Recent Changes in BART Patronage: Some Findings on Fare Elasticities

DAVID REINKE

Some recent trends in the San Francisco Bay Area Rapid Transit (BART) weekday patronage and analyses of the most significant causes of these changes are presented in this paper. BART patronage had been increasing steadily from 1981 through mid-1985, reaching a high of 215,000 passengers per day. But patronage growth ceased, then began to decline slowly. After a 32 percent fare increase in January 1986, patronage dropped sharply. Spring 1986 weekday patronage was 10 percent below its level 1 year previously. The fare increase was greater for longer-distance trips; most of the patronage decline took place in the longer trips. Patronage began to grow again more than 18 months after the fare increase, but it still remains 8 percent below the 1985 high. Most of the change can be attributed to the fare increase. Measured fare elasticities were –0.31 overall, –0.37 in the peak, and –0.17 in the off peak. It was also observed that fare elasticities for peak trips to downtown San Francisco were significantly higher for markets that experienced higher percentage fare increases. Other causes of patronage decline were temporary degradation of level of service due to construction work on the system, movement of jobs out of San Francisco, and increased use of casual carpooling for the morning commute to San Francisco. The decrease in gasoline prices did not appear to have a significant effect on patronage.

The San Francisco Bay Area Rapid Transit (BART) had been experiencing a steady growth in patronage from 1980 through mid-1985, when patronage began to decline slightly (Figure 1). A 32 percent fare increase in January 1986 caused patronage to decrease by nearly 10 percent from its highest level in early 1985. Because patronage has not returned to its previous levels, BART is facing unfunded deficits in its operating budget for the first time in its history (*1*).

Presented in this are the results of a study of changes in BART patronage from late 1984 through early 1986 (*2*). The purpose of the study was to look at what had happened to patronage and to identify the most likely causes. The study focused on the effects of the fare increase by time of day and location. The study also looked at several other events during or near the time of the fare increase that could have influenced patronage:

- BART experienced reductions in service reliability due to construction work on a third track through Oakland and on a new turnback facility at Daly City.

Office of Research, Department of Planning, Budget, and Resarch, San Francisco Bay Area Rapid Transit District, 800 Madison Street, Oakland, Calif. 94607.

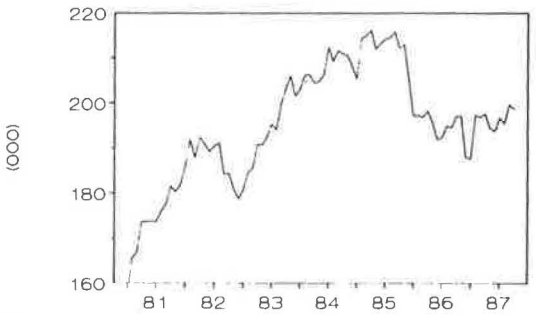

FIGURE 1 Weekday patronage, 1981–1987.

- Several large employers moved out of San Francisco during 1985 and 1986.
- Gasoline prices decreased sharply in early 1986.

Although these events are reported in this paper, the major focus is on the effects of the fare increase on patronage changes between fall 1985 and spring 1986.

At the same time BART fares were increased, the San Francisco Municipal Railway (Muni) decreased the price of its monthly pass, which can be used for trips on BART within San Francisco. The number of trips made with a BART ticket within San Francisco declined proportionally more than trips in the rest of the system. Because of this price change and problems with data on pass use, trips within San Francisco were analyzed separately; they are not included in the analyses presented in this paper.

The following section presents the changes in BART patronage from late 1984 to early 1986. This is followed by a discussion of possible causes of change and their likely effects. The findings of the study are summarized in the final section.

PATRONAGE CHANGES

Weekday Patronage

BART weekday patronage grew steadily from 1981 through mid-1985. The fare increase in September 1982 temporarily interrupted the trend of steady growth, but patronage recovered and growth resumed within 6 months of the increase. Between the winter of 1982 and 1983 and late 1984, weekday patronage grew at an annual rate of about 9 percent. Growth then decreased to a 4 percent annual rate until April 1985, when the average weekday patronage reached an all-time high of 216,155. Patronage levels in the succeeding months of 1985 exhibited normal seasonal variation; but overall growth had

ceased by summer 1985. By fall 1985, patronage was about 1 percent lower than its highest level the previous spring.

In January 1986, fares were raised by an average of 32 percent. The fare increase included an adjustment to the mileage-based fare formula so that longer trips experienced a proportionally greater fare increase than shorter trips (Figure 2). Patronage decreased sharply; between fall 1985 and spring 1986, patronage on BART decreased from 214,007 in fall 1985 to 197,523 in spring 1986, a decrease of 16,484 (8 percent). (The apparent decrease immediately before early 1986 is a seasonal effect due to the November and December holiday periods.) What distinguishes patronage trends during the 1986 fare increase from those of previous fare increases is the longer amount of time for resumption of growth. After the September 1982 fare increase, the lost patronage was regained within 6 months. More than a year after the 1986 fare increase, weekday patronage was almost 8 percent below its level of fall 1985.

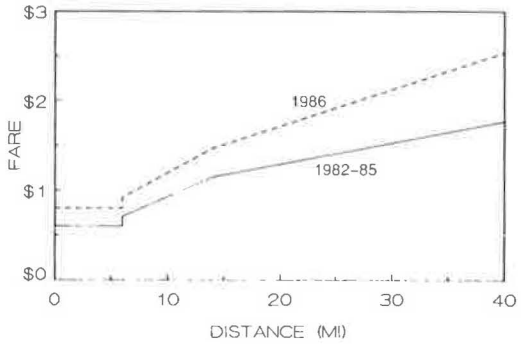

FIGURE 2 Mileage-based fare.

BART's experience is typical of other major transit operators in California (Table 1). Other operators have experienced patronage declines since 1984, as part of a general trend or in response to fare increases.

Changes by Time of Day

BART patronage by time period for fall 1985 and spring 1986 is shown in Table 2. The greatest absolute and proportional change was in the peaks. Peak patronage declined by 10 percent and off-peak by 4 percent. The different proportional changes for a.m. and p.m. peak periods was a significant finding and is discussed in greater detail later in this paper. Peak-period patronage accounted for 67 percent of the daily total in fall 1985, but 83 percent of the decrease in patronage occurred during the peaks.

TABLE 2 PATRONAGE BY TIME OF DAY

	Fall 1985	Spring 1986	Change (%)
a.m. peak	61,228	54,402	−11.1
Midday	38,049	36,779	−3.3
p.m. peak	55,705	50,744	−8.9
Evening	18,204	17,061	−6.3
Total	173,186	158,986	−8.2

NOTE: Time periods are defined as follows: a.m. peak, beginning of service to 10 a.m.; midday, 10 a.m. to 4 p.m.; p.m. peak, 4 p.m. to 7 p.m.; evening, 7 p.m. to end of service.

Before the fare increase, off-peak patronage was growing at a greater rate than peak patronage. This trend (assuming it would have continued after January 1986) probably offset some of the effects of the fare increase, contributing to the lesser decline in patronage in the off peak.

Changes by Location

To simplify analysis of changes in patronage by location, the 34 BART stations were aggregated into 11 market areas. A market area was defined to be a group of adjacent stations in which the travel and socioeconomic characteristics of patrons were similar. Figure 3 shows the configuration of the BART system and its 34 stations; Table 3 lists the stations in each market area (trips with both ends in San Francisco were not included in this analysis).

Changes in entries and exits by market area are shown in Table 4. Most market areas show an imbalance in such changes. For stations in the San Francisco Central Business District (CBD), which is primarily a destination for two-way trips on the system, entries decreased proportionally less than

TABLE 1 PATRONAGE CHANGES FOR SELECTED CALIFORNIA TRANSIT OPERATORS

	March–April		
Operator	1984 and 1985[a] (%)	1985 and 1986[b] (%)	Fare Changes
AC Transit	−4.5	−0.1	Transbay fare increase 1986
Caltrain	2.6	3.4	
Golden Gate Transit	−13.3	0.1	Fare increase, 1984–85; 20–30 percent local fare decrease, 1985–86
San Mateo Transit	1.4	−6.8	40 percent increase, 1985–86
Santa Clara Transit	−1.6	−2.7	
Sacramento Regional Transit	0.6	−7.7	33–40 percent increase, 1985–86
Southern California Rapid Transit	6.8	−11.7	70 per increase, 1985–86
BART	4.4	−8.5	32 percent increase, 1985–86

[a]March–April 1984 compared to March–April 1985.
[b]March–April 1985 compared to March–April 1986.

FIGURE 3 System map.

TABLE 3 MARKET AREA DESIGNATIONS

Market Area	Stations
Contra Costa West	El Cerrito Plaza, El Cerrito del Norte, Richmond
Berkeley	Ashby, Berkeley, North Berkeley
Oakland NW	Rockridge, Oakland West, MacArthur
Oakland CBD	Lake Merritt, Oakland City Center/12th St., 19th St.
Oakland South	Fruitvale, Coliseum, San Leandro
Alameda South	Bay Fair, Hayward, South Hayward, Union City, Fremont
Contra Costa East	Walnut Creek, Pleasant Hill, Concord
Contra Costs Central	Orinda, Lafayette
San Francisco CBD	Embarcadero, Montgomery, Powell, Civic Center
San Francisco Outer	16th St., 24th St., Glen Park, Balboa Park
Daly City	Daly City

exits. Most other market areas show the opposite change: entries decreased proportionally more than exits.

Travel to and from the San Francisco CBD accounts for the majority of peak period trips. A breakdown of these trips by nine major market areas is shown in Table 5. About one-quarter of the a.m. peak trips to the San Francisco CBD originate in the three stations comprising the Contra Costa East market area; more than one-half originate in three market areas: Contra Costa East, Alameda South, and Daly City.

The largest proportional declines in patronage are associated with the largest numbers of trips and with the longest trips; the number of shorter trips decreased less than the number of longer trips. The largest proportional decrease was in the largest single market, Contra Costa East, which accounted for one-third of the total decrease in peak travel to and from the San Francisco CBD. Other significant decreases include trips from southern Alameda County and from Daly City. These areas together account for nearly 70 percent of the decrease in a.m. peak trips to the San Francisco CBD and 40 percent of the total decrease in peak trips.

What is especially significant about these changes is that for most of these areas, the rate of decrease in the a.m. peak period is greater than that in the p.m. peak, indicating an increase in use of BART for only the evening commute direction; the imbalance is the greatest for the Contra Costa Central area (Orinda and Lafayette stations), where casual carpooling has been observed to increase between 1985 and 1986 (see section on Other Causes).

Effects on Fare Revenue

Although patronage has decreased, fare revenue has increased since the fare increase (Table 6). The average weekday fare increased by 32 percent from fall 1985 to spring 1986. Average daily extracted fare revenue increased by $50,000 (22 percent) between fall 1985 and spring 1986. (Extracted fare is the total nominal dollar amount of the full fare; it does not include fare discounts.) Revenue increased by 19 percent during the peak periods and 29 percent during the remainder of the day because of the higher percentage drop in patronage during the peaks.

Another way of viewing the changes is that the peak period accounted for 67 percent of the total number of passengers in fall 1985 and 61 percent of the revenue increase. The remainder of the day accounted for 33 percent of the passengers in fall 1985 and 39 percent of the revenue increase.

CAUSES OF PATRONAGE CHANGES

Fare Increase

The overall response to the fare increase is similar to that experienced by BART in the past (*3*). The aggregate elasticity

TABLE 4 PATRONAGE CHANGES BY MARKET AREA

	Entries			Exits		
	Fall 1985	Spring 1986	Change (%)	Fall 1985	Spring 1986	Change (%)
Contra Costa West	10,172	9,391	−7.7	10,536	9,715	−7.8
Berkeley	13,616	12,205	−10.4	13,943	12,755	−8.5
Oakland NW	10,441	9,488	−9.1	10,528	9,841	−6.5
Oakland CBD	18,323	16,678	−9.0	18,393	16,938	−7.9
Oakland South	12,179	11,041	−9.3	12,372	11,411	−7.8
Alameda South	19,787	18,133	−8.4	20,195	18,696	−7.4
Contra Costa East	16,390	14,842	−9.4	16,756	15,549	−7.2
Contra Costa Central	4,473	4,055	−9.3	5,189	5,095	−1.8
San Francisco CBD	53,873	51,108	−5.1	51,578	47,258	−8.4
San Francisco Outer	5,274	4,738	−10.1	4,646	4,061	−12.6
Daly City	8,659	7,306	−15.6	9,050	7,667	−15.3
Total	173,186	158,986	−8.2	173,186	158,986	−8.2

TABLE 5 PEAK PERIOD TRIPS TO AND FROM SAN FRANCISCO CBD

	a.m.: To SF CBD			p.m.: From SF CBD		
	Fall 1985	Spring 1986	Change (%)	Fall 1985	Spring 1986	Change (%)
Contra Costa West	2,731	2,593	−5.1	2,482	2,361	−4.9
Berkeley	1,765	1,638	−7.2	1,957	1,887	−3.6
Oakland NW	4,336	4,130	−4.7	3,483	3,424	−1.7
Oakland CBD	2,333	2,166	−7.2	2,279	2,098	−8.0
Oakland South	2,729	2,427	−11.1	2,359	2,203	−6.6
Alameda South	6,264	5,526	−11.8	5,393	4,945	−8.3
Contra Costa East	8,783	7,423	−15.5	7,343	6,381	−13.1
Contra Costa Central	2,137	1,769	−17.2	2,313	2,304	−0.4
Daly City	4,594	3,928	−14.5	4,042	3,470	−14.1
Total	35,671	31,600	−11.4	31,651	29,073	−8.1

is about −0.31 (arc elasticity). This is somewhat higher than the average rapid rail fare elasticity (−0.17 ± 0.05) found in a study of transit fare changes in the United States (*4*, *5*). One likely reason for this is that BART riders have higher incomes than average; higher-income transit riders typically have higher fare elasticities. Another reason appears to be that higher fare increases result in higher fare elasticities.

TABLE 6 CHANGE IN EXTRACTED FARES BY TIME PERIOD

Time Period	Fall 1985 ($ 000s)	Spring 1986 ($ 000s)	Change Amount ($ 000s)	Change Percent
a.m. Peak	83.9	98.5	14.6	17.4
Midday	46.8	60.5	13.7	29.3
p.m. Peak	76.1	91.8	15.7	20.6
Evening	24.4	30.0	5.6	23.1
Total	231.2	280.9	49.7	21.5

Peak demand is more elastic with respect to fares than off-peak demand (Table 7); peak elasticity is −0.37 and off-peak elasticity is only −0.17. Most transit properties in the United States have found fare elasticity in the off-peak to be about double the peak value. A likely explanation for this finding is that peak-period passengers on BART have higher automobile ownership and availability than off-peak passengers, and therefore have more freedom to choose a travel mode.

TABLE 7 FARE ELASTICITIES BY TIME PERIOD

Time Period	Elasticity
a.m. Peak	−0.44
Midday	−0.11
p.m. Peak	−0.35
Evening	−0.21
Total	−0.31

This finding is surprising. It violates the conventional wisdom that off-peak patronage is more sensitive to fare increases than peak patronage. Growth in peak-period patronage on BART has been constrained by capacity; the per- centage growth during the off-peak has been significantly greater. Hence, these results may be due to a growth trend during the midday period that was partly offset by the fare increase. Another contributing factor may be that capacity and level-of-service problems have made these passengers more sensitive to fare changes (see the next section, entitled Capacity and Level of Service).

Measured fare elasticities by market area show some significant differences (Table 8). Some of the observed differences in patronage changes between different geographic areas may be due to differences in socioeconomic characteristics. The Contra Costa East and Contra Costa Central stations (Orinda through Concord) are in areas where residents have higher incomes and automobile availability than those living near western Contra Costa and southern Alameda County stations.

TABLE 8 FARE ELASTICITIES BY MARKET AREA

	Entries	Exits
Contra Costa West	−0.29	−0.30
Berkeley	−0.41	−0.33
Oakland NW	−0.38	−0.26
Oakland CBD	−0.36	−0.32
Oakland South	−0.37	−0.30
Alameda South	−0.30	−0.26
Contra Costa East	−0.34	−0.26
Contra Costa Central	−0.37	−0.07
San Francisco CBD	−0.19	−0.32
San Francisco Outer	−0.39	−0.49
Daly City	−0.61	−0.60
Total	−0.31	−0.31

The different elasticities for entries and exits reflect an increase in the use of BART by commuters to San Francisco for only one direction: the return trip in the evening. The difference is the greatest for the Contra Costa Central area, where casual carpooling is prevalent.

Higher-fare elasticities are associated with higher percentage fare increases. The fare increase was not uniform across the entire system. Station-to-station fare increases ranged between 27 percent and 40 percent, the larger percentage increases applying to the longer travel distances, as a result of BART's policy decision to reduce the mileage charge difference between shorter and longer trips. An initial analysis of peak-period patronage between BART stations showed a strong correlation between the percentage increase in fare and the observed elasticity. A more detailed look was taken at elasticities for a.m. peak-period trips to the San Francisco CBD

(Figure 4). The data show a highly significant relationship between the fare elasticity and the percentage fare increase. There may be some spurious effects because of the correlation between the percentage fare increase and the travel distance; high load factors on long trips may have made these travelers more sensitive to the fare change. Passengers who take shorter trips may be less sensitive to the high peak load factors on the transbay routes because they do not have to stand as long.

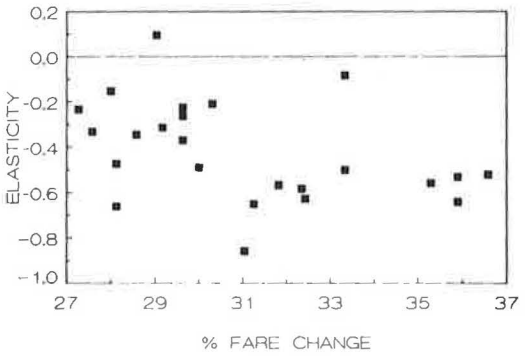

FIGURE 4 Fare elasticities: a.m. peak to San Francisco.

But it does appear that there is indeed a relationship between the percentage fare increase and the fare elasticity. If this cross-sectional relationship is also valid for longitudinal changes, it would indicate that small fare increases at more frequent intervals would cause less of a decrease in patronage than large fare increases at less frequent intervals.

Capacity and Level of Service

Patronage in the peak period has been limited by capacity on BART's three transbay routes. Capacity on the transbay lines to Concord and Fremont has remained approximately constant since mid-1981. Capacity on the Richmond to Daly City line has increased by more than 50 percent since service was started, and patronage grew by a somewhat greater amount. An analysis of transbay peak seating capacity and patronage showed that average peak load factors on the transbay routes peaked at about 1.5 during spring 1985, when system patronage reached its highest level. Thereafter, patronage began to decline, probably as a result of the high load factors, service problems, or a combination of the two. The peaking of the load factors around 1.5 suggests that this may be the maximum average load factor that BART passengers are willing to tolerate. Seating capacity increases that occurred after the fare increase do not appear to have resulted in increases in peak period patronage on these routes.

On-time performance was affected by work on a third track through downtown Oakland, which affected train movement from MacArthur through 12th Street stations beginning in July 1985; and by work on the turnback facility at Daly City. Train throughput (as a percentage of scheduled throughput) decreased significantly. Peak-period train delay events as a percentage of scheduled trains increased (Figure 5). The increase in train delays began to occur at the same time as

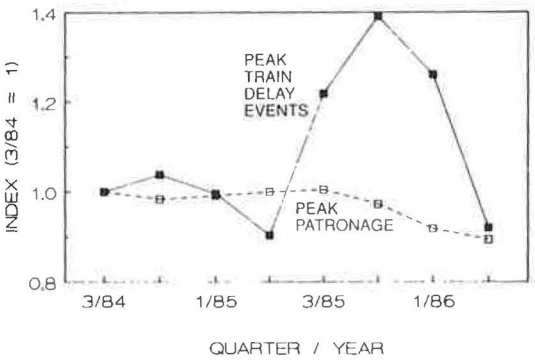

FIGURE 5 Train delays and patronage.

patronage growth stopped, in spring 1985. This a plausible explanation for at least part of the difference in patronage decreases between the a.m. and p.m. peak periods between spring 1985 and spring 1986.

The results indicate that capacity limitation, combined with level of service problems, were probably the major reason why patronage stopped growing in mid-1985.

Other Causes

Other explanations that have been advanced for BART's patronage decline and the lack of recovery include jobs moving out of San Francisco, the drop in gasoline prices in early 1986, increased casual carpooling, and fare evasion.

Several large employers have moved out of San Francisco and relocated in the suburbs between 1984 and 1986; some of these were located near BART stations in downtown San Francisco. Year-end employment data from the California Employment Development Department show that the total number of jobs in San Francisco was 562,400 in 1984; 570,900 in 1985; and 568,800 in 1986. The decrease between 1985 and 1986 occurred primarily in the finance sector, which accounts for a large number of jobs in San Francisco located near BART stations. About 35 percent of the work force in this area lives in the BART service area outside of San Francisco. Thus, of the approximately 2,000 jobs lost between 1985 and 1986, about 700 were held by BART service area residents. About one-third of the commute trips to San Francisco from the East Bay are made on BART. Hence, the estimated decrease in BART trips due to job relocation is about 500 per day, which accounts for only 2 percent of the observed decrease in peak patronage to downtown San Francisco. Hence, the contribution of job relocation to the decline in patronage did not appear to be significant.

The sharpest recent decrease in gasoline prices occurred at the same time fares were increased. The average cost per gallon of unleaded gasoline in Northern California decreased from $1.35 to $1.12 (17 percent) between fall 1985 and spring 1986 (California State Automobile Association surveys). But the average decrease in out-of-pocket costs was only about 3 percent to 5 percent for trips to downtown San Francisco because fuel costs account for less than one-third of the total out-of-pocket operating cost; parking accounts for most of the cost. Peak trips to work locations where gasoline is a higher percentage of automobile operating cost decreased proportionally less

than trips to downtown San Francisco; if gasoline prices had a significant effect, the opposite would have been expected. Hence, gasoline price changes do not appear to have significantly affected BART patronage.

One feature of changes in patronage from fall 1985 to spring 1986 is the larger proportional reduction in the a.m. peak compared to that in the p.m. peak (see Table 5). An increasing number of commuters to San Francisco appear to use BART only for the evening commute, largely because of increased casual carpooling across the Bay Bridge (*6*). The imbalance is greatest at Orinda and Lafayette stations, where casual carpooling has become prevalent. Figure 6 shows graphically the proportional difference in patronage changes (from spring 1985 to fall 1985) between the a.m. and p.m. peak for travel to and from the San Francisco CBD. Most stations lie above the diagonal, indicating that patronage has declined more (or increased less) in the a.m. peak than it has in the p.m. peak. Orinda station, for example, shows nearly a 20 percent decrease in a.m. peak trips to San Francisco, but less than a 5 percent decrease in trips from San Francisco in the p.m. peak. Stations where casual carpooling is less easy to do, such as Daly City, tend to lie closer to the diagonal than stations where it is easier, such as Orinda.

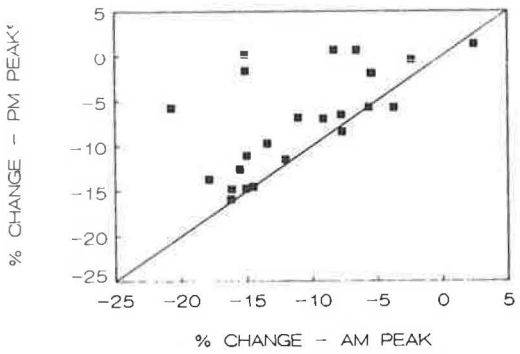

FIGURE 6 Peak direction change to and from San Francisco.

The increase in casual carpooling is not a primary cause of lower patronage; it is an effect of the fare increase and reduced level of service, which provide incentives for commuters to rideshare.

Fare evasion has been another source of directional imbalance in patronage changes. Since 1983, BART passengers can use the monthly pass on Muni to ride BART within San Francisco. Before September 1987, when the pass was used to exit BART within San Francisco, it was not checked to see if it was used to enter the system. As a result, many passengers from East Bay stations have used a minimum fare BART ticket to enter the system in the East Bay and the Muni monthly pass to exit the system in San Francisco. The fare increase has made it economical for BART passengers at many East Bay stations to buy a Muni monthly pass solely to avoid paying the regular BART fare. In an analysis of entry gate counts, it was estimated that about 1,200 passengers per day from East Bay stations were using the Muni monthly pass this way (the revenue loss to BART from this type of fare evasion is at least $500,000 per year). The result of this is to undercount the actual number of trips going from the East Bay to San Francisco. Hence, elasticities for a.m. trips may be overestimated by as much as 0.01.

SUMMARY AND CONCLUSIONS

BART's ridership departed from its 5-year growth trend in mid-1985, when patronage began to decline slightly (about 1 percent) from its highest levels. The initial decline before the fare increase was probably caused by reduced capacity and level of service due to construction work on two major projects.

Most of the decrease in patronage since fall 1985 can be attributed to the fare increase. The aggregate elasticity is consistent with transit experience in the United States. What is startling is that the elasticity during the peak is markedly greater than during the off peak. This may be due in part to increased sensitivity to fare increases on the part of peak passengers, many of whom have had to stand. The association between greater elasticities and greater travel distances lends support to this view. Furthermore, the reaction to a fare increase may have been greater now than in 1982, in part because the inflation rate is now much lower than it was then, making the recent fare increase more visible to riders. Another contributing factor appears to be the reduced level of service as a result of capacity expansion projects, which continued through the first 3 months of the fare increase.

The greater elasticity of a.m. peak travel is largely because of the availability of casual carpooling as an alternative. There has been a large apparent increase in the percentage of peak-hour patrons who use BART for only the return trip in the evening peak. Fare evasion by East Bay passengers who use the Muni monthly pass to exit in San Francisco accounts for a large part of the apparent difference in patronage changes between the a.m. and p.m. peaks.

Peak fare elasticities appear to increase as the percentage change in fare increases. This is contrary to standard transit patronage estimation procedures, in which constant fare elasticities are assumed. If this finding holds longitudinally, it would indicate that it may be preferable to raise fares in smaller increments to minimize the effects on patronage.

Other possible causes do not appear to have affected patronage as much as the fare changes and reduced level of service. Although job movement out of downtown San Francisco may have caused a small portion of the patronage loss, it is unlikely to be a long-term effect; the total number of jobs in San Francisco is expected to increase through the year 2000. There is no evidence that decrease in gasoline prices has had a significant effect on patronage.

The results suggest that there is little that BART can do in the immediate future to increase patronage by adopting a new fare structure. The fare increase has increased revenues. A partial rollback of fares would cause a moderate increase in patronage, but fare revenue would decrease. Differential pricing between the peak and the off peak does not appear to be an effective option. If anything, the off-peak market appears to be better able to absorb a fare increase than the peak market.

Some of the findings may provide guidance for future fare changes. Because peak elasticities appear to increase with an increasing percentage change in fares, it may be better to adopt a policy of more, yet smaller, fare increases rather than fewer,

but larger increases. The effects of a fare increase also appear greater during periods of lower inflation, as is occurring now. If BART is considering another fare increase during a time of reduced level of service, it may be preferable to delay the increase until service levels have been restored.

BART will also have to change its marketing policy. In the past few years, BART has been reluctant to market the peak because of lack of seating capacity. Instead, BART has focused its marketing efforts on off-peak travel, mainly shoppers. But it is clear from the results of this study that a recovery of lost patronage will have to depend on attracting more commuters. The peak period accounted for 67 percent of the weekday patronage in fall 1985, but 83 percent of the decrease in average weekday patronage. Commuters are likely to be more frequent riders than off-peak patrons; attracting a single commuter would have the same effect on patronage as attracting several off-peak patrons who ride infrequently. High-peak load factors should not discourage efforts to market the peak because BART passengers have in the past been willing to tolerate high load factors.

Marketing targeted at more specific markets is indicated by the results of this study. Patronage losses have been the largest on the eastern portion of the Concord line, at Daly City, and the southern part of the Fremont line. BART should therefore look at how to encourage more use from these areas, perhaps through marketing targeted at CBD work locations near BART stations.

ACKNOWLEDGMENTS

This research was supported by the San Francisco Bay Area Rapid Transit District. The author wishes to thank Ward Belding, BART Office of Research, for his extensive review and helpful suggestions during this research.

REFERENCES

1. *1986 BART Five-Year Plan.* BART Office of Research, Department of Planning, Budget, and Research, Oakland, Calif., June 1986.
2. D. Reinke. *BART Patronage Study.* BART Office of Research, Department of Planning, Budget, and Research, Oakland, Calif., Feb. 1987.
3. T. Usowicz. Measured Fare Elasticity—The 1975 BART Fare Change. In *Transportation Research Record 799*, TRB, National Research Council, Washington, D.C., 1981, pp. 38–42.
4. P. Mayworm et al. *Patronage Impacts of Changes in Transit Fares and Services.* UMTA, U.S. Department of Transportation, Sept. 1980.
5. R. H. Pratt and J. N. Copple. *Traveler Response to Transportation System Changes*, 2nd ed. FHWA, U.S. Department of Transportation, July 1981.
6. RIDES for Bay Area Commuters, Inc. *Casual Carpooling: An Update.* San Francisco, Calif., June 1987.

The conclusions in this paper are solely those of the author.

Publication of this paper sponsored by Committee on Public Transportation Marketing and Fare Policy.