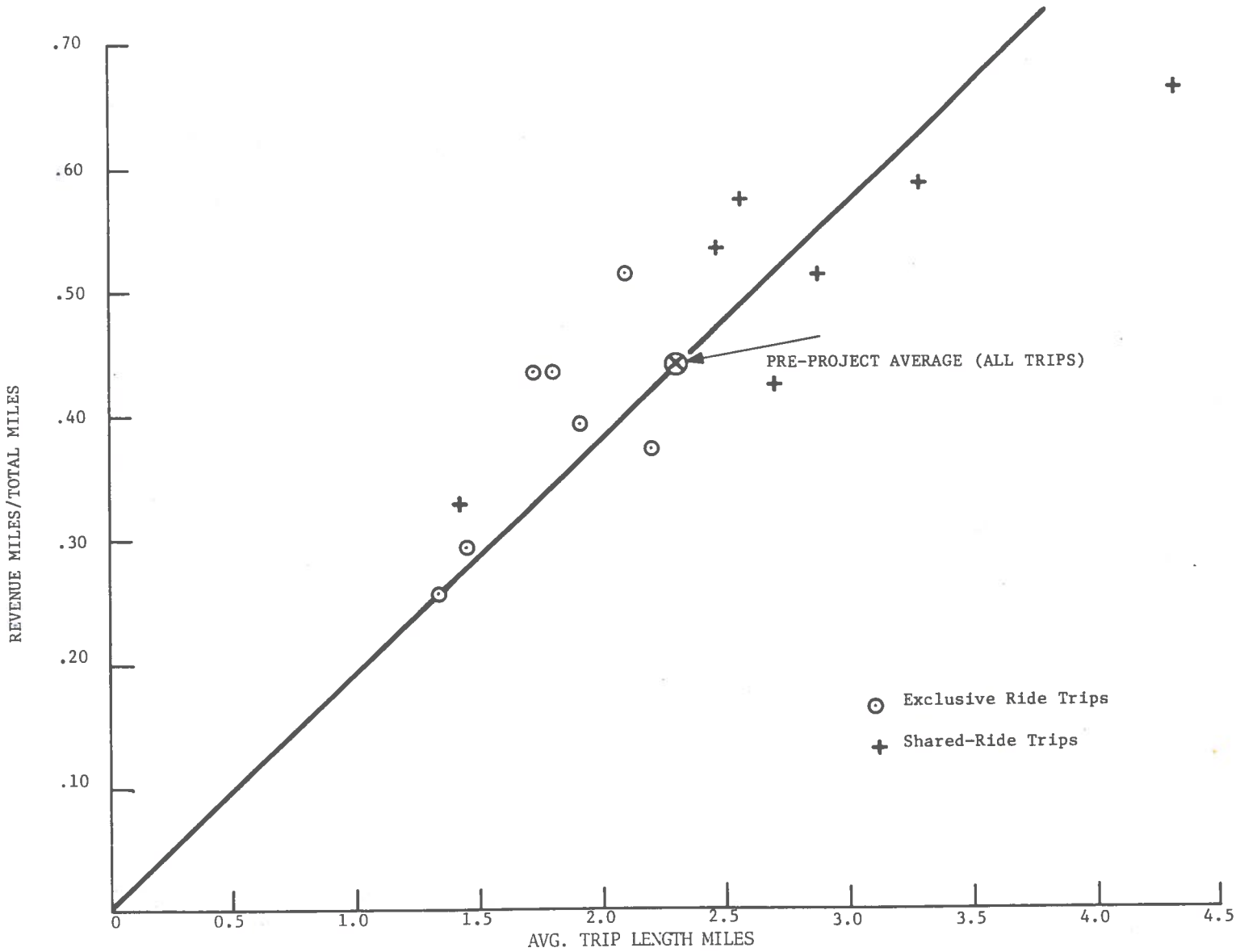
[5]Three firms participated, but one went out of business early in the demonstration, and another provided less than 5% of all trips.

such a way as to impact labor and vehicle productivities. For instance, operators assert that shorter trips are less economical because of increased deadheading and dispatching costs. If the fare structure is the same for project and non-project trips, then such factors as the average trip length, extent of shared riding, and dwell time will impact the efficiency and hence the relative profitability of the project service on a per trip basis.

An analysis of way-bill data from a sample of cabs in the Los Angeles Harbor Area (Ref. 10) project supports the contention that shorter trips are less efficient. For the days sampled, the ratio of paid miles to total miles traveled is plotted in Figure 6 against the average trip length. Averages for exclusive ride trips are distinguished from shared-ride trips. Since only project trips were sampled, non-paid miles from the finish of the previous trip (project or non-project) to the start of a project trip were assigned to the paid miles of that project trip. The ratio of paid to total miles, which is a measure of operating efficiency, increases with average trip length for both exclusive and shared-ride trips. Because the 15¢ flat fare policy in the Harbor Area project is low enough to enable people to shift a portion of their walk trips to taxi, project passenger trip lengths average 1.5 miles compared with an average of 2.3 miles for non-project trips. As a result, the shorter project trips appear to generate less revenue per taxicab mile.

Another factor influencing the profitability of project trips is the extent of shared riding. If more shared riding takes place, the revenue per revenue mile and the ratio of revenue miles to total miles will increase; the average ratio from the sample of waybill data obtained from the Los Angeles project was .39 for exclusive ride trips, and .52 for shared ride service. The extent of shared riding is about 16 percent of all project trips and, at current trip lengths, it would have to increase considerably in order to raise the paid mile to total mile ratio to 44 percent, which is the ratio for all taxi trips before the project. Subsidized passengers in Los Angeles are being encouraged to schedule their trips as far in advance as possible to facilitate the scheduling of shared ride tours.

Since project riders in Los Angeles can't share a cab with non-project persons (presumably because of different fare policies), the extent of shared riding is constrained. Only about 16 percent of subsidized trips were shared compared with an average of 29 percent of all taxi trips before the project. In Danville, 36 percent of all project trips were shared with another trip (project or non-project)



Source: Taxicab Waybill Data from Los Angeles Harbor Area User-Side Subsidy Project

FIGURE 6. REVENUE MILES/TOTAL MILES VS. TRIP LENGTH

compared with 28 percent of all non-project trips. Project trip lengths in Danville were only about 15 percent shorter, because the zonal fare policy results in a minimumum fare of at least 38 cents, even for very short trips. Hence, the greater extent of shared riding for project trips offset the reduced efficiency of slightly shorter trip lengths and the revenue per total cab mile was about equal for project and non-project trips.

Another factor which can affect the extent of shared riding in both project and non-project trips is the taxi supply. Dispatchers are unlikely to arrange shared riding if there is an excess supply and other cabs in the vicinity are vacant. This has been reported by the project administrator in Kinston to be the explanation for the low incidence of shared riding. An on-board taxi survey there revealed that 13% of project users (and about the same proportion of non-project trips sampled) were part of a shared-ride tour.

In sum, project fare levels which encourage the use of taxis for very short trips will result in a lower ratio of paid miles to total miles and require more dispatching time relative to fewer, longer trips. Similarly, policies which limit the potential for shared riding, especially those which prohibit sharing among project and non-project trips, will further constrain the revenue per taxicab mile.

If project trips are generally less profitable than other trips, taxi operators will be reluctant to serve project users at times when the demand approaches fleet capacity, and may cause them to experience a drop in level of service compared with non-project trips.

A positive impact of project trips on the economics of taxi operations is the potential for spreading the demand more uniformly over the day. If project trips occur during periods of low total demand, the excess taxi capacity can be utilized, and since non-project trips are not foregone, the operator may be less concerned about the relative profitability of subsidized trips. Some taxi operators (Kansas City, S.F. Bay Area) have reported that this has occured (Ref. 1,3). However, for the three cities (Kinston, Lawrence, Montgomery) where data exists to permit a comparison of demand profiles over the day for target and non-target riders, Lawrence is the only site where the target population is making significantly fewer trips during the peak period than other taxi riders.

Attitudes of Taxi Operators Regarding User-Side Subsidies

Taxi operators' attitudes toward user-side subsides are reflected in their willingness to participate in the program. For all demonstration projects except Montgomery, most or all of the local taxi firms elected to serve project users. In Montgomery, only 3 of the 16 local taxi companies are participating; two firms withdrew from the project during the first year. Reasons given for not participating include: (1) the complexity of the grid-fare structure (Montgomery is the only demonstration where the non-project fares are based on meters and mileage; all other sites have zonal fare structures for all taxi trips); (2) time required for preparing and submitting vouchers; (3) delays in reimbursement of vouchers submitted; and (4) some drivers implied that they underreport revenues and are wary of an audit trail. The burdens of increased paperwork are felt more by small taxi companies, and in Montgomery as well as other sites, the small operators are less likely to be interested in participating.

Even though the grid-fare system was unpopular during the initial stages of the Montgomery project, participating taxi operators have become accustomed to it. In fact, when the city council recently opted to permit shared-taxi service for the general public (a decision which was influenced by the demonstration project), taxi operators recommended adoption of the grid-fare structure.

When taxi operators in Montgomery were interviewed before the project began, perceptions were mixed, and out of 57 drivers interviewed only 23 had a positive attitude. Those who were pessimistic had concerns about misuse of the program, extra time and paperwork required, and cash flow problems resulting from delays in voucher reimbursement.

As a result of this negative predisposition of drivers in Montgomery and the difficulty in getting taxi firms to participate in the user-side subsidy program, the resultant average taxi coverage is 1 per vehicle square mile there as compared with 10, 5.6 and 2 vehicles per square mile for Lawrence, Kinston, and Danville, respectively. This limited availability of project taxis in Montgomery, particularly in minority neighborhoods, has probably prevented many registered persons from becoming regular users.

In the other three demonstration sites, over 80% of the taxi firms have become project providers, and there are no instances of providers in these cities dropping out of the program, except for reasons independent of the project. went out of business (for reasons independent of the

project). In both Kinston and Danville, participating taxi operators have generally favorable attitudes toward the project.

For the six user-subsidized projects underway in the San Francisco Bay Area, taxi operators under contract to the city to serve eligible elderly and handicapped persons are reportedly very pleased with the project (Ref. 1). These projects differ from the SMD demonstrations in that five of the six programs contracted with a single operator, while one program contracted with two taxi companies.

In Kansas City, all operators were encouraged to participate, but some, including the largest company, declined for various reasons, such as objections to the fixed fare and subsidy policy - $2.00/trip ($1.50/trip subsidy plus 50¢ user share) for any trip under four miles. Three out of the five participating taxi companies have subsequently dropped out of the program, apparently because of insufficient capacity to serve project trips and/or insufficient economic incentives to continue participating (Ref. 3).

Providers in West Virginia have had a strong positive attitude toward TRIP, although none of them believed that TRIP revenues would ever be sufficient to propel the industry into long term financial stability. Over 97% of providers (taxi and bus) surveyed are participating, and the only common complaint of taxi operators has to do with delays in reimbursement (Ref. 2).

Transferability of Current Findings

Most of the user-side subsidy projects discussed in this paper are still underway, hence many of the important lessons to be gleaned from them are pending analysis of data which is still being collected. Findings expected to be available at a later date include disaggregate measures of mode choice, changes in travel behavior and mobility, project taxi demand profiles over the day, and impacts on the travel habits of semi and non-ambulatory persons resulting from the extension of user-side subsidies to private operators of lift equipped vans, which will be tested at the Montgomery and Lawrence projects. The following conclusions can be drawn from the results to date regarding the transferability of user-side subsidies and specific issues relevant to other applications:

- The user-side subsidy is a viable means of providing transportation for a selected market,

involving public and/or private providers. It is easy to administer and does not require the purchase and operation of vehicles.

- Project registrants comprise anywhere from 15 to 47 percent of the total eligible population, and are distinguished by lower income and auto availability than the target market as a whole.

- Where taxi supply is adequate, over 40% of all registrants take at least one project trip per month by taxi. The mean project trip rate for users at sites studied has been between 4-8 trips per month, and tends to remain stable, with only slight fluctuations over time. Handicapped non-elderly persons are the most frequent users, averaging 6-12 project trips per month.

- The aggregate price elasticity of demand for taxi trips, where the average user fare increased from $.31 to $.62 per trip, was about -.28, which is in the range of price elasticity values reported for the transit industry.

- User-side subsidies for taxi travel are a cost-effective alternative to publicly operated demand responsive service. In small communities (under 15 square miles), the average total cost per project trip (including administrative costs) is about $1.80 to $2.00. At a 50% fare discount, the project share of the cost is about $1.00-$1.30 per trip. For medium size cities, or service areas under 50 square miles, the project cost is in the range of $1.50 to $2.25 per trip.

- Administrative costs for taxi discount programs vary from 25¢ to 70¢ per trip.

- There is no evidence as yet indicating that competition among providers will tend to improve service quality; however, it is preferable to involve as many providers as possible to ensure adequate coverage and a stable supply of taxis for project trips.

- Taxi operators may have reservations about participating and require some assurance that reimbursement delays will not be intolerable. Small taxi firms are less likely to be willing to participate, because of the burden of increased paperwork.

- Project fare levels which encourage the use of taxis for very short trips will reduce the ratio of paid miles to total miles and require more dispatching time relative to fewer, longer trips.

- The compatibility of project and non-project fare structures is essential to maximize the extent of shared riding.

- Implementation of user-side subsidies for taxi service with meter-based fare structures is more complicated, especially if shared riding is permitted. However, introducing zone fare for project trips only is not an attractive solution from the point of view of taxi operators. There are two potential problems: the complexity of having different fare structures for project and non-project trips; and the likelihood that drivers will assert that zone fares for some trips are less than meter fares.

- Fraud and abuse do not constitute a major problem when appropriate administrative procedures are followed to monitor users and providers.

- Providing subsidies for bus and taxi modes extends the penetration of the target population, primarily because able-bodied elderly persons who rarely travel by taxi will continue to choose the bus.

- Where a user-side taxi subsidy program was already in place, the extension of the project discounts to include travel on the public bus system resulted in a 20% increase in the monthly administrative cost of the program, or a marginal administrative cost of 2¢ per project bus trip.

- Over twice as many bus trips as taxi trips are taken by project registrants where user-side subsidies are available for both modes. However, conventional buses are not an acceptable alternative for many people who use taxis, even at much lower fare levels.

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