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St. Bernard Parish, Louisiana Taxi Feeder Demonstration Project

Final Report
August 1979

Service and Methods Demonstration Program



U.S. DEPARTMENT OF TRANSPORTATION
Urban Mass Transportation Administration
Office of Service and Methods
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<p>16. Abstract</p> <p>The taxi feeder demonstration project in the St. Bernard Parish (Louisiana) began in June 1976 and ended in April 1979. It was designed to study the use of taxicabs as a convenient means of extending public transportation coverage at a relatively low cost per passenger. The service, in existence since 1974, offered residents of the suburb of New Orleans the option to use a taxi for the trip to or from the bus stop. The cost of this trip is included in a joint fare for the entire trip.</p> <p>This report describes the demonstration setting and the project evolution. The impact of taxi feeders on regular bus and taxicab services and costs as well as on ridership and revenues is presented. The applicability of the procedures developed in this project for other areas is also discussed.</p>			
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PREFACE

The St. Bernard Parish in Louisiana was funded by the Service and Methods Demonstration (SMD) Program in the Urban Mass Transportation Administration (UMTA), U.S. Department of Transportation, to conduct a demonstration project to provide taxi feeder service to conventional bus transit. Under a grant from the SMD Program, The Urban Institute monitored this project; this report is the product of the monitoring effort.

Many of the data for the analysis were provided by the St. Bernard Bus Company and the Arabi Cab Company. Peter Rusck, one of the owners and the manager of the two companies, was especially helpful in locating and preparing operating data and other information. The travel surveys and other data collection efforts were carried out by Management Science Associates Inc. under the direction of Barry Render and Harris Segal. The project administrators for the St. Bernard Parish Planning Commission, Harold Wilbert and his predecessor, Robin Couvillon, also contributed to the monitoring task.

We would like to thank Paul Fish and Jim Bautz, the UMTA demonstration project monitors. Thanks are also due to our colleagues at The Urban Institute, particularly Ronald Kirby who offered useful suggestions throughout the monitoring effort. Francine Tolson, Rebecca Rea and Keith Goodman helped with the analysis of the data.

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The taxi feeder demonstration project in the St. Bernard Parish (Louisiana) began in June 1976 and ended in April 1979. It was designed to study the use of taxicabs as a convenient means of extending public transportation coverage at a relatively low cost per passenger. The service, in existence since 1974, offered residents of the suburb of New Orleans the option to use a taxi for the trip to or from the bus stop. The cost of this trip is included in a joint fare for the entire trip.

The service would operate as follows: for the trip from their homes to the bus stop, users call the dispatcher of the taxicab company and request a cab. They pay the fare and receive a transfer which can be used on the bus to pay for the bus fare; its value toward the bus fare is equal to what the user paid the cab driver (originally 50¢, then 25¢). On the bus, the user pays the difference between that amount and the respective fare, which is calculated on a zonal basis. For the return trip home, the passenger receives a transfer from the bus driver. The driver notifies the dispatcher via two-way radio, who then sends a cab to pick up the passenger(s) discharged at a given bus stop. Taxicab drivers are reimbursed by the bus company on the basis of the transfers they turn in.

Coordination, dispatching and revenue allocation are simplified by two factors. First, there is only one taxicab company in the Parish. Second, the taxicab and bus companies share ownership, dispatching, and other support functions. This setting precluded problems with the allocation of feeder/distributor trips among different providers or any confidentiality problems that might arise in revenue and cost allocation.

Overall, the taxi feeder service has been operating successfully. In terms of ridership, its volume is about 10 percent of that of regular taxicab operations. It is fairly well known throughout the community, though not always by its "trade name" (BUCAT, for BUs-to-CAb-Transfer). User satisfaction with the service increased during the demonstration period.

One of the objectives of the service has been to match riders for the feeder/distributor trips in the interest of higher vehicle productivity. The analysis suggests that little was accomplished in this direction for feeder trips, from the home to the bus stop. The average number of passengers for this direction was about the same as that for regular taxicab trips. In the other direction, from the bus stop to home, significantly higher vehicle occupancy rates were achieved. Consequently, for the drivers the difference between the taxi feeder revenue and the revenue which would have been obtained under regular pricing rules was smaller for bus-to-home trips than for those in the other direction (11¢ vs. 19¢). By comparison, for the taxicab company, which receives no income from any of the feeder/distributor trips, the hypothetical loss is higher for the bus-to-home than for home-to-bus trips because of the larger number of passengers per trip.

Generally, the taxi feeder/distributor trip would have been made as a pedestrian or as a car passenger, were the service not available. Roughly one-fifth of the users indicated that they would not have made the trip without the service. Most of the users of the service are regular customers who have been using public transportation for some time.

The service had only a marginal effect on either transit or regular taxicab ridership. Only about three-fifths of the feeder service users also used regular taxicab services. Of that group, only about one-fifth indicated that they had increased their use of the regular taxicab service since they had begun to patronize cabs for the trip to or from the bus. In terms of time series of bus and taxicab ridership, secular trends, exogenous factors and random fluctuations obscure any effects of the feeder service on aggregate ridership.

The demonstration project has shown that a public transportation coverage can be provided with integrated taxicab-transit service without significant operational problems. However, some of the procedures that worked on a relatively small scale in St. Bernard may be less effective under different institutional conditions. The BUCAT service will continue to operate after the demonstration, and plans call for an increase in the user payment and additional subsidy funds.

THE DEMONSTRATION CONCEPT

The efficient provision of public transit services in areas with low residential densities faces a number of obstacles. Low demand densities result in low levels of vehicle utilization for conventional transit operations. In response to these problems, typical for suburban areas particularly during off-peak periods, transit operators have been forced to reduce or drop service. There has also been some experimentation with alternatives to a fixed-route regularly scheduled transit services.

One option is to integrate some form of demand-responsive feeder service with the fixed-route line-haul operation. Miller (1977) outlines the basic characteristics of such an integrated system:

... Smaller vehicles would respond to telephone requests, pick up users at their home, and take them to designated points for transfer to the scheduled transit service. On the return trip, the small vehicles would take the transit users from the transit stop to their home. In a well integrated system the transfers would be coordinated to minimize passenger wait time and the service would have convenient transfer mechanisms such as joint fares and sheltered transfer points.

The use of smaller demand-responsive vehicles for the collection and distribution portions of the trip, combined with fixed-route service for the line-haul portion, promises greater overall efficiency in the provision of public transportation services. For a given transit operation, the addition of a feeder service could substantially increase transit coverage, one of the chief objectives of UMTA's Service and Methods Demonstration (SMD) Program. Alternatively, substitution of demand-responsive service for regularly scheduled operations in areas with low demand densities can provide the same level of

transit coverage at lower cost. These arguments have made integrated feeder services quite attractive to transportation planners.

In designing such an integrated system, operators must choose the type of vehicle used in providing the demand-responsive service. One option is to offer the feeder service as a component of regular taxicab services in the area, subject to certain conditions and at a different fare. Taxicabs are particularly well suited for providing paratransit services in areas with low demand densities. The inherent advantages of using taxicabs for this purpose include their experience in serving suburban communities and small towns in a demand-responsive mode. In addition, their operating costs tend to be comparatively low because of lower wage rates, more flexible work rules, and use of part-time drivers.

These inherent advantages are at least partially offset by some of the problems that taxicab operators would face in providing transit feeder service as an adjunct to their regular exclusive-ride service. First of all, there are the general problems of the taxicab industry: a weak financial condition, old and often poorly maintained vehicles, and high driver turnover. In addition, operating the feeder service would raise some specific problems that may be outside the expertise of taxicab operators: modify dispatching rules to increase ride-sharing for feeder trips, coordinate feeder operations with bus movements, and handle the financial aspects of the integration of public and private services, particularly in the case of joint fares. Other problems may arise whenever more than one taxicab company is involved in providing the feeder service, such as the allocation of feeder trips, the coordination of dispatching, and the allocation of revenues among companies. Problems of management and operations as well as institutional barriers account for the fact that the operating experience with taxicab feeder services to fixed-route transit is extremely limited.

One of the few sites with such a feeder service using taxicabs is the St. Bernard Parish in Louisiana, a suburban part of the New Orleans metropolitan area.* Given the interest in the potential of this type of system, UMTA's Service and Methods Demonstration Program decided to fund a demonstration project designed to study the effects of improvements of the existing taxicab feeder service in this area. The project was seen as an opportunity to learn more about the operations of such a service and its overall impact on demand and supply characteristics of public transportation.

Basically, the demonstration project involved an expansion of the taxicab feeder service area, reductions in the fare charged for the service, and variations in service levels for the fixed-route transit operation. The St. Bernard Parish Planning Commission, an arm of the Parish government, acted as the grantee. Actual operations were the responsibility of the privately owned bus company with three buses, and the taxicab company which could deploy up to 20 vehicles at any given time.

The project started in June 1976 and ended in April 1979; this report covers operations through December 1978. The overall project budget was \$325,000. Part of the funds were budgeted for the purchase of a 40-passenger bus and several taxicabs. These vehicles were to be purchased by the St. Bernard Parish Policy Jury and leased to the operators.

QUESTIONS FOR THE ANALYSIS

The analysis of the experience in the St. Bernard Parish demonstration project is concerned with various facets of the taxicab feeder service, regular taxicab operations, and the fixed-route transit system. These concerns can be delineated in a list of specific questions for the analysis. The overall scope

* Another example of this type of service is Peterborough (Ontario, Canada). See Ministry of Transportation and Communications (1975) for a documentation of the Peterborough experience.

of the analysis is of course limited by the specific setting in which the demonstration took place. One of the significant characteristics of the demonstration project related to the institutional framework. St. Bernard Parish is served by one privately owned bus company, and one taxicab company. Both companies are owned by the same individuals. They share management, labor, dispatching, maintenance facilities and headquarters. These close relationships between the two operators of public transportation services in the St. Bernard Parish greatly facilitated the provision of integrated services. Thus, questions of financial interactions, revenue allocation and coordination of operations can only be answered within a fairly narrow context.

The specific questions for the analysis of the experience with the St. Bernard Parish feeder service are presented in the monitoring plan for the demonstration project (Miller, 1976). The questions can be grouped into three major categories. The first set of questions concerns the actual operating experience. The St. Bernard demonstration project was approached as a naturalistic experiment: flexibility of managerial response to perceived conditions and opportunities was deemed more important than strict adherence to a set demonstration plan. The analysis must therefore document the background and evolution of the project.

The second set of questions concerns the service characteristics and costs of service. Finally, the analysis focuses on a set of questions regarding the demand response to the provision of public transportation services -- regular taxicab, taxicab feeder, and transit -- in the Parish. This portion of the analysis examines overall ridership patterns as well as trip and user characteristics. Who uses the service? How satisfied are the users? What types of trips is the service used for? What are the revenue implications? These are the kind of questions examined in this context.

MONITORING APPROACH

The overall approach to monitoring the demonstration project was largely determined by the nature of the project. Since the taxicab feeder service was already in operation prior to the start of the demonstration, a simple pre-post design for an evaluation was insufficient. Moreover, the introduction of variations in service levels and fares in response to current conditions rather than according to the long-term plan hampered the application of any quasi-experimental design.

Thus, the approach employed in the monitoring effort relied heavily on time series of operating data, bolstered by specific data collection activities. These activities included the gathering of observational data on the performance of the system, and surveys of the general population of the St. Bernard Parish as well as of users of the feeder and transit services. The users of taxicabs, the feeder service, and buses were surveyed at two points in time, the spring of 1977 and the fall of 1978. There was another survey of feeder service users and users of a special bus service in the spring of 1978. Surveys of the general population were also conducted at two points in time, but with slightly different information requirements.

Another element of the data collection effort was the preparation and processing of especially detailed operational taxicab service data for selected periods, specifically the preparation of driver manifests in greater detail and completeness than is usually the case. These data, together with additional detailed information on the operating characteristics of both taxicabs and buses, provided insight into the operations of public transportation that went beyond what was available up to then.

Operating data were provided by the bus and taxicab companies which granted virtually unlimited access to all records maintained for management

purposes, and which compiled additional statistics upon request. The surveys and observations were handled by a subcontractor engaged by the grantee, Management Science Associates, located in New Orleans.

ST. BERNARD PARISH

St. Bernard Parish, the demonstration site, is one of four parishes (Louisiana's counties) that make up the New Orleans metropolitan area. It is located to the southeast of the Orleans Parish, the seat of the city of New Orleans. The other two parishes in the New Orleans Standard Metropolitan Statistical Area (SMSA) are Jefferson in the southwest and St. Tammany in the north.

With a land area of 1331 km² (514 sq.mi.), the St. Bernard Parish accounts for over one-fourth of the land area of the New Orleans SMSA. Much of the land in the Parish is marshland unsuitable for residential or industrial use. These soil conditions and land ownership patterns have restricted -- mostly residential -- development to a fairly narrow strip extending from New Orleans along the Mississippi River, as shown in Figure 2-1. This strip, roughly 5 km (3 mi) wide and 20 km (12 mi) long, is bordered in the north by the levee which separates it from the marshland. It contains the two suburban communities of Arabi and Chalmette.

For July 1977, the Bureau of the Census estimated a total Parish population of 60,600.* This number accounted for 5.3 percent of the total population of the SMSA estimated for that time. Population growth has slowed down somewhat over the last two decades. Between 1950 and 1960,

* This estimate may be high. Population estimates based on the household survey conducted as part of this study are closer to 58,200 for the second half of 1977.

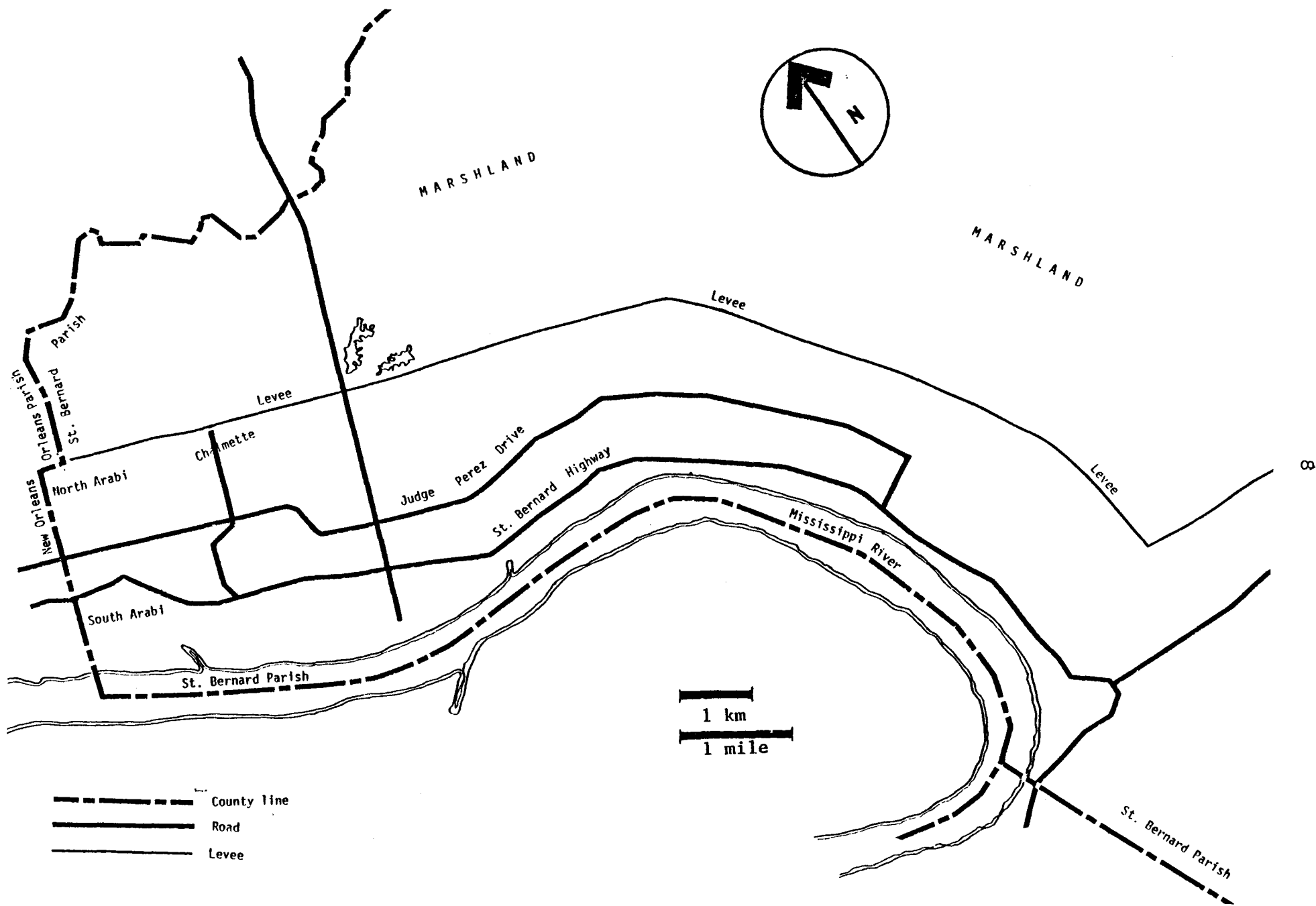


Figure 2-1. Schematic Map of St. Bernard Parish, Urban Part

the Parish population grew at an average annual rate of 6.6 percent. This growth rate dropped to 2.6 percent for the period between 1960 and 1970, and 2.4 percent since 1970.* The Parish has been growing faster than the SMSA as a whole, but not as fast as the other two suburban parishes.

The growth of the suburban parishes is largely attributable to moves within the SMSA. For the period between 1970 and 1977, net migration into the entire SMSA has been estimated at 1.8 percent of the 1970 population. Over the same period, net migration into St. Bernard Parish equalled 10.2 percent of the 1970 population.

The statistical evidence and observation of residential development patterns suggest that St. Bernard will experience only modest growth in the future. It is basically a settled suburb of the city of New Orleans with a stable population and limited economic activity of its own. There is some industry along the Mississippi River, south of the Parish's major artery, the St. Bernard Highway. It includes oil refineries, an aluminium plant, a sugar factory, and commercial port facilities. In addition, there has been some commercial development along the St. Bernard Highway and along another key artery, the Judge Perez Drive. Generally, though, the St. Bernard Parish is oriented toward New Orleans with respect to employment, shopping, entertainment and other social activities.

The extent of this orientation can be illustrated with data from the 1970 Census regarding the location of jobs of Parish residents. In 1970, more than 60 percent of all employed individuals in St. Bernard worked outside the Parish, mostly in the city of New Orleans. The comparable

* For the population estimate for 1977 derived from the household survey, the average annual growth rate would be 1.8 percent.

figure for the SMSA as a whole is 26.6 percent.* In 1970, about 29 percent of the labor force of the Parish were women, as compared to 37 percent for the entire SMSA. Tables 2-1 and 2-2 provide additional information on the characteristics of the work force in St. Bernard, based on 1970 Census data. In comparison to their SMSA counterparts, residents of the Parish are more likely to be a "skilled worker," and less likely to fall into the "professional, technical and kindred" or the "service worker" categories. For the female employment, the most prominent feature of the Parish is the dominance of the clerical and kindred occupations which account for over 50 percent of the total.

In terms of the industrial sector of employment, a worker residing in the Parish is more likely to work in the manufacturing and less likely to work in the service sector than the average SMSA worker.

Figure 2-2 illustrates some characteristics of the population as they emerged from the household surveys in the spring of 1977 and the fall of 1978. The two surveys did not produce significantly different results, with the exception of household income. The difference here is likely to be attributable to inflation. Over 50 percent of the households in the Parish have two persons over 16 years of age. The average household size was the same for both surveys, 2.36 -- not counting children under 16 years. Similarly, over 50 percent of the households own two cars. The 1977 survey indicated 4 percent of the households without cars. No carless households showed up in the 1978 survey. The overall car ownership per household was about the same in both surveys, 1.84 and 1.89, respectively.

* In the household survey in the fall of 1978, 30 percent of the respondents indicated that at least one member of their household worked in the New Orleans CBD.

Table 2-1

OCCUPATIONAL CHARACTERISTICS OF THE LABOR FORCE,
NEW ORLEANS SMSA AND ST. BERNARD PARISH, 1970
(in Percent of All Employed)

Occupational Category	New Orleans SMSA		St. Bernard Parish	
	Total	Female	Total	Female
Professional, technical and kindred	15.4%	16.9%	9.6%	12.6%
Managers and administrators	9.2	4.0	8.1	3.3
Sales workers	8.0	8.2	7.7	9.2
Clerical and kindred	19.8	37.2	21.6	52.7
Craftsmen, foremen and kindred	13.4	1.4	22.2	1.5
Operatives	13.3	7.0	15.9	6.5
Laborers, except farm	5.7	1.0	5.6	0.7
Farmers, farm managers and laborers	0.3	0.1	0.2	0.1
Service workers	14.8	25.2	9.1	13.4
Total employed (=100 percent)	368,261	136,882	17,521	5,122

Source: 1970 Census

Table 2-2

INDUSTRY OF EMPLOYED PERSONS, 1970
(in Percent of All Employed)

Industry	New Orleans SMSA	St. Bernard Parish
Agriculture, forestry, and fisheries	0.9	1.3
Mining	2.5	2.0
Construction	7.2	10.2
Manufacturing	14.1	21.6
Transportation, communications, and utilities	10.9	12.5
Wholesale trade	6.6	6.2
Retail trade	16.9	16.9
Finance, insurance, and real estate	5.8	5.6
Services	16.2	10.2
Health services	6.0	2.8
Education	7.6	4.4
Public administration	5.4	6.4
Total employed (=100 percent)	368,261	17,521

Source: 1970 Census

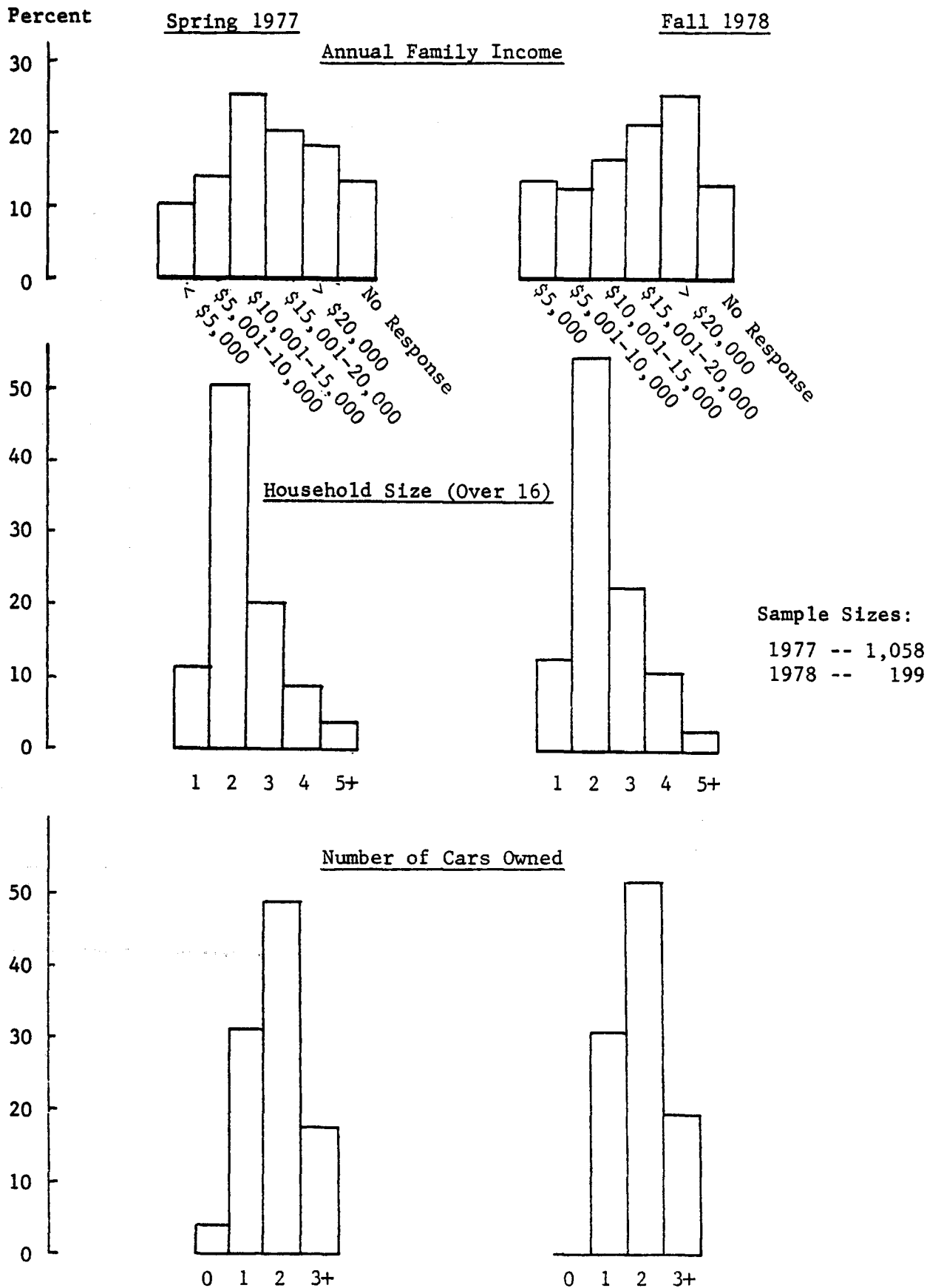


Figure 2-2 Characteristics of Households

TRANSPORTATION CHARACTERISTICS

As the ownership figures already suggest, St. Bernard relies primarily on the private automobile for travel. According to the 1977 household survey, 95 percent of all person-trips made by residents of the Parish are by car, with 80 percent driving and another 15 percent riding as passengers. Walking, motorcycle and bicycle accounted for about 3 percent of all person-trips, while less than 2 percent were made by taxi, transit or school bus.

The survey indicated that the average household in St. Bernard took 6.5 person-trips per weekday. For the (estimated) 17,000 households in the Parish, this figure would imply a total of roughly 110,000 person-trips each weekday. The local bus and taxi companies report 5,000 and 8,000 riders per month, respectively. Together, transit and taxicabs thus would account for roughly one-half of one percent of the total trips made by Parish residents. Given error margins and some problems of definition, this figure is compatible with the 2 percent cited above: transit and taxicabs play a minor role in a suburban context like St. Bernard.

As discussed further below, public transportation services in the Parish are limited. Transit service is provided by the St. Bernard Bus Company along the major artery, the St. Bernard Highway. The Arabi Cab Company, closely linked to the transit operator, is the only taxicab company in the Parish. The New Orleans bus system, operated by the utility company, provides sporadic service in the industrial area of St. Bernard.

Overall trip-making patterns therefore reflect auto user travel. Data from the 1977 survey for over 6,800 trips were coded according to zones of origin and destination, shown in Figure 2-3*. Table 2-3 shows the distribution

* For the analysis of bus and taxicab travel, a finer geographic breakdown was used.

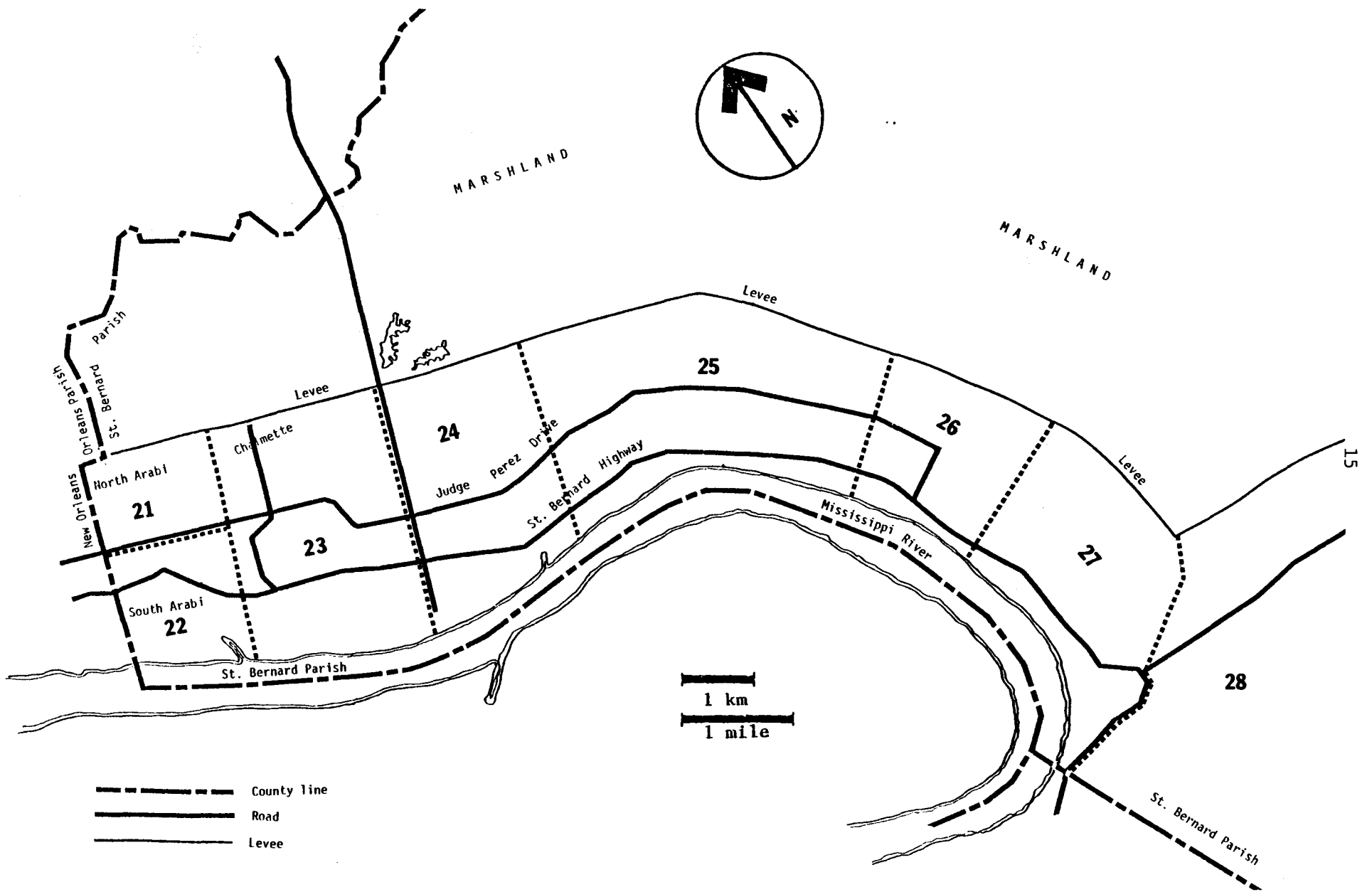


Figure 2-3. Travel Zones for Origin-Destination Analysis

of all automobile trips covered across trip purposes. Overall, work trips account for almost two-fifths of all trips, followed by social-recreational and shopping trips with 20 percent each.

Spatial travel patterns are illustrated in Tables 2-4 and 2-5. Table 2-4 shows the relative importance of the various auto travel zones as origins and destinations of trips made by St. Bernard residents. The ranking is the same for origins and destinations, with the two portions of the major community in St. Bernard, Chalmette, accounting for about one-half of all trips. The next most important zone as both origin and destination is the greater New Orleans area which accounts for about one-sixth of all trips. In contrast, the New Orleans CBD accounts for only 5 percent of all trips. Its importance is greater, once only work and shopping trips are considered. For work trips, the New Orleans CBD accounts for roughly 10 percent of both trip origins and destinations.

Table 2-5 shows the zonal pairs that account for a significant percentage of all automobile trips made by St. Bernard residents. The origin-destination matrix has been simplified to show only zonal pairs that account for at least 1 percent of total automobile trips. Given the size of the zones, it is not surprising that within-zone trips account for a major portion of all trips. The western part of Chalmette, the major community in the St. Bernard Parish, had 11 percent of all trips originating and ending within its borders. About 5 percent of all trips are between the New Orleans CBD and Chalmette, and another 2 percent between Arabi and the CBD. For these two St. Bernard communities, a CBD-oriented transit system would therefore compete for about 7 percent of the daily total of about 110,000 trips, or 7,700 trips per day.

Table 2-3

TOTAL TRIPS BY PURPOSE

Trip Purpose	Percentage of All Trips
Work	38.9%
Social or recreational	22.1
Shopping	20.2
School	4.3
Medical	2.0
Other	12.6

Table 2-4

ORIGINS AND DESTINATIONS FOR AUTOMOBILE TRIPS
(in Percent of All Trips)

Auto Travel Zone	<u>All Trips</u>		<u>Work Trips</u>		<u>Shopping Trips</u>	
	Origins	Destinations	Origins	Destinations	Origins	Destinations
23 Chalmette West	28%	28%	22%	21%	39%	40%
24 Chalmette East	21	21	19	17	24	25
30 Greater New Orleans	16	17	20	22	8	7
21 Arabi North	9	8	8	8	8	8
22 Arabi South	7	7	7	7	8	8
26 Violet	6	5	6	6	4	4
29 New Orleans CBD	5	5	9	11	2	1
25 Meraux	4	4	4	4	4	4
27 Poydras	3	3	2	2	2	2
28 Toca	2	2	2	2	1	1

Table 2-5

ORIGIN-DESTINATION PAIRS FOR AUTOMOBILE TRIPS
(in Percent of All Trips)

		To Zone									
From Auto Travel Zone		21	22	23	24	25	26	27	28	29	30
21	Arabi North	1.3	0.9	1.8						0.8	2.2
22	Arabi South	0.7	1.5	1.5	0.8					0.6	1.1
23	Chalmette West	2.0	1.5	11.1	4.9	0.8	0.7	0.5		1.5	4.5
24	Chalmette East	0.9	0.8	5.0	7.2	1.1	0.6			1.2	4.2
25	Meraux			0.9	0.9	0.6					0.9
26	Violet			0.7	0.6		1.5				1.3
27	Poydras			0.5				0.7			0.5
28	Toca										
29	New Orleans CBD	0.8	0.6	1.5	1.1						
30	Greater New Orleans Area	2.2	1.2	4.6	3.9	0.6	1.1	0.5			1.3

blank cells: under 0.5 percent

The results of the 1977 household survey thus describe an overall travel pattern for the St. Bernard Parish that is centered on the major community in the Parish, with another major share going to the city of New Orleans, particularly for work trips. While New Orleans plays also a significant role as a destination for major shopping trips, the retail sector in the Parish does attract the major share of shopping trips. New Orleans accounts for only 10 and 8 percent of all trip origins and destinations for shopping trips. This pattern is typical for a settled suburban community which is dominated by a major urban area.

INSTITUTIONAL FRAMEWORK

The St. Bernard Parish is governed by a Police Jury -- corresponding to a county commission elsewhere -- which consists of eleven members elected to four-year terms. Each of the Police Jury members represents a ward; they elect one of them as Parish president, who also served as the full-time Parish manager. The Police Jury is the official grantee for the taxi-feeder demonstration project.

For the management of the demonstration project, the Police Jury is represented by the St. Bernard Parish Planning Commission which includes several appointed members and a relatively small staff. The Planning Commission is responsible for, among other things, public transportation services in the Parish. Thus, it also represents the Parish in interactions with the other parishes of the New Orleans metropolitan area regarding transit services.

In dealing with the State of Louisiana and the federal government in transportation matters, St. Bernard Parish has been represented as part of the New Orleans metropolitan area. Given the different nature of their transportation needs and approaches to transportation financing, the suburban and urban parts

of the metropolitan area have had different priorities in their dealings with state and federal agencies. As a result of these differences, the (heavily urbanized) Orleans Parish has now applied to be recognized as a designated recipient itself, rather than just as part of the New Orleans metropolitan area. This change should also benefit the suburban parishes which have experienced delays in the processing of their applications because of problems the Orleans Parish had.

The Planning Commission has contracted with private companies for the services to be provided under the demonstration grant. The principal contractor is the St. Bernard Bus Company, which in turn has contracted with the Arabi Cab Company for the taxi-feeder service. The two companies are closely linked through ownership and shared operations, maintenance and dispatching.

Aside from the demonstration grant, the taxicab and transit companies are subject to the oversight of the Police Jury. Taxicab regulations are adapted from those in effect in New Orleans. In practice, regulatory actions have been limited to fare changes. Since the Arabi Cab Company is the only taxicab operator in the St. Bernard Parish, their interactions with the Police Jury and the Planning Commission have a more informal character.

PROJECT EVOLUTION

The demonstration project built on service innovations that had been introduced independently by the private operator of taxicab services. The Arabi Cab Company had been operating since 1956. It operates a fleet of up to 20 vehicles providing service at all times of the day and week. Originally, taxicabs were operated either by employed drivers working company-owned taxicabs, or by one of the owners of the cab company. Employed drivers could keep slightly more than half of the fare revenue they received, plus tips. In turn, they would

be responsible for purchasing gasoline. Company owners driving a cab would keep all the revenue. During the demonstration project, a third form was introduced: in early 1978, the company gave its drivers the option to purchase the cab they were driving. The driver would keep all revenue, paying the company a weekly lumpsum for the vehicle, insurance and dispatching.

Until 1972, transit service was provided in the St. Bernard Parish by a private operator, without any connections to the cab company. When this bus service was discontinued because it became unprofitable, the management of the taxicab company felt that their business suffered as a result. The likely explanation was that a sizeable portion of taxicab users could afford a taxi ride only in one direction, taking the bus in the other direction. The taxicab operator first tried to take up the perceived slack through a jitney service with taxicabs on the major artery, the St. Bernard Highway. However, it proved difficult to maintain reliable service; the taxicabs on the jitney route were easily diverted for more lucrative regular trips. The owners of the Arabi Cab Company therefore formed the St. Bernard Bus Company with the hope of improving the profitability of the combined operation by maintaining taxicab ridership at previous levels. The bus company started operations in 1973.

Common ownership and shared management, together with joint use of labor and maintenance facilities allowed for good coordination of taxicab and bus services. The linkages between these two forms of public transportation in the St. Bernard Parish were strengthened by the introduction of the taxicab feeder service, the BUCAT (BUS-to-CAB-Transfer) service, in October 1974. It was introduced originally as a pilot service in an attempt to reduce operating costs on one of the two bus routes that experienced lower demand. The service was restricted to the most densely populated areas of the Parish.

The taxi feeder service became part of regular operations. On request, the taxicab would pick up persons living more than $\frac{1}{4}$ mile from the nearest bus route and drive them to the nearest transfer point to catch the bus. Given the fixed bus schedule, the dispatcher was expected to be able to pool several telephone requests in the same general area for shared rides. On the return trip, dispatching is handled through two-way radios on the buses. The passenger simply asks the bus driver to request a taxi for the final leg of the trip home or to the final destination. The bus driver indicates to the dispatcher when and at which transfer point the passenger(s) will be discharged.

The BUCAT service was provided free for bus users. The passenger would pay the cab driver 50¢ (later 25¢) and receive a transfer good for that amount toward the bus fare. On the bus, the passenger would then only pay the difference between that amount and the fare for the respective zone. On trips back, the passenger pays the bus fare and receives a free transfer good for the taxi trip. Drivers would be reimbursed by the bus company. Their revenue for each BUCAT trip was 50¢ -- corresponding to their share of the approximate meter fare for a regular taxi trip of \$1.

The bus company received no revenue from BUCAT users beyond the difference between the payment to the taxicab driver and the actual fare. Even so, the management of the bus company felt the service to be acceptable, since it enabled them to reduce the route length and service frequency in the residential portion of the feeder area on the Judge Perez Drive as well as drop Saturday service. For the taxicab company, losing the income from transfer rides by letting the drivers keep the entire revenue was not viewed as a significant problem, since the marginal cost of these BUCAT rides was considered negligible.

Table 2-6 highlights the major milestones of the St. Bernard demonstration project. Each of the fare, equipment and service changes are discussed in greater detail in the next section. The brief chronology presented here is

designed to provide an overview, and to indicate the kinds of contributions that demonstration funds made to public transportation equipment in the Parish. It should be noted that major impacts did not occur until the second year of the project because of delays in obtaining vehicles.

It is important to note again that the BUCAT service was already in operation before the startup date for the demonstration project examined here. The demonstration was therefore designed to examine the experience with this form of integrated service through a number of variations of fares and service levels. Service variations focused on the extension of the service area for the feeder service and a number of changes in the bus service characteristics. As it turned out, the project developed into a "naturalistic experiment" with service and fare changes dictated more by the necessities of the day-to-day management of the taxicab and bus companies, rather than the original demonstration plan. The principal contribution of the demonstration funds to the management of the operations of the two companies was the improvement of service capacity through additions to the fleet of taxicabs and the easing of financial support for the acquisition of additional and the improvement of existing buses.

The concerns of the demonstration are reflected in the allocation of funds, shown in Table 2-7. The aggregate cost figures for vehicles purchased, bus and BUCAT services, and demonstration related activities indicate that almost 40 percent of the total were used to buy additional vehicles; another 20 percent supported bus operations and the expansion of taxi feeder services.

Table 2-6

BRIEF CHRONOLOGY OF DEMONSTRATION PROJECT
SERVICE CHANGES

1976

- June Demonstration project begins
- November Bus service on Judge Perez Driver and Canal Street Express discontinued

1977

- March Taxi fare change
- April New 7-passenger taxicabs recieved by Parish and leased to taxi operator (demonstration funds)
- November Bus fare increase, average 25 percent

1978

- April Canal Street Express began; St. Bernard Highway service improved (additional bus purchased with demonstration funds)
- May Two new buses received by Parish and leased to bus company (UMTA Section 5 funds)
- June Taxi feeder service expanded to areas 1 and 4; BUCAT fare changed to 25 cents

1979

- April Demonstration project ends (service continues)
-

Table 2-7
DEMONSTRATION PROJECT EXPENDITURE SUMMARY

Vehicles

40-passenger bus & fare box	\$41,594	
Nine, 7-passenger taxicab vehicles with radios and meters	90,993	
		<u>\$132,587</u>

Operations

Bus supervision and operating subsidy	\$48,000	
BUCAT expansion operating subsidy	5,100	
Marketing Activities	12,890	
Taxicab supervision & reporting	17,000	
Taxicab lease fees	(11,200)	
Project bus revenue	(2,800)	
		<u>\$ 68,990</u>

Demonstration Activities

Project management	\$55,000	
Legal and accounting services	30,273	
Data collection	38,500	
		<u>\$123,773</u>

TOTAL:	\$325,350
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INTRODUCTION

Before examining the performance of public transportation in the St. Bernard Parish in terms of ridership and revenue, the analysis should provide the background information on service patterns. This section describes the operating procedures and service characteristics for buses and taxicabs. It also reports on the available cost information. The section concludes with a description of the procedures used for coordinating taxicab and transit services and explores the applicability of these procedures to the operation of a taxi feeder service in different settings.

A distinctive feature of the St. Bernard public transportation system is its small size, with some twenty taxicabs and three to five buses. This size makes it fairly simple to describe the overall service characteristics in more general terms. For a more detailed and systematic description of service availability and supply patterns, the small scale introduces a good degree of volatility. The effects of some random events become much more pronounced than in a bigger system. For example, if one bus is out of service because its air conditioning has to be repaired, or because its driver called in sick, service levels on the transit system are reduced substantially.

The reasons for such random fluctuations in service levels are not always apparent from the available data. That of course makes it difficult to describe service policies and the resulting supply of public transportation services in a systematic manner.

Similar problems exist for taxicabs, where the analysis encounters the usual problems of disentangling the interactions of supply and demand in describing and interpreting observed service and patronage patterns. For taxicab operations, capacity constraints exist only in the very short run. Consequently, any quantitative descriptors of service patterns commonly reflect only the effects of variations in demand levels in terms of total taxicab ridership and passengers per trips.

Because of these difficulties, the discussion here examines such service descriptors as vehicle miles rather briefly. This information is used to some extent in the assessment of costs and productivity.

Quantitative and qualitative data used in the analysis here come from three sources: operating statistics maintained by the taxicab and bus companies, direct observations and discussions, and relevant results of surveys of users of public transportation as well as the general public.

With respect to operating statistics, the nature and quality of the raw data are largely determined by the operating procedures of the companies. For example, the monthly mileage for taxicab operations was estimated from entries in the shopbooks. For each cab in service, this book was used to record the odometer reading at, as a rule, the beginning of the month. For any cab that was continuously in service, these data provided the basis for computing total monthly vehicle miles simply by subtraction. Under the assumption that non-revenue use was fairly constant, this monthly mileage figure gives a good indication of the month-to-month variation in the amount of service supplied by that particular vehicle.

However, the case of a cab being continuously in service is far from typical. At some point, any given cab has to be junked and replaced by a comparatively new vehicle. In other instances, vehicles in use were sold to the drivers. They disappeared from the book, yet continued service under a dif-

ferent arrangement, though still as part of the Arabi Cab Company. In addition, some of the recorded odometer readings appeared to be rough estimates jotted down after the fact. Since these factors affect the reliability of the data, the approach taken here involved a careful examination of the available records, buttressed by discussions with individuals involved. In a number of cases, we used extra- or interpolation to generate best estimates of total monthly vehicle mileage. Overall, we feel that the figures used in the analysis reflect relative variations adequately, even though they are likely to be off in absolute terms.

SERVICE HISTORY

The brief overview of the project evolution in the preceding chapter has already touched on the major highlights of the history of public transportation services in the St. Bernard Parish. As a background for the analysis here, this overview needs a little more detail regarding service and fare policies.

The Arabi Cab Company became the sole provider of taxicab services in the St. Bernard Parish in 1971 by buying out its competitor, the Chalmette Taxi Company. In the same year, the Parish set up a Taxi Board to regulate and supervise taxicab operations. The relevant regulations were adopted from those in effect for New Orleans.

In 1972, the privately owned transit company went out of business. The management of the Arabi Cab Company perceived a related drop in its business, presumably from patrons who used to split a given roundtrip between bus and taxi. In response, the cab company attempted to provide a jitney service along the major artery, the St. Bernard Highway. This jitney service, somewhat unpopular with drivers, encountered serious problems with service reliability. The cab company owners therefore started a new bus company, the St. Bernard Bus

Company. School-bus type vehicles provided service on two routes; the St. Bernard Highway, and the Judge Perez Drive (see map in Figure 3-1). The average fare charged was 50¢; however, fares were graduated by distance traveled through a zone structure. The fare from zone 1 (closest to New Orleans) to the other seven zones was 35¢, 40¢, 50¢, 60¢, 70¢, 90¢, and \$1.50.* All travel within a given zone cost 25¢. Fares between other zonal pairs were calculated on the basis of fares from zone 1. For example, the fare between zones 2 and 6 would be calculated in the following manner: the difference between the fares from zone 1 to zone 6 (70¢) and zone 2 (35¢) was 35¢; this amount would then be added to the 25¢ base fare to yield the actual fare of 60¢. Fares for all zonal pairs for the St. Bernard Highway route are shown in Table 3-1.

The fare structure for the bus system was further complicated by the existence of different rates for the Judge Perez route. On this route, the base (intra-zone) fare was 35¢, with fares from zone 1 to the other seven zones being 40¢, 50¢, 50¢, 60¢, 70¢, 90¢, and \$1.50.

The taxi-feeder to bus service was introduced on a pilot basis in October 1974. Its main purpose was to reduce the bus operating costs on the Judge Perez route by reducing the route length and dropping Saturday services, and to provide publicity for both the bus and the taxicab services. Originally, the BUCAT (BUS-CAB-Transfer) service was offered in areas 2, 3, and 4 (cf. Figure 3-1). Together, these areas account for almost one-half of the population of St. Bernard. All residents of these areas living more than a quarter mile from the bus routes were eligible for this service, which would take them to a transfer point from their home, and back to their home on the return trip. Ideally, the dispatcher would be able to group rides both to and from the buses, thereby improving the productivity of the taxicab.

* In area 8 -- the relatively large area beyond Poydras -- residents can call the bus company to have the bus meet them at a designated point along the highway.

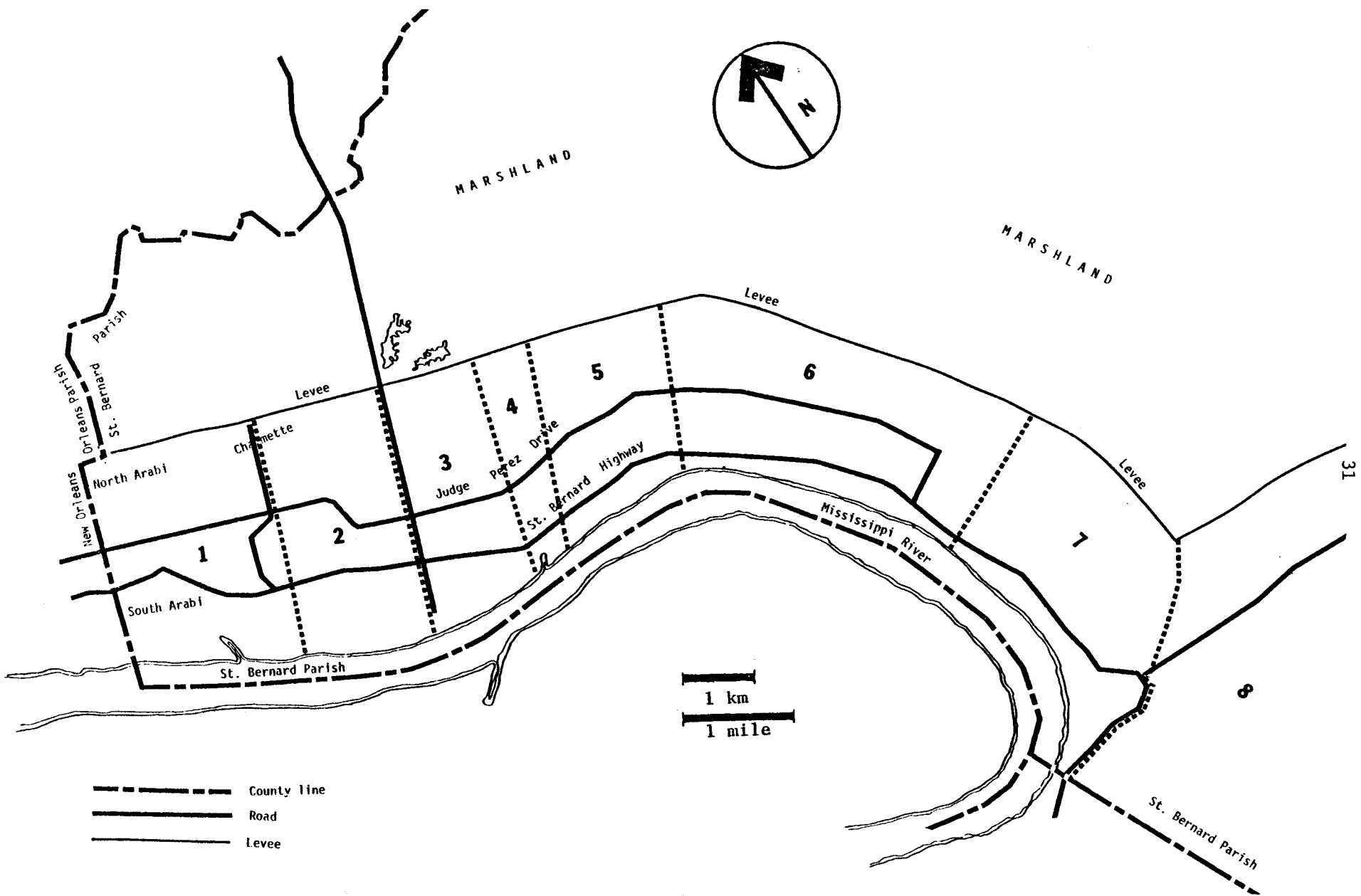


Figure 3-1. Fare Zones for St. Bernard Bus Company

Table 3-1
 FARES BETWEEN ZONAL PAIRS FOR ST. BERNARD BUSES
 (One-Way Trips, St. Bernard Highway)

To From	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8
Zone 1	\$0.25	\$0.35	\$0.40	\$0.50	\$0.60	\$0.70	\$0.90	\$1.50
Zone 2		0.25	0.30	0.40	0.50	0.60	0.80	1.50
Zone 3			0.25	0.35	0.45	0.55	0.75	1.50
Zone 4				0.25	0.35	0.45	0.65	1.50
Zone 5					0.25	0.35	0.55	1.50
Zone 6						0.25	0.45	1.50
Zone 7							0.25	1.50
Zone 8								1.50
New Orleans	0.60	0.70	0.75	0.85	0.95	1.05	1.25	1.85

Note: Zones refer to service areas. On November 4, 1977, fares from zones 1, 2, and 3 were changed to \$.30, \$.40, and \$.50, respectively.

The basic features of the taxi feeder service have not changed since its introduction. Patrons using the service from their home or other departure point to a bus stop pay the taxicab driver 50¢. They receive a transfer in exchange worth up to 50¢ toward the bus fare. If the actual bus fare exceeds 50¢, the user pays the difference to the bus driver. In our example of a trip from area 2 to area 6, costing 60¢, the taxi feeder user would hand in the transfer (worth 50¢) and pay an additional 10¢.

In August 1975, the Arabi Cab Company was granted a fare increase by the St. Bernard Taxi Board. The mileage charge of 50¢ remained; but the 50¢ drop was raised to \$1.00. This kind of change affected shorter trips disproportionately.

In the meantime, the bus company had introduced a special service for commuters to the New Orleans Central Business District, known as the Canal Street Express after its destination in New Orleans. This service offered two or three trips to New Orleans in the morning and back in the evening. In the fall of 1976, operating this service became increasingly difficult as a result of extensive street reconstruction on its route. The express service was therefore discontinued in November 1976.

Bus service was further curtailed in November 1976 with the elimination of the Judge Perez Drive route. Ridership on this route did not appear sufficient to warrant this service. Consequently, bus service after November 1976 was offered only on the St. Bernard Highway. (The Canal Street Express service was reintroduced in the spring of 1978.)

March 1977 also saw another change in the fare structure of the taxicab company. The change involved a reduction of the drop charge from \$1.00 to 70¢, and an increase in the mileage charge from 50¢ to 60¢. Moreover, any additional passenger was now charged 25¢.

Service capacity improved in the spring of 1977 with the arrival of several new 7-passenger taxicabs, purchased by the Parish out of project funds, and leased by the Arabi Cab Company. Project funds also paid for an additional.

The fare structure for the bus service was changed in November 1977, resulting in an average increase of 25 percent. This increase was accompanied by some slight modifications of the zone boundaries. The spring of 1978 brought some service improvements, notably the addition of a bus to the St. Bernard Highway route, reducing headways, and the resumption of the Canal Street express service. Two new buses were delivered in May 1978, purchased by the Parish with Section 5 funds and leased by the bus company.

In June 1978, the BUCAT service was expanded from areas 2 and 3 to include areas 1 and 4. At the same time, the BUCAT fare was lowered to 25¢, plus the bus fare. In late fall 1978, the bus company sold the buses it owned, operating essentially with two of the leased buses and keeping the third as a backup.

At the end of the demonstration project (April 1979), plans call for a continuation of the BUCAT service in the current service areas, and the continued provision of bus service on the St. Bernard Highway, as long as the vehicles currently available will last.

MANAGEMENT AND OPERATING PROCEDURES

The overview of the history of public transportation in the St. Bernard Parish over the last few years already gives a fairly good impression of the overall management style for both taxicab and bus services. Decisions about services and fares were made in direct response to perceived problems and opportunities. The somewhat informal operating approach allowed for considerable flexibility in shaping public transportation. This flexibility was enhanced by the institutional context -- the close links between the taxicab and bus companies, the almost informal regulatory environment at the local level, the absence of union involvement, and the quasi-monopoly of the two public transportation operators.

The system's flexibility was tempered somewhat with respect to the demonstration project by its relationships with the St. Bernard Parish Police Jury and the Planning Commission. Since the Parish was the grantee, many of the decisions involving project funds and project operations had to wait for resolution at the Parish level. In some instances, because of differing requirements and operating procedures, this process took longer than it would have otherwise. The interaction also affected the cashflow situation for the operator. For example, the application for UMTA operating assistance (Section 5) is submitted together by the New Orleans parishes. The recent application has been held up by a disagreement between UMTA and the New Orleans bus system, operated by the New Orleans Public Services, Inc. (NOPSI), over equal employment opportunity requirements. The delay affected the St. Bernard Bus Company more than transit operators in the other parishes, since St. Bernard is the only parish that does not reimburse the bus system directly, but waits for the payment of UMTA operating assistance. As a result, the cashflow situation for the bus operator suffered as a result of developments outside the control of either party.

Relationships between the St. Bernard Parish Police Jury and the transit operator for the demonstration project were outlined in a contract completed in December 1976. This contract stipulates that the equipment bought for the project would remain the property of the Parish, establishes provisions for labor protection and minimum wages, and specifies the procedures used for computing the operating assistance to be paid to the bus operator. The lease of equipment was further detailed in a separate lease agreement.

Interactions between the bus and the taxicab company were also codified contractually. However, the more important element in their day-to-day operations was of course their immediate proximity. As already noted, the bus company was formed by the owners of the taxicab company. In practice, buses and taxicabs shared management, dispatching, and maintenance and repair facilities. In addition, in a few instances drivers switched between buses and cabs.

The two companies are headquartered in a small two-room building with an attached garage. The building houses the dispatcher's room and serves as the office for the bus and taxicab companies.

The organizational and physical characteristics of the two public transportation providers greatly facilitated solutions of the two major problems of any attempt at integrating services of different types:

- coordination of services -- dropoff by one mode, pickup by the other; and
- satisfactory allocation of revenues and cross-subsidization.

The coordination of services was the task of the dispatcher. For cab-to-bus trips, the dispatcher would get a request by telephone. After a short waiting period to see whether there would be other BUCAT requests from the same area to allow for ride-sharing, the dispatcher would send a taxicab to the pickup location. Typi-

cally, the cab closest to the respective location would be the one to take the call, as in the case of "regular" taxi trips. Exceptions were possible, if they were necessary to spread the BUCAT trips among drivers, since these trips were perceived by some drivers as not being all that remunerative.

The dispatcher would also inform the driver of the bus -- all of which were equipped with two-way radios -- that BUCAT passengers were due at a particular stop. However, cases in which the bus waited because BUCAT patrons had called too late or were delayed for other reasons were not common.

In the other direction, from bus stop to final destination, the BUCAT passenger would tell the bus driver the stop he or she wanted to get off as well as the final destination. The bus driver would call in this information to the dispatcher who would send a cab to that stop. Since the request from the bus could combine requests from several passengers, shared rides from the bus stop tended to be more common than in the other direction, as discussed further in the next section.

A useful measure of the degree to which coordination between the two modes worked is the relative waiting time for passengers transferring from cab to bus or vice versa at the bus stops. As part of the monitoring effort, the waiting times of BUCAT passengers were observed over random blocks of time at four different transfer points over a week during October, 1978. These data were collected for a total of 84 bus arrivals, 44 in the westbound and 40 in the eastbound direction. Headways for observed bus arrivals ranged from 22 to 120 minutes, with an average of 39 minutes for westbound and 43 minutes for eastbound buses. The observations yielded data on 31 BUCAT patrons, 11 transferring from the cab to the bus, and 20 from the bus to the cab.

For the cab-to-bus transfers, waiting times ranged from 0 to 19 minutes, for an average waiting time of 8.9 minutes (median: 10 minutes). The coordination seemed to be working better in the other direction. Waiting times for

bus-to-cab transfers ranged from 0 to 15 minutes, for an average waiting time of 5.1 minutes (median: 5 minutes). In fact, in the cases observed, all but two of the twenty bus-to-cab transfers were picked up within six minutes after the arrival of the bus.

These figures compare with an approximate average waiting time of 16 minutes for the bus by all passengers surveyed in spring of 1977 and in the fall of 1978. According to the results of these surveys, more than 35 percent of the bus passengers waited more than 20 minutes for the bus. Since these waiting times are largely affected by the degree of schedule adherence by buses, it appears that BUCAT patrons do benefit somewhat from the bus-taxicab coordination once they get to the bus stop. Their waiting time seems to be less than that for the general bus passenger.

Even so, the waiting time data suggest that coordination between the two modes is better for the distributor function of the BUCAT service. This is also shown in the average taxicab occupancy observed in this connection: the average occupancy for cab-to-bus transfers was 1.6, for bus-to-cab transfers 2.0. These results are further supported by evidence derived from taxicab records examined below.

The allocation of revenues between the two modes involved some fairly complex procedures that worked primarily because of the close relationship between the taxicab and the bus company. Originally, the process was rather uncomplicated. The drivers kept the entire 50¢ they received for cab-to-bus transfers. The normal split of 50 percent of all fares for the taxicab company did not apply to these charges.* For the taxicab portion of bus-to-cab transfers, the drivers turned in the transfer slips and received 50¢ from the bus company. Under this

* In spite of this arrangement, drivers did not tend to regard BUCAT trips as the equivalent of a regular \$1.00 trip; their perceptions were reinforced when the BUCAT fare was lowered to 25¢ in June 1978.

arrangement, the task of allocating revenues was straightforward. All internal payments were from the bus company directly to the taxi drivers.

There are a number of ways of estimating the subsidy that a BUCAT user actually received. One option is to compare the actual cost of making the linked trip to the cost of making this trip by taxicab and bus in the absence of the BUCAT option, that is, if the regular fare were charged for both of these modes. For the taxicab portion of the trip, it is possible to use the number of passengers and trip length data from driver manifests (discussed further below in the section on ridership and revenues) to calculate the hypothetical cost to the user. For home-to-bus stop trips, the fares collected for a taxicab trip serving BUCAT riders during a sample week in April 1977 averaged \$0.69. Using the respective number of passengers and the trip length recorded in the driver manifests, the average hypothetical fare would have been \$1.77. Per trip, BUCAT users received therefore a subsidy of \$1.08, corresponding to 61 percent of the hypothetical fare.

Since the driver kept all of the user payments under this scheme, the revenue was equivalent to that for a regular trip of \$1.38 (double the \$0.69 actually received). For a \$1.77 regular trip, the driver would have kept \$0.88. Thus, for the driver the BUCAT arrangement meant a hypothetical loss of \$0.19 per BUCAT trip. For the taxicab company, the BUCAT option implied foregoing revenue of \$0.88 per trip, or half of the hypothetical fare for the average BUCAT trip.

Because of higher vehicle occupancy figures, the picture is slightly different for BUCAT trips from the bus stop to the final destination. The fare collected for the average trip of this type was \$0.92. This amount corresponded to a hypothetical fare of \$2.07 for the given trip length and number of passengers. The users thus received an average subsidy of \$1.15 per trip, or

56 percent of the hypothetical fare. The driver split of the hypothetical fare would have been \$1.03, which implies a hypothetical loss of \$0.11 per trip for the driver, and of \$1.03 for the taxicab company.

From the driver's point of view, then, the average BUCAT trip from the bus stop is associated with a lower "loss" than a trip in the other direction. For the company, the hypothetical loss is higher for bus-to-cab transfers. It should be noted that these estimates of "losses" are intended only as illustrations. Since many of the BUCAT trips might not have been made at regular fares, the opportunity cost of the average trip was less than the hypothetical fare calculated here.

With the change of the BUCAT fare in June 1978 to 25¢, the drivers still collect a total of 50¢ for each BUCAT user. The cab company settles with the taxi drivers on a daily basis. They are paid 50¢ for each bus transfer turned in and 25¢ for each trip to the bus stop. These payments are checked against transfers issued and received by the bus company. Generally, cash settlements between drivers and the taxicab company, and between the taxicab and bus companies proceed smoothly, because they can be handled in a fairly informal and friendly manner.

There can be little doubt that the successful resolution of the two major issues in coordinating taxicab feeder and transit services in the St. Bernard Parish was greatly aided by the three key characteristics of the operation:

- there is only one taxicab company in the area, which reduces the problem of dispatching to one of choosing among drivers rather than among companies;
- the small size of both the taxicab and the bus operations made it possible to handle operational problems in an informal manner;
- the close connections between the bus and taxicab companies in institutional, operational and physical terms offered the pre-conditions for coordination and smooth settlement of accounts.

TAXICAB OPERATIONS

The Arabi Cab Company, in existence since 1956 and the sole provider of taxicab services in the St. Bernard Parish since 1971, operates a fleet of between 16 and 20 radio-dispatched, air-conditioned taxicabs on a 24-hour, seven-day-a-week basis. The taxicabs are operated under three different arrangements. Normally, the vehicles are owned by the company and are driven either by employed drivers or by the owners of the company. There are also several vehicles that are being purchased by the drivers, but continue to form part of the company's fleet.

The company handles routine maintenance and repairs on all the vehicles it owns. Employed drivers work under a 50 percent commission arrangement. They purchase their own gasoline. The five owners of the company keep all the receipts from driving a cab.

Early in 1978, the company introduced an option for its drivers to purchase their cabs. The arrangement allows the drivers to pay a flat sum per week to the company which includes payment for the vehicle (\$47.50 per week), insurance (\$30.00), and a fee for dispatching services (\$47.50). The drivers keep all their receipts and are responsible for their own repairs and maintenance. Thus far, four of the drivers have taken advantage of this opportunity.

The taxicab operations are almost exclusively limited to the transportation of persons. Package delivery used to be a significant part of the business, but is now handled by the Arabi Industrial Package Company, set up by the owners of the cab company with three small vehicles. Package delivery is being handled by taxicabs only if the three delivery vehicles cannot handle all requests.

For their passenger operations, the current fare structure is \$0.70 per drop and \$0.10 for each one-sixth of a mile. Any additional passenger in a preformed group is charged \$0.25. During heavy-demand

periods, shared riding is attempted, with the permission of the original passenger. In these cases, each passenger pays a discounted full meter fare. The discount is determined by the dispatcher. Elderly and handicapped persons are given a 10 percent discount on the regular fare. The large Checker cabs with wide doors and low steps in the fleet (vehicles purchased by the Parish with demonstration funds and leased to the company) can accommodate wheelchair-bound passengers.

As noted earlier, it is difficult to describe the service levels for taxicab operations independently of demand patterns. Given the flexibility in this public transportation mode, service levels can be quickly and easily adjusted to keep excess capacity to a minimum. Excess-demand situations, in turn, are likely only in case of peaking over short periods of time. Even so, it is of some interest to look at a measure of service level, vehicle-miles per month, and compare it to the costs incurred.

Figure 3-2 shows estimated total monthly vehicle miles for the St. Bernard taxicab operations. Because of adjustments and missing data, the actual mileage is probably higher, but the data shown provide a reasonable description of the month-to-month variations. It is adequate to assume that the noise factor does not vary systematically from month to month. Monthly mileage figures over a period of two years do not show significant trends, although a curve fitted through the observed points shows a positive slope. Inspection of the curve also indicates that the highest monthly mileage figures tend to be registered in December, January, March and June. The monthly patterns become clearer in the form of monthly index measures, as shown in Figure 3-3, which compares mileage and cost indices.

The monthly cost patterns associated with maintenance and repair are shown in Figure 3-4 for the two-year period examined here. These costs include labor costs and expenditures for parts and lubricants. They do not cover gasoline

Figure 3-2. Estimated Monthly Taxicab Mileage
(1976-1978)

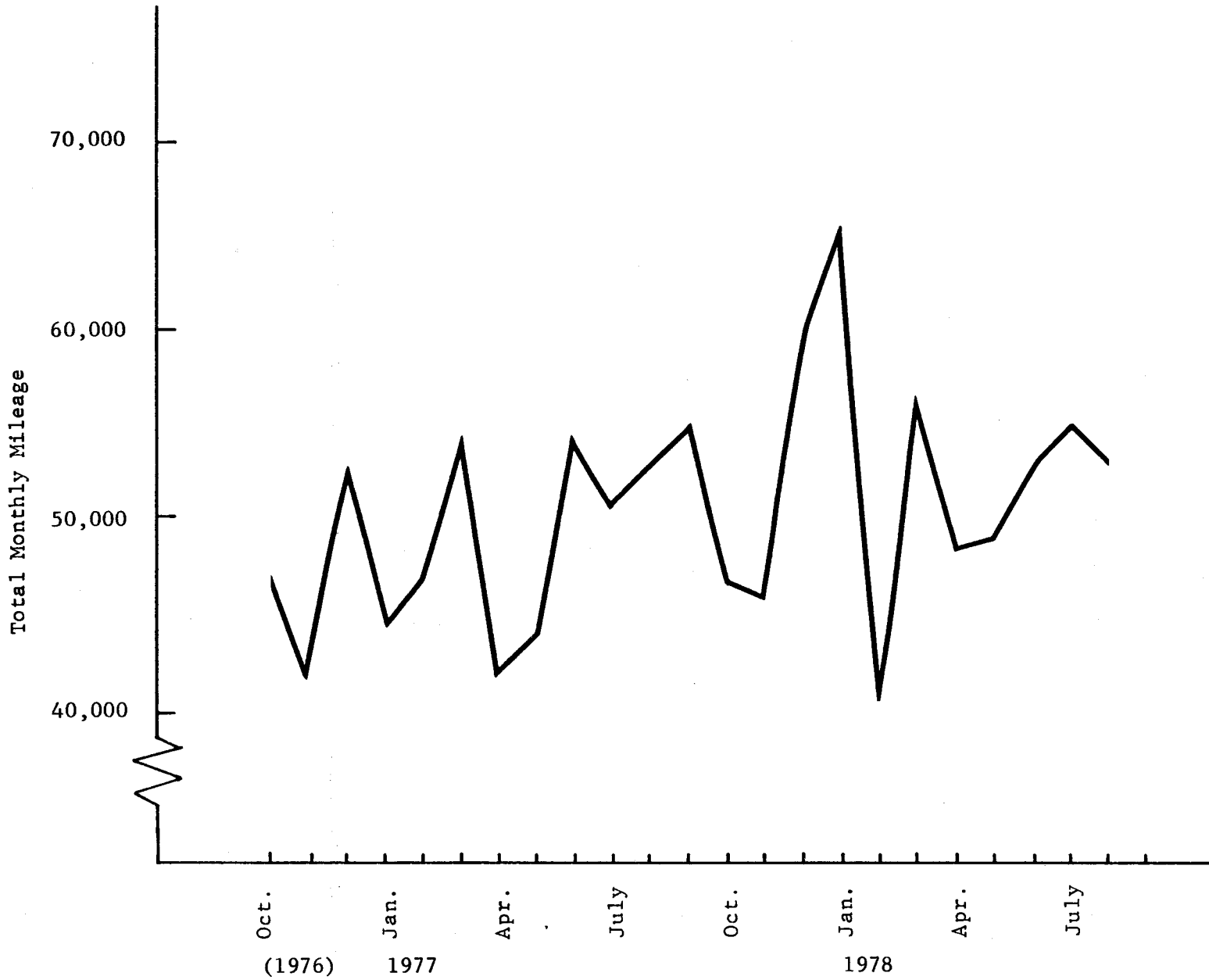


Figure 3-3. Monthly Indices for Taxicab Mileage and Maintenance Costs

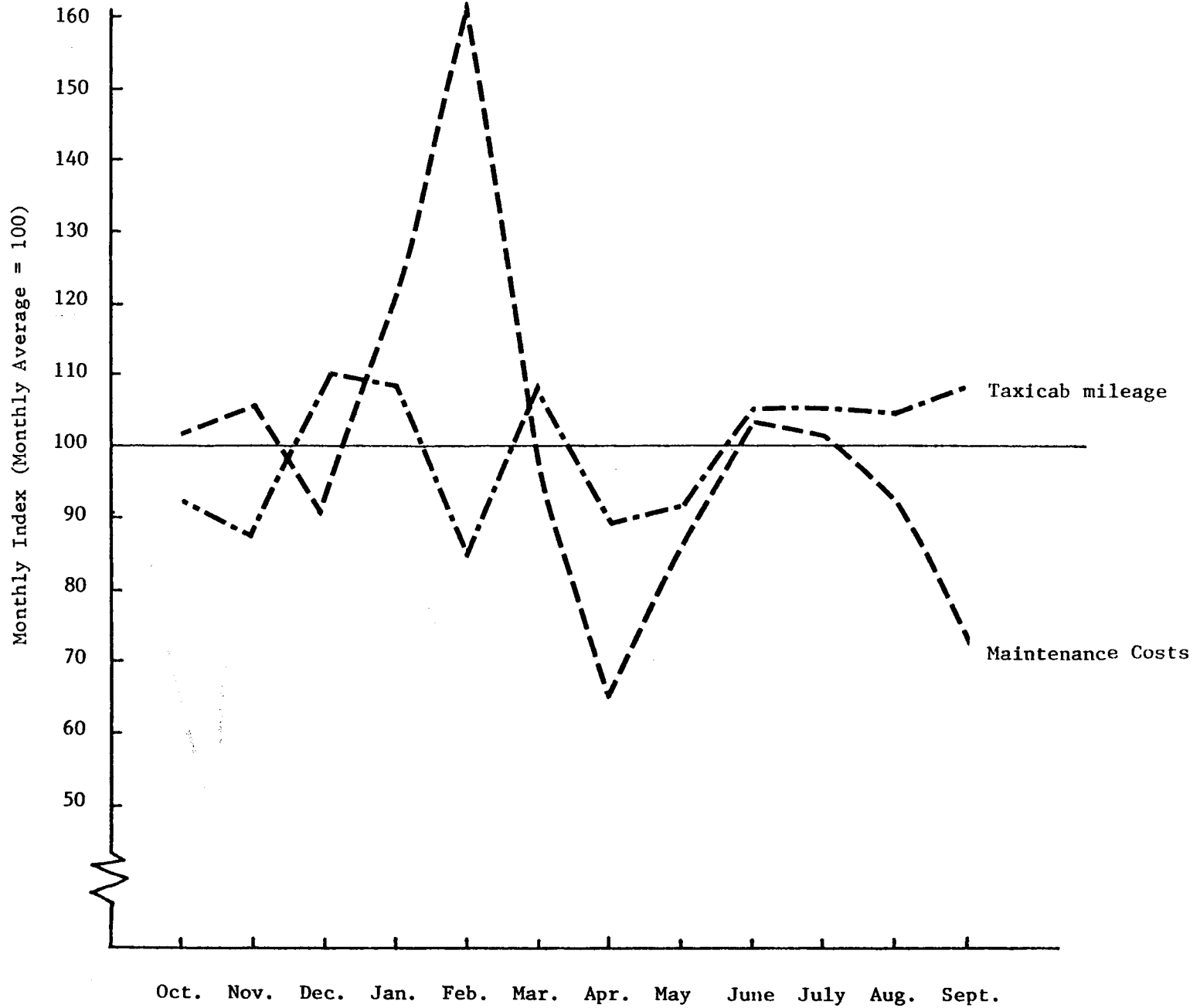
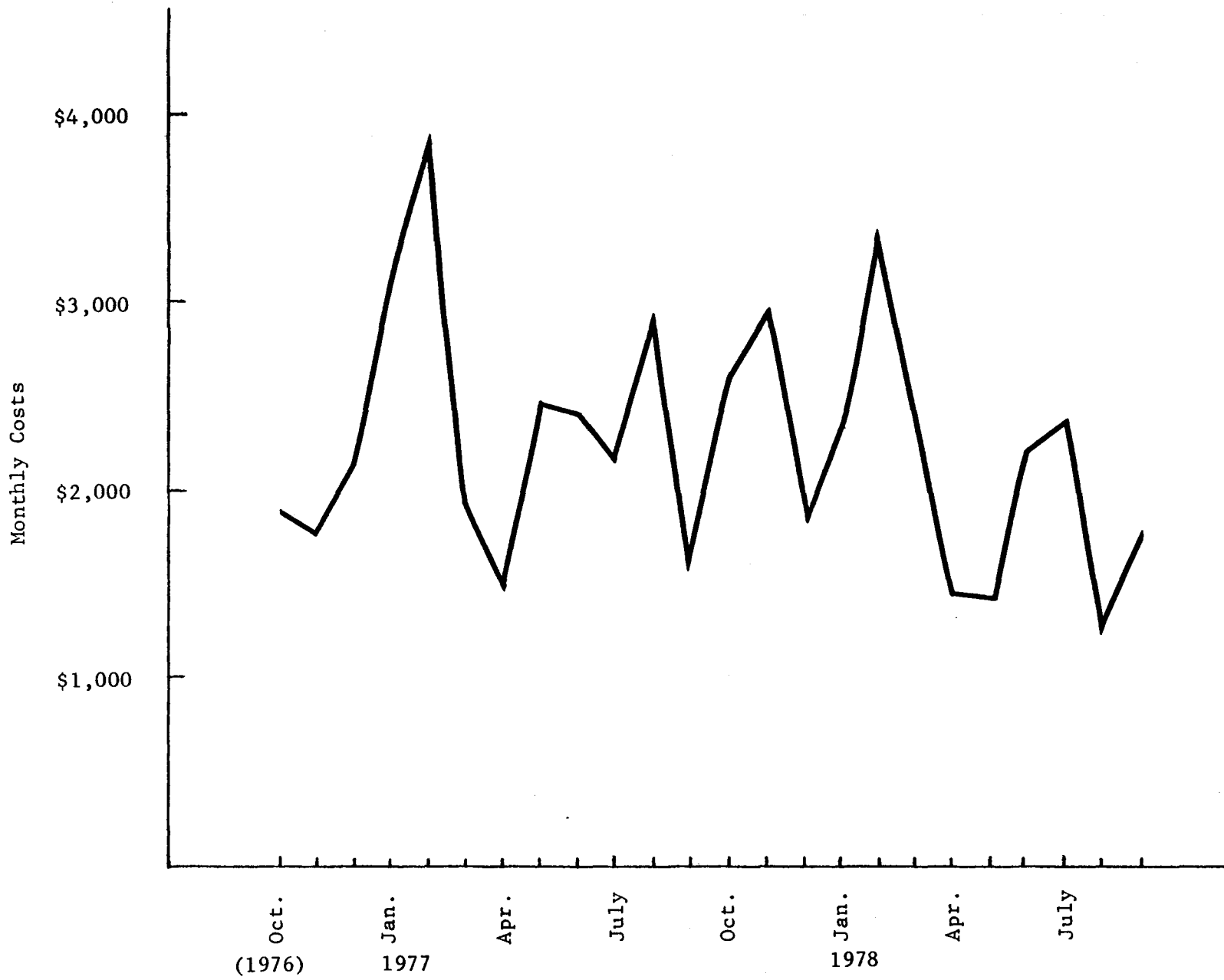


Figure 3-4. Monthly Taxicab Maintenance Costs, 1976-1978



purchases or any overhead items. Given the structure of operations, all overhead expenditures are likely to remain fairly constant from month to month. Gasoline purchases of course are directly proportional to the vehicle mileage.

Inspection of the cost patterns for the two years examined suggests cyclical variations. These patterns become clearer by looking at average monthly index figures, as shown in the broken line in Figure 3-3 superimposed on the corresponding index figures for vehicle mileage. The comparison of the cost and mileage curves clearly illustrates the interactions between service needs and maintenance/repair opportunities. Whenever the taxicabs are used more, repair and maintenance is postponed and carried out during months with lower service levels.

BUS OPERATIONS

Transit service is provided by 40-passenger school-bus type buses equipped with air conditioning. The original buses owned by the St. Bernard Bus Company did not have air conditioning, but they were retrofitted with AC units in 1978. There were periodic maintenance problems with all of the AC units.

Bus service was provided on a fairly informal basis, with considerable deviations from the published schedules. Scheduled headways varied between 20 and 30 minutes, depending on the route and service configuration in effect at that particular time. However, actual headways could be considerably longer, particularly if equipment or drivers were not available.

Equipment reliability has been a problem throughout the demonstration project. The air conditioning units retrofitted into the buses owned by the company tended to break down regularly. Absence of air conditioning in a climate such as New Orleans' in the summer can make bus travel quite unpleasant. An effort was therefore made to repair the AC units as quickly as possible -- a

process that made it difficult to maintain scheduled service frequency. Reliability was also affected by other problems.

One measure of the effects of relatively low reliability of transit service is the waiting time encountered by bus riders. For the BUCAT users, we have seen that this waiting time averaged between 5 and 10 minutes. For all bus riders, the distribution across different waiting time ranges for the two surveys in Spring 1977 and Fall 1978 is shown in Table 3-2. While there are some differences between the two waiting time distributions, they are not significant in the statistical sense ($\chi^2 = 2.69$ with 3 degrees of freedom). The distributions imply an average waiting time of 15 and 16 minutes, respectively. For a scheduled 30-minute headway, the typical case, this value would also hold for passengers who arrive randomly at the bus stop, without any knowledge of the schedule. Since many of the bus riders in the St. Bernard Parish are regular users, as discussed in the next section, the relatively long waiting times are attributable to deviations from the schedule.

Given this situation, it is not surprising that the biggest complaint of bus users is the unreliable service. In both surveys, the respondents provided comments on bus operations. The lack of schedule adherence was cited most often as a short-coming of the system.

On a more positive note, the size of the operation and the fact that many of the patrons are regular riders introduces a personal element into the transit service. This element definitely contributes to service quality, as reflected in the comments of users.

Table 3-3 shows the breakdown of total costs of bus operations for the last full calendar year of the demonstration (1978). The categories were established in the contract between the Parish and the bus company, which determined the allocation of overhead items to bus and taxicab operations.

Table 3-2
WAITING TIME FOR BUSES

Waiting Time in Minutes	Spring 1977	Fall 1978
0 - 9	41%	43%
10 - 19	23	28
20 - 29	14	11
30+	22	18
Average waiting time	16.2	14.9
(Number of respondents)	(415)	(219)

Table 3-3
BUS OPERATING COSTS FOR 1978

Category	Expenditures	As Percent of Total
Drivers' salaries	\$20,676	18.1%
Management	20,172	17.7
Maintenance and repairs	18,108	15.9
Supervision	16,466	14.4
Fuel	11,873	10.4
Shop expenditures	11,728	10.3
Dispatching	4,737	4.2
BUCAT payments to taxicab drivers	4,656	4.1
Rent and utilities	3,402	3.0
Insurance	1,614	1.4
Miscellaneous	718	.7

The category of drivers' wages accounts for the highest percentage, followed by management and supervision. Maintenance and repair and shop expenditures together account for over one-fourth of the total bus costs. Another significant cost item is fuel, which accounts for more than 10 percent of the total.

BUCAT Operations

Since BUCAT operations are an integral part of the ongoing taxicab business, it is difficult to isolate the service and cost characteristics of this part of public transportation in the St. Bernard Parish. In terms of total ridership, the BUCAT service amounts to about 10 percent of regular taxicab service. Aside from the subsidies per trip which have been discussed above, there is no indication that BUCAT trips result in operating costs that are different from those for regular taxicab service.

INTRODUCTION

Aside from questions of administrative feasibility and appropriate management techniques, the central concern of the analysis of the St. Bernard taxi feeder demonstration project is the response by users of public transportation. What is the level of demand for taxi feeder trips? Has the introduction of this kind of service had any effects on transit ridership? On taxicab ridership? These are the types of questions that would be of interest to any operator considering the introduction of integrated feeder services. Of similar interest are trip and user characteristics.

The history and the setting of the demonstration project make a direct assessment of the effects of the feeder service on taxicab and bus ridership difficult. As it turned out, there were few variations of the feeder service during the demonstration period. An expansion of the service area finally became reality in the last six months covered here. Data for the period preceding the introduction of the BUCAT service are limited to aggregate monthly ridership figures. Even so, an analysis of the available time series data, together with an examination of the survey data collected during the demonstration project, does allow for some interpretive conclusions about the effects of the service on ridership and related performance indicators for public transportation.

The discussion in this section focuses first on the changes in total ridership for taxicabs and buses over time. This analysis relies on the

available time series data. The discussion then proceeds to a description of the trip characteristics on taxicabs and transit buses, before turning to a sketch of the user characteristics for these two public transportation modes. This portion of the analysis uses primarily data from the user surveys conducted in the spring of 1977 and the fall of 1978. Data from the household interviews -- virtually all non-users -- highlight the major characteristics of patrons of public transportation in the St. Bernard Parish. These data are also used in assessing the efficacy of advertising and public relations work for the BUCAT service. The data base for the description of trip characteristics also includes detailed driver manifest data for five sample weeks over the duration of the demonstration project.

The section concludes with an attempt to assess the impacts of the taxi feeder service on the level and composition of ridership for both taxicabs and transit. The available evidence suggests that these impacts are marginal. In this particular setting, the BUCAT service was primarily a promotional tool that may have helped the image of public transportation overall, with some possible attendant effects on ridership. Its actual use, though, has been largely limited to a small group of regular riders.

TOTAL RIDERSHIP TRENDS

The time series examined here have been compiled from the operating statistics of the taxicab and bus companies. Data for taxicab ridership come from the dispatcher's log, while bus ridership is based on drivers' reports. While there may be some inaccuracies,* the overall reliability of these data appears to be quite acceptable. There are no indications of systematic bias.

* One known source of inaccuracies for the total number of taxicab trips is the method used prior to July 1977, which involved multiplying the number of pages of the dispatcher's log by an average number of trips per page.

Taxicab Ridership

The development of taxicab ridership between October 1971 and December 1978 is shown in Figure 4-1. Over the entire period, ridership declined at an average annual rate of 1.25 percent, from a monthly level of 7,262 in October 1971 to 6,629 in December 1978. The average of the decline over the seven-year period, though, obscures the patterns of change over time. These patterns become somewhat clearer after some smoothing of the time series data. The solid line in Figure 4-2 shows three-month moving averages; the broken line shows the hypothetical ridership figures obtained by factoring out systematic monthly variations (dividing the raw data by the index figure for the corresponding month).

It is possible to distinguish four major phases. The first phase, from October 1971 to October 1972, is characterized by a steady increase in ridership, by 17 percent. This phase is followed by a slight decline over the next two years, characterized by substantial seasonal fluctuations. It should be noted that these seasonal variations, particularly apparent in the three-month moving averages, are not consistent over the years. In 1972/73, the peak occurs in December 1972, while it is much later in 1973/74.

Following the relatively stable period with seasonal fluctuations, there is a steady drop in ridership over the period January 1975 to late 1977, interrupted by a seasonal peaking in the winter of 1975-76, and a smaller peak in the winter of 1976-77. The last phase, from October 1977 through the end of the period examined here, exhibits a steady increase in ridership. While part of this increase is accounted for by the seasonal peaking in the winter of 1978, as indicated by the lower values for the seasonally adjusted data, it must be compared to the virtual absence of seasonal peaking in the two preceding years. The growth in taxicab ridership over the last fifteen months of

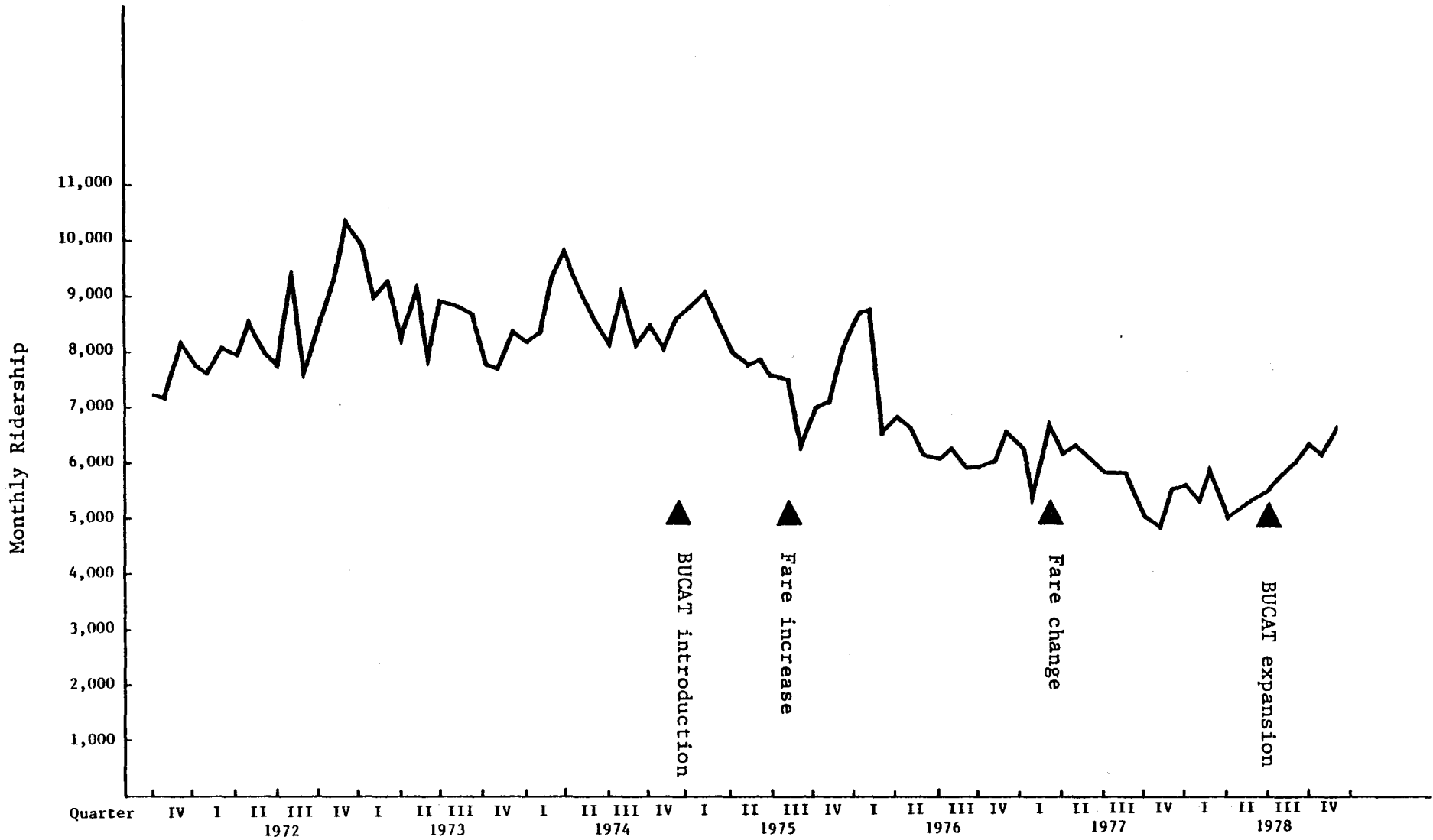


Figure 4-1. Monthly Taxicab Ridership

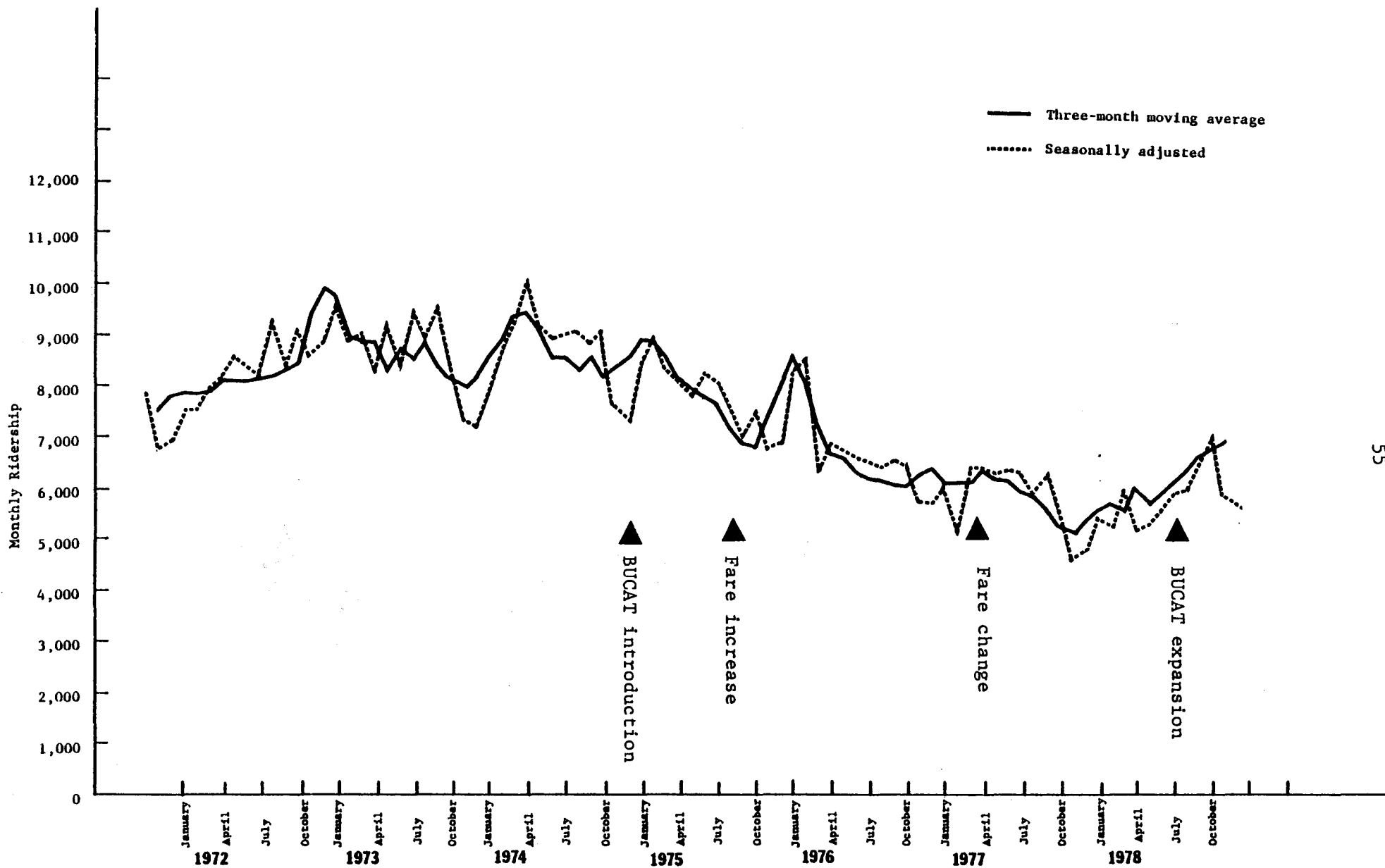


Figure 4-2. Taxicab Ridership (Adjusted Data)

the period examined therefore appears to constitute a reversal of the downward trend that shaped the preceding years.

The changing trends in taxicab ridership over time can also be sketched in terms of the annual growth rates. Table 4-1 shows the percentage change for each year, calculated by comparing the ridership for December of that year with that for December of the preceding year. Ridership increased initially at a rapid rate and declined subsequently, holding steady only in 1974. In 1978, the consistent decrease over the preceding years is reversed, resulting in a 19 percent increase between December 1977 and December 1978.

The patterns are also reflected in different form in the average monthly ridership figures for each year. The average increased over the first three years, dropped substantially between 1974 and 1977, and stayed the same between 1977 and 1978.

Is there any indication that changes in service or fare policies have affected ridership? Four events are identified in Figures 4-1 and 4-2. The introduction of the BUCAT service in 1974 and its expansion in 1978 are associated with increases in ridership. Using the data adjusted for seasonal variations (in Figure 4-2), we see a substantial jump between December 1974 and January 1975. This increase, which occurs on top of the usual winter peak in taxicab ridership, can be attributed at least in part to the introduction of BUCAT service with its attendant publicity.

Whether the expansion of the BUCAT service area in June 1978 had any effect on overall taxicab ridership is questionable. The increase in the seasonally adjusted ridership figures was moderate and not out of line with the upward trend at that time. It should be noted, though, that the expansion of the service area was not accompanied by much fanfare, since budget constraints prevented advertising and other marketing efforts.

Table 4-1

Annual Growth Rates and Averages for Bus Ridership

Year	Growth Rate*	Average Monthly Ridership
1972	26.2	8,400
1973	-18.3	8,680
1974	2.2	8,715
1975	-6.3	7,840
1976	-17.0	6,754
1977	-17.0	5,809
1978	18.8	5,811

* Percentage difference between ridership for December of respective year and that for December of preceding year.

The evidence for the effects of the two fare changes is inconclusive. In both cases, the relative magnitude of the change varied with the distance traveled. The first fare change, in August 1975, was the more drastic one. Raising the drop charge from 50¢ to \$1, leaving the mileage charge at 50¢, increased the cost of a 2-mile trip by 50 percent. As Table 4-2 shows, the fare impact declined with increasing distance. However, even for a 5-mile trip, the actual fare still went up by 20 percent, from \$2.50 to \$3.00.

While the first fare change hit short trips particularly hard, the second fare change in March 1977 reversed the direction of impact. In fact, fares for shorter trips declined. For a two-mile trip, the fare decreased by 13.3 percent. There was no change for a trip of average length,* while a 5-mile trip cost 3.3 percent more than before.

Inspection of the time series suggests that the first fare change was associated with a decrease in monthly ridership by 7.2 percent (for the seasonally adjusted data). However, this decrease occurred at the end of a three-month downward movement with monthly rates of change of -2.9 and -6.0 percent for the two preceding months. It is therefore difficult to attribute the decline between August and September 1975 to the fare increase, at least in its entirety. It is likely that it did contribute to the change, though. In any case, the ridership recovered fairly quickly for January and February 1976, even after the usual seasonal effect is accounted for, before it dropped substantially in March.**

It is difficult to detect any impact of the second fare change. Given the magnitude of the change, it would be unreasonable to expect any significant

* The average trip length was computed from driver manifest data, discussed further below.

** It is possible that the impact of the fare change was delayed by an extended Mardi Gras season. In 1976, Ash Wednesday fell on March 3, as compared to February 12 in 1975.

Table 4-2
Percentage Taxicab Fare Changes for Selected Trip Lengths

Trip Length (Miles)	Percent Change August 1975	Percent Change March 1977
2.0	50.0%	-13.3%
3.6 (average)	27.7	0.0
5.0	20.0	3.3

variations in ridership in any case. Aggregate ridership figures would only show the net effects of increases in shorter trips and decreases in longer trips in response to the fare changes.

The quantitative evidence thus suggests that the responses to significant service and fare changes were as would be expected, even though it is not possible to determine the magnitude of either short or long term changes in ridership induced by these management actions.

Bus Ridership

The time series for bus ridership for the two routes, St. Bernard Highway and Judge Perez Drive, and for the express service to New Orleans are shown graphically in Figure 4-3. The graph also shows the total monthly ridership for the St. Bernard Bus Company for the five-year period 1974 through 1978.

Total ridership over the first three years is characterized by pronounced fluctuations. It reached its peak in the spring of 1975, when a strike on the New Orleans bus system brought an influx of passengers for the express service to New Orleans (known as the Canal Street Express after its destination in New Orleans). The service levels needed to accommodate this demand resulted in lower service levels on other routes, particularly the St. Bernard Highway, resulting in a drop in ridership.

The previous peak had occurred in the spring of 1974, with increases observed for both the St. Bernard Highway and the Judge Perez routes. Ridership subsequently declined, mostly on the Judge Perez route, until the New Orleans transit strike led to the peaking in early 1975. This peak was followed by a gradual decline, with seasonal fluctuations throughout the latter part of 1975. The next year experienced a gradual climb back to a level of about 10,000 passengers in late summer. This recovery was largely fueled by increases on the Judge Perez and the Canal Street Express routes. When service on these

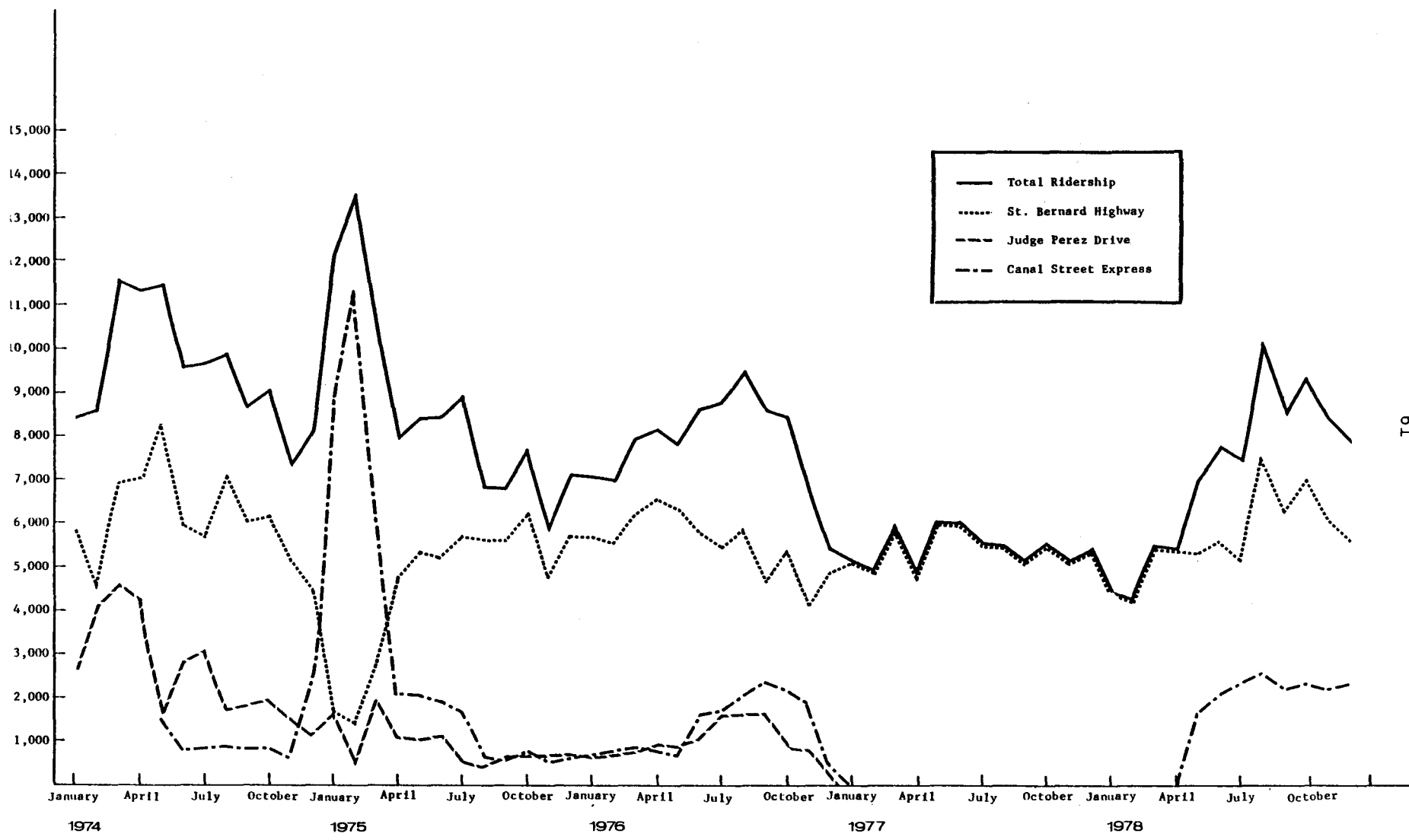


Figure 4-3. Bus Ridership in St. Bernard Parish

two routes was discontinued in late 1976, total ridership dropped precipitously, since ridership on the St. Bernard Highway route increased only marginally.

The interpretation of the time series data on bus ridership illustrates the effects of service policies. Major shifts in patronage can typically be attributed to changes in service levels. For example, the initial increase in ridership on the Judge Perez Drive route in early 1974 was at least partly attributable to the addition of a second bus which reduced headways from one hour to 30 minutes. When this bus was removed, ridership dropped continuously until May 1976.

However, there are no service improvements that would account for the bump in the time series for the Canal Street Express and the Judge Perez Drive in the last few months preceding the discontinuation of these services. The increase was significant: between May and June 1976, ridership on the Canal Street Express increased from 690 to 1690, while ridership on the Judge Perez Drive route went from 784 to 1116 (and 1613 in July).

Even so, variations in service levels appear to be one important determinant of bus ridership trends. The only fare increase (November 1977) appears to have affected ridership only temporarily, if at all. Determining its exact impact is difficult, because the fare increase (by 25 percent on the average) coincided with the seasonal winter slump in ridership. Given the characteristics of the typical bus user, discussed further below, a marginal response to changes in fares would be expected. While most of the riders belong to lower income groups, they are typically transit dependent. The price elasticity of their demand for transit services is therefore low, at least under certain threshold values for the fares.

Improvements in service also account for much of the increase in transit ridership, particularly the resumption of service on the Canal Street Express.

BUCAT Ridership

Figure 4-4 shows the development of the taxicab feeder ridership since October 1974. Over the first twelve months, monthly ridership grew rapidly from under 100 to a peak of over 1,200 users. While ridership fluctuated considerably it remained at a high level until July 1976, when it dropped from over 1,000 to less than 700. The reasons for this drop are unclear, particularly since bus ridership during this period picked up somewhat, at least on the Judge Perez Drive and the Canal Street Express (see Figure 4-3).

BUCAT ridership subsequently stabilized at an average of about 600 per month over the next two years. While there was some fluctuation, it appears that a level of about 500 formed the floor for BUCAT ridership.

June 1978 brought the lowering of BUCAT fares to 25¢ (plus the additional bus zone charges) and the expansion of service to areas 1 and 4. The lower fare and improved service level is reflected in an increase in ridership over the period June to August. After August, ridership declines back to about 700 by December 1978. The increase in ridership and subsequent decline mirrors the development of bus ridership in the last half of 1978, as illustrated in Figure 4-3. Since the service and fare changes occurred together, it is impossible to estimate any elasticities from the available information.

TRIP CHARACTERISTICS

Data needed to describe the characteristics of trips undertaken on the two public transportation modes in the St. Bernard Parish come from two sources. First, the user surveys for bus and taxicab riders conducted in the spring of 1977 and in the fall of 1978 provide data on each trip and its relationship to general travel patterns of the respondents. Secondly, the manifests maintained by the taxicab drivers provide useful information on each trip. Drivers were

Monthly Ridership

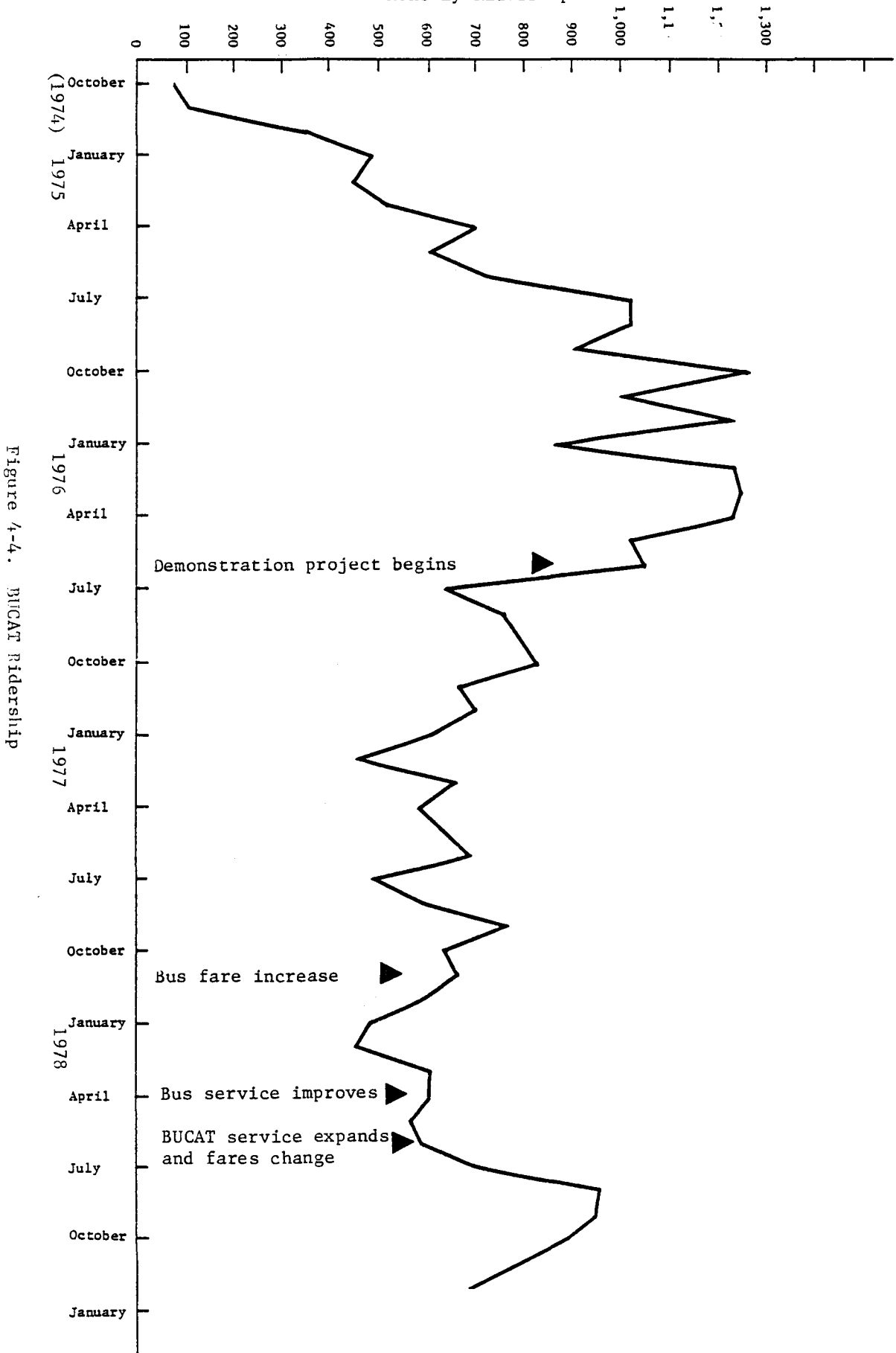


Figure 4-4. BUCAT Ridership

asked to be especially careful in maintaining these records during five sample weeks, in January and April of 1977 and 1978, and in August 1978. Thus, the data base includes relatively detailed data for all taxicab trips during these five sample weeks.

Taxicab Trips

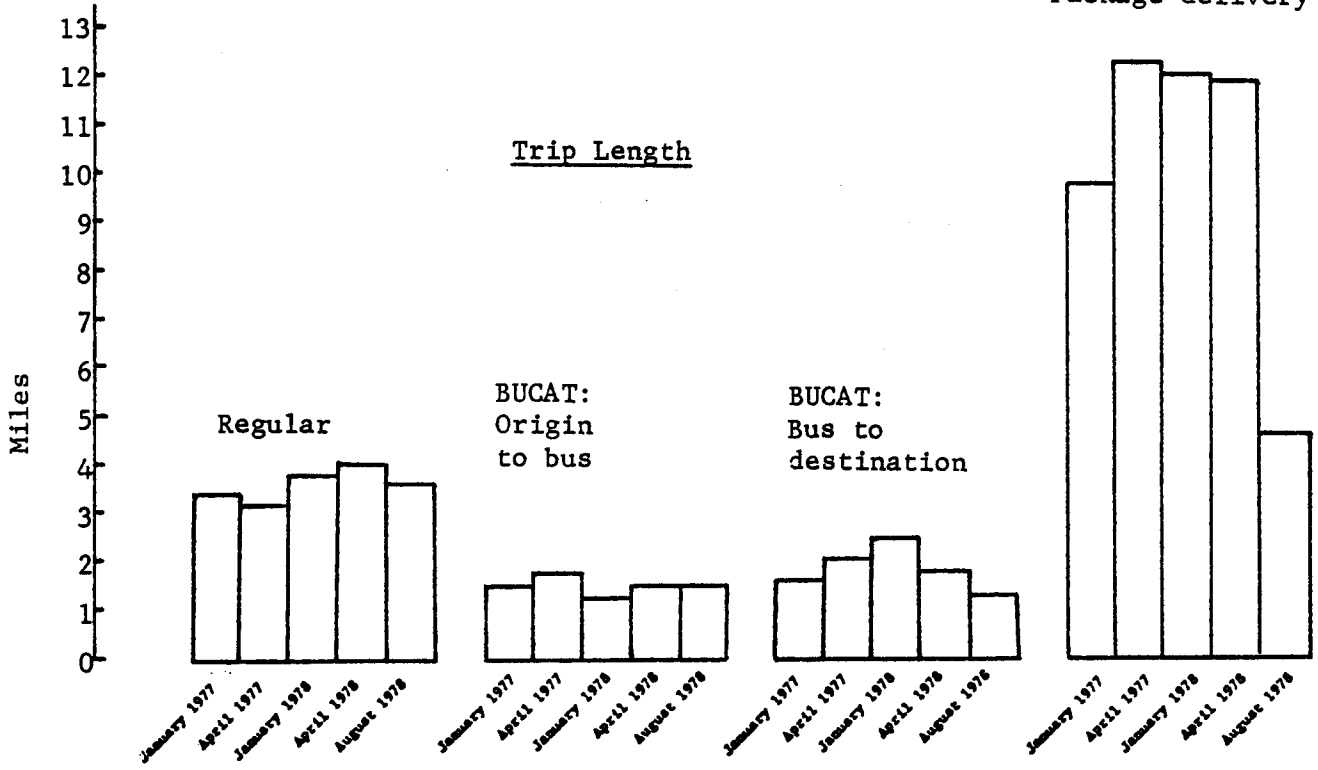
Figure 4-5 shows the trip length and the fare for each taxicab trip for the five sample weeks and for the four trip categories, regular taxicab trips, BUCAT trips from the home to the bus stop, BUCAT trips from the bus stop to the final destination, and package trips.

With respect to trip length, the data suggest little change over time for regular taxi trips. The typical trip is between 3 and 4 miles long. The comparison of the average trip length for January and April 1977 illustrates the effects of the fare change in March 1977, which reduced fares for shorter trips. The average trip length for regular trips decreases. It subsequently increases again to the 1978 levels.

There is relatively little change in the trip length for home-to-bus BUCAT trips, which cover $1\frac{1}{2}$ miles on the average. Only two of the sample weeks deviated from this average, April 1977 and January 1978. There are no obvious explanations for these variations. Changes over time are more pronounced for the bus-to-home BUCAT trips which increase initially from 1.7 miles in January 1977 to 2.5 miles in January 1978. However, by August 1978 the average trip length for this category had decreased to 1.3 miles, less than that for home-to-bus feeder trips.

The trip lengths for package delivery trips are shown primarily for the sake of completeness. The average trip length for these trips exceeds that of passenger trips substantially. The sharp drop between April and August 1978 is attributable to the fact that taxicabs now only handle those package deliveries

Package delivery



Package delivery

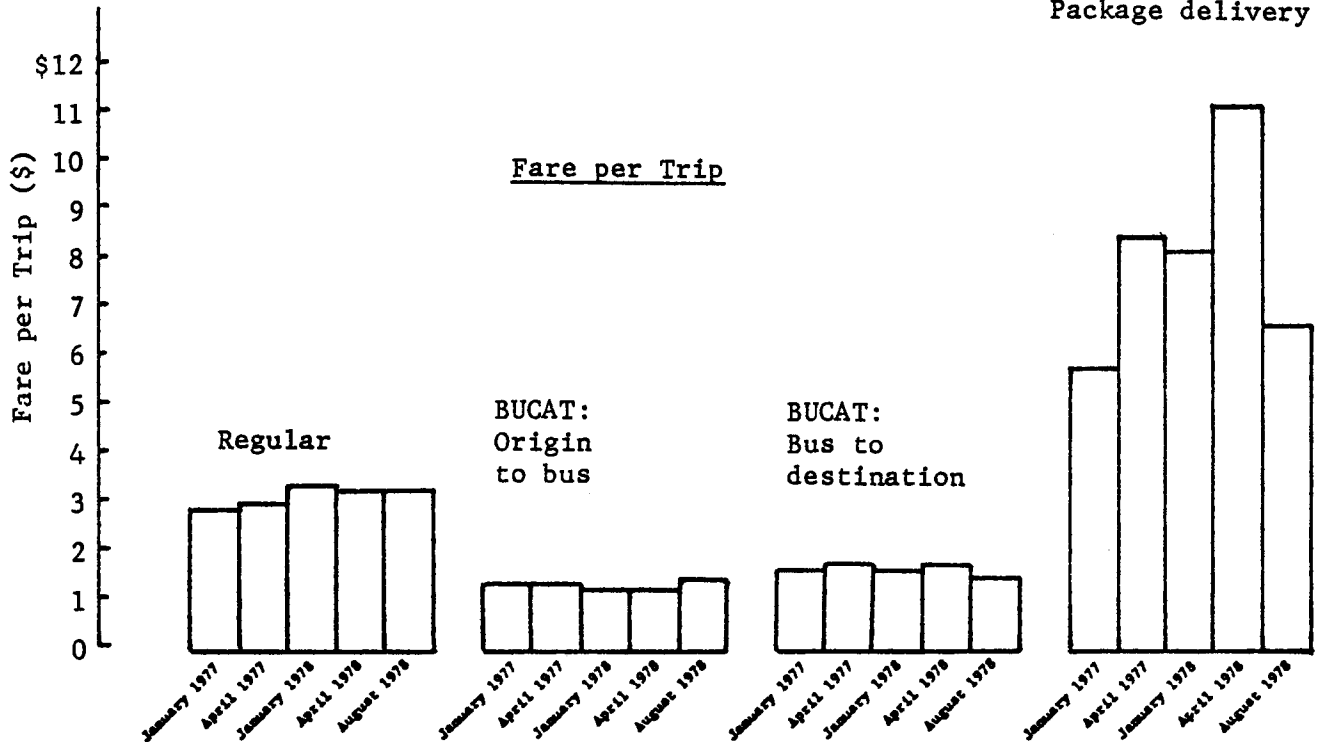


Figure 4-5. Taxicab Trip Lengths and Fares

that exceed the capacity of the newly established package delivery service, the Arabi Industrial Package Company, which is linked to the taxicab company. Taxicabs are usually given the shorter deliveries when the package service vehicles are not available.

Fares per trip can change as a result of three factors: changes in the fare structure, variations in trip length, and differences in the number of passengers carried. Four of the five sample weeks have the same fare structure that was introduced in March 1977. The number of passengers per trip is shown in the bottom portion of Figure 4-6. For regular taxicab trips, there was virtually no change over the period January 1977 to April 1978; only August 1978 shows a slight increase (from 1.3 to 1.4). Thus, differences in vehicle occupancy do not play a role in determining variations of the fare per trip.

The effect of the fare change in March 1977 is apparent in the comparison of the fare per trip for January 1977 and April of that year. While the average trip length decreased, the fare per trip increased slightly. After that, the fare increased pretty much with the average trip length. This pattern is further illustrated in the top portion of Figure 4-6, which shows the fare per mile. There is very little variation in this figure. The fare per mile varies between \$1.10 and \$1.17 for four of the five weeks; it increases to \$1.30 for August 1978, which also experiences an increase in the average number of passengers.

The fare for the BUCAT trips has been calculated as the full revenue equivalent, that is, a single BUCAT trip by one person was assumed to cost \$1.00, regardless of the actual fare paid (50¢ or 25¢). This approach was taken to factor out the effects of the subsidy paid by the taxicab and bus companies, respectively. For the home-to-bus BUCAT trips, we obtain average fares between \$1.15 and \$1.40. While there is not much variation, there is some indication that the average occupancy initially increased slightly and dropped subsequently

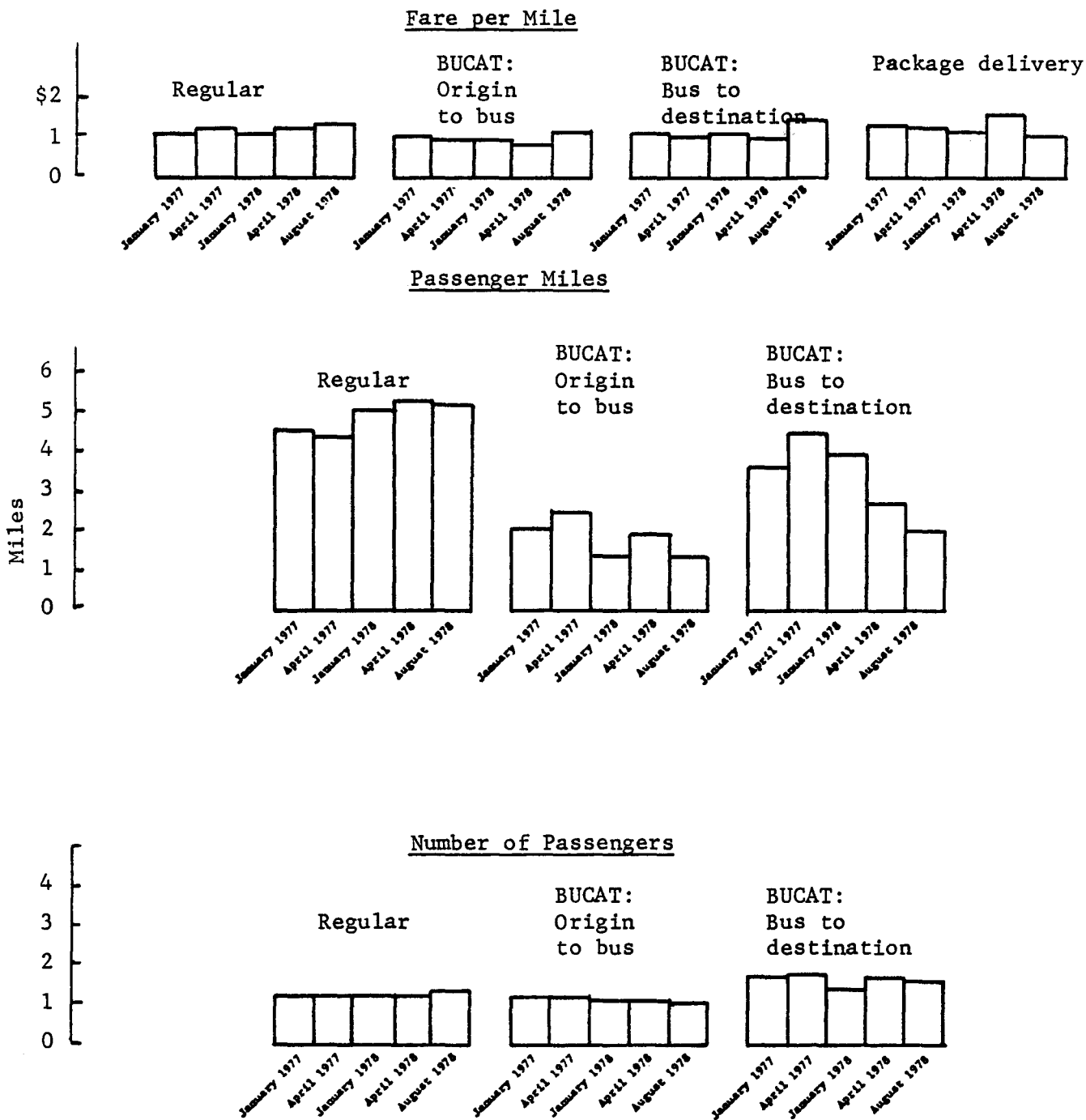


Figure 4-6. Taxicab Trip Characteristics

for the two early 1978 sample periods. It increased again for the August 1978 week.*

The fare per trip for the bus-to-home BUCAT trips is significantly higher than for trips in the other direction. This difference is due to the higher vehicle occupancy that can be obtained by grouping bus passengers for the BUCAT trip. As indicated in the bottom part of Figure 4-6, the average number of passengers per trip is substantially higher for the bus-to-home trips. While the home-to-bus trips show an average occupancy figure of between 1.1 and 1.3, the corresponding values for the bus-to-home trip range from 1.4 to almost 1.8. Generally, they are also substantially higher than the occupancy figures for regular taxi trips.

A crude measure of the profitability of different types of trips is the total fare received per mile traveled. For regular taxi trips, this measure stayed fairly constant over the first four sample periods. It increased for August 1978 as a result of the increase in average vehicle occupancy. For both types of BUCAT trips, there is a downward trend over the first four sample periods, followed by a substantial jump in the fare per mile for August 1978. This increase, attributable to higher occupancy levels, is presumably a result of the lower fare and improved service introduced in June 1978. The discussion above has shown that BUCAT ridership overall increased in response to these changes. This increase appears to have been accompanied by an improvement of the productivity of the BUCAT feeder service.

The improvement in productivity yielded the highest fare per mile for the bus-to-home BUCAT trips of all types of passenger trips. This result is significant, since it illustrates the potential of the taxi feeder service in improving productivity for the taxicab company.

* The relative movement may not be reflected in the average number of passengers because of missing observations and marginally different observation sets.

Table 4-3 shows the distribution of trips across purposes for the spring 1977 and fall 1978 user surveys. Most of the trips (30 and 28 percent) were work trips. Shopping, medical and social/recreational trips account for up to 20 percent of the total each. There appears to have been a decrease in the share of medical trips from 18 to 10 percent, and a corresponding increase in that for social/recreational trips. This change implies an increase in the number of discretionary trips as a percentage of the total. The change also makes the two distributions significantly different (at the 95% confidence level).

There are also significant differences between spring 1977 and fall 1978 in the distribution across alternative modes for the taxicab trip. In both surveys, almost one-third of the respondents indicated that they would not have made the trip, if a taxicab had not been available. The percentage of passengers who could have been driven by somebody else decreased from 28 to 23 percent, while that of those who would have walked increased slightly. The New Orleans bus system declined substantially as an alternative mode, while both the St. Bernard bus system and the private car became more important. (The two distributions are significantly different at the 5 percent confidence level.)

Operating data of the taxicab company provide some insight into systematic variations of taxicab ridership by day of week and by week of month. For the five months used as sample periods for the driver manifest data, the average ridership figures by day of week and by week of month are shown in Figures 4-7 and 4-8, respectively. The day-of-week patterns pretty much confirm the usual assumptions, with demand increasing from Monday to Friday, dropping off for Saturday, and falling sharply for Sunday. The ridership patterns by week of month reflect the influence of demand patterns for the population, with ridership highest in week 1, and decreasing steadily toward the end of the month.

Table 4-3

Trip Purposes for Taxicab Riders

Trip Purpose	Spring 1977 Survey	Fall 1978 Survey
Work	30%	28%
Shopping	19	17
Medical	18	10
Social/Recreational	10	20
School	3	3
Other	20	22

Table 4-4

Alternative Mode for Taxicab Trip

Alternative	Spring 1977 Survey	Fall 1978 Survey
Ride automobile as passenger	28%	23%
Walk	19	22
Ride St. Bernard bus	11	16
Ride New Orleans bus	11	2
Drive automobile	2	6
Forego trip	30	31

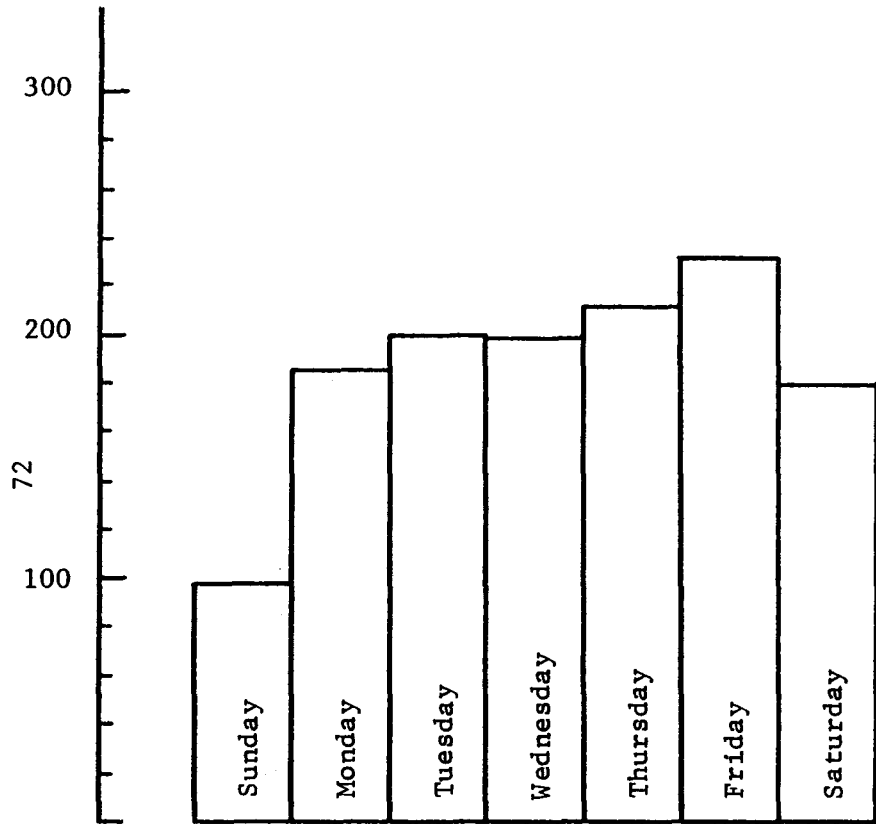


Figure 4-7.
Taxicab Ridership by Day of Week

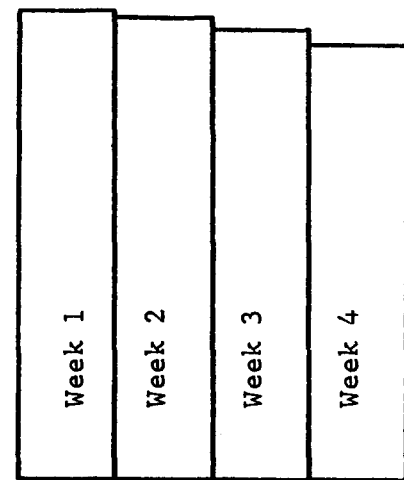


Figure 4-8.
Taxicab Ridership by Week of Month

Bus Trips

Data on individual bus trip characteristics are limited to the results of three surveys. Two of these surveys included all bus riders and the BUCAT users among them; they were conducted in the spring of 1977 and the fall of 1978. A third survey, conducted in the spring of 1978, focused on patrons of the Canal Street Express. During the same period, a survey of users of the taxi feeder service was carried out.*

Table 4-5 shows the distribution of respondents across the different modes used to get to the bus and to get from the bus to their final destination. Walking is clearly the dominant mode, both for getting to the bus, and for the trip from the bus stop to the final destination. For the regular bus service, the importance of walking as an access mode has increased between spring 1977 and fall 1978, accounting for almost three-fifths of the total. As we already observed in connection with the taxicab data, the New Orleans bus system appears to become less important, while driving to the bus stop and the use of the BUCAT service have increased their shares. For the Canal Street Express, a significant portion of the bus users are driven to the bus stop.

For getting from the bus stop to the final destination, bus riders tend to rely less on walking in the fall of 1978 than in the spring of 1977. There seems to be a significant growth in the use of BUCAT services, from a negligible share in the spring of 1977 to one-tenth of the total in 1978. Express bus riders differ from those of the regular bus in their greater reliance on driving their own car to their final destination; they are less likely to use a New Orleans bus to continue their trip.

* The sample size of 415 for the first survey (spring 1977) included 40 BUCAT patrons; in the fall of 1978, the total sample size was 226, including 25 BUCAT users. The survey of express bus riders covered 64 respondents, and there were 25 BUCAT users in the spring 1978 survey. The small sample sizes in the spring 1978 surveys should be considered in interpreting their results.

Table 4-5
Access Mode to Bus Stop and Mode to Final Destination

Mode	Access Mode			Mode to Final Destination		
	Spring 1977	Spring 1978	Fall 1978	Spring 1977	Spring 1978	Fall 1978
Walk	48%	72%	58%	72%	69%	61%
New Orleans bus	42	*	26	20	3	18
Automobile (passenger)	8	17	9	5	9	10
Automobile (driver)	*	*	5	1	8	1
BUCAT	1	*	2	*	3	10
Regular taxicab	*	6	*	1	6	*

* 0.5 percent or less

Note: Spring 1978 survey for Canal Street Express bus riders only

Table 4-6
Trip Purpose for Bus Riders

Trip Purpose	Regular Bus		Canal Street Express
	Spring 1977	Fall 1978	Spring 1978
Work	34%	48%	86%
Shop	17	13	2
Social/Recreational	16	11	2
School	15	5	0
Medical	6	14	3
Other	11	10	6

The distribution of the bus ridership interviewed in the surveys across different trip purposes is shown in Table 4-6. In all three surveys, the dominant purpose is work travel. For the regular bus service, the share of work trips in the total has increased from one-third in the spring of 1977 to almost one-half in the fall of 1978. This increase has been accompanied by decreases in the shares of shopping and social/recreational trips, and, in particular, school trips. In contrast, the share of trips for medical purposes more than doubled from its 1977 level of 6 percent.

For the express bus riders, work trips account for the vast majority of the total. Since the service is designed to serve work trips to the New Orleans CBD and back to St. Bernard Parish, this result is to be expected.

The limited mobility of St. Bernard transit users is illustrated by their indications of their alternatives to the bus trip in Table 4-7. Less than 10 percent could have driven their own car. One-fourth could not have made the trip, while 56 percent would have depended on somebody else to give them a ride. The importance of different alternative modes varies somewhat with trip purpose. For work trips, 79 percent would be made by some other mode, while the option of not making the trip becomes more important for more discretionary trips, such as shopping with 36 percent fewer trips in the absence of the St. Bernard bus system.

BUCAT Trips

Many of the characteristics of BUCAT trips have already been described in the context of the analysis of taxicab and bus trips above. Table 4-8 complements this description by showing the alternatives to the BUCAT trip for getting from the original location to the bus stop, or from the bus stop to the final destination. A surprisingly high percentage of respondents indicate that they would be driven by somebody else, while between one-fifth and one-third would

Table 4-7

Alternative Mode for Bus Trip by Trip Purpose
(Fall 1978)

Alternative	Trip Purpose						Total
	Work	Shop	Medi- cal	Social/ Recr.	School	Other	
Automobile (passenger)	25%	6%	9%	6%	3%	8%	56%
Automobile (driver)	5	1	*	2	*	*	9
Walking	2	1	*	*	*	*	5
Taxicab	3	*	*	*	*	*	5
No trip	9	5	3	4	2	2	25
Total	43	14	16	11	5	11	100

* = 0.5 percent or less; sample slightly different from that in Table 4-6 because of missing observations for alternative mode (n = 193)

Table 4-8

Alternative to BUCAT Trip

Alternative	Spring 1977	Spring 1978	Fall 1978
Walking	25%	20%	32%
Automobile (passenger)	40	56	48
Automobile (driver)	0	0	8
No trip	35	24	12

walk. The percentage of respondents who stated that they would not have made the trip if the BUCAT service were not available decreased from 35 percent in the spring of 1977 to 12 percent by fall 1978, a significant decline (at the 95 percent confidence level). This difference may be in part attributable to the inclusion of BUCAT users from areas that had benefited from the service only for a fairly short period of time.

USER CHARACTERISTICS AND SATISFACTION

The surveys conducted in 1977 and 1978 provide a description of the characteristics of users of public transportation in the St. Bernard Parish, their useage patterns, and their opinions of the services provided. Some attempt was also made to assess the degree to which non-users knew about existing options, particularly the BUCAT service.

Overall, public transportation users tend to come from the group of the transit dependent -- female, from a lower socioeconomic background, with limited access to an automobile. Users tend to be satisfied with the regular taxicab service and the BUCAT option. However, there is some dissatisfaction with the reliability of the transit service. The taxi feeder service is fairly well known among non-users, with most of them having learned about it in the newspaper.

User Background

The majority of public transportation users is female. In the fall of 1978, 80 percent of all taxicab and BUCAT users were female, and 70 percent of the bus riders. These percentages have remained fairly stable since early 1977, with the highest proportion of women among BUCAT riders and the lowest among bus patrons.

The major socioeconomic characteristics of taxicab and bus riders are shown graphically in Figures 4-9 and 4-10. (Similar characteristics for the general population are presented in Figure 2-2.) In terms of the income distribution, there has been an apparent shift toward the higher income categories. While part of the change can be attributed to inflation, there is reason to believe that the users of public transportation are financially better off. For the taxicab users, the average family income (computed by using class mid-points) increased between spring 1977 and fall 1978 at an annual rate of 26.6 percent -- substantially above the rate of inflation. The corresponding figure for the income of bus riders was 23.4 percent. Even though these figures in fact suggest a qualitative shift in the background of public transportation users, the data are insufficient to confirm this impression.

There have been few changes in the distribution of users across household size categories, with the exception of an increase in one-person households, accompanied by a corresponding decrease in the share of two-person households. Such a shift would appear to be in line with national trends.

With respect to car ownership, comparative data for the two survey periods are only available for taxicab users. For them, there has been a shift toward more cars per household between 1977 and 1978. It is interesting to note that for the spring of 1977, the average car ownership was slightly higher for bus than for taxicab users. While the percentage of households without cars was about the same for the two types of riders, there was a higher proportion of households with two or more automobiles among bus users. Combining this finding with the other data suggests that taxicab users may be slightly more dependent on public transportation than transit riders; the differences are small, but consistent. In 1978, 19 percent of the bus patrons indicated that they could have driven themselves instead of taking the bus. That is a fairly high percentage.

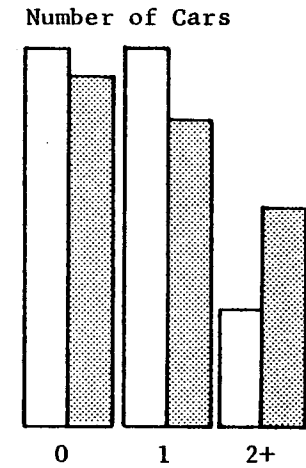
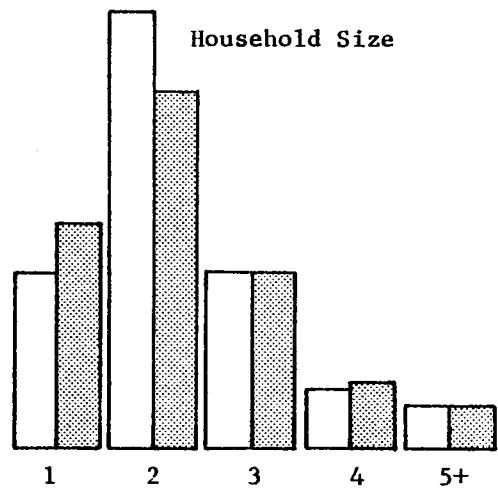
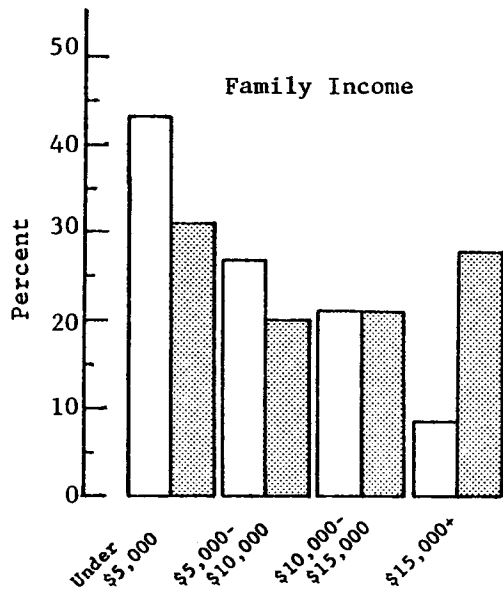


Figure 4-9 Characteristics of Taxicab Users

□ Spring 1977
 ■ Fall 1978

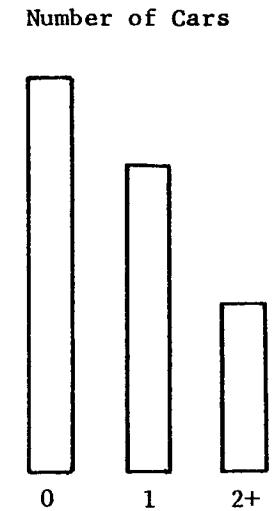
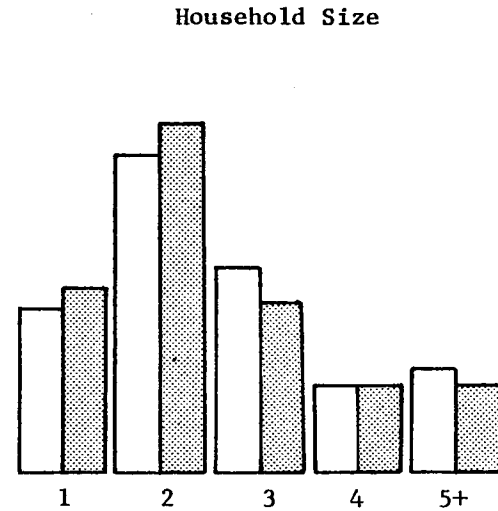
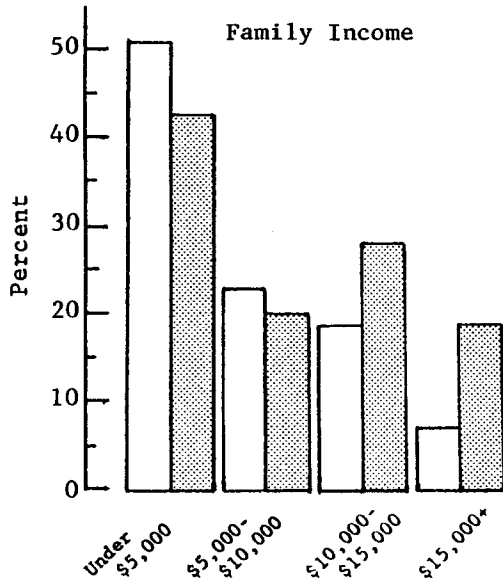


Figure 4-10: Characteristics of Bus Users

(Not asked in 1978)

The analysis above has shown that the percentage of work trips in the bus total has increased between 1977 and 1978 (from 34 to 48 percent, as shown in Table 4-6), while it has remained about the same for taxicabs (30 vs. 28 percent). We would therefore expect that bus use would tend to be more regular. This expectation is confirmed by the available data, as shown in Tables 4-9 and 4-10. Among bus riders, the percentage of respondents who used the bus five times per week or more increased from 32 percent in the spring of 1977 to 37 percent by fall 1978. For BUCAT users, the corresponding percentage of steady riders increased from 25 percent to 36 percent. The BUCAT user data suggest that much of this increase may have occurred in 1978, because the percentage in the spring of 1978 was about the same as in early 1977.

By comparison, the percentage of taxicab users who indicated that they take the cab more than five times per week decreased from 14 percent in the spring of 1977 to 10 percent in the fall of 1978. Incidental useage also seems to have decreased: in 1977, only 27 percent indicated that they were using the taxicab "rarely," while that proportion had increased to 43 percent in 1978.

Taxicab users thus seem to depend more on public transportation, but are using it on a more "as-needed" basis than bus riders who include a higher percentage of choice riders and who tend to use the bus more for regularly scheduled trips. The increase in the proportion of steady users for buses and BUCATs may explain in part the increase in overall ridership for these services observed in 1978.

Bus and BUCAT users tend to become regulars. Table 4-11 shows how long respondents to the surveys have been using these two types of services. For buses, about 70 percent (both in 1977 and in 1978) had been riding the bus for two years or more. There had been an increase in the proportion of bus riders

Table 4-9

Frequency of Use for Taxicabs
(for Current Users)

Frequency of Use	Spring 1977	Fall 1978
Rarely	27%	43%
2 - 5 times per week	59	47
6 - 9 times per week	8	8
10 or more times per week	6	2

Table 4-10

Frequency of Use for Buses and BUCAT
(for Current Users)

Frequency of Use	Buses		BUCAT		
	1977	1978	1977	1978 (Sp.)	1978 (F)
Occasionally	23%	18%	0%	0%	20%
1-2 times per week	25	23	52	36	28
3-4 times per week	20	22	23	40	16
5 or more times per week	32	37	25	24	36

Table 4-11

Length of Use of Public Transportation Services

Have Used Mode for	Buses		BUCAT		
	1977	1978	1977	1978 (Sp.)	1978 (F)
Less than 6 months	9%	15%	27%	40%	30%
6 months - 1 year	6	6	18	4	20
1 - 2 years	14	10	25	8	12
2 years or more	71	69	30	48	48

relatively new to the system, with a ridership history of less than six months. This change would indicate that the transit system's ridership increase in 1978 can also be attributed to its ability to attract new riders. Changes in the distribution of BUCAT riders across these categories are limited to a decline in the proportion of users who have been using the service for one to two years, accompanied by an increase in the percentage for those in the over-two years category. There was also an increase in new users in the spring of 1978, together with a smaller fraction in the intermediate category (six months to one year). These patterns are consistent with the ridership trends over time.

User Satisfaction

In the surveys, users were asked to indicate their satisfaction with the public transportation services. The results are shown in Table 4-12 for taxicab, bus and BUCAT users. The satisfaction ratings are summarized by assigning numerical scores to each category, from -2 (very dissatisfied) to +2 (very pleased):

Overall, the services involving taxicabs -- both regular trips and BUCAT service -- are received quite favorably. The average satisfaction ratings have decreased somewhat for regular taxi trips, essentially a result of a shift between the categories of "very satisfied" and "okay." In contrast, the satisfaction ratings for both the bus system and the BUCAT service have improved: between the spring of 1977 and the fall of 1978, the average rating for bus services increased from 0.16, just above "neutral," to 0.85, close to "okay." The BUCAT service has experienced a steady increase in user satisfaction, from 0.92 in the spring of 1977 to 1.44 in the fall of 1978. In the fall of 1978, 96 percent of the respondents were either very satisfied with the service or rated it "okay."

Table 4-12

Satisfaction with Public Transportation Services
(Current Users)

Rating (Numerical)	Taxicabs		Buses		BUCAT		
	Spring 1977	Fall 1978	Spring 1977	Fall 1978	Spring 1977	Spring 1978	Fall 1978
Very pleased (+2)	59%	33%	20%	29%	41%	56%	52%
Okay (+1)	34	56	32	47	38	24	44
Neutral (0)	4	6	10	6	3	4	0
Somewhat unhappy (-1)	3	3	20	16	8	12	4
Very dissatisfied (-2)	0	1	18	2	10	4	0
Average score	1.49	1.17	0.16	0.85	0.92	1.16	1.44

Familiarity With BUCAT Among Non-Users

The introduction of the taxi feeder service had been viewed in part as a marketing tool for public transportation. One indication of the success of the effort is the degree to which the general population is aware of the service; a related question concerns the way in which non-users as well as users learned about the service.

In the fall 1978 household survey, respondents were asked whether they knew of the BUCAT service. Only 16.3 percent said that they knew what "BUCAT" was. Out of that number, 90.6 percent could describe the service correctly. Thus, under 15 percent of the population know BUCAT as a "brand name" and can relate it to the service provided. However, a much higher percentage knows of the service itself; 56.6 percent of the respondents indicated that they had heard of the bus-taxicab transfer service, once it was described by the interviewer. Out of this group, 63.7 percent could recall some form of advertising about the service that they had seen in the last four months. Newspaper advertising apparently was the most important type, cited by 60.6 percent of the respondents who recalled any advertising.

Advertising seems to become more important in attracting users to the taxi feeder service. In 1977, only five percent of the BUCAT users indicated that they had learned about the service through advertising. This percentage had increased to 30 percent by the fall of 1978, as shown in Table 4-13.

Table 4-14 suggests that BUCAT use by regular taxicab riders has increased somewhat. The percentage of respondents who used BUCAT at least sometimes increased from 21 to 27 percent between the spring of 1977 and the fall of 1978. Over the same time period, the percentage of regular taxicab riders who were unaware of the feeder service decreased from 61 to 37 percent -- a good level of recognition.

Table 4-13

Sources of Information About BUCAT for Users

Found out about BUCAT service through	Spring 1977	Fall 1978
Friends	38%	22%
Taxi driver	15	13
Bus driver	42	35
Advertising	5	30

Note: Question not asked in the spring of 1978.

Table 4-14

BUCAT Use by Regular Taxicab Users

Frequency of Use	Spring 1977	Fall 1978
Regularly	7%	12%
Rarely	14	15
Never	18	37
Not aware of service	61	37

Does exposure to the taxicab feeder service induce users to call more frequently on regular taxicab service? According to the results of the user surveys, the percentage of BUCAT patrons who also use regular taxicab service has declined somewhat over time; in the spring of 1977, 62 percent of the BUCAT users indicated that they also patronized regular taxicab services, compared to 40 percent in the fall of 1978. The percentage for the survey taken in between, in the spring of 1978, was 60 percent. These results might reflect the impact of the expansion of the BUCAT service in the summer of 1978; this expansion may have attracted a higher share of riders who normally do not use taxicabs.

BUCAT riders using regular taxicab service were also asked whether their use of regular services had changed as a result of their BUCAT use. The responses do not show any clear trend. In the spring of 1977, 23 percent of the respondents indicated that their use of regular services was "definitely up" or "somewhat up." By the spring of 1978, this percentage had dropped to 13 percent and increased again to 30 percent by the fall of that year. It is difficult to interpret these findings, particularly in view of the fact that the number of respondents to this question was fairly small (15 and 10, respectively). Even so, it would appear that the introduction of the BUCAT service has contributed marginally to the use of regular taxicab services.

REVENUE TRENDS

Given the total ridership for either mode of public transportation in the St. Bernard Parish, revenues are a function of the fare structure in effect at a given point in time, and of the relevant trip characteristics, primarily distance. The discussion above has already examined some aspects of the effects of fare changes for regular taxicab services on trip characteristics and revenue per trip. The discussion here focuses on aggregate measures of revenue.

The solid line in Figure 4-11 shows the changes over time in the total revenues of the taxicab company. The data are reasonable measures of revenue, even though their accuracy is limited. There are a number of problems with the methods used in obtaining these data. Gross revenue for taxicab service is not available prior to July 1977. Until that time, the records of the taxicab company covered only the total income it received from the commissioned drivers. This figure includes package delivery receipts.

Generally, drivers are on a commission rate of 50 percent, buying their own gas. However, the company allows the drivers to keep more than the 50 percent of the fare revenue as vacation and sick benefits. To encourage competition among the drivers, the company also awards gas credits to the higher-income drivers. In 1977, these practices led to a situation in which drivers contributed about 45 to 48 percent of their gross fare revenues to the company. This "split" is shown in Figure 4-9.

The overall trend in taxicab revenue has been positive. While taxicab ridership has exhibited a declining tendency, as shown in Figure 4-1 and 4-2, the fare increases have been sufficient to stabilize and increase revenue over time.

While there has been an increase in the average fare per taxi trip which compensated for the decline in business, revenue per bus passenger has remained stable over time. The pattern of bus company revenue over time mirrors that of total ridership, as shown in Figure 4-3, almost perfectly. After initial peaks in the first quarters of 1974 and 1975 (the latter helped by the effects of the New Orleans bus strike), the revenues of the bus company remained stable, subject only to seasonal fluctuations into the second half of 1976. With the termination of the Canal Street Express service and service on Judge Perez Drive, bus company revenues dropped and stayed at a lower level throughout 1977.

— Revenue Taxicab Company
- - - Revenue Bus Company

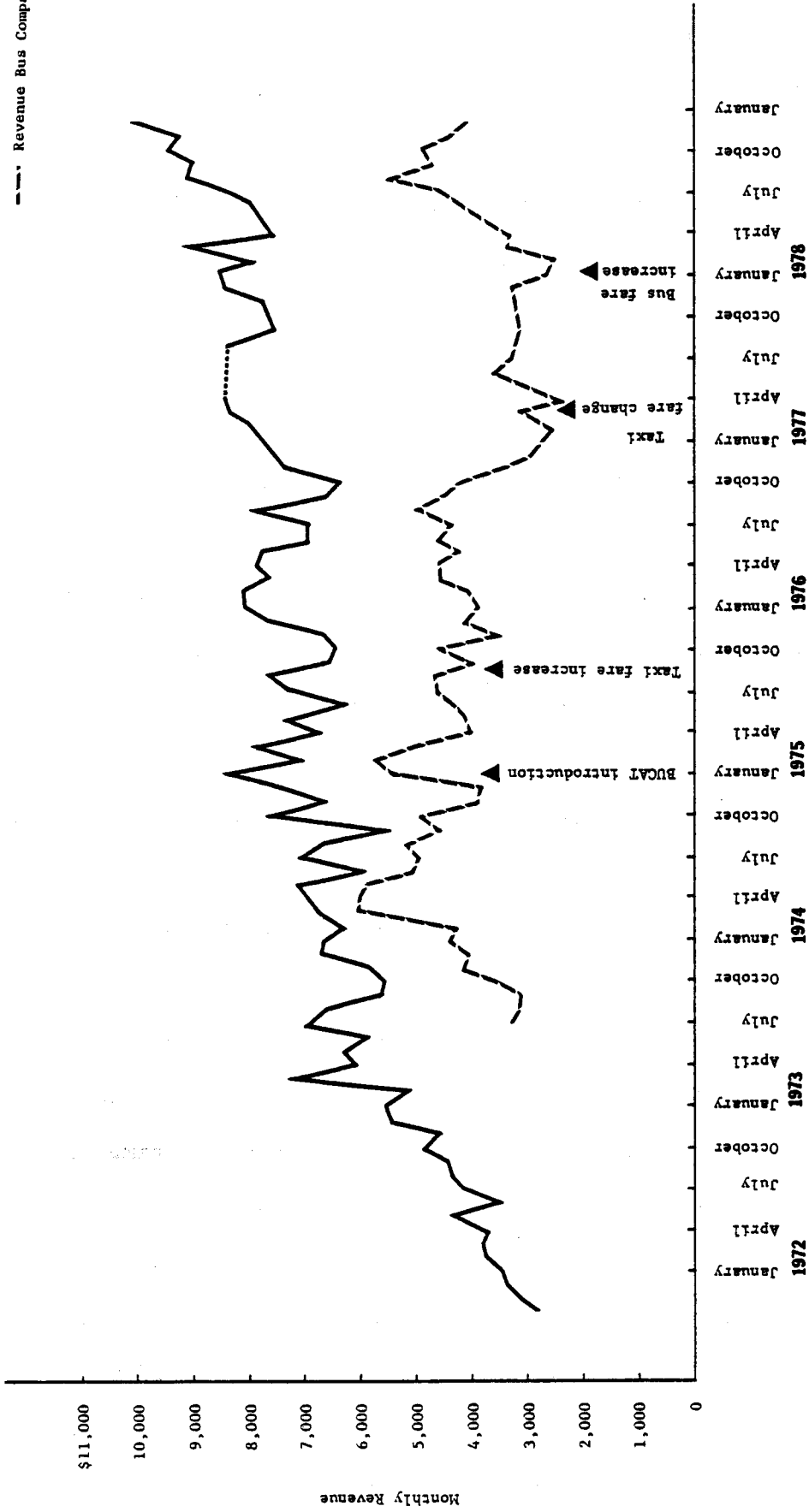


Figure 4-11: Taxicab and Bus Company Revenues

The effects of the recovery in terms of ridership during 1978 were strengthened by the fare increase at the beginning of the year, for an average of 25 percent. Any effects of the fare increase on ridership and consequently on revenue are compounded by the increase in ridership during 1978 that appears to be due to external factors.

SUMMARY

The analysis in this section has indicated that ridership for public transportation in the St. Bernard Parish overall has declined over the last few years, although there are signs of a recovery in the last year of the demonstration period, 1978. There are indications that the expansion of BUCAT service in the summer of that year may have contributed to the improvement in the overall ridership of both taxicabs and buses.

There are significant differences between BUCAT trips to the bus stop and from the bus stop to the final destination. While shared rides are encouraged in both directions, it has been easier to combine riders at the bus stop -- passengers arriving together on the same bus. As a result, the average number of passengers for bus-to-home trips is significantly higher than for home-to-bus trips. Consequently, the subsidy for BUCAT trips is higher for trips to the bus stop than in the other direction. Moreover, the distribution of the effective subsidy for BUCAT trips favors drivers for the bus-to-home trips, compared to home-to-bus trips.

The findings suggest that the users of public transportation tend to fit the image of the transit dependent. There is some evidence that the average bus rider belongs to slightly higher socioeconomic groups than the average taxicab user.

Satisfaction with the regular taxicab service and with the BUCAT service is fairly high, while the lower reliability of bus services has contributed to a more negative assessment of its quality. The taxi feeder service is well-known among residents of the area, although not necessarily under the name of BUCAT. Satisfaction with the BUCAT service appears to have improved among users over time.

The main benefit of the taxi feeder service is that it has allowed public transportation coverage throughout St. Bernard Parish without expanding the small-scale transit system. The demonstration project in the St. Bernard Parish has been useful as a vehicle for exploring the feasibility and impacts of using taxicabs for the feeder and distributor portion of trips that used conventional bus transit for their linehaul portion. The institutional conditions in the Parish provided a fairly unique laboratory for operating such a feeder service, since both providers of public transportation, the taxicab and the bus companies, were closely linked and without direct competition.

The demonstration project was basically a "naturalistic experiment," since management decisions by the privately owned public transportation providers were made in response to market conditions and opportunities, rather than according to the dictates of the demonstration plan. In many instances, these decisions were necessitated by delays in the flow of demonstration funds through the public sector grantee to the private transportation providers. Financing and regulatory problems also affected the introduction of planned service improvements according to the demonstration schedule. These difficulties can be attributed to the necessary cooperation between a small provider, whose cash flow is critical and who is therefore dependent on a more flexible management approach, and a public body without background in public transportation operations. These problems are likely to be endemic to similar situations. They should be taken into consideration in the planning stages. It may also be worthwhile to consider approaches to keep these problems to a minimum.

The analysis of the experience in the St. Bernard Parish suggests that a feeder service of the type offered here may account for about 10 percent of all

taxicab trips and for about 10 percent of transit access/egress trips. Users tend to be quite satisfied with the service, significantly more so than with the (small-scale) transit service itself.

The demonstration project did not produce any evidence that the introduction of the service had a significant impact on bus or regular taxicab ridership. This finding is at least in part attributable to the fact that most of the transit riders as well as taxicab users do not have access to a car. The introduction of the feeder service appears to have made it easier for this group to use transit, without having to walk or having to arrange for a ride to or from the bus stop with somebody. There is no direct evidence that it has attracted more choice riders.

The unique institutional setting restricts the transferability of the procedures used in the St. Bernard Parish demonstration project to other situations. In particular, the reconciliation and allocation of revenues between the bus company, the taxicab company, and drivers were handled in a fairly informal manner. While there were general procedures for reimbursing drivers for feeder transfers, the close linkages between the two companies and the shared headquarters made it easy to solve any arising problems in an ad-hoc fashion. In a more formalized environment, involving more than one provider of taxicab services and transit services, these methods might not be applicable. Even so, the demonstration has shown that the basic structure of an integrated public transportation system in an area with relatively low demand densities can be simple, without raising significant management problems.

Locally, the feeder service is acceptable and it will continue to operate in the areas included during the demonstration. To meet increasing taxi operating costs, plans call for providing the taxi drivers a significant increase in the amount they receive per BUCAT rider. Increased revenues will result from a substantial increase in the user charge (from 25¢ to \$1.00) and from additional bus subsidy funds.

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