cause of the higher operating speed due to less stops, the in-vehicle travel time decreases, which attracts additional riders. The net result was, however, a reduction in ridership. With an increase to 12.5 posted stops per mile, the ridership increased by much less than the magnitude of the decrease caused by fewer stops per mile. This is a reasonable result because the percentage of change in walking distance is also about one-half of the magnitude, as it was with the decrease in stops per mile.

For both routes, the model indicated that a 20 percent increase in ridership generally caused a decrease in operating speed by about 1 to 4 percent. Also, the number of stops with some passengers boarding or alighting increased by about 5 to 15 percent for a 20 percent increase in ridership. The total delay increased proportionately. For Route 28, the user cost per passenger increased only slightly. Due to the already crowded conditions on Route 27, however, the user costs per passenger were affected to a greater extent. Still, the average increase was only about 1 percent.

CONCLUSIONS

In determining a transportation mode choice, the overall travel time is a very important element. Although the adverse effect of out-of-vehicle travel time is most severe, it is also important to reduce the in-vehicle travel time as much as possible. A major disadvantage of the bus is that it has to stop continually to allow passengers to board and alight. Not much attention has been given to determining explicitly the impact that this stopping has on the overall operating speed of the route.

By using data from Milwaukee, Wisconsin, the distribution of passengers boarding and alighting at stops along a route was analyzed. It was found that a Poisson distribution could be used only on routes with low ridership. Nevertheless, the negative binomial distribution was found to be a good descriptor of passenger boardings and alightings over a range of ridership levels. Data from Lafayette, Indiana, were used to analyze the bus dwell time. It was found that the bus dwell time per passenger decreases with the natural logarithm of the boardings and alightings at the stop. From these findings, a procedure was developed to determine the resulting bus delay and its effect on operating speed.

The methodology was then tested by using data from Milwaukee, Wisconsin, and assuming different numbers of stops per mile. Analysis of the output revealed two major findings. First, a change in posted stops along a low-demand route will have only a minor effect on bus operating speed but will reduce the user's walking distance. Second, because additional posted stops along a high-demand route will save walking distance at the cost of greater in-vehicle travel time, an optimum number of posted stops per mile should be sought.

This methodology can be applied to all operating-policy changes that have an effect on the operating speed. Appropriate performance measures can then be used to examine the impact of the various policy options.

ACKNOWLEDGMENT

We are grateful to the Milwaukee County Transit System for the passenger data used in the study. Also, the help of Virgil Anderson in assisting with the statistical analysis is appreciated.

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Publication of this paper sponsored by Committee on Bus Transit Systems.

Economics of Commuter Express Bus Operations

BRAD WILLIAMS AND BILL WELLS

With the recent cuts in federal subsidies for transit operations, planners are looking for ways to reduce their operating costs. One way of doing this is to allow the private sector to provide commuter express bus service at little or no subsidy. A study of commuter express bus operations is summarized in which it is concluded that the operating cost for a private carrier is only about half that of the public carriers in Southern California. After 22 public bus lines had been evaluated, the conclusion was that more than $5 million per year in subsidy could be eliminated if the 22 bus lines were operated by private carriers. The cost savings are attributed to more favorable work rules and the ability to use less costly equipment. One other factor is that private operators will continue operation of a bus only if it is nearly full. The analysis was based on operating budgets for the two transit districts in Los Angeles and Orange Counties and on a survey of private agencies in the region.

This paper is the product of a 10-month study that has focused on the respective roles of the public and private sectors in providing commuter express bus services. The study has examined two critical, interrelated issues affecting public policy decisions in this area. The issues are (a) the comparative economics of public and private agencies and (b) the institutional and regulatory framework within which services are currently provided and that constrain policy changes.

In this paper we concentrate on the economic analysis that was performed during the course of the study. The procedures that were used in obtaining cost and revenue estimates are described and the findings are summarized.

There are a number of events that have occurred from the local to the federal level that effectively created the arena in which this analysis was made. The net result of these events is that public transit agencies are facing severe budget constraints that are hampering expansion efforts and may soon necessitate some service cutbacks. At the same time the population growth in the region, much of which is in outlying areas where housing is less expensive, is creating a demand for more transit, both local and express.

From the outset the study was designed to address the concerns of public and private agencies as well as the regional planning community. To achieve this end, a special task force was formed to bring together the numerous and varied interests to give technical direction and policy feedback to the study.

Membership on the task force included public transit agencies and private commuter bus agencies plus planning, funding, and regulatory agencies. Participation by the entire membership was extremely spirited and productive despite often-conflicting goals. Input by the task force has proved invaluable in obtaining and interpreting the material used in this paper and in improving the overall quality of the entire study.

ECONOMICS OF COMMUTER EXPRESS BUS SERVICE

In this section we examine the costs and revenues associated with both public and private operations and compare them on a route-by-route basis. Operating-cost models are developed for each type of service and the estimated costs are compared. Revenues are estimated for both types of service with an adjustment to compensate for the fare elasticity of demand. A total of 22 existing Southern California Rapid Transit District (SCRTD) and Orange County Transit District (OCTD) bus lines are examined, which include peak-only, park-and-ride, and subscription-service categories.

Operating Costs

Careful attention was given to the estimation of operating costs for public and private agencies to ensure a realistic basis of comparison. Allocating the exact cost to a particular bus line is difficult, especially for public agencies. Therefore, some generalizations were made based on systemwide characteristics.

Public Transit Operations

Since the majority of public express service in the region today is provided by SCRTD and OCTD, in this analysis we concentrated on these two districts. The analysis was further restricted to a select number of express bus lines that operated exclusively during peak periods. Various cost-allocation models were examined and compared in order to find the most consistent basis on which to estimate operating costs.

OCTD Operations

OCTD has been using a cost-allocation model for the past few years that allocates unit costs to vehicle hours, vehicle miles, and revenue vehicles. This model was broken down into peak and off-peak periods for FY 1981 under the assumption that the peak-period service is more costly than off-peak service. The FY 1981-1982 model for peak-period service is

$$OC = 20.55\ (VH) + 0.95\ (VM) + 25{,}901\ (PV)$$

where

- OC = fully allocated annual operating cost,
- VH = total vehicle hours (revenue plus non-revenue),
- VM = total vehicle miles (revenue plus non-revenue), and
- PV = number of scheduled vehicles during each peak period (the model acutally distinguishes between a.m. and p.m. peak-period vehicles; to simplify the model, the two variables were merged into a single peak-vehicle variable with no loss of accuracy).

SCRTD Operations

Research disclosed three entirely different cost-allocation models for SCRTD. Although they came from different sources and represented different fiscal years, all three models were derived from SCRTD annual budgets.

A three-variable model, similar to the OCTD model, gave cost estimates consistently about 24 percent above those of the OCTD model. This relationship is very close to the relationship between unit costs for the two districts as shown in their short-range transit plans. SCRTD projected that in FY 1981 the operating cost per vehicle service (revenue) hour would be \$49.20, whereas OCTD projected a similar unit cost of \$39.45. This indicates that SCRTD experiences unit costs about 25 percent higher than those of OCTD.

The model looks as follows for FY 1981-1982:

$$OC = 27.90\ (VH) + 1.22\ (VM) + 27{,}268\ (PV)$$

Private Transit Operations

Private bus agencies have some distinct advantages over public agencies that allow them to experience much lower costs for the same or similar services. Many of these advantages stem from the fact that most private agencies are not subject to the salary levels and operating restrictions that have recently characterized labor agreements in the public sector.

Survey of Agencies

Twenty-six questionnaires were sent to private agencies in the region asking for cost estimates for nine existing SCRTD and OCTD express bus lines. Because the purpose of the questionnaire was simply to determine the total cost, no breakdown or itemization was requested.

The comments of the various respondents to the questionnaire made it apparent that a generalization of private operating costs is very difficult. Issues such as the value of the vehicles, worker or professional drivers, and terminal locations can create situations where the cost per mile of two bus lines may be vastly different whereas the level of service as perceived by the riders may be identical. The following descriptions indicate the wide range of operating characteristics that determines a corresponding wide range in cost. These examples represent extreme situations. Most private services fall somewhere between these extremes.

1. Maximum-cost service could be provided by using a new intercity bus with all extras costing well over \$150,000. These buses are returned to the storage facility after the run, which requires deadheading miles equal to or greater than revenue miles. Drivers are paid for each run from the time

the bus leaves the storage facility until it is returned to that facility.

2. Minimum-cost service could be provided with used buses that are still functional and comfortable, worth between $12,000 and $25,000. Worker drivers pick up the buses from a storage location near the origin point of the line and leave them at the destination point during the day. There are virtually no deadhead miles or nonrevenue hours for which the driver must be paid.

Except for the vehicle being used, the characteristics described above may be totally unknown to the rider. The cost of operating private express bus service, then, is not directly correlated with the level of service.

In some cases, worker drivers may be undesirable or difficult to find. Use of older equipment may be a cost saver for these cases. Finding worker drivers for a new service along a corridor not previously served by express bus may be particularly difficult. Most worker drivers have well-established patterns of commuting during specific hours in the morning and evening. Often they are transit users who have been riding on the particular bus that they later drive. When this type of contact is unavailable, new services may not always have the option of worker drivers. This might mean that the cost of providing a new service may be somewhat higher than that for certain already established services.

Private Agency Costs

Although only a small number of agencies responded to the questionnaire, the majority of their cost estimates were quite similar; they averaged $2.79/revenue mile.

One respondent, who operates a small agency that uses worker drivers exclusively, provided an estimate about one-third the magnitude of the others. The response indicates that it may be possible to achieve operating costs significantly below those estimated here with the exclusive use of worker drivers and perhaps older equipment.

One large agency indicated that they have contracts for commuter services that are significantly below the $2.79 value and others that are significantly above. This illustrates the variance that exists in the cost of private operations. It also indicates the problem in generalizing private costs for comparison with public costs. Every commuter express bus service has its own unique operating characteristics that must be considered when the service is evaluated. Although general comparisons are made in this paper, a more detailed study should be done on a line-by-line basis before any conversion from public to private operations is implemented.

Cost Comparison

By using the cost models described above, the cost of operating 22 existing SCRTD and OCTD bus lines was calculated for both public and private agencies.

Table 1 gives the results of the cost calculations. In general, the cost of providing commuter express services is 50 percent as expensive for private agencies as it is for public agencies. On a line-by-line basis, this ratio ranges from a low of 0.34 to a high of 0.76.

The results of this cost comparison are quite significant. A savings of 50 percent in the total operating cost of commuter express bus service could be achieved by using private rather than public carriers. As an indication of the magnitude of these savings, converting the SCRTD subscription and park-and-ride buses to private operation would save the district nearly $5 million a year. This is about 9 percent of their planned UMTA Section 5 operating subsidy for FY 1982, and 1 percent of the total operating budget for SCRTD.

Table 1. Comparison of public and private operating costs.

Type of Service	Cost ($) Private	Public	Difference	Ratio Private/ Public
Subscription	466,428	1,004,024	537,596	0.46
SCRTD park-and-ride	4,180,933	8,617,796	4,436,863	0.49
OCTD park-and-ride	574,697	925,489	350,792	0.61
Total	5,222,058	10,547,309	5,325,251	0.50

Operating (Fare) Revenue

The analysis of operating revenue focused on fares, ridership, and the sensitivity, or elasticity, of ridership to fares. Other ancillary revenue sources such as advertising were not considered, because they would have had only a marginal effect on the results.

Fares

Private agencies are in the business to make a profit and must compete with other private agencies as well as with subsidized public transit districts. Therefore, they tend to charge the lowest possible fare that will allow them to recover their costs plus a small percentage. Their fares are often calculated on a line-by-line basis. By minimizing the number of runs per line to ensure maximum ridership on each bus, they are able to keep the fare as low as possible. Generally, a bus less than 80 percent full loses money and does not remain in service for long without some revenue guarantees from a sponsoring firm or agency.

By using this individualized approach toward determining fares for private commuter express bus service, it is possible to have private fares that are higher than public fares in some cases and lower in others. In many instances today, the published fares for private services are close to the comparable public fare.

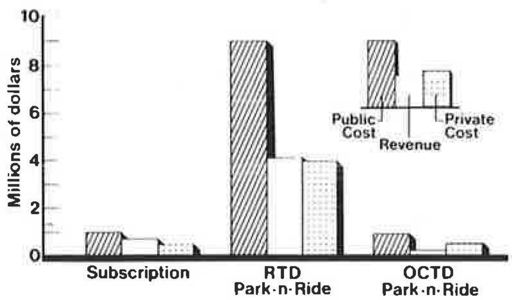
This economic analysis compares existing SCRTD and OCTD lines under public and private operating scenarios. The assumption is used that the private agencies would charge the same fare as the public agency whenever that fare would provide a revenue at least 6 percent above the cost. Fares for services where this does not occur are increased until the revenue, adjusted for fare elasticity, reaches that threshold.

Elasticity

A recent analysis of elasticities for SCRTD by the University of California, Los Angeles, has estimated a range of elasticities from -0.09 for system-level peak-period trips to -0.15 for all-day trips of more than 15 miles. This range is below the transit industry average of -0.28 and is consistent with averages for peak-period and work transit trips. The midpoint of this range, -0.12, was chosen as an appropriate approximation for estimating the impacts of fare increases on commuter bus ridership.

It is important to remember that every line that will be studied will have its own fare elasticity that will change for each station served along the line. A general elasticity parameter can, at best,

Figure 1. Economic comparison.



only provide a rough estimate of the actual impact that a fare increase would have on any particular line. Because there is no reasonable way to obtain elasticities on a line-by-line basis, the general parameter is the best approach to use. It is useful in obtaining order-of-magnitude impacts both on a systemwide and a line-by-line basis. The figure selected above will provide a reasonable estimate of fare-increase impacts on commuter bus ridership.

Ridership and Revenue

Both SCRTD and OCTD have estimates of ridership on each line that are periodically updated. At the time of this study the most recent OCTD estimates provided ridership numbers for November 1980. SCRTD's latest estimates were for June 1980.

The recent increases in fares by both districts were much greater than the current inflation rate and have had a detrimental effect on ridership. Therefore, the ridership estimates were adjusted by using the -0.12 elasticity assumption.

Total revenues for all of the bus lines under study are $5,042,523, or about 48 percent of the total public cost. Total subsidy for the 22 bus lines is $4,740,658.

Economic Analyses

The economic comparison of public and private operations is shown in Figure 1 and tabulated below (of the OCTD park-and-ride lines, three are not profitable at any fare level):

Type of Service	No. of Lines	No. Profitable Without Fare Increase	No. Requiring Fare Increase
SCRTD subscription	8	8	0
SCRTD park-and-ride	9	4	5
OCTD park-and-ride	5	0	2

This section summarizes the findings of that comparison and then develops a prototypical commuter express bus line that will provide an example for analyzing new services in markets not currently served at all.

Comparison of Existing Bus Lines

In the aggregate, the 22 transit district bus lines examined in the study would show an improvement in farebox recovery ratio from 0.48 to 0.97 by converting to all private carriers and keeping the current fare structure intact. Because of their lower costs, municipal agencies would experience results of smaller magnitude than those shown here. Subsidy per trip for the park-and-ride services would decrease from $2.39 to $0.18. There are large differences between subscription and park-and-ride service, as the discussion below indicates.

SCRTD Subscription Service

The SCRTD subscription buses are currently operating at a farebox recovery ratio of 0.67, which is far better than the system average. The service has an annual deficit of $335,624.

Private operation of the same service could be provided at a 43 percent profit. Because of the high farebox recovery ratio, however, it is unlikely that SCRTD would like to convert the service. Loss of these lines would have the net effect of reducing SCRTD's overall operating ratio, which would be undesirable for them.

SCRTD Park-and-Ride Service

Analysis of the nine SCRTD park-and-ride bus lines shows that they currently operate with a farebox recovery ratio of 0.49. This is slightly better than the systemwide average of 0.44 for FY 1981. However, the service still shows an annual deficit of more than $4 million and a subsidy per trip of $2.16.

Operation by private carriers shows a profit of 0.6 percent, or $27,080, when no adjustment is made to the fare. The subsidy per trip of $2.16 is totally eliminated. An increase in the fares for the entire service of only 6.2 percent would provide sufficient revenue for a 6 percent profit with a loss in ridership of 0.7 percent, or 59 trips. These findings are based on a private cost model that is biased upward. It may be possible that this entire service could be operated at an acceptable profit by private carriers with no change in fares.

On a line-by-line basis, four of the lines would be profitable with no increase in fares. Three more lines would be profitable with fare increases of less than 30 percent. The remaining two lines would require fare increases of greater than 50 percent. These two bus lines would probably need more than a fare increase to become profitable because the elasticity would most likely be greater than -0.12 for such large fare increases. Perhaps a combination of fare increases and service reductions would be warranted for these lines.

In general, the analysis of the SCRTD park-and-ride service indicated that the service could be operated profitably by private carriers. A fare increase to raise the profit margin to 6 percent might cause a drop in patronage of less than 1 percent, and some decrease in ridership due to service cutbacks might result. These negative impacts could be offset by the elimination of an annual subsidy requirement of $4.4 million, or $2.16/trip. The annual subsidy that could be saved for a person who rides the bus every weekday is $1,103.

OCTD Park-and-Ride Service

OCTD park-and-ride service operates with a high subsidy, as its 0.18 farebox recovery ratio indicates. This is slightly lower than their systemwide average of 0.20. This is due to low fares coupled with a ridership that averages about 24 riders per bus. Subsidy per trip averages $6.08/trip, or $3,101/yr for a person who rides the bus every weekday. A person riding bus number 291 every weekday is subsidized $7,655/yr.

Of the five bus lines examined, two could be operated profitably under private ownership. They

Table 2. Economic comparison of prototypical commuter express bus line.

Characteristic	Public	Private
Route description		
One-way route miles	31.0	31.0
Daily trips in and out	12, 12	12, 12
Monthly pass ($)	87.74	93.18
Ridership		
Daily	864	858
Per bus	36	36
Economic comparison		
Annual cost ($)	931,537	452,250
Annual revenue ($)	454,863	479,710
Profit ($)		27,460
Subsidy ($)	476,673	
Subsidy per trip ($)	2.16	0
Farebox recovery ratio	0.49	1.06
Annual subsidy per user ($)	1,103	0

would require fare increases of 70.3 and 140.6 percent, however, assuming that the fare elasticity would not change for these large increases. This would require the fares to be $96.00 to $136.00/month. Most likely, fare increases of this magnitude would result in a far greater loss in ridership than shown here. The other three bus lines could not achieve profitable revenues at any fare level without accompanying service cutbacks.

Raising OCTD fares by 67.1 percent to $94.00/month would make them comparable with SCRTD fares. Assuming this fare level for the private operations and constant elasticity, the annual subsidy for all five bus lines could be reduced from $759,379 to $408,587. This is $3.21/trip. It might be possible for small private agencies to provide the service by utilizing worker drivers exclusively. As indicated earlier, this might produce the kind of cost savings needed to put the service in the black.

Prototypical Commuter Express Bus Line

Evaluating the economics of any new commuter express services will have to be done on a line-by-line basis as opportunities arise. The following is an economic comparison of a prototypical bus line under both public and private operation that might be proposed in some corridor not currently being served by private or public carriers. The characteristics of the line are based on average characteristics of the nine SCRTD park-and-ride bus lines examined in this study. This comparison is given in Table 2.

The typical commuter express bus line has a route length of 31 miles and averages 26 mph. It provides 12 runs into an employment center during the morning peak and 12 away from the employment center in the afternoon. The public operator carries an average of 36 passengers per bus at a monthly rate of $87.74. The public operator receives a farebox recovery ratio of 0.49 and has an annual subsidy of $476,673. The subsidy per trip is $2.16. The annual subsidy to an individual who rides the bus every weekday is $1,103.

The private carrier operates the same service but charges a higher fare so that a 6 percent profit is achieved. The monthly rate is $93.18 and almost 36 passengers per bus are carried. Annual profit is $27,460. There is no subsidy per trip.

Operation by a private carrier saves the community the entire subsidy for the service, or $476,673. In addition, a $27,460 profit per year is being realized by a local enterprise. Therefore, the entire benefit to the community is $504,133. From this must be subtracted the additional $49,693 in fares paid by the 858 riders, an average of $57.92 per year per rider. Only six daily riders are lost due to this increase in fares.

The final analysis, then, is that choosing a private carrier over a public operator nets a financial benefit to the community of $454,440 at the cost of losing six riders per day. Since this is a new service, however, those six riders are not losing a service; they simply choose not to take advantage of a new service. The public operator has not been required to add $476,673 to its annual deficit and may choose to spend that money on another transit service somewhere else in the region.

Service Level and Subsidy Trade-Offs

With public transit operators facing conflicting needs to expand service yet decrease subsidies, the economic benefits of expanding private carrier service should be seriously explored. The subsidy per passenger of the SCRTD park-and-ride lines is 4 times the system average and more than 10 times the amount of some buses that operate in dense residential areas. As an example, data compiled in 1979 by SCRTD showed a subsidy per passenger of $0.12 for the Wilshire Boulevard local line (Line 83), whereas the park-and-ride line to Diamond Bar (752) was $2.07.

If some of the current public commuter express lines were converted to private carriers, the public operator could make the choice to expand local service in areas with high residential density (and many transit dependents) or to reduce the total system subsidy. Similarly, expansion of commuter express bus service through private carriers would have little or no effect on the existing budgets of the public operators. Either option allows the public operator to improve service for the entire region without adding any strain on the operating budget.

WHERE DO WE GO FROM HERE?

The findings that are summarized in this paper are significant and point toward the need for rapid policy actions by transportation planning and operating agencies in the region. The institutional and regulatory environment, however, is generally restrictive in providing for a major policy move toward private operation of a public service. State legislation, Public Utility Commission (PUC) regulations, federal regulations such as the Section 13(c) labor protection provision, and even the collective-bargaining agreements of local operators all tend to support the concept of public operations for commuter express bus service. Yet the economic benefits of expanding the role of the private carrier in this area may well be worth the effort.

After carefully researching the institutional and regulatory environment in Southern California, the Southern California Association of Governments approved the following policy recommendations:

1. All transit districts and municipal operators in the region should review their commuter express bus operations and determine the potential cost savings to be achieved by conversion to private operations.
2. All transit districts, municipal operators, and planning agencies in the region should take immediate steps to remove any institutional barriers to converting to private operations, including pressing for new state or federal legislation, if required.
3. All transit districts and municipal operators in the region should cooperate to the fullest extent possible with private operators to make private service a part of the regional transit service. This could include (a) dissemination of

schedules and other operating data and (b) transfer discounts.

4. All transit districts and municipal operators should promote the expansion of private commuter express bus operations by (a) not contesting PUC certificate applications unless the proposed service would have a serious negative impact on the public system, (b) not expanding public commuter express services in areas where private operations appear feasible, and (c) assisting private operators in identifying new commuter express bus markets.

5. Expansion of privately operated services will need promotional, informational, and coordinative support, which might well be provided by Commuter Computer.

This paper documents the potential economic advantages of giving the private bus operator a much larger role in providing commuter express services. Rapid implementation of these recommendations has the potential to increase transit service while reducing annual operating subsidies paid by the public.

Publication of this paper sponsored by Committee on Bus Transit Systems.

Sources of Rising Operating Deficits in Urban Bus Transit

DON H. PICKRELL

Annual operating expenses incurred by U.S. urban transit systems rose more than $5 billion from 1960 to 1980, of which a rapidly declining fraction was covered by farebox receipts. As a result, the industrywide operating deficit approached $4 billion by the end of this period. Although rail transit systems first incurred large operating losses, by 1980 the motor bus segment of the U.S. public transit industry accounted for three-quarters of its aggregate deficit. Recent growth in bus transit operating deficits can be traced to escalating costs per unit of service, rapid service expansion despite declining utilization of existing service levels, and decisions to simplify and reduce fare structures. A detailed examination of each of these sources of rising operating losses is presented, and attempts are made to assess both their individual contributions to deficit growth and their respective underlying causes. Following this examination, an illustration of how these developments interacted to produce the explosive growth in bus transit operating deficits that occurred during the 1970s is given. Specific recommendations are made for bringing growing losses under control.

By many measures, the decade of the 1970s was a pivotal episode in the history of the American public transit industry. After declining steadily for more than 25 yr, total U.S. transit ridership began to climb slowly after 1972 and continued to grow throughout the remainder of the decade; by 1980, the annual number of riders carried by U.S. transit systems returned to the level of the early 1960s. Similarly, after nearly 30 yr of decline, the number of vehicle miles operated by the industry increased dramatically during the 1970s, so that by the end of the decade, nationwide transit service was restored to its level of 25 yr earlier. Much of this revitalized service was provided by using new, higher-capacity vehicles traveling at faster speeds and offering new amenities such as more spacious seating and air conditioning. By 1980, transit vehicles operated over nearly 125,000 track and route miles in the United States, more than a quarter of which were added during the 1970s. Thus despite the tremendous growth in urbanized land area that occurred during this time, both the density and coverage of transit routes in most major U.S. cities reached new postwar highs by 1980 (1).

Other developments, however, were less encouraging: Total operating expenditures incurred by U.S. urban transit systems rose more than $4.5 billion over the decade, of which a rapidly declining fraction was covered by farebox receipts. As a result, the industrywide difference between fare revenue and operating expenditures fell from a surplus of slightly more than $100 million in 1970 to a deficit approaching $4 billion by 1980 (1,2). The most alarming aspect of this growth was that operating costs and deficits not only grew quickly in the early part of the decade, when service and ridership continued their long-term decline, but rose even more rapidly as patronage and service grew throughout the remainder of the decade. By 1980, the motor bus segment of the U.S. urban public transit industry accounted for nearly 70 percent of service offered and total passengers carried nationwide, as well as three-quarters of the aggregate deficit incurred by U.S. public transit operators.

The recent explosion in bus transit operating deficits can be traced to four basic sources: escalation in the unit costs of providing transit service, rapid service expansion despite declining demand for and utilization of existing service levels, and operators' decisions to simplify and reduce transit fare structures. The effects of these trends on urban bus transit finances in the United States over the period from 1960 to 1980 are given below (computed from Tables 1-3):

Factor	Percentage of 1960 to 1980 Decline in Net Operating Income
Increasing real expenditure per seat mile of service	31
Growth in seat miles of service provided	24
Declining passenger miles carried per seat mile of service provided	14
Declining real fare revenue per passenger mile carried	31

Even after adjustment for inflation, rising unit operating costs were responsible for nearly one-third of the $3.2 billion drop in aggregate operating income over the two decades studied, and increases in the level of service provided contributed about another quarter. The remainder of the drop in aggregate operating income resulted from declining demand for transit service together with reductions in fares at which it was offered. Because fare levels clearly affect the use of transit services that are supplied, it is impossible to fully separate the influences of declining demand and fare reductions on transit operators' deteriorating fi-