Revenue and Ridership Changes in Ontario Cities Caused by Transit Fare Increases

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This report describes the development, accuracy, and application of a simple method for predicting changes in transit-system revenue (ridership) caused by an increase in fares. The method is based on an empirical cross-sectional model and on data obtained from 29 Ontario transit systems for which all necessary ridership, revenue, and vehicle kilometer data were available. Analysis covered the period of the first nine months after the fare increase. Results show that revenue change caused by a fare increase is predictable and is a function not only of the increase but also of the distance (service level) change, past ridership trends, city size, level of transit service, and time elapsed after the increase. A change in vehicle kilometers can be expected to have a greater effect on revenue than an equivalent percentage change in fares would. The effectiveness of a fare change in producing increased revenue apparently decreases with the time elapsed since the increase.

Rapidly increasing transit operating costs and deficits have induced a number of transit operators in Ontario to increase fares during the last two or three years. The effects of these recent increases were analyzed in view of the following two objectives: (a) providing transit operators with a simple method for estimation of revenue and ridership changes brought on by planned increases in transit fares and (b) providing transportation planners with basic empirical information on transit fare and service elasticities.

Results of these analyses are summarized in this report, which describes a simple method for predicting revenue (ridership) changes caused by changes in fares. It also attempts to separate and quantify the effects of additional variables that influence changes in revenue, such as past ridership trends, service level, employment, city size, time elapsed after the last fare increase, and time interval between the last two fare increases.

PREVIOUS STUDIES

The effect of transit fare increase on ridership has been a subject of numerous studies, most of which, however, have attempted to describe the effect of increased fares by using a two-variable relationship in the form of transit fare elasticity defined, for example, as shrinkage ratio:

$$\text{Ridership shrinkage ratio} = [(Ra/Rb) - 1]/[(Fa/Fb) - 1] \qquad (1)$$

where

- Ra = ridership after the fare change,
- Rb = ridership before the fare change,
- Fa = fare after the fare change, and
- Fb = fare before the fare change.

The shrinkage-ratio concept has also been used in a recent Ontario transit fare elasticity study (1). This study analyzes effects of fare increases, implemented during 1975 and 1976 in 14 Ontario cities, for the first three months immediately following the increases. According to the study, the ridership shrinkage ratio for large Ontario cities (more than 200 000 population) was about -0.20. In other words, considering Equation 1, a 10 percent increase in fares would result, during the first three months after the fare increase, in a 2 percent reduction in ridership. The shrinkage ratio for smaller cities was about -0.33, the same shrinkage ratio recommended previously by the so-called Simpson-Curtin formula (2).

MULTIPLE VARIABLE APPROACH

Changes in ridership are influenced not only by changes in fares but also by changes in a number of other factors or variables such as changes in level of service, number of people employed, city size, and length of time elapsed since the increase. The shrinkage ratio, being essentially a two-variable relationship, cannot systematically include the effects of all variables influencing the ridership change. To include additional potential variables and their interaction, a multivariable mathematical modeling approach was used.

DATA BASE

Selection of Systems

To eliminate bias, data for all 29 Ontario transit systems that satisfied basic data requirements of accuracy and completeness were included in the study. The systems are listed in Table 1, which also gives for each transit system the date of the fare increase evaluated in this study, average 1976 monthly ridership, average 1976 monthly vehicle kilometers, time elapsed since the previous fare change, adult cash fares before and after the fare increase, and percentage increase in adult cash fares.

Eight transit systems listed in Table 1 have not experienced a recent fare increase but were included in the analysis to increase the scope of generalization and to provide a measure of ridership change in the absence of fare increase. For three systems (Niagara Falls, Ottawa, Metro Toronto), two consecutive fare increases were included. This resulted in a total sample of 32 observations based on 29 transit systems.

The majority of ridership, revenue, and vehicle kilometer data were collected on a monthly basis and were then aggregated into three-month intervals. The aggregation permitted the inclusion of cities for which only quarterly data were available and helped to mitigate monthly data variation caused by such factors as weather conditions, number of work days per month, and accounting and recording procedures.

The three-month interval was also used to investigate the initial versus subsequent changes in ridership caused by the fare increase. The following four time periods were analyzed:

1. Months 0-3: First three months immediately after the fare increase,

2. Months 3-6: From three to six months after the fare increase,
3. Months 6-9: From six to nine months after the fare increase, and
4. Months 0-6: First six months following the fare increase.

Mathematical models predicting revenue and ridership changes were developed for all four time periods. However, only the models developed for the 0-6 time period are described in detail in this report, because models for all four time periods are analogous and the number 4 models are deemed to be the most useful for forecasting purposes.

Data Description for Model Number 4

Data for the first six months following the fare increase are summarized in Table 2.

Table 1. Ridership and fare data.

No.	Municipality	Date of Fare Increase	Monthly Ridership	Monthly Vehicle Kilometers	Time Since Previous Change (years)	Adult Cash Fare (cents)		Adult Cash Fare Increase (%)
						Before	After	
1	Fort Frances	4/77	30 000	64 000	2.8	35	35	0.0
2	Port Hope	1/77	60 000	63 000	2.5	25	25	0.0
3	Thorold	5/77	20 000	84 000	1.2	25	35	40.0
4	Orillia	1/75	500 000	214 000	2.5	25	25	0.0
5	Newmarket	1/77	210 000	132 000	5.5	30	30	0.0
6	Stratford	3/76	640 000	473 000	3.5	25	30	20.0
7	Woodstock	8/76	510 000	435 000	8.0	20	30	20.0
8	Pickering	3/77	320 000	707 000	1.0	45	50	11.1
9	Barrie	3/76	520 000	410 000	2.5	25	40	60.0
10	Belleville	4/77	1 010 000	528 000	1.7	30	40	33.3
11	Chatham	6/75	760 000	446 000	10.0	30	30	0.0
12	Welland	3/76	750 000	707 000	2.3	25	35	40.0
13	North Bay	1/77	1 580 000	1 147 000	7.5	25	25	0.0
14	Sarnia	4/76	1 340 000	1 154 000	4.6	25	30	20.0
15	Peterborough	1/77	2 020 000	1 022 000	4.0	25	25	0.0
16	Guelph	8/75	3 100 000	1 173 000	4.0	25	35	40.0
17	Oakville	4/76	1 730 000	1 502 000	3.6	30	35	16.7
18	Niagara Falls	3/76	1 150 000	641 000	6.0	25	30	20.0
19	Niagara Falls	4/77	1 150 000	641 000	1.0	30	35	16.7
20	Brantford	3/77	2 130 000	1 205 000	6.7	25	30	20.0
21	Sault Sainte Marie	2/77	2 890 000	1 600 000	1.8	30	35	16.7
22	Oshawa	1/77	3 100 000	1 717 000	1.3	35	35	0.0
23	Saint Catharines	4/77	4 710 000	2 779 000	1.8	30	35	16.7
24	Kitchener-Waterloo	3/76	7 190 000	3 982 000	5.5	25	35	40.0
25	Windsor	3/76	6 480 000	3 410 000	4.0	35	40	14.3
26	London	3/76	3 530 000	7 073 000	5.0	30	40	33.3
27	Mississauga	4/77	7 430 000	6 128 000	0.9	50	55	10.0
28	Hamilton	3/76	24 150 000	12 281 000	6.9	30	40	33.3
29	Ottawa	3/76	50 920 000	28 101 000	5.3	30	40	33.3
30	Ottawa	3/77	50 920 000	28 101 000	1.0	40	50	25.0
31	Metro Toronto[a]	3/76	99 999 000	127 915 000	0.9	40	50	25.0
32	Metro Toronto[a]	1/77	99 999 000	127 915 000	0.8	50	55	10.0

[a]Actual 1976 monthly ridership was 29.2 million passengers.

Table 2. Data for model number 4.

No.	Municipality	Vehicle Kilometer Change (%)	Average Fare Increase (%)	ICI Change (%)	ARF	Ridership Change (%)	Revenue Change (%)
1	Fort Frances	9.15	0.0	0.00	1.083	-0.94	-3.72
2	Port Hope	-0.72	0.0	1.00	1.036	1.02	1.69
3	Thorold	-22.78	17.50	-2.09	1.095	-35.46	-24.16
4	Orillia	-0.65	0.0	-0.56	1.110	8.27	8.48
5	Newmarket	1.02	0.0	2.37	1.031	3.04	3.04
6	Stratford	6.46	26.54	5.95	1.048	1.69	27.99
7	Woodstock	3.31	33.33	5.56	1.432	3.60	38.14
8	Pickering	-2.88	22.46	0.52	1.227	-6.02	15.22
9	Barrie	61.94	57.62	4.58	1.297	14.71	80.64
10	Belleville	-4.95	25.12	0.73	0.829	-10.79	11.62
11	Chatham	1.24	0.0	4.06	1.135	-1.87	14.53
12	Welland	17.63	44.39	-1.01	1.441	3.33	49.22
13	North Bay	9.77	0.0	0.09	0.978	8.73	16.95
14	Sarnia	-5.94	39.50	5.52	1.247	1.70	41.93
15	Peterborough	4.19	0.0	-7.68	0.843	13.64	12.01
16	Guelph	10.50	25.10	-0.22	1.143	7.61	34.61
17	Oakville	0.01	26.57	1.56	1.200	-6.58	18.24
18	Niagara Falls	-9.34	37.15	0.09	1.100	-13.34	18.95
19	Niagara Falls	10.61	19.69	5.06	0.972	-1.93	17.29
20	Brantford	4.30	15.15	2.02	1.020	-2.41	12.33
21	Sault Sainte Marie	-0.62	42.25	-0.33	1.051	-16.54	18.77
22	Oshawa	-3.44	0.0	4.96	0.986	-0.84	0.69
23	Saint Catharines	0.14	13.19	-0.19	1.026	0.61	14.21
24	Kitchener-Waterloo	-5.96	43.88	2.69	1.049	-13.22	24.87
25	Windsor	-2.13	19.28	9.08	1.053	-3.89	14.52
26	London	0.05	41.83	1.14	1.014	-10.70	26.69
27	Mississauga	0.91	6.31	0.62	1.076	3.25	9.74
28	Hamilton	2.29	25.22	0.50	1.067	1.43	27.02
29	Ottawa	8.18	17.62	1.54	1.140	13.38	31.29
30	Ottawa	3.86	7.50	1.57	1.099	9.93	18.19
31	Metro Toronto	0.04	23.44	1.54	1.017	-3.34	19.28
32	Metro Toronto	-0.58	14.26	0.53	0.953	-2.17	11.77

Figure 1. Time periods used for number 4 models.

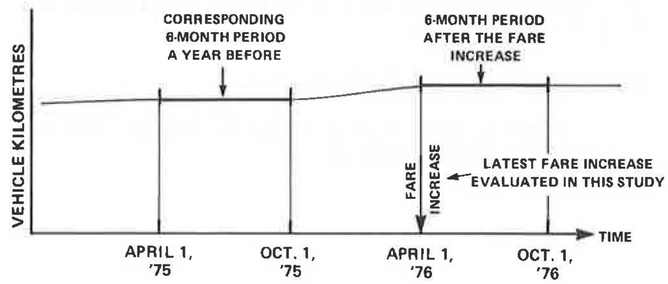
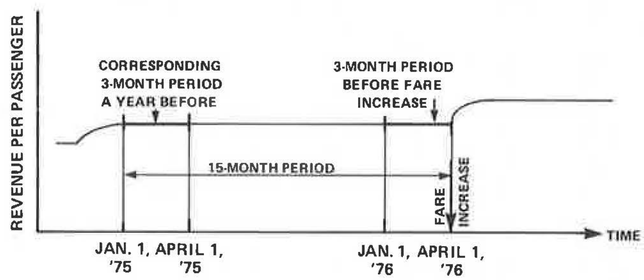


Figure 2. Time periods used for calculation of adjustment revenue factor.



Change in Vehicle Kilometers

The change in vehicle kilometers operated by a transit system while it provides regular passenger service during the first six months after the fare increase can be expressed as a percentage. The change is based on the vehicle kilometers operated during the corresponding six-month period a year before. The time periods used for the number 4 models are schematically shown in Figure 1. The average change in vehicle kilometers was about +3.0 percent.

Data unavailability made it impossible to distinguish where, when, and why the changes in vehicle kilometers occurred.

Average Fare Increase

Average fare increase is defined as the percentage increase in the average revenue per passenger during the first six months after the fare increase. The increase is related to the average revenue per passenger during the corresponding six-month period a year before. The average fare increase depends on the overall change in the transit fare structure and may not be equal to the increase in the adult cash fare. For this reason, average fare increase rather than adult cash fare increase was used in the model. The average increase, for the 24 observations of fare increase, was about 26 percent.

Change in Industrial Composite Index

Industrial Composite Index (ICI) is an employment index reported by Statistics Canada (3). It reflects change in employment for industrial and commercial establishments of 20 or more employees. As such, the ICI provides both a certain measure of general economic activity and a measure of population change. It is expressed as a percentage change in the ICI, unadjusted for seasonal variations, during the first six months after the fare increase, based on the ICI during the corresponding six-month period a year ago.

Unemployment rate may be a better measure of general economic activity; however, Statistics Canada (4) reports the unemployment rate only on a regional basis (Ontario is divided into 10 economic regions).

Adjustment Revenue Factor

The adjustment revenue factor (ARF) was calculated by dividing the total passenger revenue during the three months preceding the fare increase by the total passenger revenue during the corresponding three-month period a year before.

The time periods used for the calculation of ARF are schematically shown in Figure 2. ARF is designed to take into account past trends in ridership and may be considered a surrogate for many contributing but nonmeasurable variables. The ratio of revenues rather than a ratio of riderships was used in its calculation because the ridership is a secondary, derived variable usually estimated from the revenue.

The ridership estimate is based on the total value of received revenue (in terms of cash fares, tickets, and tokens) and assumed proportions of different fare groups (adults, children, students, senior citizens). The average ARF was about 1.09.

If the fares were actually increased during the time span for which ARF is being calculated, i.e., any time during the 15-month period preceding the last fare increase (see Figure 2), ARF would not reflect past trends in ridership. It would mainly reflect past trends in revenue. In this case, ARF should be calculated as a ridership ratio.

Ridership Change

Ridership change was defined as the percentage change in the number of revenue passengers carried by regular service during the first six months after the fare increase as compared to the number of revenue passengers carried during the corresponding six-month period a year before. The change in ridership ranged from an increase of 14.7 percent to a decrease of 35.5 percent (Table 2, column 7); average ridership decrease was about 1.1 percent.

Revenue Change

Revenue change was defined as the percentage change in revenue (from regular passenger service) during the first six months after the fare change based on revenue during the corresponding six-month period a year before. The average increase in revenue was about 18.5 percent.

DEVELOPMENT OF MODELS

A number of mathematical models empirically relating revenue and ridership changes to various independent variables were constructed and evaluated by using a least-squares technique. The following two models were chosen for their accuracy and simplicity.

$$\text{Revenue change} = -40.0 + 0.68\,M + 0.41\,F + 35.4\,ARF + 2.85 \log R - 5.8\,S \quad (2)$$

$$\text{Ridership change} = -30.0 + 0.50\,M - 0.42\,F + 24.2\,ARF + 2.57 \log R - 4.8\,S \quad (3)$$

where

M = change in vehicle kilometers (percent),
F = increase in average fare (percent),

ARF = adjustment revenue factor,
R = average 1976 monthly transit ridership in passengers (maximum value is 10^7 passengers), and
S = service level factor or S = V/R, where V is average 1976 monthly vehicle kilometers operated by the system and R is as defined above,

and where the revenue change is the percentage change in revenue during the first six months after the fare increase, and the ridership change is the percentage change in ridership during the first six months after the fare increase.

The average 1976 monthly ridership and vehicle kilometer data were used in the models because 1976 was the last year for which the data were available for all transit systems evaluated.

Assuming that the relationships in Equations 2 and 3 are valid for other transit systems and times, the model equations can be used for predicting revenue and ridership changes caused by increased fares and simultaneous increases in fares and service levels.

MODEL EVALUATION

Statistical Evaluation

The table below shows standard errors of estimate and multiple correlation coefficients for the two models.

Model	No. of Observations	Standard Error of Estimate (%)	Multiple Correlation Coefficient
Revenue change	32	3.95	0.978
Ridership change	32	4.01	0.931

The multiple correlation coefficient for the revenue-prediction model was 0.978, which indicates that about 96 percent (0.978^2) of the total variance in this variable was explained by the model. This is a relatively high percentage considering the amount of data aggregation and number of potentially significant factors not included in the model for lack of data or the absence of statistical significance. Examples of these are measures of economic activity, weather, comfort and convenience, advertising, and publicity.

The fact that 4 percent of the variance was not explained by the revenue-prediction model does not necessarily mean that all other variables not included in the revenue-prediction model account for only 4 percent of the change in transit revenues and are thus more or less insignificant in affecting transit revenues.

The selection of variables included in the model was not entirely predetermined and this, together with sample correlation and the inherent reliability, or rather unreliability, of multiple correlation coefficients (7) may have resulted in the overestimation of the multiple correlation coefficient of the sample.

All partial regression coefficients of the models were significant at the 0.01 probability level.

According to the table above, the accuracy of the revenue-change model was higher than the accuracy of the ridership-change model. This difference in the accuracy is also illustrated in Figures 3 and 4 (the numbers correspond to those in Table 1), which show plots of predicted versus observed values for the two models. The lower accuracy obtained for the ridership change model may have been caused by the procedure by which the ridership was derived from revenue and particularly by the changes in this procedure with time. Consequently, whenever possible, priority should be given to the revenue-change model.

Sensitivity of Model Variables

This section contains a brief evaluation of the influence of model variables as predicted by the models. Emphasis is placed on the revenue-prediction model; the evaluation of the ridership model would be analogous.

Effect of Vehicle Kilometers

The change in vehicle kilometers was found to be the most significant variable and to have the highest correlation with revenue change. This result is in agreement with those of previous studies that service elasticity is generally larger than fare elasticity (1, 6, 7). The partial regression coefficient for the change in vehicle kilometers (0.68 in Equation 2) suggests that each 10 percent change in vehicle kilometers results in a 6.8 percent change in revenue during the first six months after the fare increase.

The model's effect of distance change is an average aggregated effect. Because data were unavailable, when (for example, peak period versus off-peak period or for weekday versus weekend), where (change in route alignment versus change in headways), and why (to improve level of service versus to meet capacity requirements) the change occurred were not distinguished.

Effect of Fare Increase

The fare increase was the second most significant variable. The partial regression coefficient for the average fare increase suggests that each 10 percent increase results in a 4.1 percent increase in revenues during the first six months after the fare increase. This corresponds to a revenue fare elasticity (or shrinkage ratio) of about -0.4.

The effect of fare increase is an aggregated effect that reflects only the average increase in the fare structure. However, different market segments (children, students, adults, senior citizens) may have quite different fare elasticities for the same fare increase. Moreover, in many cases, transit fares were not increased uniformly for all market segments.

Effect of ARF

ARF is intended to take into account past trends in ridership. This is necessary in order to estimate what the revenues would have been without the increase. ARF reflects ridership growth, unadjusted for weather variations, during the year preceding the fare change. According to the partial regression coefficient of 35.4, for each 1 percent change in revenue during the year preceding the fare change, we can expect a corresponding 0.35 percent change in revenue during the next six months.

Effect of Service-Level Factor and Ridership Size

Service-level factor (defined as the ratio of average monthly vehicle kilometers to average monthly ridership) and ridership have been included in the model to reflect the effects of these closely interrelated variables on fare elasticity.

1. Level of service: Transit riders are more sensitive to fare increases if the level of service is low. Level of service usually increases with an increase in city size.

2. Proportion of work trips: The fare elasticity is lower for work trips than for other trip purposes (8). The proportion of work trips usually increases with city size.

3. City size: City size is highly correlated with ridership size, a variable included in the model. Fare elasticity usually decreases with an increase in city size because of differences in level of service, propor-

Figure 3. Comparison of observed versus predicted change in revenue.

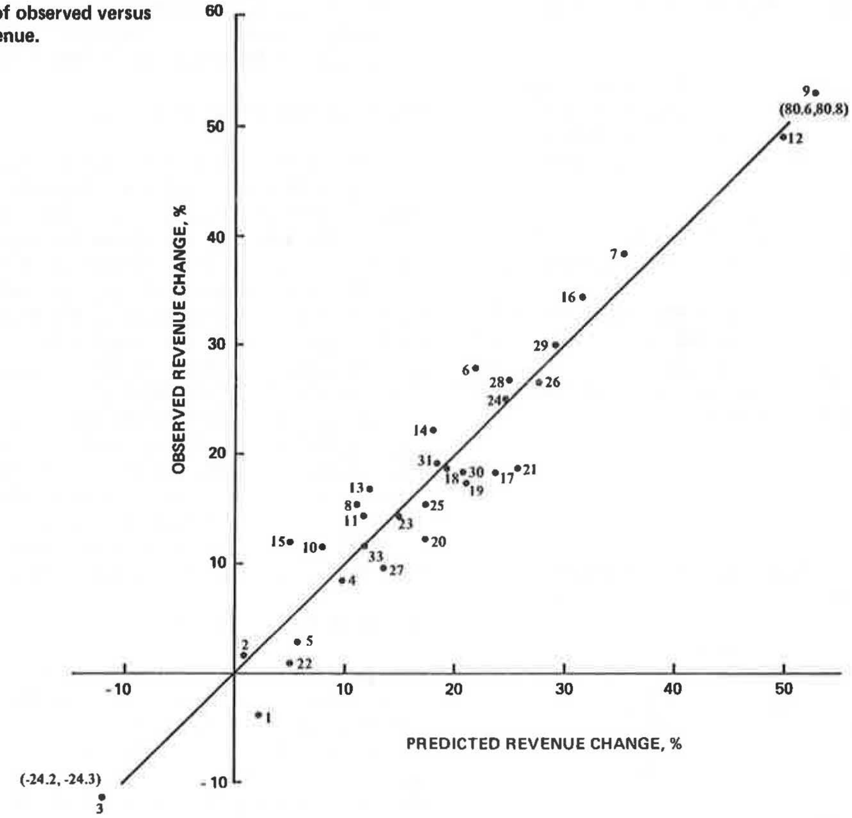


Figure 4. Comparison of observed versus predicted change in ridership.

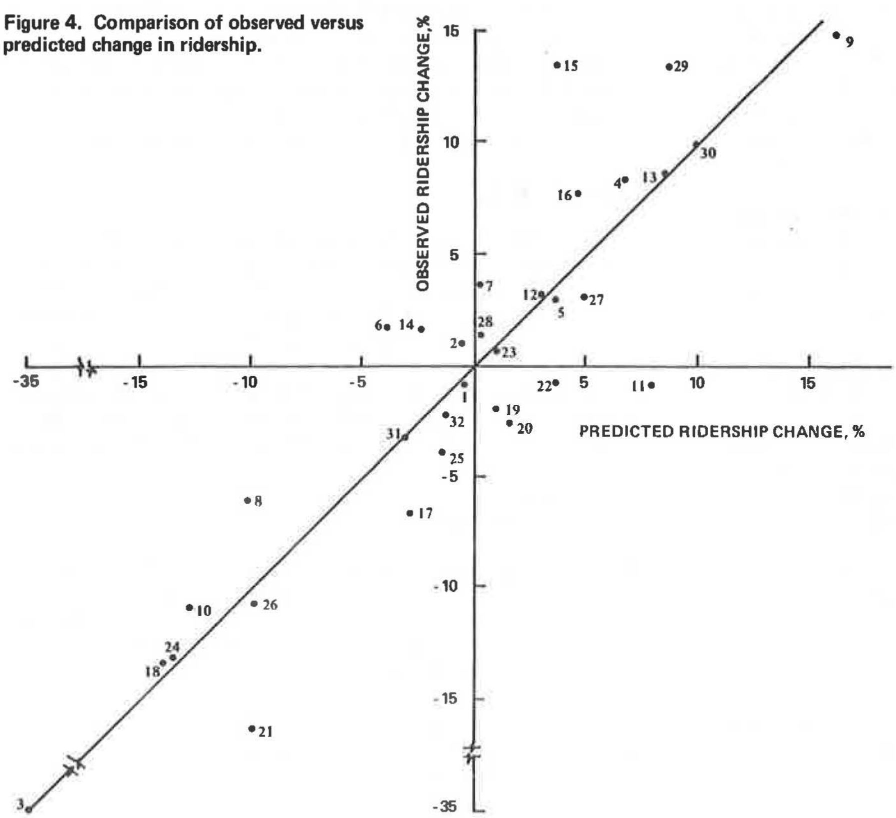


Figure 5. Definition of time intervals between and after fare increases.

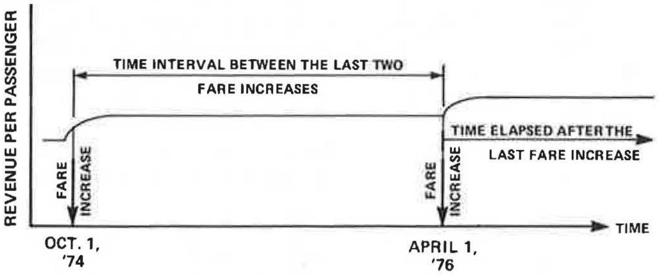


Table 3. Partial regression coefficients for average fare increase obtained for revenue-prediction models.

Time Period After Fare Increase (months)	Partial Regression Coefficient	Standard Error of Partial Regression Coefficient	t-Test	No. of Observations
0-3	0.452	0.0768	5.88	32
3-6	0.331	0.0789	4.20	32
6-9	0.203	0.1212	1.67	30

Table 4. Overall longer-term effects of fare increase.

Time Period After Fare Increase (months)	Average Fare Increase (%)	Average in Vehicle Kilometer Change (%)	Average Revenue Increase (%)	Average Ridership Change (%)	No. of Observations*
0-3	26.52	3.52	24.88	-1.33	24
3-6	25.50	2.72	20.19	-4.06	24
6-9	26.78	3.55	23.25	-2.32	21

*Only transit systems with fare increases were included.

tion of work trips, parking restrictions in downtown areas, and other factors.

The sign of the partial regression coefficient for the service-level factor indicates that its increase, usually associated with a reduction in city size, would result in a revenue reduction. The partial regression coefficient for ridership suggests that each 10-fold increase in ridership size results in an additional 2.85 percent increase in revenue change (all other variables being constant). One should note that variable ridership size is essentially used as a surrogate variable for "city population served by transit," which was not available.

EFFECT OF VARIABLES NOT INCLUDED IN MODELS

Time Interval Between the Last Two Fare Increases

The time interval between the last two fare increases was defined as years between the previous fare increase and the last fare increase (see Figure 5, where the numbers correspond to those in Table 1). The last increase is by definition the one evaluated in this study, and it was the latest fare increase for which all pertinent data were already available.

This variable, in its logarithmic form (logarithm of values in Table 1, column 6) was found to be statistically significant only at the 0.05 probability level and as such it was not included in the models. Results obtained for this variable indicated that the length of time between the last two fare increases has a beneficial (but not statistically reliable) effect on revenue. This is a quite logical effect considering that the fare increases were not deflated. Thus, a 30 percent fare increase after five years since the previous fare increase may represent only a marginal real increase in fares if adjusted for inflation.

Change in Economic Activity

Because of the lack of better indicators, the change in general economic activity was measured by ICI. This index in its logarithmic form (logarithm of Table 2, column 5) was found to be statistically significant at about the 0.05 probability level for some models. Results suggest that the increase in ICI increases transit revenues, while the reduction in ICI has no effect on revenues. This is a preliminary observation; a better measure of economic activity is needed for a more authoritative conclusion.

Elapsed Time After Fare Increase

The influence of the length of time elapsed after the fare increase on revenue and ridership was analyzed with the help of three analogous revenue- and ridership-change models developed for the three consecutive time periods: (a) three months after the fare increase (0-3), (b) from three to six months after the fare increase (3-6), and (c) from six to nine months after the fare increase (6-9).

Partial regression coefficients for the variable fare change obtained for the three consecutive time periods after the fare increase are summarized in Table 3. Using the t-test, it may be shown that the difference between the partial regression coefficient obtained for the time period 0-3 (0.452) and the corresponding coefficient obtained for the time period 6-9 (0.203) is statistically significant. This indicates that the effect of fare increases on transit revenues changes with the length of time elapsed after the date of the fare increase.

The effectiveness of a fare change in producing increased revenue decreases with the time elapsed since the fare increase. For example, according to the models (see Table 3), while each 10 percent increase in fares resulted in a revenue increase of about 4.5 percent during the first three-month period (0-3 months), during the last three-month period (6-9 months) it resulted only in a revenue increase of about 2 percent. It appears that transit riders need some time before they can switch to other modes of transportation or eliminate certain unessential trips or both.

The overall average trends in revenue and ridership are illustrated in Table 4. According to the table, both revenue and ridership declined during the latter time periods in spite of the increase in vehicle kilometers.

Other model variables were not influenced by the elapsed time after the fare increase.

CONCLUSIONS

1. Revenue (or ridership) change caused by a fare increase is predictable and is a function of at least the following variables: fare change, distance change, past ridership trends, city size, level of transit service, and time elapsed since the fare increase. In addition to these basic variables, other marginal variables such as length of time elapsed between the last two fare increases and a change in general economic activity may be important.

2. No transit system studied suffered a loss of revenue from increased fares, with the exception of Thorold, where a 17 percent increase in average fares coincided with a 22 percent reduction in vehicle kilometers.

3. A given percentage change in vehicle kilometers

(change in level of service) has a greater effect on revenue (ridership) than an equivalent percentage change in fares.

4. The effectiveness of a fare increase in producing increased revenue decreases with the time elapsed since the increase. It appears that transit riders need some time after the fare increase before they can switch to other transportation modes or eliminate certain unessential trips or both.

5. An overall revenue increase may be a sufficient parameter for financial and budgetary purposes. However, in view of the role of public transit in today's society, we need a better understanding of the effect of transit fare increases on different socioeconomic and demographic groups.

6. The models are not suitable for estimation of revenue or ridership changes in the absence of a significant fare increase. An extrapolation of historical trends will probably yield better results. The models are also unsuitable for estimating revenue or ridership changes brought about by only a small change in vehicle kilometers. Better estimates of future revenue or ridership changes may be obtained by specific analysis of routes, time periods, and reasons for which the distance changes are planned.

7. For long-term use the models presented in this report should be checked and updated periodically.

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Abridgment

Who Pays the Highest and the Lowest Per-Kilometer Transit Fares

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Most U.S. transit systems charge a basic flat fare for bus trips within large zones surrounding urban centers, and additional incremental charges for longer intercity and intraurban bus trips. Naturally, under such fare structures, fares per kilometer for transit users vary greatly as trips differ in length. But, since such differences are often correlated with differences in rider characteristics, the issue of the equity of such fare structures has recently come into focus (1-3), particularly in light of transit-operating subsidies. The concept of distance-based fare structures has been proposed as a means to increase ridership and revenues while equalizing fares per kilometer across all transit users (4, 5). Therefore, the issue of fare equity needs to be considered by transportation planning professionals.

This paper takes a close look at fare equity, from the standpoint of the transit user, by investigating fares per kilometer paid by different groups of bus riders.

STUDY AREA

The research consisted of an examination of the ridership profile of the transit system operating in the capital district of Albany, New York, an area comprising three medium-sized cities within a radius of about 16 km (10 miles)

The fare structure is a basic flat rate. Riders within the urban centers pay 40 cents plus additional increments up to a maximum fare of 75 cents for intercity and intraurban bus trips. It should be noted that there are half-fare rates available to senior citizens and handicapped persons and special discount commuter and school passes.

The data base consisted of coded responses to questionnaires distributed during an on-board survey conducted in November 1975. More than 1100 questionnaires were analyzed; an average of 43 300 one-way trips are made daily on the system. Each questionnaire is related to one bus trip. Using information asked of the respondents concerning origin, destination, and fare paid, the fare per kilometer and the trip duration (in minutes) for each bus trip were calculated.

DIFFERENCES IN AVERAGE FARES PER KILOMETER

The average fare per kilometer for all riders in the sample was 11 cents/km (18 cents/mile) with a standard