U.S. Department
of Transportation

**Urban Mass
Transportation
Administration**

The Status of the Nation's Local Mass Transportation: Performance and Conditions

Report to Congress

June 1988

PERFORMANCE REPORTS

(e)(1) The Secretary shall submit a report in January of each even-numbered year of estimates by the Secretary on the current performance and condition of public mass transportation systems with recommendations for necessary administrative or legislative changes.

(2) In reporting to Congress under this subsection, the Secretary shall provide a complete assessment of public transportation facilities in the United States. The Secretary also shall assess future needs for those facilities and estimate future capital requirements and operating and maintenance requirements for one-year, five-year, and ten-year periods at specified levels of service.

-- 49 USC 308

THE SECRETARY OF TRANSPORTATION

WASHINGTON, D.C. 20590

June 14, 1988

The Honorable George Bush
President of the Senate
Washington, D.C. 20510

Dear Mr. President:

I am pleased to submit the enclosed biennial report, "The Status of the Nation's Local Mass Transportation: Performance and Conditions," in response to the requirements of 49 U.S.C. 308.

The report updates the information and recommendations of the previous report and should be of value to the Congress and the Department for developing policies and program requirements to administer the Federal mass transportation assistance program.

Although the report finds that the transit industry faces continuing problems in its efficiency and productivity, there appears to be a leveling off of the rate of cost escalation.

As Federal subsidies were reduced in recent years, new initiatives to competitively contract out services and improve productivity have been implemented throughout the industry. The Department will continue to encourage State and local officials to increase performance in these areas.

We look forward to working with the Congress and the industry to assure that Federal resources are used to address the significant challenges of ensuring mobility for America's citizens.

Sincerely,

Jim Burnley

Enclosure

The Sta[illegible]f the Nation's Local M[illegible]Transportation: Perform[illegible]and Conditions

Report of the Secretary of Transportation to the United States Congress

June 1988

Pursuant to 49 USC 308

United States Department of Transportation
Urban Mass Transportation Administration
400 Seventh Street, SW
Washington, D.C. 20590

PREFACE

49 USC 308(e) requires the Secretary of Transportation to submit a biennial report to Congress on the current performance and condition of the Nation's public mass transportation systems. The initial report was submitted in September 1984; the second report was submitted in June 1987. This is the third report. Section 308(e) reads as follows:

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>
> (2) In reporting to Congress under this subsection, the Secretary shall prepare a complete assessment of public transportation facilities in the United States. The Secretary also shall assess future needs for those facilities and estimate future capital requirements and operation and maintenance requirements for one-year, five-year, and ten-year periods at specified levels of service.

GOAL FOR THIS REPORT

This report puts the Department in conformance with the statutory schedule for submission of these reports. Given the limited period of time since submission of the previous report, it

essentially updates that report by adding an additional year of data (1985) to the profile of the industry and the calculation of performance measures. In addition, it addresses a number of emerging issues such as suburban congestion and provides a discussion of a number of initiatives now being taken by local policymakers to assess transit in a more strategic manner and to improve efficiency and productivity.

With the completion of seven years of reporting under the requirement of Section 15 of the Urban Mass Transportation (UMT) Act, a consistent and nearly universal data base now exists for assessing the performance of the transit industry over a reasonable period of time. Although the concepts and methodology underlying the performance assessment in this report must be considered subject to future revision or refinement, this assessment can nevertheless serve as a meaningful basis for judging the effectiveness and utility of Federal assistance for mass transit in current Federal budget and program decisionmaking.

ORGANIZATION OF THIS REPORT

This report is organized in 9 chapters under three parts:

PART I: Summary and Overview of Mass Transportation

Chapter 1 summarizes the conclusions of the analysis and presents the Department's recommendations for action.

Chapter 2 presents a profile of the mass transit industry and its role in providing mobility.

PART II: Conditions and Performance of Mass Transportation

Chapter 3 summarizes the major demographic trends affecting the market for mass transit and emerging mobility issues.

Chapter 4 examines how transit operating costs are being financed and the options for additional contributions from the farebox and State and local governments.

Chapter 5 describes the transit industry's operating performance with respect to measures of operating efficiency, service effectiveness, and operating cost-effectiveness.

Chapter 6 discusses issues in transit industry capital investment decisionmaking.

PART III: Perspectives for Policymakers

Chapter 7 discusses options for local policymakers in a strategic planning context.

Chapter 8 identifies a variety of successful local actions to improve efficiency and productivity.

Chapter 9 documents the potential for increased private sector involvement in providing transit service, both as an unsubsidized market competitor and as a contractor providing subsidized service more efficiently.

Appendix A details the data sources and methodology used in developing industry performance measures and presents additional data not included in Chapter 5.

A Glossary of technical terms and abbreviations has been included.

DATA SOURCES

The primary source of data concerning transit costs and service since 1980 is the reports filed by transit operators pursuant to the requirement of Section 15 of the UMT Act. For purposes of this report (as well as the previous one), local Section 15 reports have been used following the calandar year basis of the UMTA annual volumes of Section 15 statistics since 1983. This has required the substitution process for earlier-year data described in Appendix A.

Where possible, Section 15 data is supplemented from other sources--particularly the industry-wide projections developed by APTA up until 1983. In general, any long-term trend data (such as 1965 to 1980 or 1983) is taken from APTA, while 1980 through 1985 data used to profile the industry and assess performance is taken from the reconstituted Section 15 data base.

The Section 15 reporting requirement applies only to transit properties in urbanized areas. Only limited data is available about mass transit in rural areas through an inventory of services receiving assistance under the UMTA Section 18 and 16(b)(2) programs. As a result, this report is primarily about mass transit in urbanized areas.

Commuter rail services were not covered by Section 15 reporting until 1984. To allow for a valid assessment of trends, commuter rail data has been deleted in the computation of performance measures in Chapter 5 covering the five-year period between 1980 and 1985, although commuter rail is included in profile data in Chapter 2 describing the state of the industry in 1985. Since commuter rail amounts to about 13 percent of transit in terms of operating costs, the effect of deleting this data on the performance patterns and trends discussed in Chapter 5 should be limited. Appendix A provides a more detailed discussion of the significance of this data.

Another significant data source has been the Nationwide Personal Transportation Studies (NPTS) conducted by the U.S. Bureau of the Census in 1983, 1977 and 1969. These studies provide data on travel and the individual and household

characteristics of those making trips and using different travel modes.

ACKNOWLEDGMENTS

This report has taken account of views and findings from a wide variety of sources within the transit industry and from studies undertaken independently or specifically for such use. It draws freely from a number of studies without making particular reference to the source; but in many cases a citation is provided [in brackets] to identify the source for particular findings. These and other sources are listed in the Bibliography, although their authors should obviously not be held accountable for how this report uses their material.

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PART I

SUMMARY AND OVERVIEW OF MASS TRANSPORTATION

CHAPTER 1: SUMMARY AND CONCLUSIONS

The Department of Transportation's role in supporting mass transportation is to assist State and local governments in their efforts to develop and maintain efficient and effective mass transportation services in urban and non-urban areas. The intergovernmental relationship through which this function is carried out has undergone considerable change in its twenty-four year history. A dramatic increase in the level of total Federal, State and local subsidy provided for mass transportation resulted in more extensive transit services, but service patronage has increased only marginally. The total level of governmental subsidy has been more than adequate to support public transit's role in meeting local mobility needs, but there remains a clear need for significant improvements in productivity, operating efficiency and deployment of services.

Local public transit systems and their private sector supply and service groups are commonly referred to as the "transit industry." This report evaluates recent trends in operating performance and describes the effects of policies and practices of the industry, the changes in the different markets for mass transportation services, capital investment practices, and new and emerging solutions to changing mobility needs using competition and public/private partnerships. It evaluates the results of the

use of capital and operating assistance by local policymakers to respond to the changing role of transit.

The report's findings reflect the diversity of operating environments and practices of public transit systems in urban areas throughout the United States, which are shaped by public policies, needs and market conditions peculiar to each locality.

This report, like its two predecessors, provides the most recent available factual information describing the performance and condition of the Nation's local public transit systems. Performance indicators are used to summarize the operating results of local transit systems and the effects of Federal, State and local policies and practices. Additionally, analysis of regional and urbanized area size differences is provided. The influence of external factors (i.e., congestion, fuel prices and auto ownership) on local service operations is also examined.

The report recommends actions by the Federal, State and local policymakers. The flexibility of the Federal financial assistance program for transit has improved during the last 20 years:

- In 1974, a Federal operating assistance program was initiated and grew to more than $1 billion annually by 1982. These subsidies were accompanied by real cost escalation which has shown signs of attenuating only since 1984.
- In 1982, Federal assistance reached another milestone, a dedicated Federal one-cent fuel tax was authorized which generates approximately $1.2 billion annually.
- In 1987 further changes to the Federal program were made to add to local flexibility in financing public transit projects (leasing, advance construction, associated capital maintenance). The Surface Transportation and Uniform Relocation Assistance Act of 1987 also provides for ensuring the cost-effectiveness of New Start projects.

PERFORMANCE AND CONDITION

The transit service afforded each passenger has grown increasingly costly as the industry has struggled to maintain ridership against a tide of rapidly changing mobility needs. This is reflected in a real increase of 139 percent in operating cost (not including capital cost) per passenger since 1965. In the same period, overall labor productivity declined by 22 percent, despite a more skilled (and costly) transit workforce--more mechanics, managers and professional staff. Preliminary evidence of a possible levelling off of costs since 1984 may be a sign that this greater skill mix is beginning to arrest the long term decline in performance.

Traditional transit markets continue to erode as geographic dispersal of jobs and housing occurs in suburban areas. Rising incomes, increased auto ownership and greater mobility independence of women and the elderly are further reducing transit's attractiveness to those previously considered "captives." As a result, the post-war decline in ridership continued until the energy crisis in 1972 and since then has rebounded to a point slightly below the 1965 ridership level. Meanwhile, between 1970 and 1980 the number of daily work trips on transit in urbanized areas decreased by about 123,000 commuters; transit's share of daily worktrips fell from 13 percent to 9 percent.

Nevertheless, between 1970 and 1980, daily worktrips between suburban residences and central city jobs increased by 531,000,

allowing transit to maintain its 11.5 percent share in this market segment. This was a remarkable achievement in keeping up with the 52 percent increase in this critical and often congested flow of people. Furthermore, in most urbanized areas transit also provides a minimal level of mobility for the working poor and the poor in general. If transit could find ways, beyond its customary fixed-route, large-vehicle approach, to provide low cost mobility to suburban economic opportunities where most of the job growth is occurring, transit could increase its ridership among the working poor and other groups, and could thereby fill a deficiency in urban mobility systems.

Real operating cost escalation in the transit industry, which only recently appears to be levelling off, has been sustained by four major factors:

- declining labor productivity (an 18 percent drop since 1975) and high absenteeism, at levels 3 times greater than for the overall economy;
- relatively high total compensation for employees (up as much as 20 percent in constant dollars in the past ten years);
- extension of service farther into low density suburban areas to attract downtown travel, generating increasingly lengthy, and therefore costly, trips; and
- ownership of rolling stock exceeding peak requirements, in some cases by as much as 100 percent, which requires excessive maintenance and storage costs.

On the capital side of the equation, UMTA provided $35 billion in capital assistance between 1964 and 1987. The findings in this report support the conclusion that the industry has not maximized the benefits of this capital investment. This

can be illustrated by an overall ownership of 45 percent more vehicles (including inactive vehicles) than are required for peak service schedules. Another troubling sign is the continued decline in vehicle miles per vehicle. There are a number of factors that have contributed to the reduced efficiency in the use of the capital funding provided:

- o attempting to serve all peak demand, some of which could be served more economically by ridesharing or private sector operators;
- o putting a priority on capacity expansion when scarce capital funds would be more productively invested to better maintain and modernize existing equipment; and
- o local efforts to exploit the availability of discretionary capital assistance, requiring a local contribution of no more than 25 cents on the dollar, for new investments that are advocated on the basis of unrealistic cost and ridership predictions.
- o Resistance to considering the cost-effectiveness of replacing existing rail services with buses or other alternatives rather than restoring them.
- o Reluctance to consider alternative forms of service provision, such as busways, timed transfers, paratransit and competive procurement of services.

Despite these factors, the massive Federal investment, in partnership with state and local governments, has made considerable progress in restoring the nation's transit infrastructure. The nation's bus fleet has been modernized. The needed support facilities have been provided to service bus fleets. A number of new rail systems have been built. The older rail systems, built before the advent of the UMTA program, are being modernized. Substantial progress has been made in a number of cities and sufficient funding is available to complete the

restoration and modernization of those facilities that are cost effective.

While traditional transit facilities have been upgraded and services improved, new challenges face the industry. Suburban mobility problems are emerging in many urban areas around the country. If transit is to play a part in meeting these new challenges, significant change in how transit is conceived, organized, packaged and delivered will be necessary. In order to compete with the ubiquitous automobile, transit will need to tap the resources and ingenuity of the private sector and will need to adopt service innovations that can make transit use more convenient for its customers (such as eliminating long waits for connecting buses at transfer points through a timed transfer system).

LOCAL POLICIES AND OPERATING PRACTICES

Federal, State and local policymakers must continue to upgrade their service policies and practices to gain the economic advantages and cost savings available through competition and productivity improvements. Innovations and new policy perspectives in service delivery and financing are needed in the following areas, discussed in the subsequent paragraphs:

- o Competitive Service Delivery,
- o Capital Investment Practices.
- o State and Local Revenue Sources,
- o Farebox Contribution, and
- o Policymaking Institutions
- o Public Transit Benefits,

Competitive Service Delivery

Most local transit systems function without competition. In the aggregate, subsidies cover 56 percent of operating costs and public grants total 100 percent of capital costs. Without competition, the public has no benchmark for judging whether the existing public operator's costs are justifiable. Competition among service providers for certain types of service would generate upward pressure on productivity and downward pressure on labor compensation, excessive work absences, surplus rolling stock, and inefficient use of equipment.

Capital Investment Practices

There are instances in which capital investment decisions and financial planning by transit operators do not adequately provide for future costs of service and capital asset replacement. On March 30, 1987, UMTA issued guidance to grantees reemphasizing the importance of financial capacity when making new capital investments or anticipating major system rehabilitation or replacement. An effective capital and financial planning process would make explicit cost estimates of timely future capital replacement and modernization projects (although not necessarily

assuming that all capital must be replaced in kind). Financial planning would also estimate the operating deficits of planned new investments and would put in place the financial mechanisms necessary to provide for the future availability of the public revenue required to operate and otherwise sustain these investments.

State and Local Revenue Sources

In terms of budget condition and untapped revenue capacity, State and local governments generally are in a good financial position to exercise greater responsibility for funding transit capital and operating costs. A stable and reliable State or local funding source would help assure funding on a regular, predictable basis for rehabilitation and improvements as well as to repay bonds. State and local governments are in a much better position to administer a subsidy program for mass transportation deficits which are the product of decisions they make on service levels, fares and labor policies than is the Federal government. When State and local funding is accompanied by realistic and credible capital investment planning, private financing sources are more likely to participate. State and local governments can foster adoption of performance standards for operations such as minimum farebox recovery ratios, targeted subsidies and labor productivity levels.

While innovation in transit can involve very difficult choices for policymakers and the temptation to defer decisions can be great, there is no substitute for decisive localized action. In areas where mass transportation use is intensive, States and localities have time and again proven to be effective leaders.

Farebox Contribution

Relatively few local systems have adopted cost-based fare structures which reflect the difference between more costly services extended to suburbs and less costly central city trips. Artificially restrained fares influence the demand for public transit service. By insulating transit users from the full effects of cost escalation, artificial fares eliminate the incentive for users to resist unreasonable cost escalation. Charging one dollar regardless of trip length obviously makes the longer trip service more attractive and the shorter trip service less attractive. The logical outcome of this pattern over the years has been a system metamorphosis. Costly longer trips have increased in place of cheap shorter trips until the system accomodates only affluent suburbanites and the few people who have no affordable alternative.

Policymaking Institutions

The institutions for local transit policy formulation should reflect a distinction between: (1) the public trustee role of determining what services are needed and seeing that they are

provided by the most cost-effective means; and (2) the role of service provider. Either one of these roles is likely to be subordinated to the other when both are vested in and performed by the same institution. Separating the two roles could result in better utilization of alternative approaches to service delivery, such as contracting out with competing public and private providers. The Transportation Research Board of the National Academy of Science has organized a national advisory committee of transit experts and local government officials to review organizational patterns in the transit industry. The committee is scheduled to report its findings in spring 1988.

Public Transit Benefits

A serious misperception of transit's role in cities undermines transit's bargaining position relative to organized labor and suppliers, a factor which is critical to transit's economic balance sheet. As stewards of the scarce public resources available for transit, local policymakers should question the erroneous view that the principal beneficiaries of transit subsidies are the poor and others who have no alternative to transit for mobility. Owing to this misperception, maintenance of the status quo regarding service levels, routes and fares is often assigned such an absolute priority by local policymakers that tough, arms-length, labor negotiations are impossible. In reality, low income users receive less than 23 percent of the transit subsidy, and transit provides less than 1 in 15 trips made

by the poor. Nowadays, transit's benefits flow largely to affluent suburban residents who regularly commute to work downtown.

RECOMMENDATIONS

The following recommendations may serve as a basis for action by the Congress, State and local governments, the Department of Transportation and transit operators:

1. Increase productivity and efficiency of transit services.

Competition in the provision of transit services would afford local policymakers and taxpayers with a benchmark for judging the efficiency of transit and would bring market incentives to bear on productivity. Local systems contracting with the private sector for the provision of transit services have found that they save from 10 percent to 50 percent of what the public operator service costs. Wider use of private sector services offers promise of additional savings from reduced peak service and expansion needs.

Abuses of the labor provisions of Section 13(c) of the UMT Act decrease productivity and hinder achievement of cost savings from contracting out. Section 13(c) was intended to protect labor from a worsening of its bargaining rights during the era of public takeovers; now it increases operating costs and stifles innovation.

The separation of transit region-wide policymaking from service operations may encourage greater flexibility in obtaining a cost-effective mix of contract services.

2. Maximize the benefits of capital investments.

More efficient utilization and investment in capital assets would result if the local financial stake in proposed projects were higher. Capital investments should be based upon the use of objective criteria at both the local and national level for selecting projects. Congressional earmarking of discretionary program funds for individual projects should be discontinued. Congress has added Section 3(i)(3) to the UMT Act which will provide greater scrutiny of local financial commitment.

More creative fare structures and subsidy approaches should recover the farebox contribution equitably and more effectively target any subsidies to their intended beneficiaries.

Financial planning for the total cost of operation, maintenance and replacement of transit capital stock would increase the effectiveness of capital investments.

3. Finance capital investments through public/private partnerships

Greater involvement of the private sector in capital decisionmaking and financing would make planning more realistic and reduce the cost of investment projects. The private sector can be a source of funds from joint development and special assessment arrangements. Involving the private sector can introduce the discipline of the marketplace to what heretofore has been largely a political process for defining investment plans.

In strategies for financing transit, the potential for reducing costs by improving efficiency and productivity should

have equal weight with obtaining new local revenue sources. In a troubled industry, the challenge that transit policymakers have is the efficient allocation of financial resources and the cost-effective use of the equipment and facilities purchased with them.

Although only about 7 percent of mass transit costs are currently contracted with private sector providers, and 2 percent of costs involve competition, the private sector has shown a clear ability to provide mass transit services at considerable cost savings.

Federal, State and local governments share the responsibility of making better use of the subsidy funds available for public transit. The level of services provided and investments made must be based upon cost-effectiveness. This is essential if transit is to fulfill its role in providing mobility.

4. Restructure the Federal assistance program to enhance local decisionmaking.

Federal assistance for mass transit should assist State and local governments in maintaining balanced urban mobility networks to support the economic viability of urban areas and to meet the mobility needs of citizens who are dependent on public transportation. However, the current Federal transit assistance program discourages local policymakers from implementing the most cost-effective mobility choices. The categorical grant program does not allow local areas the flexibility they need to tailor solutions to their particular and often localized transportation

challenges. Instead of being crafted to solve real problems, local plans are often crafted for their grantsmanship value vis-a-vis categorical "transit" grants.

CHAPTER 2: PROFILE OF LOCAL MASS TRANSPORTATION

HIGHLIGHTS

- About $11.0 billion was spent in 1985 to operate more than 2.4 billion vehicle miles of mass transit service. This does not include any capital or interest cost for existing or new transit investments.

- In 1985, urban mass transit ridership totaled 8.4 billion unlinked trips, down slightly from 1984. Preliminary data indicates that ridership was about the same in 1986. Over the last several years increases in a number of large areas have masked larger declines in smaller areas around the country.

- Transit users pay 44 percent of transit operating costs, the balance being made up from Federal assistance (8 percent) and State or local subsidies (48 percent). Users pay none of the capital costs, which are covered completely by Federal, State and local funds.

- Overall, the largest share of transit trips is for the purpose of going to and from work. However, in smaller areas, transit is primarily used for other purposes. In 1983, transit service was used for about 9 percent of urban work trips (6.2 million workers).

- In 1983, transit trips represented 4.8 percent of all local passenger miles of travel by residents of urbanized areas.

This chapter presents a profile of mass transit service provision and use.

"MASS TRANSIT" DEFINED

For purposes of the current Federal transit assistance program, "mass transportation" or "mass transit" is defined as:

> ". . . transportation by bus, or rail, or other conveyance, either publicly or privately owned, which provides to the public general or special service (but not including school

> buses or charter or sightseeing service) on a regular and continuing basis." {Section 12(c)(6), Urban Mass Transportation Act of 1964, as amended}

This definition covers the fixed route and regularly scheduled services provided by either publicly or privately owned or operated buses, streetcar and rapid rail systems, and commuter rail. These are local services, for travel within or to an urbanized area; or, in the case of non-urbanized areas (rural areas and urban areas of less than 50,000 population), serving places within the same geographic area. Although this does not include intercity service, some routes or services may serve both types of trips at the same time.

"Mass transit" also includes a broad array of service arrangements (and vehicles) known as paratransit, which may provide service on demand or on a door-to-door basis rather than on a fixed route or schedule. The key ingredient making such services part of mass transit is their availability to the public, as in the case of subscription buses or some kinds of specialized services offered for the elderly or handicapped. Therefore, some otherwise purely private or individual arrangements--such as car or vanpools--can be considered, and indeed are, mass transit when they are publicly sponsored and coordinated.

Taxi services--which are collectively nearly as large as mass transit in terms of fare revenues collected--may be considered mass transit when they operate in a shared ride mode (as is allowed in Washington, D.C.) instead of the traditional exclusive ride mode.

PROVISION AND USE OF TRANSIT SERVICE

Transit Service and Ridership

More than 2.4 billion vehicle miles of mass transit service per year are being provided by more than 5,000 entities operating more than 105,000 vehicles (in addition, 3,100 entities, using as many as 125,000 vehicles, provide taxi service). Urban transit ridership in 1985 amounted to about 8.4 billion individual transit trip segments[1]. Rural and specialized service provided by private non-profit organizations total another 0.3 billion rides. Looked at another way, this level of transit ridership consists of work trips by approximately 6 million out of 100 million workers plus trips for other purposes by as many as 5 to 6 million people each day.

Transit Infrastructure

According to UMTA's annual transit industry statistical report (Section 15) and an inventory of rural and specialized operators developed by Rural America, the vehicle fleet in 1985 consisted of the following:

1Transit trips are counted as each individual vehicle boarding, so a one-way trip starting on one vehicle and transferring to two others would be counted as three trips; a similar return trip would also count as three more trips. The use of passenger-miles as a measure avoids distortions due to such multiple counting. In these terms, urbanized area transit use totaled 38 billion passenger-miles in 1985.

Buses	58,857
Subway Cars	9,726
Streetcars and cablecars	1,049
Commuter rail cars	3,975
Commuter rail locomotives	395
Vans	1,827
Other (including ferryboats)	355
Rural service vehicles (primarily vans)	12,142
Elderly and handicapped service vans	16,796
Total	105,122
Taxis	125,000

In addition to this vehicle fleet, the other major elements of the existing transit infrastructure include:

1,642 route miles of rail rapid transit track
861 rail rapid stations
44 rail rapid light maintenance facilities
429 route miles of streetcar track
12 streetcar light maintenance facilities
4,300 miles of commuter rail track*
883 commuter rail stations
24 commuter rail light maintenance facilities
4 ferry boat light maintenance facilities
513 bus light maintenance facilities

* An undetermined proportion of commuter rail track is used for non-transit purposes as well.

For the period from 1965 to 1985, the total amount of transit service provided, as measured in vehicle miles, has increased by about 10 percent. In addition, there has been some shift in the distribution among transit modes. These changes are reflected in the changing patterns of transit use, discussed below.

Transit Costs and Revenues

In 1985 the operating cost incurred in providing mass transit service (not including any of the capital costs) was approximately

$11.0 billion. Capital expenditures in 1985 totaled over $4 billion. Overall, between 1965 and 1985, the unit operating cost per vehicle mile of transit service has risen at more than double the rate of inflation. However, the rate of increase has been slower since 1980 and preliminary data for 1986 indicates that operating costs may have been increasing no faster than inflation since 1984. This trend is shown in Figure 2-1. (This and other performance measures are discussed in more detail in Chapter 5.)

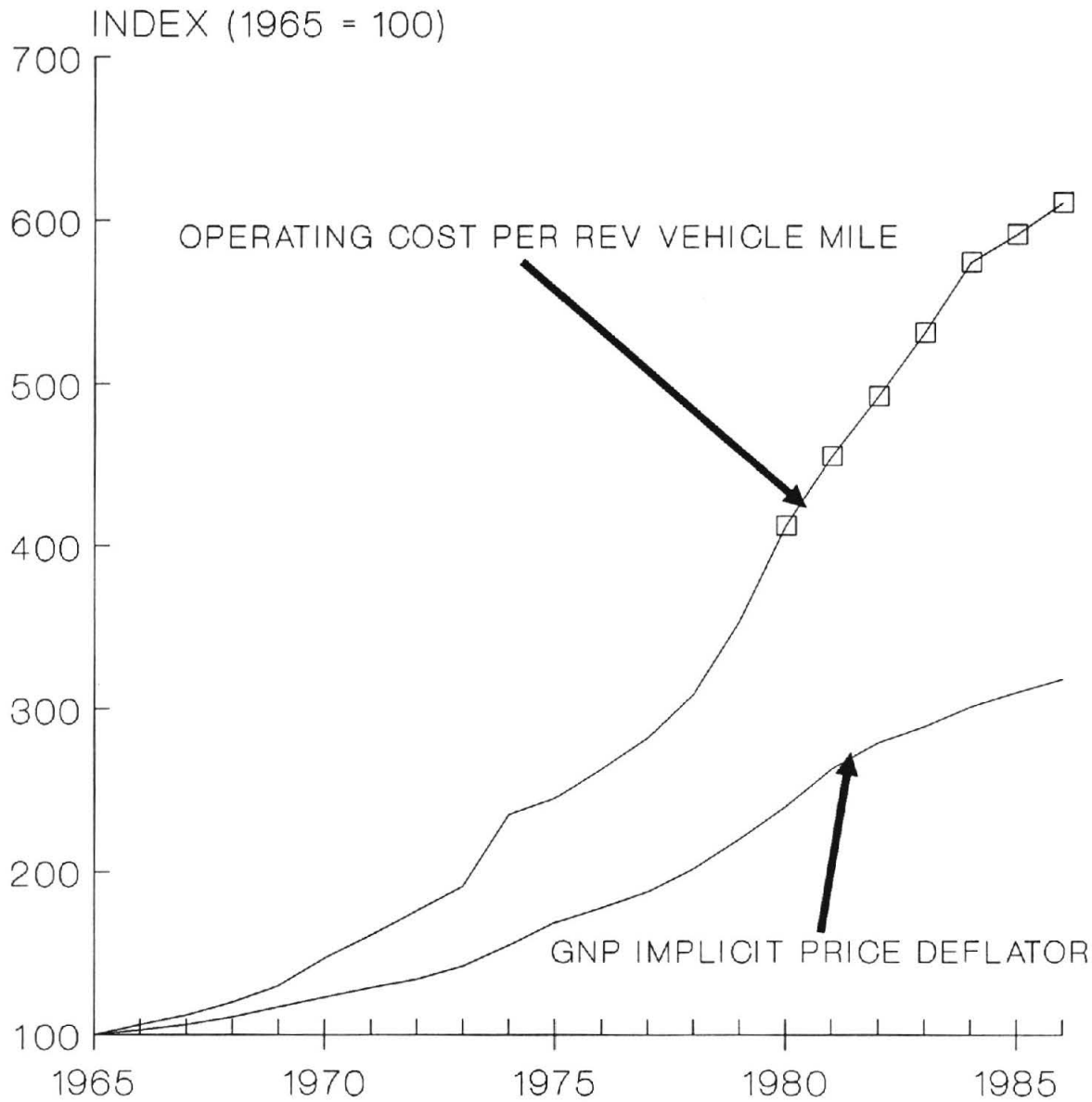
Fare and other revenue from users of $4.8 billion covered about 44 percent of operating costs in 1985, while State and local subsidies of $5.3 billion covered 48 percent and a Federal subsidy of $882 million covered 8 percent. These shares have shifted over time as Federal operating assistance began in 1975 and peaked in both dollar and percentage terms in 1980. Since then, the Federal share has declined as the amount has remained constant in dollar terms. Essentially, as transit operating costs have continued to grow beyond inflation, State and local governments are covering an increasing share.

Service Intensity, Coverage and Frequency

Regular mass transit service is being provided in 316 of the 373 designated urbanized areas. For all urbanized areas in 1983, more than 78 percent of the population had transit service available within one-half mile of their residence; this coverage is somewhat higher in large areas (those over 1.25 million) with

Figure 2-1

CHANGE IN TRANSIT UNIT OPERATING COST PER VEHICLE MILE* AND IMPLICIT PRICE DEFLATOR, 1965 TO 1986



*Vehicle Revenue Miles After 1980
SOURCE: APTA FACT BOOKS; SURVEY OF CURRENT BUSINESS; SECTION 15 AFTER 1980.

rail services than in the smallest areas (between 50,000 and 200,000)--80 percent vs. 71 percent. The coverage of non-urbanized and rural areas is not known.

Over the past 15 years transit routes have been added and lengthened to follow the decentralizing trends in most urban areas and to institute new service within urban communities or smaller urban areas. However, while route miles increased 38 percent between 1970 and 1980, when most of this expansion took place, vehicle miles increased only 20 percent. This resulted in a 18 percent decline in average service frequency, one of the primary factors influencing ridership.

TRANSIT MARKETS AND USE

Accounting for Urban Environment

From a user's perspective, transit bus and rail services are very similar from place to place, but transit organizations vary greatly by size, modes of service provided, urban environment and user characteristics. Thus, aggregate national statistics alone can be deceptive and can mask variation in performance resulting from these basic influences. Combining indicators across different transit modes (as is done in parts of this report) can also produce imprecise results. For example, a vehicle hour of bus service provides much less capacity than a vehicle hour of rail service. On the other hand, rail is much more capital intensive than bus. In order to assess the status and performance of the industry, it is therefore useful to look at smaller

groupings of the data that may assist in taking account of some of this variation. The most important factor to account for is the urban environment in which transit operates. Urban area size and density, along with auto ownership and development patterns, strongly influence transit demand, the characteristics of users, service and economic performance.

Accordingly, transit performance data in this report is broken down by categories reflecting the size of the urbanized area and the modes operated within the urbanized area and its geographical location. The size and mode breakdown is as follows:

Urbanized Area Population and Mode Groups

Over 1,000,000 With Rapid Rail
Over 1,000,000 Without Rapid Rail
500,000 to 1,000,000
200,000 to 500,000
50,000 to 200,000

Because urbanized areas developed at different times and in different ways depending on where they are located, the geographical location of the service area is a reasonably reliable, if imprecise, surrogate for urban density and automobile ownership patterns across the country. Transit operations are grouped by the following five geographical divisions: Northeast, Midwest, South, West and Pacific Coast. Details of these groupings are presented in Appendix A.

Purposes of Transit Trips

In essence, urban area residents make use of transit for one of two reasons. One group of transit riders is using transit because it represents a better mode choice for a particular trip because of cost or convenience. In the largest, most congested urban areas, they are trips for which an automobile simply is not practical. These trips are largely to and from work in traditional Central Business Districts and thus these riders are primarily using transit for peak hour commuting.

A second group of transit riders uses transit because they are without access to an automobile (even temporarily) because of income, age or other reason. In most cases, this user has no choice and must rely on transit for basic mobility. These trips are largely for shopping, social, recreational, medical or other similar purposes, although some of these users also make work trips on transit.

The relative balance between these groups of users varies widely from urban area to urban area. However, in general, transit in the larger areas tends to focus more on the "peak hour commuting" riders, while in the smaller areas "basic mobility" riders are more prevalent. Evidence of this comes from a sample of surveys of transit users conducted on-board transit vehicles. In the largest, multimodal urbanized areas, work trips predominate. For example, in New York, over 70 percent of subway riders were making trips to or from work, while only 2 percent were making shopping trips and only 8 percent were taking trips to

school. On the other hand, in middle-sized cities, work trips represent less than half of the total. For example, in Dayton, only 46 percent of trips were to or from work, while 23 percent were school trips and 11 percent were shopping trips. In the smallest urban areas, an even smaller proportion, just slightly more than one-third of the trips, are work trips. For example, in Kalamazoo, only 34 percent of trips were to or from work, while 13 percent were for shopping and 30 percent were for school. The higher proportion of school trips in the smaller areas reflects decisions to include school transportation as part of the transit systems' responsibilities in smaller areas.

Transit Users

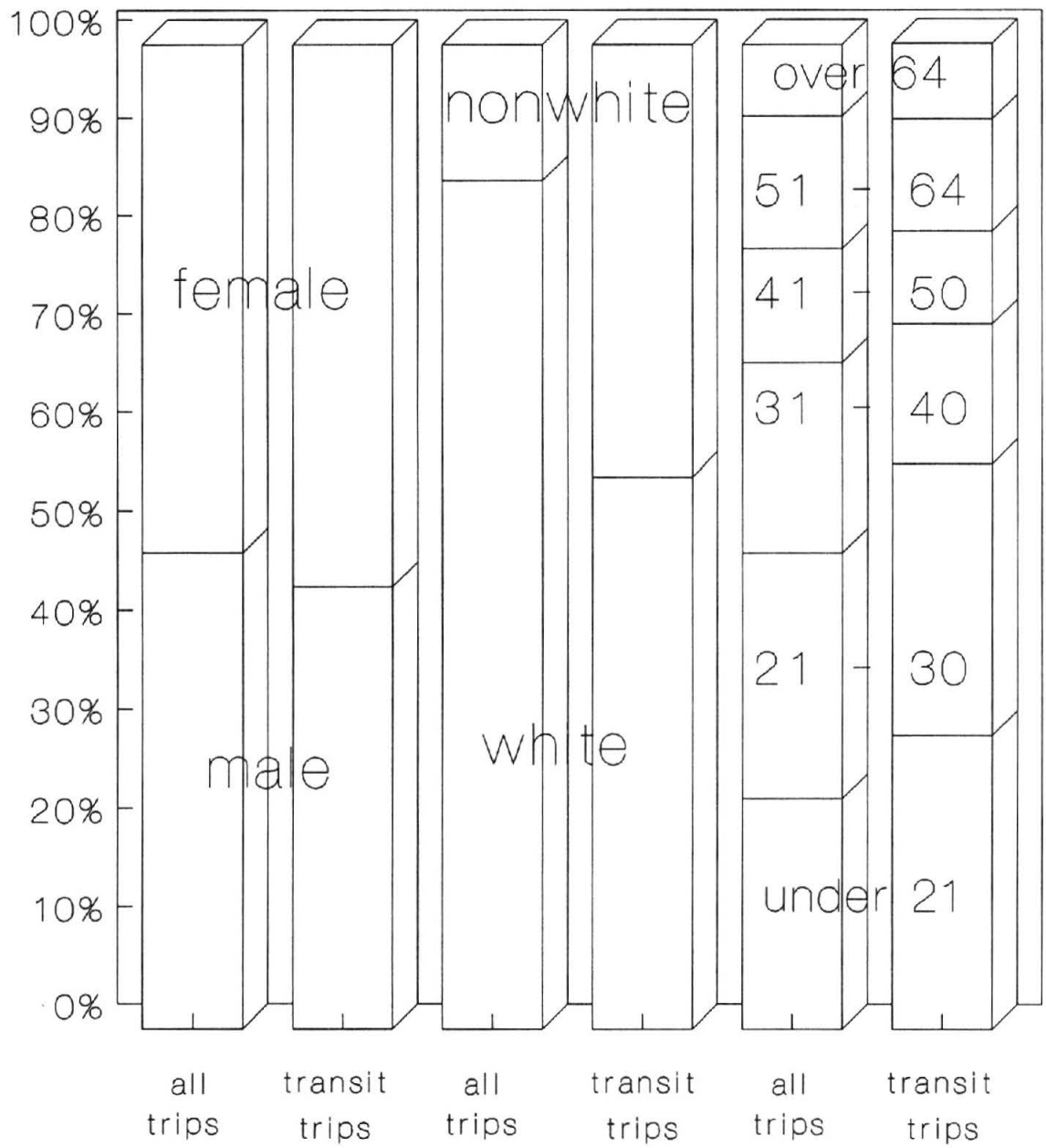
These varied reasons and purposes for transit use are reflected in its users. Since transit attracts workers for whom work trips are more economical by transit and persons without automobiles for all trip purposes, among transit users--as compared to all urban travelers--there are more women, more young people, more nonwhites and more people with low incomes. These distributions, all derived from the 1983 Nationwide Personal Transportation Study (NPTS), are illustrated in Figure 2-2 and are highlighted below.

In 1983 females took more overall trips than males and this was more pronounced among transit users; 55 percent of transit users were female, compared with 52 percent of all urban tripmakers. The disproportionate use of mass transit by females

Figure 2-2

DEMOGRAPHIC PROFILE OF TRANSIT USERS COMPARED WITH ALL LOCAL TRIPS BY URBANIZED AREA RESIDENTS--1983

male/female white/nonwhite age groups



SOURCE: NATIONWIDE PERSONAL TRANSPORTATION STUDY, 1983

has been declining as auto ownership has become more affordable and popular among women.

Nonwhites accounted for 44 percent of transit users, but only 14 percent of all tripmakers. This reflects the residential concentration of low income nonwhites in the central cities where transit service is most available and attracts most of its riders.

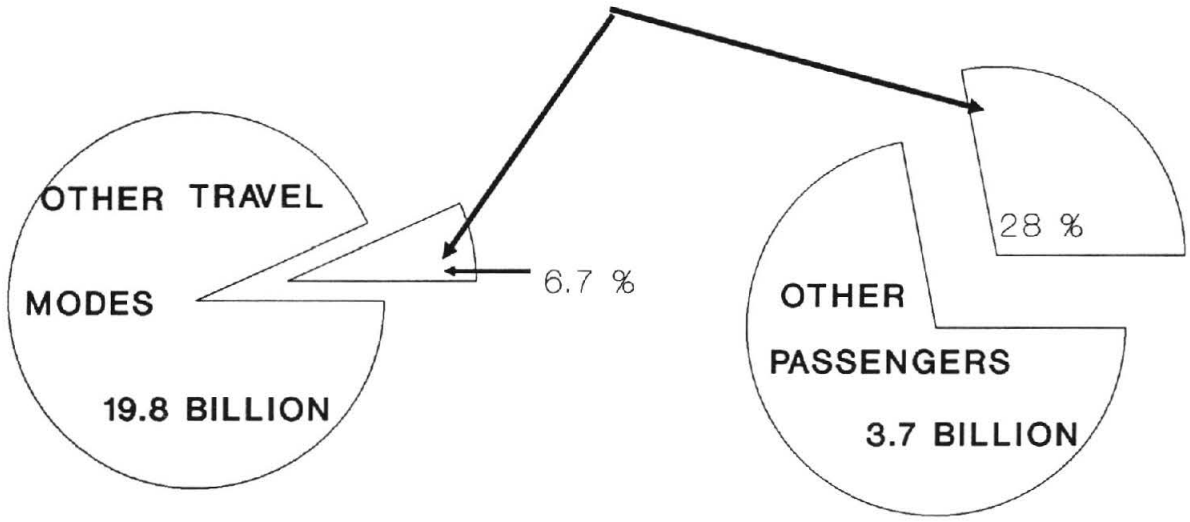
Nearly 30 percent of transit users were below 20 years of age, while only 23 percent of all tripmakers were in this group. This reflects the fact that regular mass transit serves as the schoolbus for many urban schoolchildren.

Transit use by the elderly was only slightly higher than their share of total travel.

Approximately 28 percent of transit users were from households with incomes below the poverty level (of $10,000). Another 28 percent were from households with incomes between $10,000 and $19,999, 18 percent between $20,000 and $29,999, 19 percent between $30,000 and $49,999, and the remaining 7 percent were from households with incomes above $50,000. Nevertheless, while 28 percent of transit users are from households with incomes of under $10,000, these trips make up only 6.7 percent of the trips made by these persons (Figure 2-3).

Despite the fact that one and one-half times as many urban transit users as urban area residents overall (56 percent versus 38 percent) had lower incomes (under $20,000), Federal subsidies are not well targeted to lower income transit users. A study of

THE USE OF MASS TRANSIT BY LOW INCOME URBAN RESIDENTS, 1983
(BILLIONS OF LOCAL TRIPS)



* Annual household income below $10,000
SOURCE: NATIONWIDE PERSONAL TRANSPORTATION STUDY, 1983

Figure 2-3

the share of Federal subsidy funds accruing to different income groups shows that individuals from households with incomes below $20,000 receive only 12 cents in federal subsidy per transit trip as compared to 18 cents (or 42 percent more) received by those with household income over $50,000 (Charles River Associates, 1986). In other words, only 47 percent of the federal subsidy in 1983 benefitted transit users with lower incomes, who made 56 percent of the total trips. This is due primarily to the long distance peak-hour commutes made by the upper income groups on the more costly subway and commuter rail systems. Trip lengths for those with incomes over $20,000 was 1.8 times that of those with incomes under $20,000. These longer trips lengths mean that subsidies per passenger-mile were actually higher than for lower income persons.

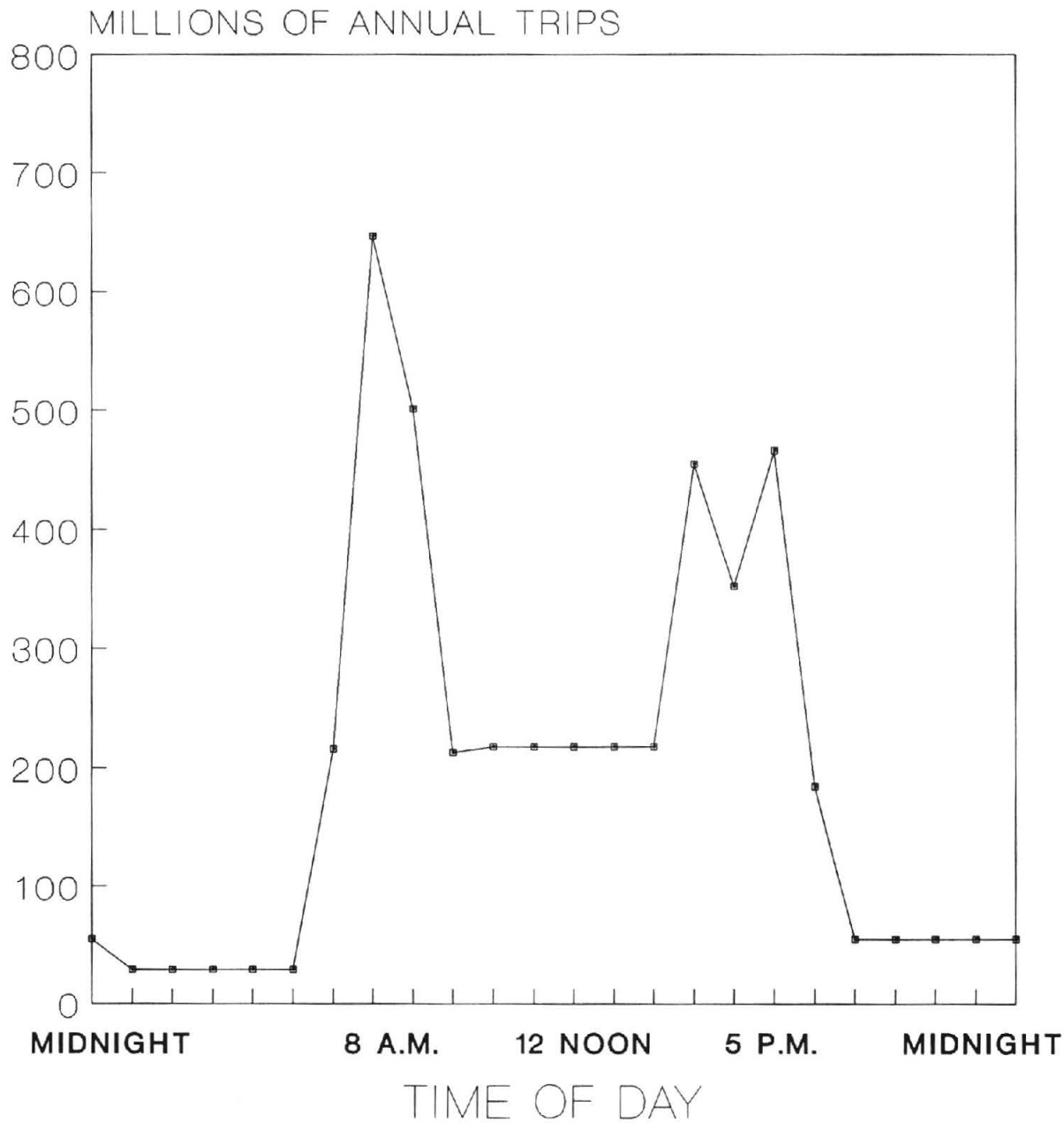
Peaking of Service Demand

Because of the large share of transit trips which are for work, transit usage is highly concentrated in the 5 hours constituting the morning and evening "rush hours"--52 percent occurs between 7-9 a.m. and 3-6 p.m., and only 29 percent during the intervening 6 hours (the remaining 19 percent travel between 6 p.m. and 7 a.m.). As illustrated in Figure 2-4, there are three times as many trips made during the heaviest single peak hour (7-8 a.m.) as there are during the average daytime off-peak hour.

Transit systems have responded to this peaking of demand by providing significantly higher levels of service in the peak

Figure 2-4

PEAKING IN THE USE OF TRANSIT
1983
LOCAL TRIPS BY URBANIZED AREA RESIDENTS



SOURCE: NATIONWIDE PERSONAL TRANSPORTATION STUDY, 1983

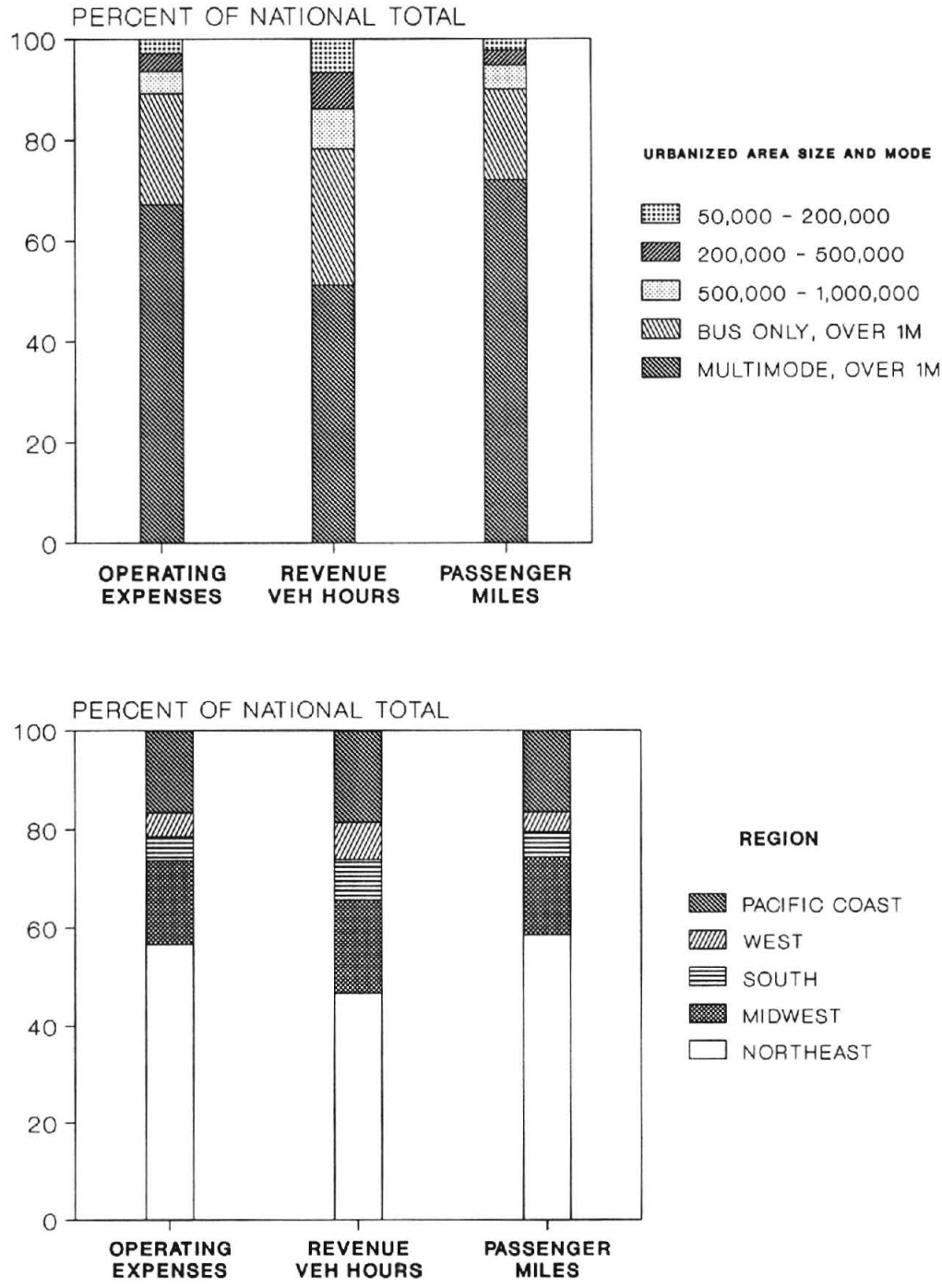
periods. In 1985, on average, for every 100 vehicles required to meet the offpeak service schedule, 182 vehicles were required to meeting the peak service schedule. "Peaking" has remained at about this level since 1980, having declined only about 4 percent since then. Urban areas with large populations served by rail systems tend to have the most peaked transit service, reflecting the work trip orientation of service in these areas. Urban areas with smaller populations served by small bus systems have the lowest peaking in their transit service, reflecting the predominant basic mobility, non-work orientation of service in these areas.

Transit Concentration in Large Urbanized Areas

Transit usage is most concentrated in the older urbanized areas which developed around transit systems, demonstrating that transit use is highest in areas where it can compete best with the automobile. Figure 2-5 provides an indication of the concentration of transit service in larger areas and in certain parts of the country. More than half of the nation's transit ridership occurs in the older, denser areas of the Northeast; about 90 percent of the ridership occurs in the areas over 1 million population. On the other hand, only 2.8 percent of ridership is found in areas under 200,000 despite the fact that these areas account for 18 percent of the nation's urbanized population.

Figure 2-5

TRANSIT SERVICE, USE AND COST



SOURCE: UMTA STAFF ANALYSIS OF
1980 - 1985 SECTION 15 DATA

Trends in Transit Use

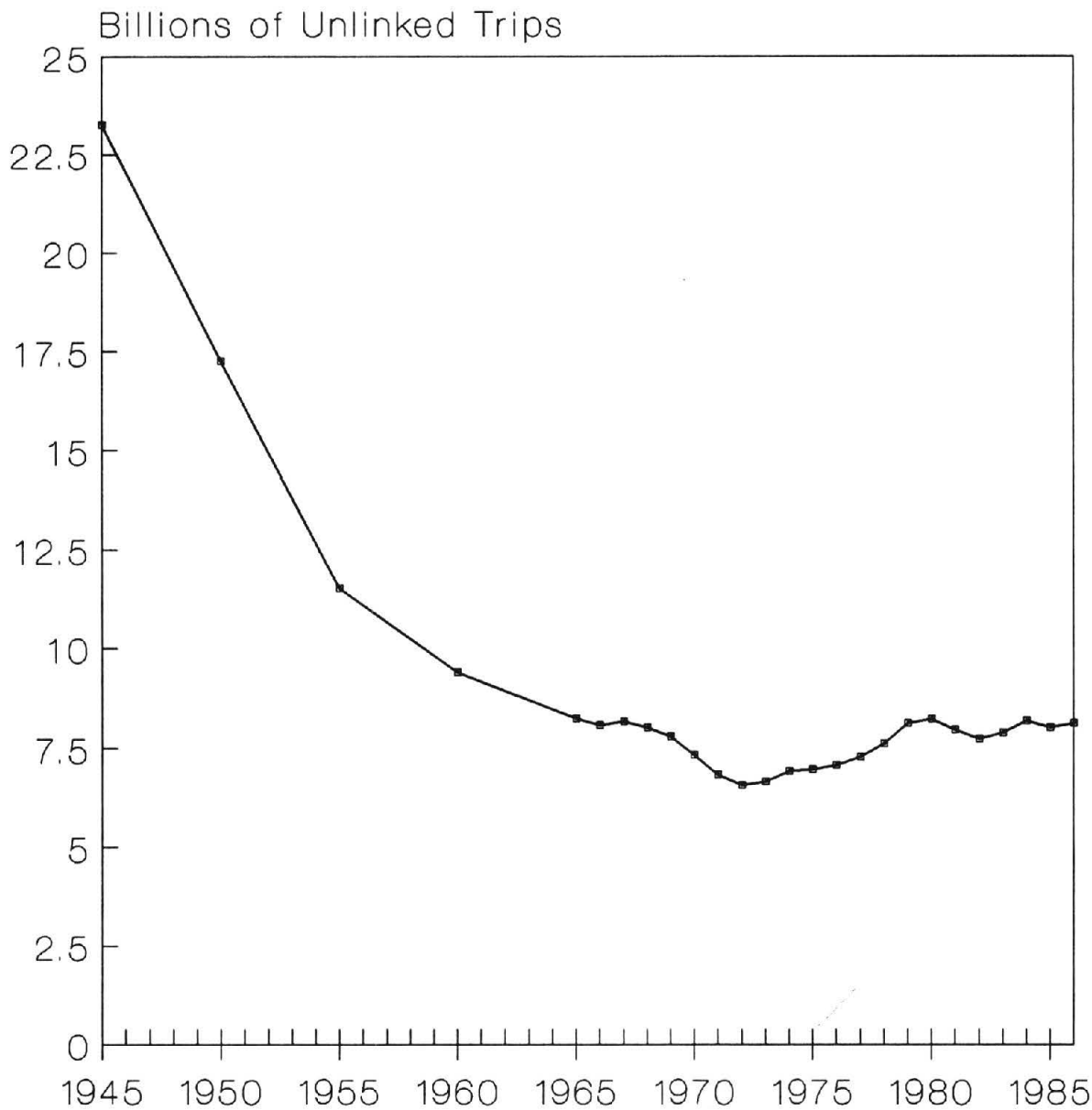
Trends in transit use reflect the effect that the market forces described in Chapter 3 are having on transit's roles. After reaching its highest levels during the Second World War, total transit ridership resumed a decline that had begun in the late 1920's and continued until it hit its low point in 1972. Figure 2-6 illustrates this trend in total ridership since 1945. After 1972, ridership began to rise as massive increases in Federal, state and local assistance allowed for improvements in capital equipment and facilities and maintenance of real fares at near-constant levels. The energy crunch of 1979 stimulated additional increases.

Since 1980, transit ridership has been more or less stable on the basis of national totals. The economic recession resulted in a ridership decline in 1981 and 1982 to 8.0 billion. Since that time, total ridership increased to 8.5 billion again in 1984, before falling to the 1985 level of 8.4 billion. Preliminary data indicates that ridership in 1986 remained at about this level.

While national totals are stable, transit use is becoming more highly concentrated in the larger urbanized areas. Some fairly large increases in a small number of larger areas mask declines in the smaller areas. As a result, the proportion of transit ridership in areas over 500,000 has increased from 89.6 percent in 1975 to 92.8 percent in 1985, while the share in areas between 100,000 and 500,000 population has declined from 9.2 percent to 5.9 percent. Essentially, in the largest areas,

Figure 2-6

U.S. TRANSIT RIDERSHIP
1945 TO 1986
(Excludes Commuter Rail Trips)



SOURCE: APTA FACT BOOKS (1945-1983 DATA)
SECTION 15 (1984 - 1986 DATA;
1986 DATA PRELIMINARY)

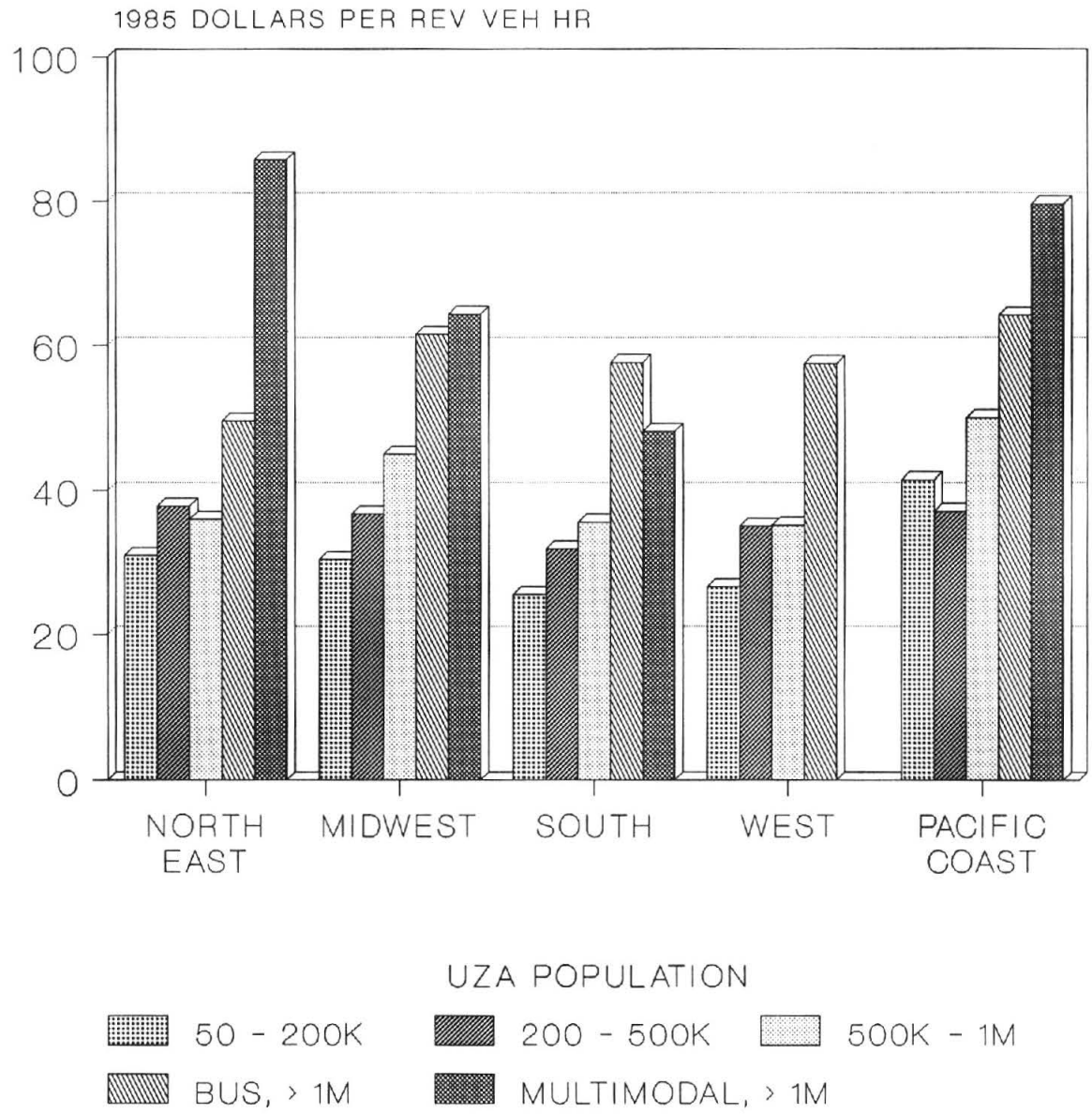
where transit tends to serve primarily work trips which are more convenient or less costly on transit, transit has maintained and slightly increased ridership. However, in the smaller areas, where transit tends to serve primarily transit dependent riders, the increases in automobile ownership and incomes have eroded the use of transit.

Impact of Industry Diversity on Transit Performance

The variations in the kinds of users served in different area sizes and types also has an impact on transit performance. This is discussed in detail in Chapter 5. Figures 2-7, 2-8 and 2-9 summarize the performance measures for operating efficiency, effectiveness and operating cost-effectiveness for 1985 for all transit systems as developed in Chapter 5. The Northeastern multi-modal systems, reflecting their position in areas which have developed around transit and in which transit retains a significant role in serving work trips, carry many more passengers per hour of service than the other groups. However, an hour of service in these systems has operating costs which are much more than all the others. The smaller bus-only systems carry fewer passengers, reflecting their restricted role as a provider of basic mobility to those without access to an automobile (which is a small and declining market). However, their operating costs are also much lower.

Figure 2-7

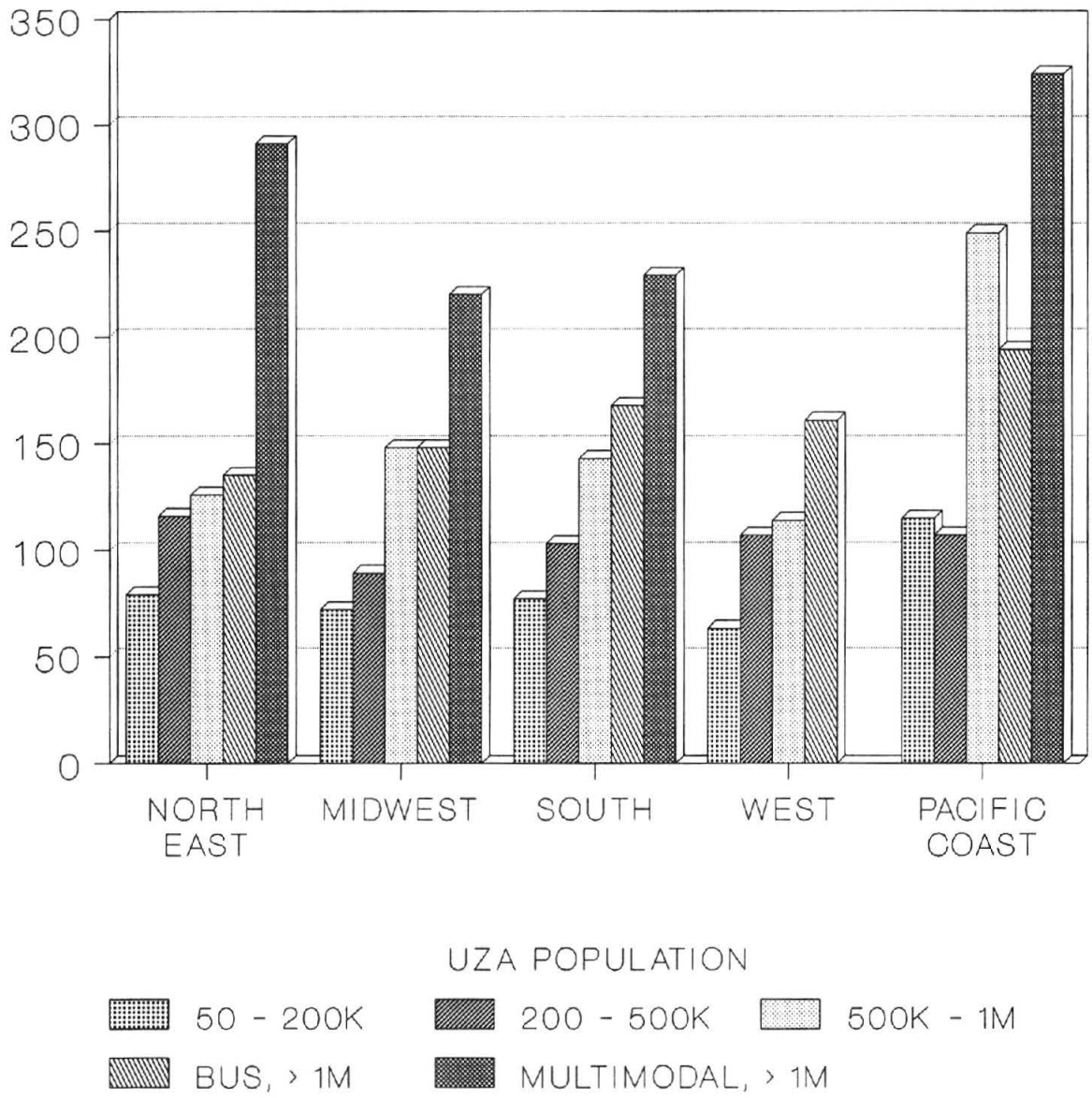
OPERATING EFFICIENCY BY AREA SIZE AND REGION GROUP OPERATING COST PER REV VEH HOUR



SOURCE: UMTA STAFF ANALYSIS OF
1980 - 1985 SECTION 15 DATA

Figure 2-8

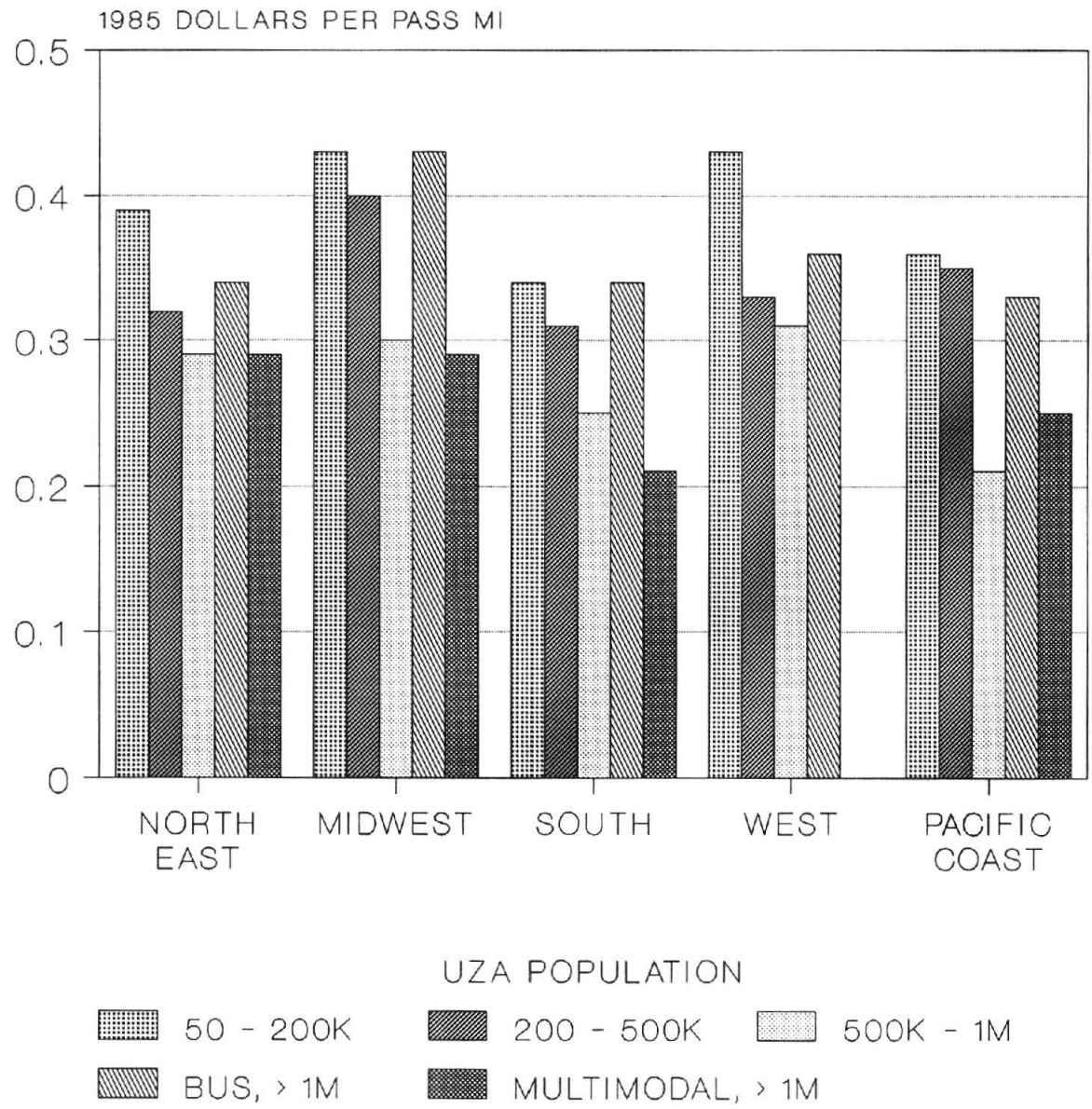
SERVICE EFFECTIVENESS BY UZA SIZE AND REGION GROUP PASS MILES PER REV VEH HR



SOURCE: UMTA STAFF ANALYSIS OF 1980 - 1985 SECTION 15 DATA

Figure 2-9

OPERATING COST EFFECTIVENESS BY AREA SIZE AND REGION GROUP OPERATING COST PER PASS MI



SOURCE: UMTA STAFF ANALYSIS OF
1980 - 1985 SECTION 15 DATA

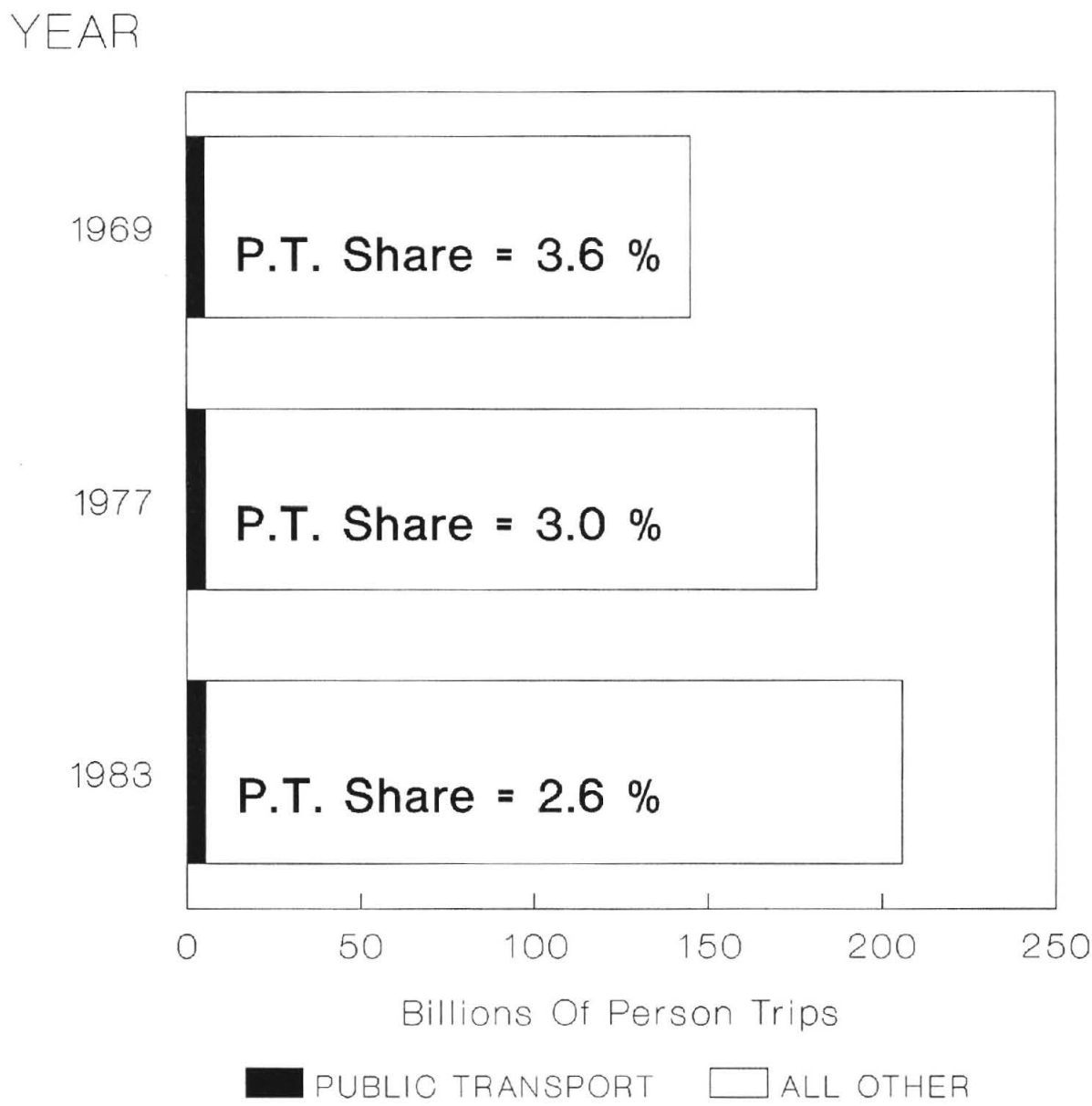
ROLE OF MASS TRANSIT IN PROVIDING MOBILITY

Because transit ridership has been essentially stable since 1980, while urban areas have continued to grow, transit has played a decreasing role in providing urban mobility. The Nationwide Personal Transportation Studies, national surveys of travel carried out periodically by the U.S. Bureau of the Census, provide a picture of how much and how Americans travel in carrying out their business and personal affairs. Data for 1983 shows a total of 206 billion person trips on all passenger modes; a 14 percent increase over 1977 and a 42 percent increase over 1969. Meanwhile, population was only 9 percent larger in 1983 than in 1977 and 16 percent larger than in 1969. About 5.4 billion of these trips[2] were made by public transportation--representing a decline to 2.6 percent from its 3.6 percent share in 1969 (Figure 2-10). About 40 percent of the 1.9 trillion total passenger miles in 1983 represents purely local travel (less than 50 miles) by residents of urbanized areas, where most transit service is provided. Transit was used for 4.75 percent of these local passenger miles (Figure 2-11). This decreasing role of mass transit in providing mobility has accompanied the increased ownership and availability of private automobiles, trucks, recreational vehicles and other private motorized transportation as discussed in Chapter 3.

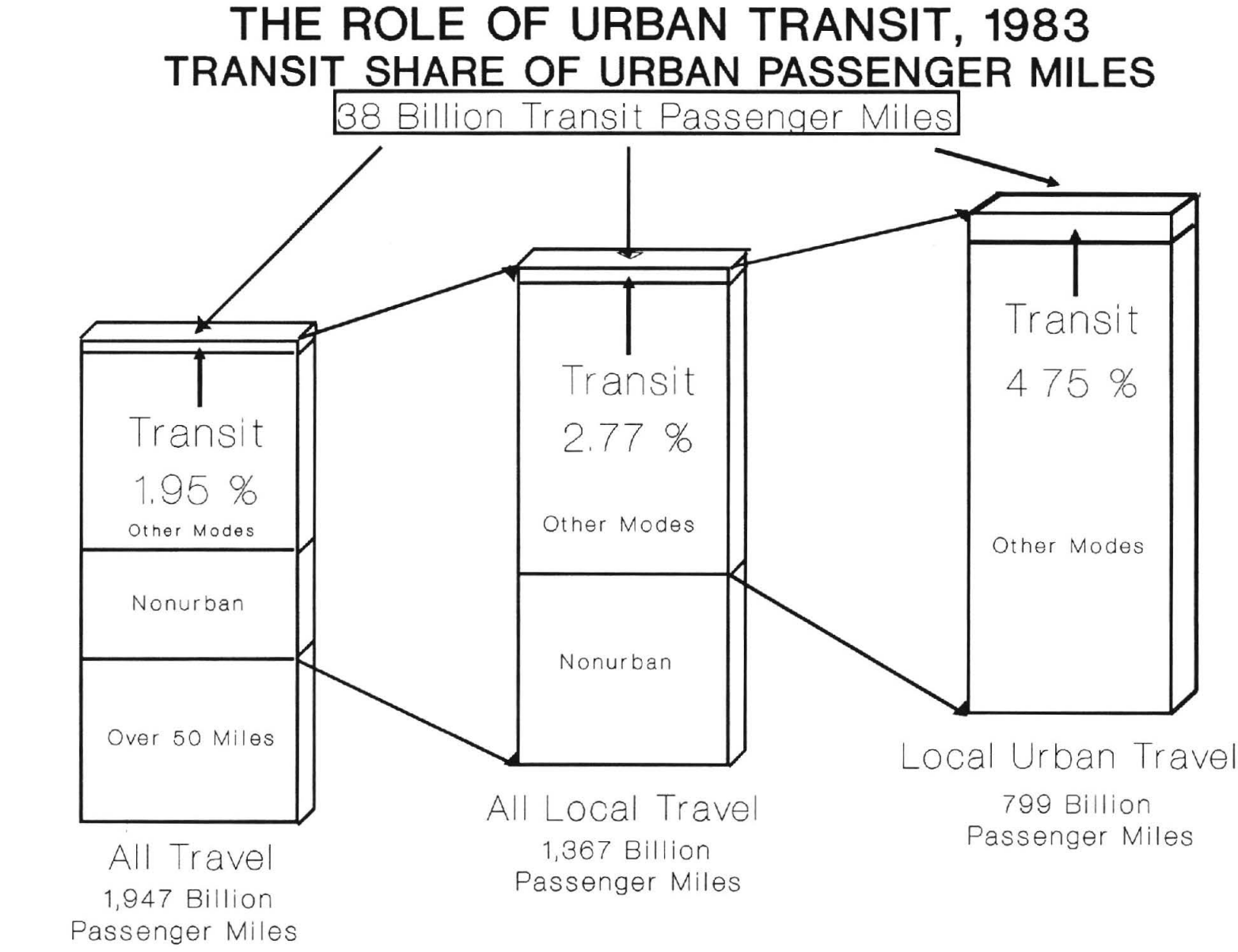
2The Nationwide Personal Transportation Study (NPTS) total of local transit trips differs from the 8.4 billion figure derived from Section 15 reports because the NPTS definition of "trip" is closer to a linked trip than to the unlinked trip (or boarding) reported in Section 15. This difference does not affect the analysis here.

Figure 2-10

PUBLIC TRANSPORT SHARE OF PERSON TRIPS
(Excludes walking and bicycle trips)



SOURCE: FHWA, SUMMARY OF TRAVEL TRENDS, 1985
(Corrected)



SOURCE: NATIONWIDE PERSONAL TRANSPORTATION STUDY, 1983

Figure 2-11

SPECIALIZED AND RURAL MASS TRANSIT PROVIDERS

There is extremely limited information available about the provision and use of mass transit in small urban and rural areas and about the provision of specialized services for the elderly and handicapped in urbanized areas. Owing to the comparatively small number of transit users and providers in rural areas, they fail to appear in any large nationwide survey, such as the Nationwide Personal Transportation Studies (NPTS). Only the agencies receiving Federal assistance are identified in the data presented below.

Rural America, a non-profit organization representing rural jurisdictions, has developed an inventory of Federally-assisted services and data on the 4,487 agencies receiving Federal funds under Section 18 and 16(b)(2) of the UMT Act. Rural America has used its inventory to make the following estimates [Rural America, 1986]:

- About 83 percent of the agencies are private, nonprofit organizations; 14 percent are public agencies; and the remaining 3 percent are private, for-profit. However, the amount of private sector service provision is unclear, chiefly because in 90 percent of the State programs, private for-profit providers are eligible for grant funds only through a public or private nonprofit recipient.
- The average rural program provider (under Section 18) has a fleet of 13 vehicles and provides 180,000 one-way trips annually.
- The average specialized service provider (under Section 16(b)(2)) has a fleet of 5 vehicles providing 28,500 annual one-way trips.

There are an estimated 172 million annual one-way small urban and rural public transit trips nationwide, based on the inventory of agencies receiving funds under UMTA's rural program (Section 18). In addition, the private non-profit recipients of Section 16(b)(2) funds (i.e., for services to elderly and handicapped persons) carry an estimated 90 million trips per year. With the addition of the 27 million trips carried by subcontractors to recipients of either source of funds, specialized operators are estimated to serve a total of 290 million trips annually, or about 3 percent of the total number of transit trips.

It is unknown how much additional small urban and rural transportation is provided by numerous Federal, State, local and voluntary social service agencies for special purposes. Although many such transportation services are not, strictly speaking, open to the public at-large, they certainly reduce the need for public transportation services in low density areas. It is suspected that the total volume of such services far exceeds the estimated public transportation services in these areas.

THE TAXI INDUSTRY

As mentioned previously, taxi service can sometimes be considered mass transportation. The data reported above does not include taxi service, except to the extent that conventional mass transit service is provided under contract to a public agency. The following is a brief profile of the taxi industry as of 1981

based on limited data available from the International Taxicab Association [Gilbert et. al., 1985]:

- In 1981 at least 3,089 taxi firms operated as many as 125,000 total vehicles.
- They employed or used 191,552 drivers and other workers.
- They carried an estimated 1.7 billion passengers, generating revenues of $3.4 billion.
- Vehicle miles of service totaled 6.4 billion.
- More than 20 percent of the operators serve communities with population less than 10,000.

In comparison with the conventional transit industry, the taxi industry employs about the same number of workers, provides three times as many vehicle miles of service, generates larger operating revenues and requires no public subsidy, and probably serves more than 40 percent of total passengers served by local public transportation.

CONCLUSION

As used and perceived by the individual rider and casual observer, transit service is a homogeneous product. This homogeneity is reflected in several ways:

- The largest share of transit trips are for journeys to work and school.
- Most trips are made on either highly standardized--from the layperson's perspective--transit buses or subway trains.
- Most rush hour transit passengers are commuting to and from work while most offpeak transit passengers do not own or have access to an automobile--usually for economic reasons.
- Most transit systems share ever-increasing operating costs and deficits.

Despite this apparent homogeneity in its physical product, users, and financial profile, important diversity exists within and among transit systems throughout the country. Diversity is a product of market conditions affecting service deployment and price setting. As a result, wide variations exist between different urbanized area types. Thus, from a policy perspective, diversity among transit systems, and especially among transit markets, is an important consideration. The remainder of this report, beginning with a discussion of transit's fluctuating markets in Chapter 3, develops such issues more fully.

PART II

CONDITIONS AND PERFORMANCE OF MASS TRANSPORTATION

CHAPTER 3: EVOLVING MARKETS FOR URBAN MOBILITY

HIGHLIGHTS

- Transit's share of urbanized area worktrips declined from 13 percent in 1970 to 9 percent in 1980.
- From 1970 to 1980, conventional transit maintained its share of suburban dwellers commuting to central cities--a segment of the journey-to-work travel market that increased over 50 percent. But transit's share declined in cross-town commutes; for commutes to suburban work locations transit's already small share fell by one-half.
- Due to natural topography, high density development and insuperable limits to highway capacity, transit remains vital to the central city in a number of urbanized areas.
- In most cities households unable or unwilling to purchase automobiles depend on transit and are thus limited to the diminishing share of economic opportunities located on transit routes.
- The growth and concentration of jobs in suburban areas, resulting in increased road traffic, are now straining transportation networks designed for residential communities and radial commuting.
- Increased highway capacity in suburban areas will be limited by resources and by local resistance to new highways through residential towns and neighborhoods.
- The greatest transportation challenges of the next decade will be to preserve or improve mobility in the suburban parts of urbanized areas.

INTRODUCTION

By way of major route expansions and low fare policies over the last two decades, public transportation has maintained its share of the rapidly growing market for commutes from suburban residential areas to central city jobs. Also, in most urbanized

areas transit continues to provide basic mobility in central cities for mainly low income persons who do not own and operate automobiles. Finally, in a few cities having very dense transit systems, public transit provides sufficient mobility so that middle income households can avoid owning automobiles. While persistent in serving central cities for these reasons, transit continues to lose commuters even there, losses which are outstripping gains among suburban residents commuting downtown. Moreover, public transportation is suffering its greatest percentage losses among holders of suburban jobs, and this suggests that conventional transit offers little promise of improving access to suburban economic activites.

Emergent suburban land use challenges, manifested in increasing traffic congestion, are expected to dominate the attention of suburban governments in the years to come. Shifts of population, jobs and other economic activity to suburban portions of urbanized areas, which have been actively promoted by suburban governments, are beginning to impose high costs and strains on suburban governments. Some are looking to public transportation along with highway expansion as part of the solution. Possible transit contributions to suburban mobility are discussed in Chapter 7 of this report.

COMMUTING AND TRANSIT

Nationwide, an estimated 60 percent of urban area public transit trips are journeys to and from work. Work trips account for an even higher percentage of transit trips in cities having

the most intensive transit systems. In fact, the capacity of most transit systems, i.e., the size of its fleet and workforce, is primarily a function of the morning and evening rush hour demand for transit services for journeys to work. Accordingly, transit's role in the local economy and its own cost-effectiveness is largely determined by the factors affecting urban travel to work, the commuter market.

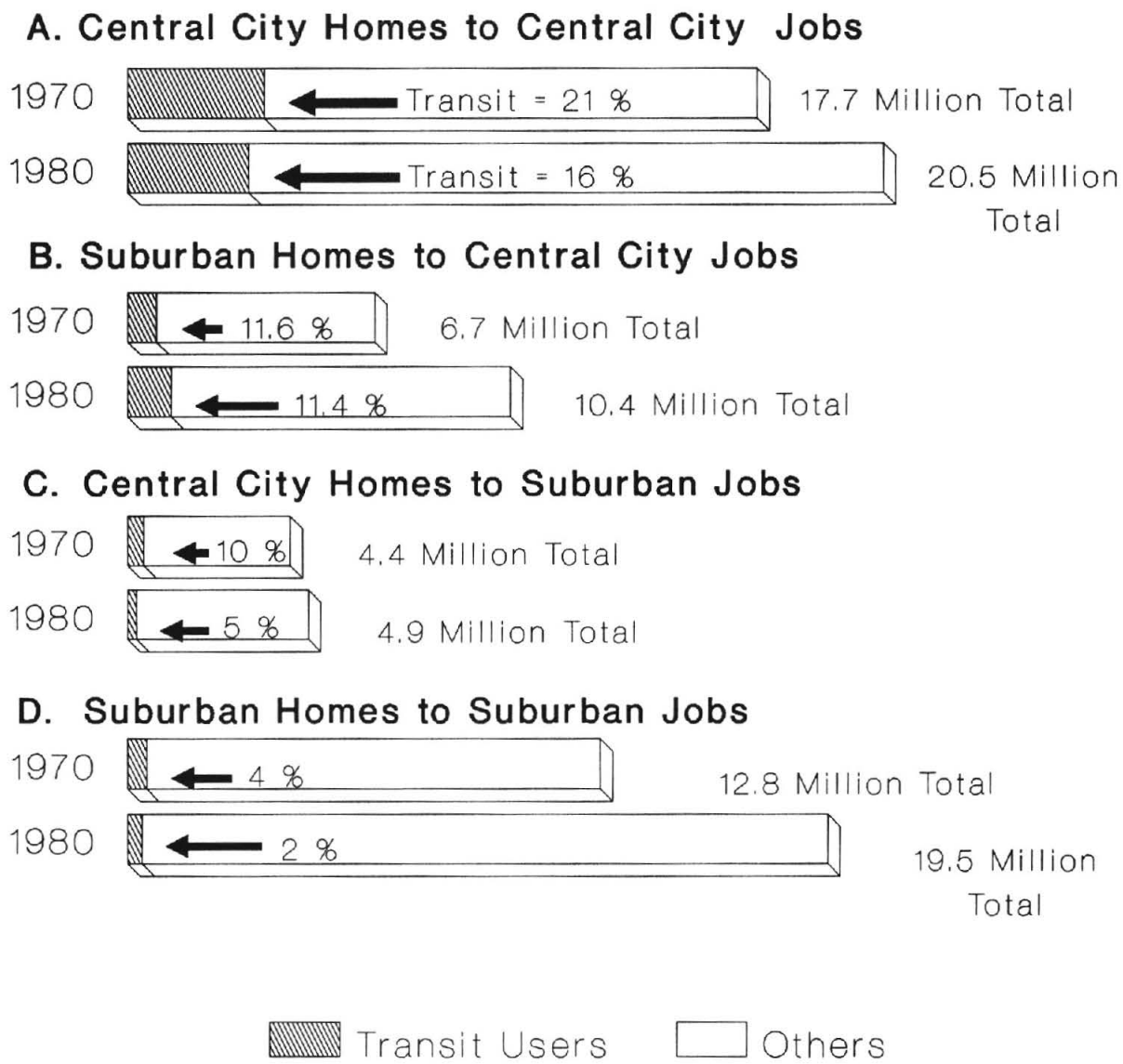
The Four Major Commuter Flows

Detailed 1970 and 1980 Census data on four basic commuter segments is presented in Figure 3-1. It shows the number of persons commuting among central city and suburban home and job locations in 1970 and 1980 and the proportion using transit. Rapid growth occurred in the two market segments which involved suburban residents (to jobs in the central cities and to jobs in the suburbs). Both grew more than 50 percent from 1970 to 1980, reflecting large population growth in the suburbs. Meanwhile, the growth in the two segments of central city residents (to jobs within the central city and to jobs in the suburbs) was modest, 8 and 15 percent, respectively.

From 1970 to 1980 the number of daily commuters who used public transportation declined by approximately 123,000, representing a decline in share of urbanized area worktrips from 13 percent to 9 percent. During the 1970's transit's daily work trip patronage grew by 408,000 (a 52 percent increase) among suburban residents commuting to central city jobs, but this gain was offset by the loss of 531,000 regular commuters within the

Figure 3-1

TRANSIT USE FOR URBAN WORK TRIPS BY MARKET SEGMENT, 1970 AND 1980 (DAILY COMMUTERS WITHIN URBANIZED AREAS)



SOURCE: UMTA, DEMOGRAPHIC CHANGE AND RECENT WORK TRIP TRAVEL TRENDS, 1985

central city (a 14 percent decline). Expressed in terms of market segment shares, mass transit maintained its share of suburban to central city commuters at about 11.5 percent while falling from 21 to 16 percent in its traditional market--worktrips within central cities.

Transit's efforts to preserve its share of the rapidly growing suburb to central city commuter market may account for a significant proportion of transit's increasing unit operating costs over the last decade. The financial and efficiency implications of this adaptation to the changing commuter market are discussed, respectively, in Chapters 4 and 5.

CENTRAL CITY DEMAND FOR PUBLIC TRANSPORTATION

Analysis of data from the 1970 and 1980 Census [Joint Center for Political Studies, 1985] indicates that, within urbanized areas, nearly 90 percent of persons who regularly commute on transit work in the central city rather than in the suburbs. The demand for transit in central cities remains relatively strong due to high residential and commercial densities and the continued concentration of the poor in high density central city residential neighborhoods. These factors are most pronounced in New York City, in which 82 percent of persons who work in Manhattan commute to work by mass transit--only 10 percent drive to work alone.

Urban Density.

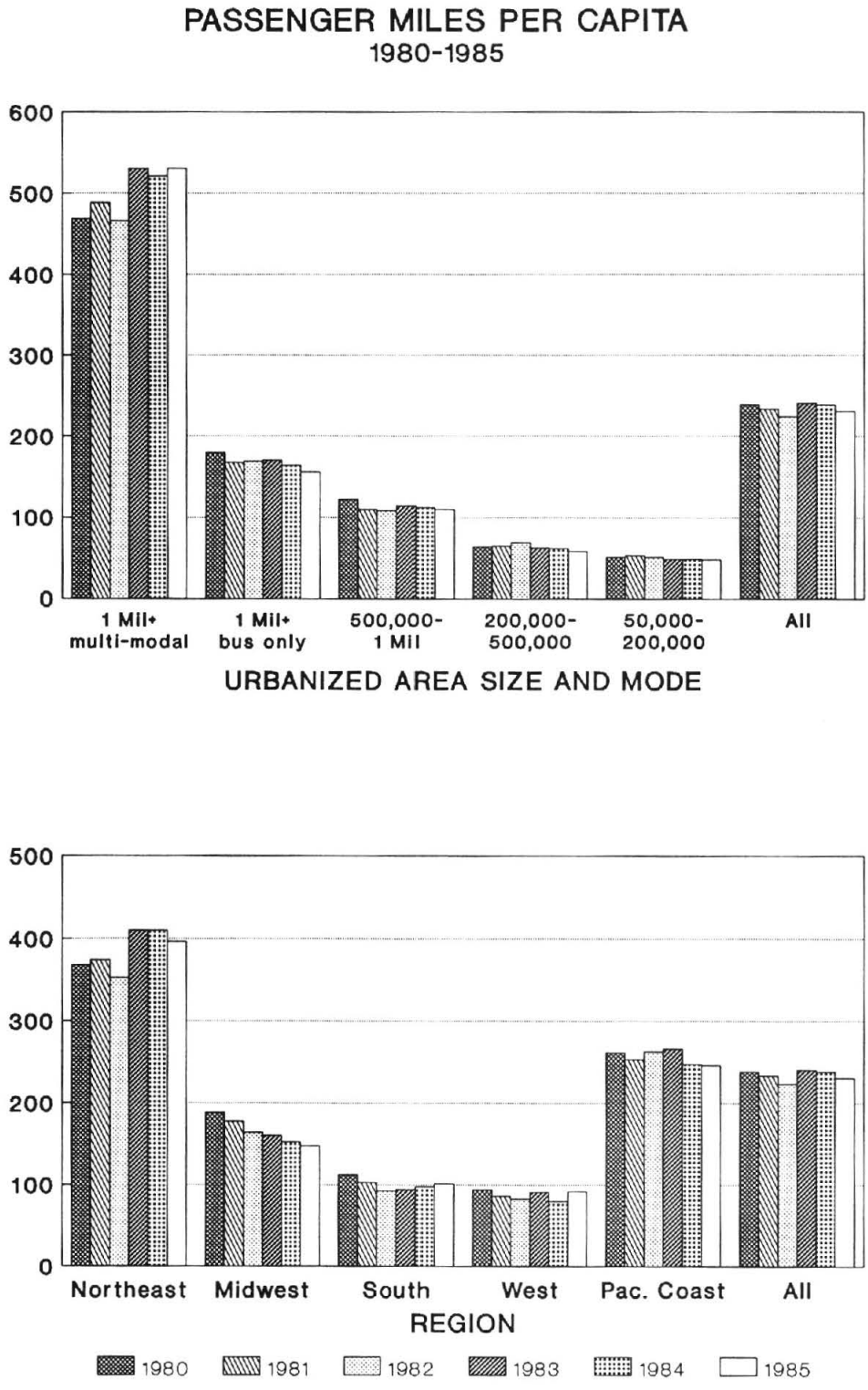
Transit attracts a large share of commuters in those urban areas in which residences and jobs are densely concentrated, so

that high capacity vehicles operating on short headways minimize travel time for passengers (especially waiting time) and, by virtue of high passenger loadings, minimize per passenger operating costs. Also, high density development simultaneously increases the time and out-of-pocket costs of single occupant automobile commuting.

The effect of differences in urban area characteristics on transit usage shows up clearly in Figure 3-2. The large, old cities with multiple mode transit systems show over ten times more use per capita than areas under 200,000, because of their historic development around transit, their high density and their obstacles to easy auto use. Bus-only areas over 1,000,000 have over three times higher use per capita than areas under 200,000. Areas in the Northeast show over four times higher use per capita than areas in the West.

Such densities are produced by forces which channel commercial and residential development into relatively narrow transportation corridors or discourage dispersion of the existing central business district. For example, the presence of a high capacity rail system in New York City, with its 465 subway and elevated rail stations, is a powerful influence in sustaining downtown Manhattan's extremely high density. While such "old rail" systems clearly help conserve very high downtown densities, it is less evident whether new rail systems can, in the presence of competing centrifugal urban development forces, promote such densities.

Figure 3-2



* Using 1980 urbanized area population
SOURCE: UMTA STAFF ANALYSIS OF
1980 - 1985 SECTION 15 DATA

Central city densities, especially in the core Central Business District (CBD), affect the mode choice of commuters who reside in the surrounding suburbs. As noted above, daily journeys to work from suburban residences to central cities increased by 52 percent during the 1970s. Transit ridership in this market segment had a parallel increase of approximately 50 percent. This success was produced by a change in the relative attractiveness of automobiles and transit. Increased traffic congestion on routes feeding the central city, particularly the Central Business District (CBD), and increased central city parking costs reduced the attractiveness of private auto use relative to public transit. An increase in government transit subsidies encouraged widespread fare reduction simultaneously with service expansions, expecially for commuter services from suburban residences to central city work locations.

Concentration of the Poor.

Public transit's historical decline in ridership has been the result of increasing auto ownership since the 1920's and especially in recent years when economic growth has made car owners of 86 percent of U.S. households. However, households with incomes below the poverty level have been slower than the general population to acquire automobiles. In 1983 approximately 60 percent of urban households below the poverty level in the U.S. owned automobiles. This comparatively low level of auto ownership accounts for the disproportionate use of transit by low income individuals. Also, the concentration of the poor in central cities, in which high population density is conducive to transit

use, reinforces transit's ability to attract the poor. As a result of low auto ownership and central city concentration, poor people are nearly twice as likely as the nonpoor to use transit. In 1983, when the percentage of poor in the general population stood at 15 percent, 29 percent of transit trips were made by poor persons.

Still, worktrips of central city residents to central city jobs declined from one-fourth from 1970 to 1980, as noted earlier. This loss resulted in large part from the increased use of the automobile for worktrips by central city residents--from 73 percent in 1970 to 79 percent in 1980.

Although the poor are twice as likely as the nonpoor to ride transit, still only one in fifteen trips made by the urban poor involve the use of transit. This reflects the fact that the relationship between poverty and transit use is a peculiar one of mutual dependency, on the one hand, and of an apparent mismatch of needs and capabilities, on the other. This statement merits some explanation as it is fundamental to better understanding urban transit use by the urban poor.

Public transportation is critical for workers who do not own and operate automobiles. For many this is a temporary situation, as they will purchase cars as their incomes grow. Many other workers, however, continually earn less than poverty-level incomes ($11,989 for a family of four in 1986). In 1986 the working poor comprised 41.5 percent of all poor people over the age of 14 [M. Millar, 1986]. The working poor are the fastest growing group among the poor, increasing from 6.5 million people in 1976 to 8.9

million in 1986, a 37 percent increase. The number of full time, year-round workers who are poor increased from 1.36 million in 1976 to 2 million in 1986, a 47 percent increase.

The question has arisen whether transit is capable of serving the growing suburban job markets which the working poor would have to participate in if they were to enter the economic mainstream. A recent study of mobility for minority groups by the Argonne National Laboratory summed up this question as follows [M. Millar, 1986]:

> Historically, public transportation has concentrated on serving the central-city-to-central-business-district (CBD) and suburban-to-CBD markets, which account for only 5 percent and 4 percent, respectively, of all work trips [and 9 percent of urbanized area worktrips]. Particular emphasis has been placed on luring the latter--largely white--riders to heavily subsidized services. By contrast, few resources have been directed toward within-suburb or reverse-commute markets (39 percent and 8 percent of all work trips). Given the dispersed nature of these trips (particularly within suburbs), it may be financialy infeasible to greatly increase service. However, public policy should recognize that reverse service has been particularly poor and, generally speaking, ridership has been limited to those with no other transportation alternative. These "captive riders" are disproportionately minorities, older workers, women, and the working poor. Few would deny that these riders need some basic level of service. All too often, however, that need goes unmet. For example, it is widely recognized that most of the new jobs for which black central city workers are qualified are in the suburbs and that the lack of adequate reverse transit service is a major obstacle to blacks' economic progress. In the absence of a fundamental reorientation of the traditional concept of radial transit services, public transportation is hard pressed to respond to these changing spatial demands.

There is conflicting evidence on the question of whether lack of mobility is an independent and significant obstacle to suburban employment for central city workers. For example, after taking account of people's individual characteristics (e.g., education),

research indicates that where people live within a metropolitan areas has little effect on their job opportunities [National Academy of Science, forthcoming]. Either way, public transit would have to undergo basic changes before it could increase the urban mobility of the urban poor to a point approaching the mobility they could achieve more cheaply with automobiles. Meanwhile, until they can afford cars, the poor and disadvantaged will continue to depend on transit whatever its shortcomings.

FACTORS RESHAPING TRANSIT USE IN SUBURBAN AREAS

The fastest growing travel market segment in urbanized areas is for trips between suburban origins and destinations. As noted earlier, transit's share of journeys to suburban work locations is very small and getting smaller. The number of daily worktrips to suburban jobs on transit declined from about 956,000 in 1970 to 654,000 in 1980. This combines workers residing in both the central city and the suburbs.

The major individual factor in shaping transit's contribution to urban mobility has been expanding auto ownership, use and reliance--and the growth of auto-oriented suburbs. Since 1945 the lion's share of growth in residences, jobs, retail trade and other activities has occurred in suburban areas. In almost all urban areas, with the possible exception of dense downtown areas, auto use has become a virtual necessity. Meanwhile, the cost of auto ownership and operation has declined in real dollar terms, so that auto ownership is now possible even for a majority of households below the poverty level.

As a reflection of the continuance of these trends, in 1969, 79 percent of households owned one or more vehicles. By 1983 this has risen to 86 percent--an increase from 49 million households to 74 million. Even among household below the poverty level there was a 25 percent increase in auto ownership in the same period. Perhaps more significantly, from 1969 to 1983 the average number of automobiles per person increased from .37 to .63. In 1986 there was one auto per licensed driver in the U.S.

The underlying demographic and income trends show no sign of diminishing. Accordingly, in most urban areas the market for conventional transit services is likely to suffer further decay. In fact, the ensuing pages focus on a new generation of conflicts between successful suburban development and existing suburban transportation systems.

The Emerging Suburban Mobility Challenge

Over the past few years, transportation, or the lack thereof, has been cited by residents as the number one problem in over a dozen metropolitan areas. Traffic congestion has eclipsed crime, unemployment, and air pollution as the highest priority public issue by a margin of two-to-one in greater San Francisco and Atlanta. This widespread dissatisfaction reflects, in part, the fact that congestion seems to afflict nearly all commuters to some degree--whether headed downtown, reverse-commuting, or traveling on a secondary cross-town artery. While only a decade ago congestion burdened mainly downtown commuters, today it pervades the highway networks of most urban areas.

The costs of congestion are mounting, not only in lost work and leisure time, but also in increased day-to-day stress, declining worker productivity, and a deteriorating quality of life. It is because of this perceived erosion of quality-of-life that communities are legislating Draconian zero-growth measures, aimed squarely at limiting the number of new automobile commuters entering their municipal boundaries. Indeed, congestion has become, at least in the minds of many, such a grievous problem in such a short period of time that responsive and responsible public and private actions are sorely needed.

Regional Population and Employment Growth

During the decade of the seventies, for instance, population and employment grew by 32.1 percent and 59.7 percent, respectively, in the twelve largest Metropolitan Statistical Areas (MSAs) in the nation's South and West, the regions normally associated with the sunbelt boom. This pace has continued into the eighties, and New England as well has recently experienced healthy gains.

Regional population growth has increased the level of congestion, in part because highway mileage has increased at a slower rate. From 1978 to 1983, total highway mileage in the U.S. increased by slightly more than 1 percent. During the same period, traffic volumes on urban interstate highways increased 7 percent.

Demographic Shifts

Growth alone is not responsible for the crippling mobility problems facing our suburban areas. Powerful demographic shifts are spawning an urban society that is more reliant than ever on the private automobile. In particular, the rapid increase in middle-age, dual-worker households with fewer children has led to greater auto reliance.

In the San Francisco Bay area, for instance, from 1981 to 1985, the annual growth rate of population was 1.4 percent, while households and employment grew 2.1 percent and 2.4 percent annually. During this same period, the number of vehicle miles traveled increased by 4.5 percent annually, roughly three times faster than population growth and nearly twice employment growth. Similar patterns occurred in Los Angeles and Orange County, California during the 1981-1985 period.

Why is travel outpacing population growth?

- There are more people of driving and working age--people between the ages of 21 and 35, "baby boomers," have become the fastest growing age cohort.
- Auto ownership growth outpaces population growth because per capita income is up--people who earn more travel more. Households with less than $10,000 income in 1983 made 1.9 trips per day while households earning more than $40,000 made 6.2 trips per day.
- The number of vehicles per driver has increased to one per driver, as mentioned above.
- The number of households with three or more cars, moreover, increased from 10 percent in 1970 to 16 percent in 1980.
- Income is also related to mode choice. In 1983, 82 percent of workers from households with annual incomes over $40,000

drove to work, compared to only 61.7 percent to workers from families with annual incomes below $10,000.

- Family sizes are shrinking, i.e., there are more families per 1,000 people than there used to be, which leads to more travel per person. Between 1970 and 1980, the average U.S. household size declined from 3.11 to 2.75. This results in more women--with fewer children--traveling to work and other activities away from home.

- Single adult households and households with two or more unrelated adults generate more travel to more diverse destinations. This trend seems to have continued into the 1980s. In the San Francisco Bay Area, household size shrunk from 2.58 to 2.50 just in four year period from 1981 to 1985.

- Finally, there are more women in the workforce. More than two-thirds of women between the ages of 25 and 44 now work outside the home, compared to only one-third 25 years ago. With both spouses working outside the home, there becomes a greater tendency for families to live somewhere between two jobs. Often, this means both spouses need their own cars to get to work.

Overall, members of the family unit are becoming more independent, particularly with regard to activities related to mobility. The shift to smaller, middle-age, dual-worker households has resulted in greater freedom to travel by private vehicle for individuals in the household, and correspondingly, more traffic.

Decentralization of Employment

The suburbanization of congestion, it is fair to say, has followed the suburbanization of jobs, what has been termed the "second wave" of suburban growth. Nationwide, the share of total office floorspace outside of the central cities rocketed from 25 percent in 1970 to nearly 60 percent in 1985. In the San Francisco area, some 100 companies have moved over 18,000 jobs from downtown San Francisco to suburban Contra Costa County in

just two years. There has been a similar exodus in other regions, such as greater St. Louis and Philadelphia, where suburban employment has grown 17 and 8 percent respectively between 1982 and 1986, compared to a loss of central city jobs over the same period.

Corporate America has flocked to suburbia for a host of reasons, with the cheaper cost of land and closer proximity to skilled labor usually heading the list of reasons for office relocation. Underlying this, however, has been major structural change in the nation's economy that has enabled firms to relocate more easily. In particular, the changeover from a smokestack economic base to one devoted to the production of ideas and information has made many firms "footloose"--free to move wherever they can maximize their net advantage, which more and more has become the lower-cost suburbs. Telecommunication advances, moreover, have allowed many firms to spin-off their back-office functions to outlying office parks, linked to the main corporate office via cable.

Job dispersal has had a profound effect on commuting patterns. What once was a predominantly radial, downtown-focused stream of travel has been overlayed by a patchwork of complex, criss-cross, and seemingly random movement paths. According to Census data, 35.4 percent of all work trips in U.S. urbanized areas both began and ended in the suburbs in 1980, a 4.7 percentage point increase over the 1970 rate. During the 1970s the number of urbanized area workers residing in the suburbs surpassed the number living in central cities. Whereas in

1970 53.2 percent resided in the central city, in 1980 54.2 percent resided in the suburbs--with nearly 70 percent of the suburbanites working in the suburbs.

This trend does not square well with the transportation infrastructure of most of our cities, which tends to have a hub-and-spoke form, designed to serve downtowns. Consequently, those making cross-town and suburb-to-suburb journeys are all too often forced onto secondary arteries and rim roads that were never designed or oriented to serve large volumes of traffic. Circuitous trips and congestion have resulted.

Most suburban jobs have ended up in one of three types of workplaces, each of which poses different mobility challenges:

- o Suburban Corridors. These tend to be loosely organized strips of smaller, independent office and commercial developments, usually aligned along axial freeways and major arteries. Boston's Route 128 and Princeton's Route 1 "Zip Strip" are classic examples. While the traffic impact of any one project tends to be modest, the cumulative effects of numerous unrelated projects frequently jam nearby roadways.

- o Master-Planned Business Parks. Numerous campus-style office parks have been built along the fringes of metropolitan areas in recent years, designed to provide a high-quality, idyllic-like work environment for a professional work force. These projects are characterized by low employment densities, plentiful parking, and a single predominent use (with office space often taking up 85 percent or more of built floorspace). While ample on-site and near-site improvements are frequently built for these projects, their traffic impacts normally reverberate 5 to 10 miles downstream throughout the existing limited capacity road network.

- o Suburban Downtowns. Also referred to as urban villages, these employment clusters often resemble the downtowns of many medium sized cities in both scale and density. The archetype urban village is City Post Oak, some six miles west of downtown Houston where 30 million square feet of mixed-use floorspace is nearing completion. (By comparison, during the 1950s the top 33 downtowns in the U.S. combined saw only

58 million square feet of floorspace constructed). While traditional downtowns have evolved gradually, suburban downtowns have sprouted in as few as five years, adding as much as 10 million square feet of new buildings where land was previously vacant. Such rapid growth has all too often overwhelmed the local infrastructure, with clotted streets being perhaps the biggest problem. "Instant downtowns" typically produce "instant congestion."

Specialization of Residential and Commercial Areas

The final major contributor to metropolitan commuting problems has been the increasing specialization of living versus commercial and industrial areas. While one might suspect that more people would live closer to their jobs as offices migrated out to the suburbs, this is not always the case. Nationwide, the average suburb-to-suburb commute increased from around 14 minutes in 1970 to 18.8 minutes in 1980, the product of lengthening trips and increased traffic congestion.

Major discernable factors contributing to the segregation of residential from commercial areas include:

- Fiscal Zoning. As the taxing powers of local governments have been constrained and as inter-governmental transfer payments have fallen, more and more communities are zoning for fiscal purposes-- i.e., they are inviting new uses which promise to fatten local tax coffers. Normally, this involves zoning primarily for office and commercial uses with less zoning for housing, usually on the grounds that residential growth costs far more to serve (e.g., schools, libraries, etc.) than the tax dollars they generate. An example of such zoning is in Santa Clara County, California, where the General Plan calls for 250,000 new jobs but only 75,000 new housing units by the year 2000.

- Lack of Affordable Housing. Around two-thirds of new suburban jobs have been in the clerical and service-industry sectors, occupations that usually earn modest incomes. Frequently, a home near suburban downtowns and campus-style office parks cost far more than most of these workers can afford, influencing many to move to the exurbs and beyond. In Contra Costa County, the San Francsisco Bay area's fastest growing county, the average home costs around $150,000, which

requires a mortgage qualifying annual income of approximately $50,000. Yet the average worker in the country earns around $27,000. Around one-quarter of the workers in the 160 square-mile county presently reside outside of it, and the percentage continues to grow.

- o More Frequent Job-Turnover. Today's workers change jobs more frequently than in years past. The average worker had 3.8 jobs over his or her career in 1960. Today, the rate has nearly doubled, to 6.6 jobs. Macroeconomic changes account for some of this, as shifts in the nation's economy have required more career and company shifts. Corporate mergers have also spawned more job turnover. As people move from job to job more often, it clearly becomes more difficult to choose a permanent residence close to one's workplace.

The mobility implications of increasing area specialization are clear. As people live farther from suburban workplaces, they are likely to become more auto-reliant, in part because transit connections in many of these settings tend to be poor or non-existent.

CONCLUSIONS

Transit's share of urbanized area worktrips declined during the 1970's, although by route expansion transit maintained its share of suburban residents' commutes to central city jobs. Analysis indicates that general regional growth, increases in auto ownership rates, and the migration of commute trips to the suburbs are most highly correlated with this shrinkage in transit's market share. Yet high central city densities and the concentration of the poor will continue to support a strong market for conventional transit in a number of large cities.

Four main factors account for emerging suburban mobility challenges in the 1980s:

- o general population and employment growth, coupled with modest expansion of roadway capacity;
- o demographic trends that are resulting in a more auto-reliant commuting population, in particular the trend toward smaller, middle-age, dual-wage earner households;
- o the decentralization of employment, which has spawned an increase in intrasuburban commuting; and
- o increasing specialization of neighborhoods between residential and commercial purposes that have further reinforced auto-dependency.

In general, these forces have worked in favor of auto-commuting and, accordingly, increased congestion. Transit's possible role in suburban mobility is discussed in Chapter 7.

CHAPTER 4: FINANCING MASS TRANSIT OPERATIONS

HIGHLIGHTS

- Transit operating costs totaled $11 billion in 1985, not including an estimated $4 to $5 billion in capital investment costs. Operating costs were financed 44 percent through fares and other system revenues, 8 percent by Federal assistance and 48 percent by State and local subsidies.
- State and local governments are clearly taking a greater role in financing transit, although the degree of commitment varies widely. State and local governments are in a good financial position to continue this greater responsibility.
- The farebox is regaining its position as the key source of revenue as its share of operating cost coverage continues to increase.

This chapter examines the three major sources of funds for financing transit operations--the farebox, State and local subsidies, and Federal operating assistance--and assesses their prospects for additional support in the future. The potential for operating cost reductions and productivity improvements to reduce the need for fare or subsidy increases is examined in Chapters 8 and 9. This chapter does not discuss the financing of capital--either new investments or recapitalization. Chapter 6 covers the status of financing of capital and Chapter 7 discusses a number of innovative techniques in this area.

RECENT TRENDS

Total transit operating costs in 1985 were approximately $11 billion (excluding an estimated $4 to $5 billion in capital expenditures), not counting small urban and rural services or private specialized services. Overall, between 1965 and 1985 operating cost per vehicle mile increased by 91 percent, although the rate of increase has been slower since 1980 than before and preliminary data for 1986 indicates that real costs may have stabilized since 1984.

Since 1980 the share of operating costs covered by fares and other system generated revenues increased from 39 percent to the present level of 44 percent. Between 1980 and 1985 the Federal share fell from 18 percent of operating costs to 8 percent. Federal operating subsidies in those years fell by 14 percent, from $1,022 million to $882 million. State and local subsidies increased from 43 percent of operating costs in 1980 to 48 percent in 1985, having reached 50 percent in 1983.

The experience since 1980 demonstrates two important characteristics of transit's financial response to increasing operating costs. First, the feasibility of fare increases has been demonstrated by the increasing share of operating costs covered by fare revenues. Secondly, States and localities have demonstrated a willingness and capacity to increase their subsidies to transit operations. Moreover, the reductions in Federal assistance do not appear to have had any negative impact on the industry.

Figures 4-1 and 4-2 illustrate the shifting mix among the three financing sources since the initiation of Federal assistance to transit in 1964 and the initiation of Federal operating assistance in 1975.

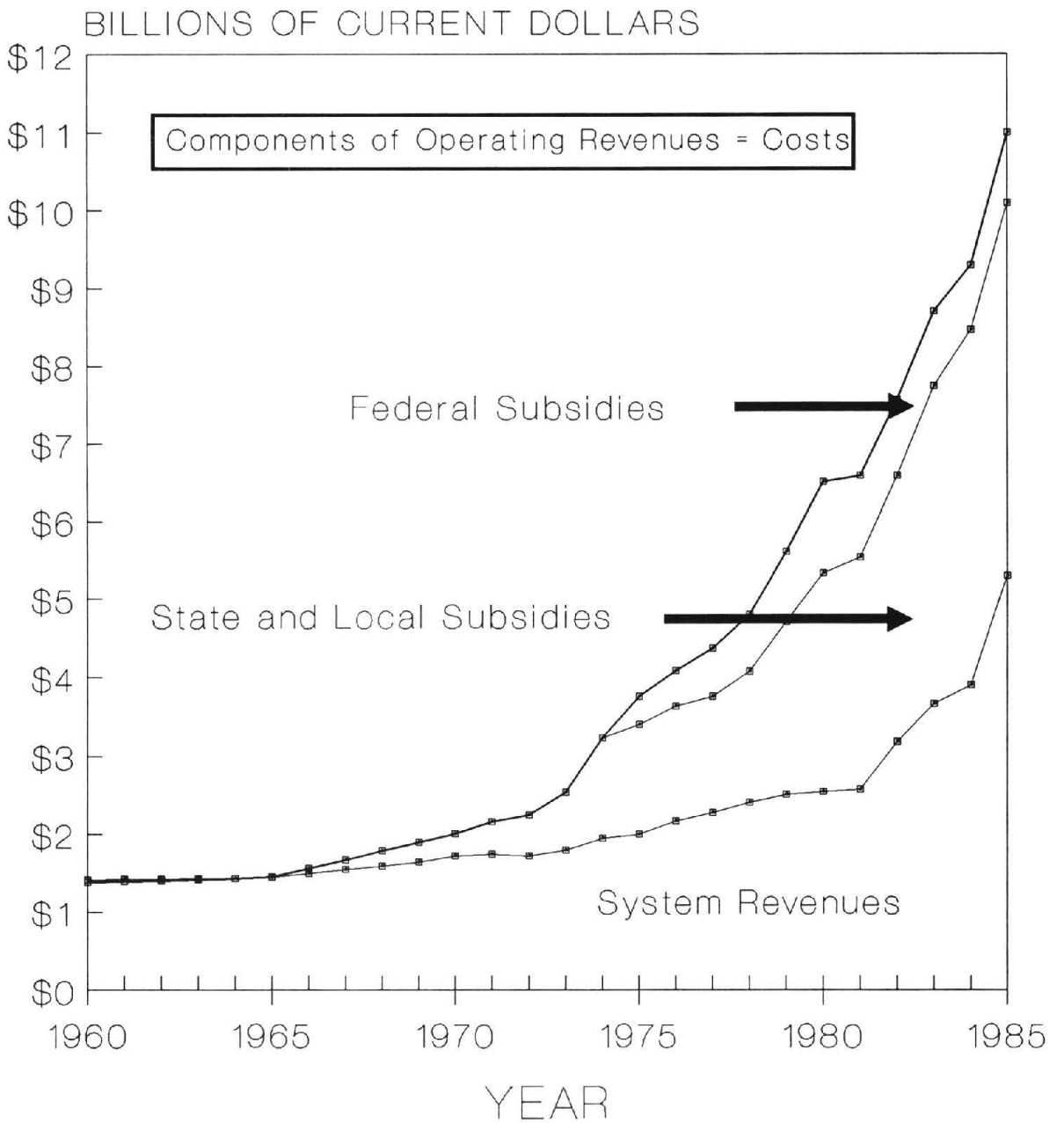
Budgetary concerns at every level of government must face the cost trend noted above; continuing to deal with it calls for renewed attention to alternative revenue sources from users and from State and local governments. However, the first order of business ought to be a hard and questioning attitude toward the current level of operating costs. In fact, any discussion of transit finance runs a dangerous risk of accepting as necessary the level of operating costs that are currently being incurred; the possibility of reducing those costs ought to be as much a concern as where the funds will come from. The potential for reducing operating costs by improving efficiency and productivity should have equal weight with new revenue sources in consideration of transit finance issues. A variety of such options is identified in Chapters 8 and 9. The apparent leveling of real unit operating costs since 1984 is an encouraging sign that this may be happening.

THE USERS' CONTRIBUTION TO TRANSIT OPERATING REVENUES

After steadily declining as a share of total operating revenues after 1945, the farebox contribution stabilized from 1980 to 1983 and then increased to 44 percent in 1985. A weighted index of transit fares has increased substantially since 1980.

Figure 4-1

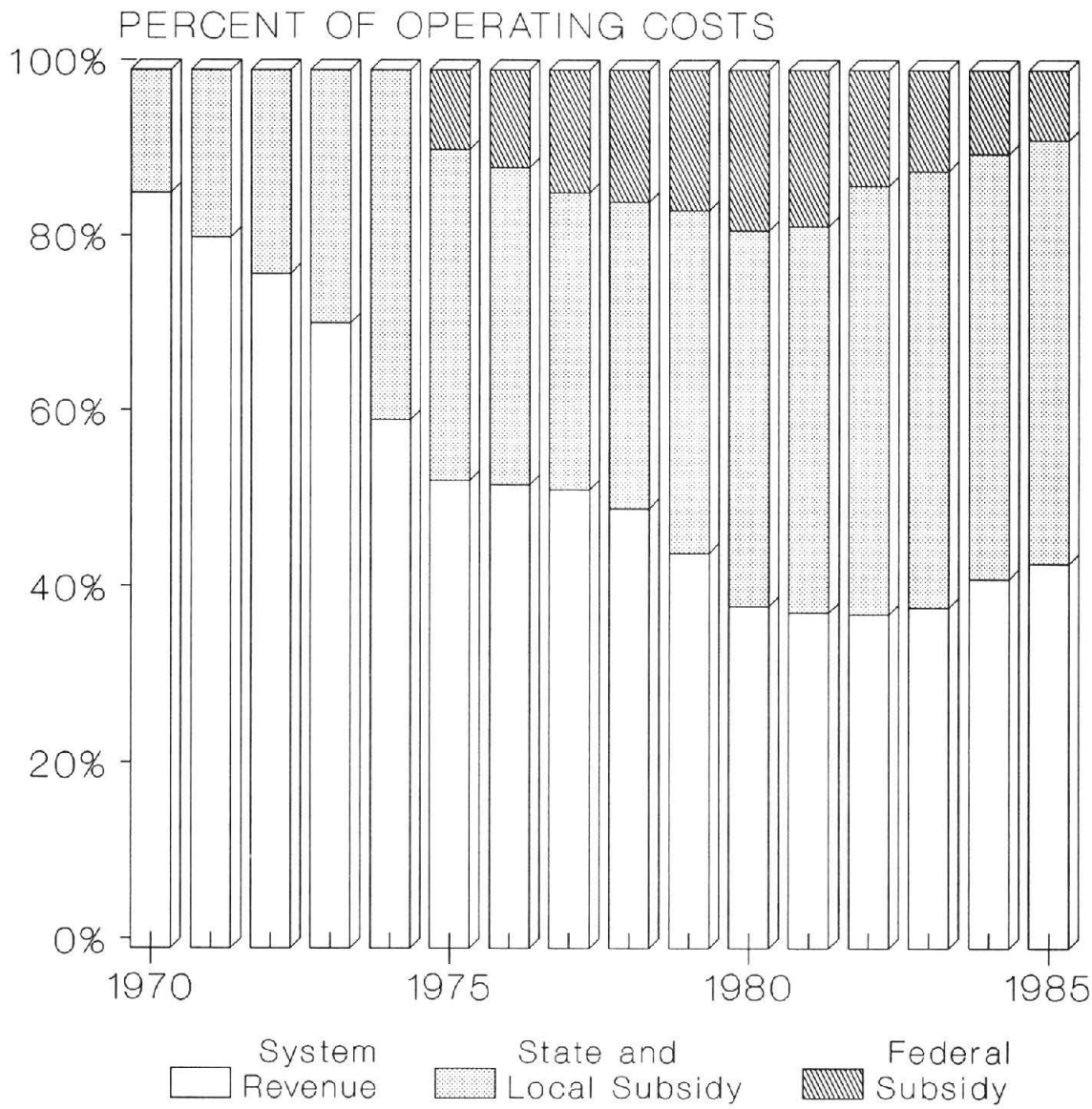
TRANSIT INDUSTRY OPERATING COSTS AND COMPONENTS OF REVENUES 1960 TO 1985



SOURCE: APTA FACT BOOK AND UMTA SECTION 15 DATA

Figure 4-2

SOURCES OF TRANSIT OPERATING REVENUES 1970 TO 1985



SOURCE: APTA FACT BOOK AND
UMTA SECTION 15 DATA

Long-Term Fare Trends

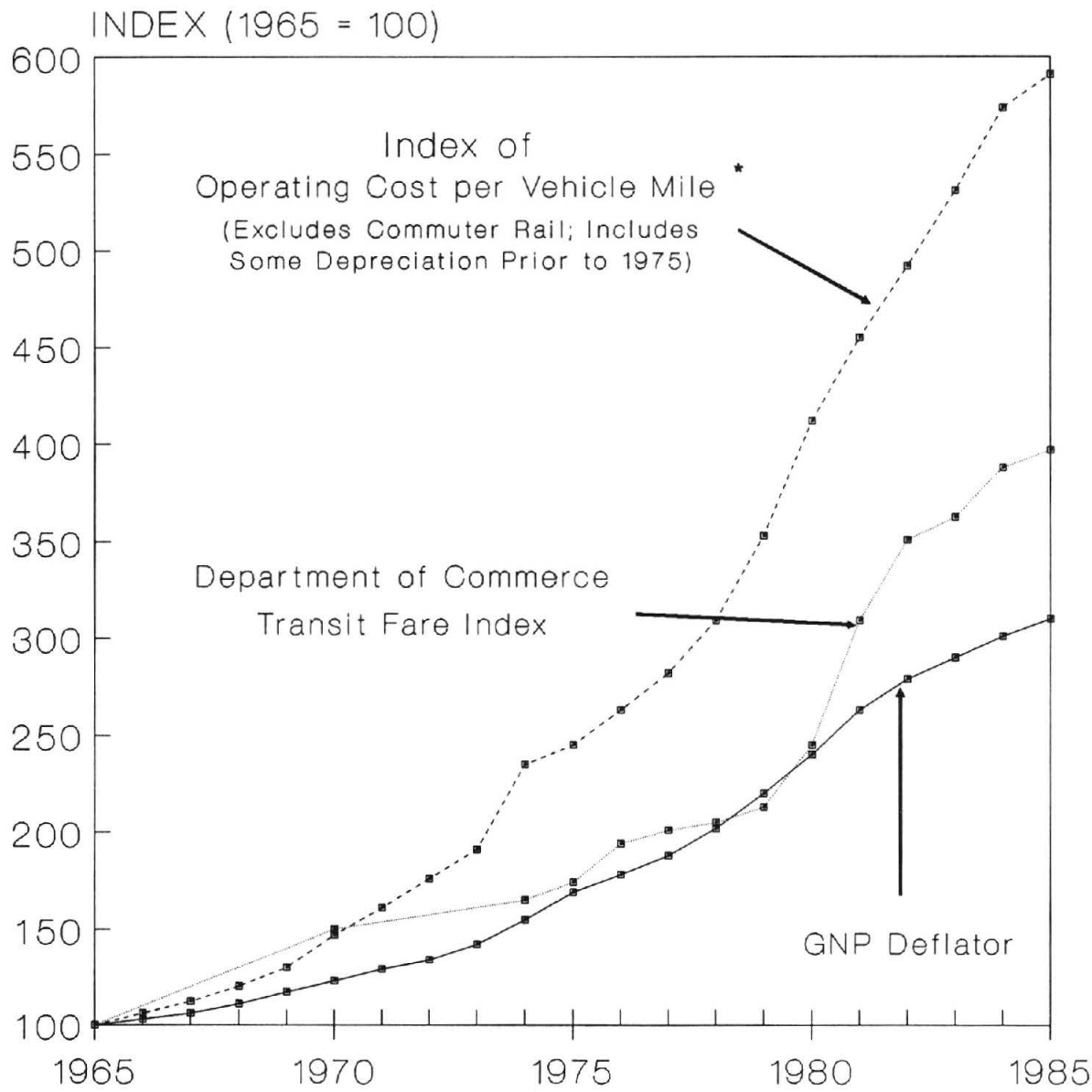
Largely because of the decade of growing operating subsidies aimed in large part at maintaining low fares, until only recently transit users have been paying a decreasing share of operating costs. Although they have not kept pace with the rising level of real operating costs, transit fares (as measured by a Department of Commerce price deflator) have more than kept pace with inflation over the last two decades. (Average fare revenue per passenger trip segment has declined, however, because the number of transit trips has increased more than the total fare revenues). These three trends are plotted in Figure 4-3.

Fare Policy Diversity

It is worth noting the diversity of fare policies across the country. Average fare revenue received per passenger mile since 1980 is shown in Figure 4-4 for each city size and regional category. Nationally, aggregate average real fare revenue per passenger mile increased by 30 percent between 1980 and 1985--to 13 cents. Average fare revenue per passenger mile is highest in the rail transit cities and lowest in cities with 500,000 to 1,000,000 population, although the variation is not large. Regionally, it is highest in the Northeast and lowest on the Pacific Coast. This pattern apparently reflects the willingness of transit users to pay higher fares in the Northeast because of the comparatively high cost of private automobile use due to

Figure 4-3

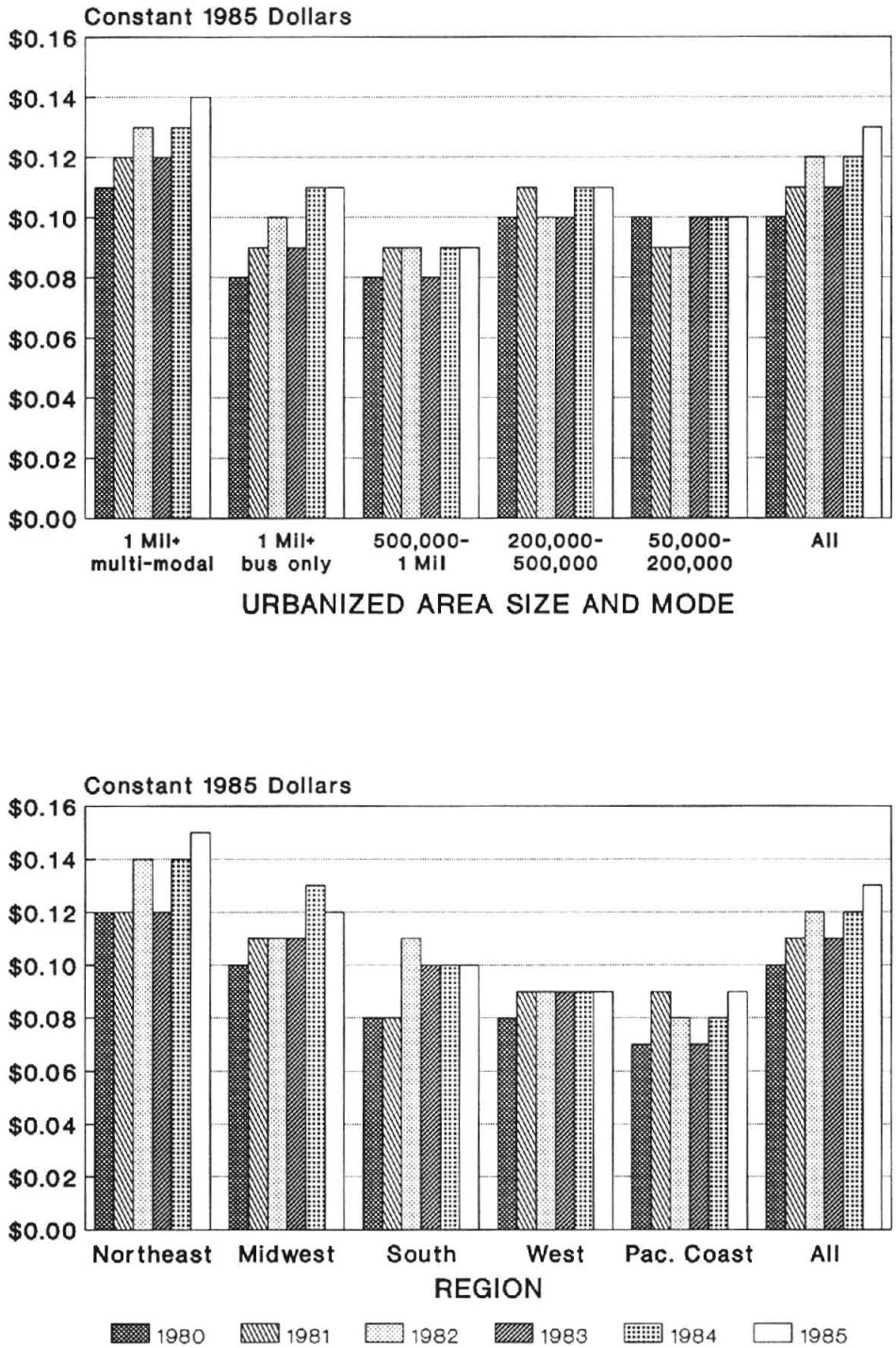
CHANGE IN TRANSIT FARES COMPARED WITH OPERATING COSTS AND INFLATION 1965 TO 1985



*Change to vehicle revenue mile in 1980.
SOURCE: APTA FACT BOOK; SURVEY OF CURRENT BUSINESS; SECTION 15 AFTER 1980.

Figure 4-4

FARE REVENUE PER PASSENGER MILE
1980-1985



SOURCE: UMTA STAFF ANALYSIS OF
1980 - 1985 SECTION 15 DATA

congestion, parking fees and inconvenience. By way of contrast, lower fares per passenger mile on the Pacific Coast are due to fare policies intended to maximize utilization in competition with low-cost auto use.

Fare Impacts

A "low fare" policy can be viewed as a means to assist low income households who depend on transit. As pointed out in Chapter 2, the subsidies that flow to the poor through low fares are not proportionate to the percentage of transit riders who are poor--due to "flat" fare policies. Since the poor tend to ride the less costly transit modes, and also travel shorter distances, cost-related fare structures could increase fare revenues without necessarily increasing the costs of transit fares for the poor.

Other reasons that are frequently cited for heavily subsidizing transit fares--such as reducing congestion and saving energy--generally involve attracting people away from single occupant auto commuting. Unfortunately, low fares have not been as effective as have service improvements--which often are extraordinarily costly. Again, fare increases combined with, and designed to help pay for, service improvements are often effective for competing with single occupant auto use.

Potential for Increased Fare Revenues

Budget requirements at every level of government require much more deliberate use of fare policies and structures to increase

the contribution from transit users as costs rise. There is potential for realizing substantially increased revenue from users.

Transit fare increases can result in higher revenues with very few lost passengers. For example:

- The principal Los Angeles transit system (the Southern California Rapid Transit District, SCRTD) increased its base fare from 50 cents to 85 cents on July 1, 1985. This 70 percent fare increase resulted in only a 6 percent ridership loss. Coverage of costs increased from 27 percent to 45 percent, reducing public subsidies by about $71 million.

- In late 1986, the Regional Transit District in Denver adopted a fare increase that was expected to increase revenues by 14 percent with only a 4 percent ridership loss.

In these examples, moving toward cost-based fare structures could have further reduced any ridership losses while increasing the added revenues.

For most systems, and especially for systems serving urbanized areas over 200,000 population, considerable revenue gains could be made by more creative use of the farebox as a revenue source. This would have the additional advantages of providing a market test of how much real demand there is for transit service and giving riders an incentive to fight the underlying operating cost increases.

Potential negative impacts of general fare increases could be offset by wider adoption of cost-based graduated fare policies [Mayworm, 1980]. Such policies target higher fares to users of the most costly services. This can be accomplished by instituting time-of-day fare differences (such as rush-hour surcharges) or

"zonal" fare systems which assess surcharges on customers traveling longer distances. Such policies offer the added benefit of fare relief for those who make shorter trips or less costly off-peak trips. The Washington Metropolitan Area Transit Authority (WMATA) has stated that the extra revenue generated by its higher rush-hour fares helped hold back a fare increase over a three-year period. In most cases, reduced fares for shorter trips could increase net revenues. Other elements of cost-based fares include premium fares for high-cost express bus service and other specialized services.

Increased reliance on the farebox through cost-based fare structures could result in tangible benefits for those transit users with low incomes. Graduated fares based on costs would automatically target increased fares to long distance, peak-hour commuters, very few of whom have poverty-level incomes. The 28 percent of transit riders who are below the poverty income level of $10,000 typically make short off-peak trips [CRA, 1986].

A 1983 Advisory Commission on Intergovernmental Relations survey of transit managers, planners, elected officials and other officials involved in local and State transit issues found that the transit industry largely supports such fare strategies. The 235 individuals surveyed in 56 cities indicated overwhelming support for greater coverage of costs from the farebox. When asked to indicate ways in which to increase revenues available to transit, 62 percent said that the revision of fares to reflect costs is "definitely" or "probably needed." Only 13 percent of

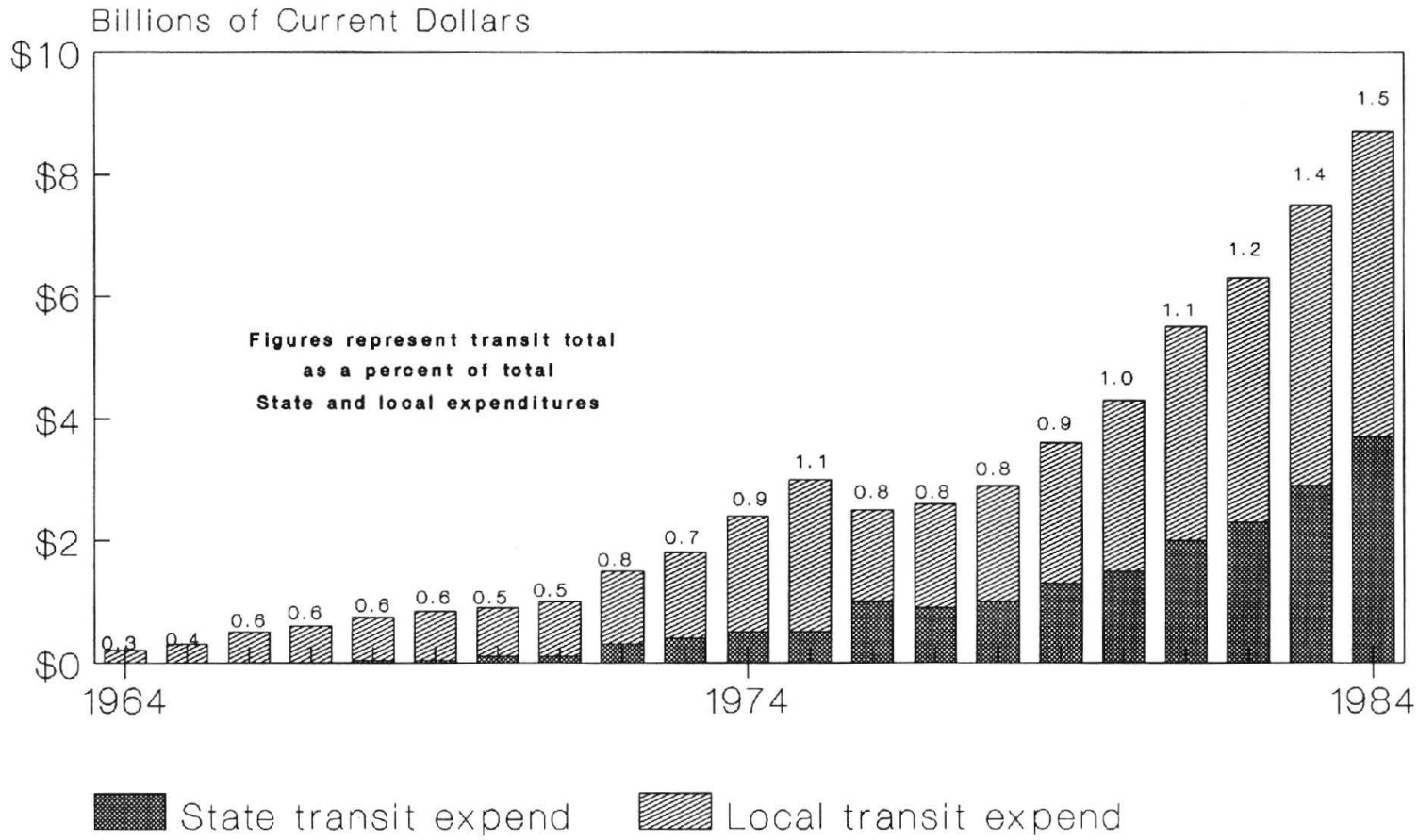
the respondents thought such measures disadvantageous; the remainder of those responding (19 percent) believed fare revision is not needed [McDowell, 1984].

STATE AND LOCAL TRANSIT SUBSIDY AND FINANCIAL RESOURCES

Past and Current Support for Transit

Even in those communities where local fare policies have resulted in recovering a stable or increasing share of operating expenses from users, the increases in transit operating costs, and the reduction in Federal assistance since 1980, have necessitated substantial increases in the amount of State and local government subsidies. State and local governments have been strong financial supporters of transit since 1963. Their total real dollar contribution increased about 9-fold between 1965 and 1984 and their 1985 contribution of $5.3 billion for operating expenses was six times the Federal contribution. Between 1980 and 1983 State and local coverage of transit operating costs increased from 43 percent to 50 percent, then fell back to 48 percent in 1984 and 1985. Despite these increases, the total level of their support amounts to less than 2 percent of combined State and local spending. Expressed as a percentage of combined State and local spending, total transit subsidies increased 5-fold--from three-tenths of one percent (0.3 percent) to one-and-one-half percent (1.5 percent) between 1965 and 1984. This trend is shown in Figure 4-5 and 1986 data for each State is included in Table 4-1.

STATE AND LOCAL EXPENDITURES ON TRANSIT* AND THEIR SHARE OF TOTAL STATE AND LOCAL EXPENDITURES, 1964-1984



*Includes expenditures on railroads.
SOURCE: SURVEY OF CURRENT BUSINESS

Figure 4-5

As shown in Figure 4-5, the level of State and local support for transit fell off briefly after the initiation of Federal operating subsidies in 1975, but then resumed its growth both in dollar and percentage terms. This record shows that State and local governments have been willing and able to increase their subsidies.

The subsidy increases respond to cost increases which merely reflect the financial outcome of the service demands local officials sought to accommodate, the fare policies they adopted, the isolation of operators from competitive pressures to maximize efficiency, and numerous other local decisions over the years. For the most part, then, localities have simply been paying the price of their own decisions (but sharing them with Federal taxpayers). It is evident that they have had both the willingness and the capacity to do so.

Furthermore, many political and market forces combine to determine local needs and to establish local fare and service policies. Thus it is crucial that the financial responsibility for the resolution of these forces remain in the hands of local decisionmakers.

Diversity in Subsidies

Here, too, it is important to note the diversity among urbanized areas across the country in the level of subsidies they provide to transit users. Figure 4-6 illustrates the diversity in subsidy per capita among both the size and regional groups of cities. The overall average real subsidy per 1980 urbanized area

Table 4-1

RECENT UMTA GRANT ACTIVITY AND INDICATORS OF STATE CAPACITY TO FUND TRANSIT

STATE	1986 PER CAPITA PERSONAL INCOME	TOTAL SURPLUS END FY87 (MILLIONS)	7 YR AVG UMTA CAPITAL GRANTS (MILLIONS)	1986 UMTA OPERATING GRANTS (MILLIONS)	ANNUAL UMTA GRANTS AS % OF STATE GEN BUDGET	ANNUAL UMTA GRANTS PER CAPITA	TOTAL FY86 STATE AID TO TRANSIT (MILLIONS)	FY 1986 STATE AID AS % OF GEN BUDGET	FY86 STATE AID PER CAPITA
ALABAMA	$11,336	$1	$3.9	$5.4	0.35%	$2.30	$0.0	0.00%	$0.00
ALASKA	$17,796	($2)	$4.1	$0.6	0.23%	$8.90	$0.0	0.00%	$0.00
ARIZONA	$13,474	$16	$8.6	$7.4	0.61%	$4.82	$29.9	1.15%	$9.01
ARKANSAS	$11,073	$0	$1.1	$2.0	0.20%	$1.30	$0.3	0.02%	$0.13
CALIFORNIA	$16,904	$580	$341.9	$124.3	1.42%	$17.28	$64.2	0.20%	$2.38
COLORADO	$15,234	$67	$19.1	$9.7	1.37%	$8.82	$0.0	0.00%	$0.00
CONNECTICUT	$19,600	$320	$30.6	$3.0	0.69%	$10.57	$71.5	1.45%	$22.42
DELAWARE	$15,010	$136	$1.8	$3.1	0.47%	$7.78	$4.3	0.41%	$6.79
DIST. OF COL.	$19,397	($210)	$81.5	$18.5	4.03%	$159.73	$104.7	4.21%	$167.25
FLORIDA	$14,646	$58	$126.6	$41.4	1.95%	$14.39	$11.9	0.14%	$1.02
GEORGIA	$13,446	$213	$73.5	$13.8	1.51%	$14.31	$1.2	0.02%	$0.20
HAWAII	$14,886	$165	$9.2	$3.7	0.69%	$12.15	$0.0	0.00%	$0.00
IDAHO	$11,223	$0	$0.4	$0.7	0.17%	$1.09	$0.0	0.00%	$0.00
ILLINOIS	$15,586	$154	$258.8	$64.1	3.06%	$27.96	$173.4	1.64%	$15.01
INDIANA	$13,136	$210	$27.7	$17.4	1.24%	$8.19	$12.4	0.34%	$2.25
IOWA	$13,348	$79	$6.0	$4.1	0.43%	$3.56	$1.7	0.07%	$0.60
KANSAS	$14,650	$73	$1.3	$2.5	0.20%	$1.54	$0.0	0.00%	$0.00
KENTUCKY	$11,238	$158	$4.7	$11.7	0.51%	$4.41	$0.7	0.02%	$0.19
LOUISIANA	$11,193	($390)	$22.3	$12.5	0.90%	$7.73	$7.0	0.18%	$1.56
MAINE	$12,790	$57	$2.4	$1.4	0.33%	$3.25	$0.4	0.03%	$0.34
MARYLAND	$16,864	$100	$114.7	$14.2	2.64%	$28.87	$211.9	4.35%	$47.48
MASSACHUSETTS	$17,722	$142	$203.6	$31.8	3.33%	$40.38	$231.7	3.28%	$39.73
MICHIGAN	$14,775	$415	$41.4	$35.9	1.20%	$8.46	$89.4	1.38%	$9.78
MINNESOTA	$14,994	$269	$13.0	$9.9	0.42%	$5.43	$29.4	0.54%	$6.98
MISSISSIPPI	$9,716	$76	$0.8	$2.7	0.22%	$1.33	*	ERR	ERR
MISSOURI	$13,789	$0	$18.7	$18.3	1.02%	$7.30	$1.0	0.03%	$0.20
MONTANA	$11,803	$10	$1.2	$1.1	0.61%	$2.78	$0.2	0.05%	$0.24
NEBRASKA	$13,742	$79	$4.9	$3.7	0.94%	$5.40	$1.0	0.11%	$0.63
NEVADA	$15,437	$51	$2.8	$1.4	0.71%	$4.32	$0.4	0.07%	$0.42
NEW HAMPSHIRE	$15,911	$75	$0.9	$1.6	0.46%	$2.47	*	ERR	ERR
NEW JERSEY	$18,626	$501	$174.7	$52.4	2.25%	$29.82	$221.7	2.20%	$29.10
NEW MEXICO	$11,422	$90	$1.3	$0.2	0.10%	$0.99	$2.6	0.17%	$1.76
NEW YORK	$17,111	$169	$479.7	$149.8	2.49%	$35.42	$826.9	3.27%	$46.53
N. CAROLINA	$12,438	$362	$6.3	$8.1	0.24%	$2.26	$1.6	0.03%	$0.25
NORTH DAKOTA	$12,472	$8	$1.2	$0.8	0.38%	$2.90	$0.0	0.00%	$0.00
OHIO	$13,933	$489	$59.5	$37.1	0.89%	$8.98	$32.4	0.30%	$3.01
OKLAHOMA	$12,283	$0	$3.4	$5.3	0.40%	$2.64	$0.3	0.01%	$0.09
OREGON	$13,328	$251	$47.2	$6.3	2.98%	$19.82	$3.0	0.17%	$1.11
PENNSYLVANIA	$14,249	$400	$228.5	$54.3	2.70%	$23.79	$310.0	2.96%	$26.08
RHODE ISLAND	$14,579	$116	$5.8	$5.6	0.92%	$11.77	$9.9	0.80%	$10.15
S. CAROLINA	$11,299	$90	$1.8	$4.3	0.21%	$1.79	$1.3	0.05%	$0.38
SOUTH DAKOTA	$11,814	$33	$0.1	$1.0	0.28%	$1.58	$0.0	0.00%	$0.00
TENNESSEE	$12,002	$76	$8.6	$9.8	0.61%	$3.84	$2.2	0.07%	$0.46
TEXAS	$13,478	($1,030)	$98.9	$15.5	1.32%	$6.85	$9.8	0.11%	$0.59
UTAH	$10,981	$52	$8.9	$4.5	0.98%	$8.06	$0.6	0.04%	$0.36

Table 4-1 (continued)

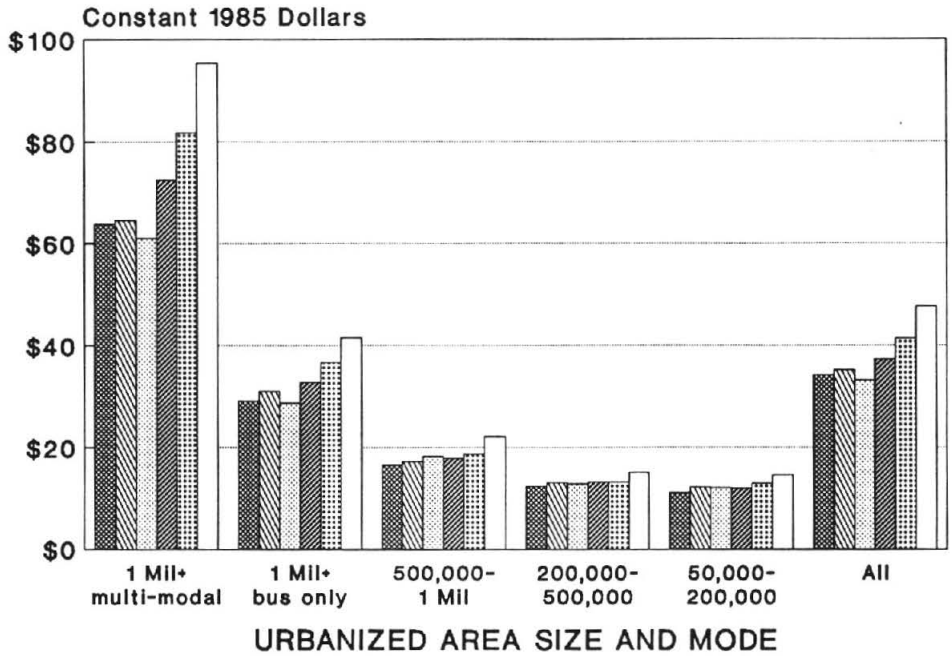
RECENT UMTA GRANT ACTIVITY AND INDICATORS OF STATE CAPACITY TO FUND TRANSIT
(CONTINUED)

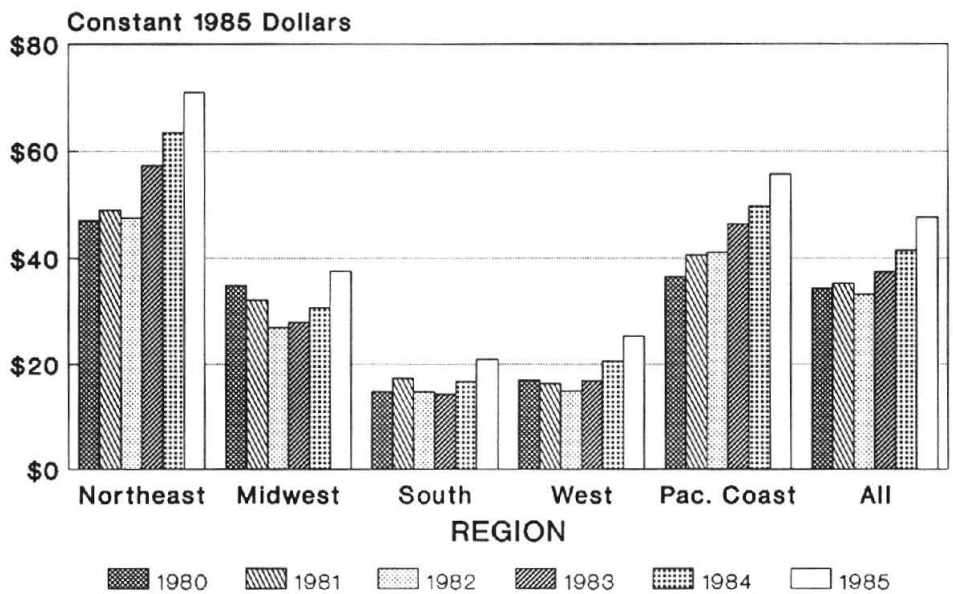
STATE	1986 PER CAPITA PERSONAL INCOME	TOTAL SURPLUS END FY87 (MILLIONS)	7 YR AVG UMTA CAPITAL GRANTS (MILLIONS)	1986 UMTA OPERATING GRANTS (MILLIONS)	ANNUAL UMTA GRANTS AS % OF STATE GEN BUDGET	ANNUAL UMTA GRANTS PER CAPITA	TOTAL FY86 STATE AID TO TRANSIT (MILLIONS)	FY 1986 STATE AID AS % OF GEN BUDGET	FY86 STATE AID PER CAPITA
VERMONT	$13,348	$54	$1.1	$0.2	0.26%	$2.33	*	ERR	ERR
VIRGINIA	$15,408	$92	$60.0	$9.6	1.38%	$12.03	$31.8	0.63%	$5.50
WASHINGTON	$15,009	$208	$42.8	$11.4	1.09%	$12.14	$1.2	0.02%	$0.27
WEST VIRGINIA	$10,576	$33	$3.1	$2.4	0.36%	$2.86	$1.2	0.08%	$0.63
WISCONSIN	$13,909	$188	$17.2	$13.9	0.59%	$6.50	$42.8	0.81%	$8.94
WYOMING**	$12,781	$163	$0.0	$0.2	0.05%	$0.45	$0.1	0.02%	$0.20
TOTAL		$5,247	$2,677.9	$860.6			$2,548.0		
AGGREGATE AVE	$14,641				1.53%	$14.68		1.10%	$10.57

SOURCES: NATIONAL GOVERNORS' ASSOCIATION & NATIONAL ASSOCIATION OF STATE BUDGET OFFICERS, FISCAL SURVEY OF THE STATES, 1987;
DEPARTMENT OF COMMERCE, SURVEY OF CURRENT BUSINESS;
UMTA GRANT STATISTICAL SUMMARIES;
AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS, 1986 SURVEY OF STATE INVOLVEMENT IN PUBLIC TRANSPORTATION.

Figure 4-6

SUBSIDY PER CAPITA
1980-1985





* Using 1980 urbanized area population
SOURCE: UMTA STAFF ANALYSIS OF
1980 - 1985 SECTION 15 DATA

population increased 39 percent between 1980 and 1985, reaching $48 in 1985 dollars. Operating subsidies (not including capital costs) are highest in the multi-modal areas, reflecting the greater importance of transit in these areas in its dual roles of serving large numbers of work trips and providing a level of basic mobility. Operating subsidies per capita are lowest in the smallest areas, reflecting the more limited role that transit plays in these areas, primarily providing a basic level of mobility for those dependant on transit. Regionally, operating subsidy per capita is highest in the Northeast and lowest in the South, again related to the roles and relative importance of transit to decisionmakers in these areas. Operating subsidies per capita are relatively high in the Pacific Coast area, reflecting, in part, policy decisions to keep fares low and provide wide coverage.

Additional diversity can be seen in the extent of State support per capita and in comparison to the extent of Federal assistance per capita. For example, the following 10 States provide the largest per-capita direct contributions for transit (both operating and capital assistance), but that contribution represents widely differing support relative to the amount of Federal assistance being received by the State and relative to other States. The disparity between State and Federal per capita contribution is greatest in Oregon, California and Florida:

State	1986 State asst. per capita	1986 Federal asst. per capita 1
Washington DC	$167	$160
Maryland	47	29
New York	47	35
Massachusetts	40	40
New Jersey	29	30
Pennsylvania	26	24
Connecticut	22	11
Illinois	15	28
Rhode Island	10	12
Michigan	10	8
Oregon	1	20
California	2	17
Florida	1	14

The data for all States is presented in Table 4-1.

Capacity for Increased State and Local Contributions

There are alternatives to continuing the current level of subsidies for transit: greater farebox recovery, implementation of competitive service contracting, and other productivity and efficiency enhancements. A number of high-payoff actions to increase productivity and efficiency are identified and discussed in Chapters 7 and 8. The prospect of continued cost increases and the need to reduce Federal budget levels make it appropriate to consider those alternatives and the fiscal capacity of State and local governments for increasing their contribution to transit.

The fact that total public subsidy support for transit has increased so dramatically, while still remaining a small portion of overall State and local expenditures, is evidence that greater financial responsibility could be assumed for transit. For example, a number of systems reported in 1985 that they would face

severe operating difficulty if Federal operating assistance were reduced. Yet some of those same localities were contributing little or nothing to operating expenses (e.g. Flint, Michigan, where the local government in 1985 contributed only 5 percent of costs) or their State in 1985 provided no operating assistance (e.g. Miami, Florida).

Over the past five years the strengthening of the economy and the control of inflation have greatly improved the fiscal health of State and local governments. For the most part, State governments are required by law to avoid operating at a deficit--they must keep their income and expenditures in balance. Since their revenues are highly sensitive to economic conditions in the general economy and any sector representing a significant element of the State's economy, they tend to accumulate reserves during "good" years in order to assist them during "bad" years. Yet during those good years, or as a result of windfalls such as the effects of Federal tax reform in 1986, the States will have an opportunity to shift resources among priorities and make choices between program expansion and tax reduction.

For example, the 1986 Federal tax revisions produced a potential increase of $5.9 billion in annual State personal income tax revenues because many of the State tax systems are tied to the Federal structure of deductions, rates, etc. During 1987 the two-thirds of the States affected by this windfall took action to modify their tax systems, and thereby retain or return some portion of the windfall to taxpayers. Overall, about 20 percent

of this windfall was retained by the States, as well as about half of the $0.6 billion corporate tax windfall. In addition, a further net increase of $6.1 billion in taxes was imposed [National Governors' Association, 1987]. Essentially, these tax changes provided the States with flexibility to modify programs and priorities and enact general fund budgets for FY 1988 totaling $231 billion, versus $219 billion for FY 1987.

These figures illustrate the flexibility available to the States and the existence of a cushion that could facilitate adjustments that might be required by any realignment of financial burdens between the different levels of government.

Table 4-1 displays a variety of fiscal indicators for each of the States. It shows that total end-of-year balances and stabilization reserves for all the States was $5.2 billion in 1987 [National Governors' Association, 1987].

There is no comparable data on local budget surpluses, but indications are that localities are experiencing small current surpluses in their general accounts; current revenues exceeded current outlays and debt service in both 1983 and 1984 [Petersen, 1985]. This has given them the ability to exercise discretion in expanding local programs or reducing taxes and therefore enhanced their ability to adapt to any readjustment of financial responsibilities for mass transit.

FEDERAL TRANSIT SUBSIDIES

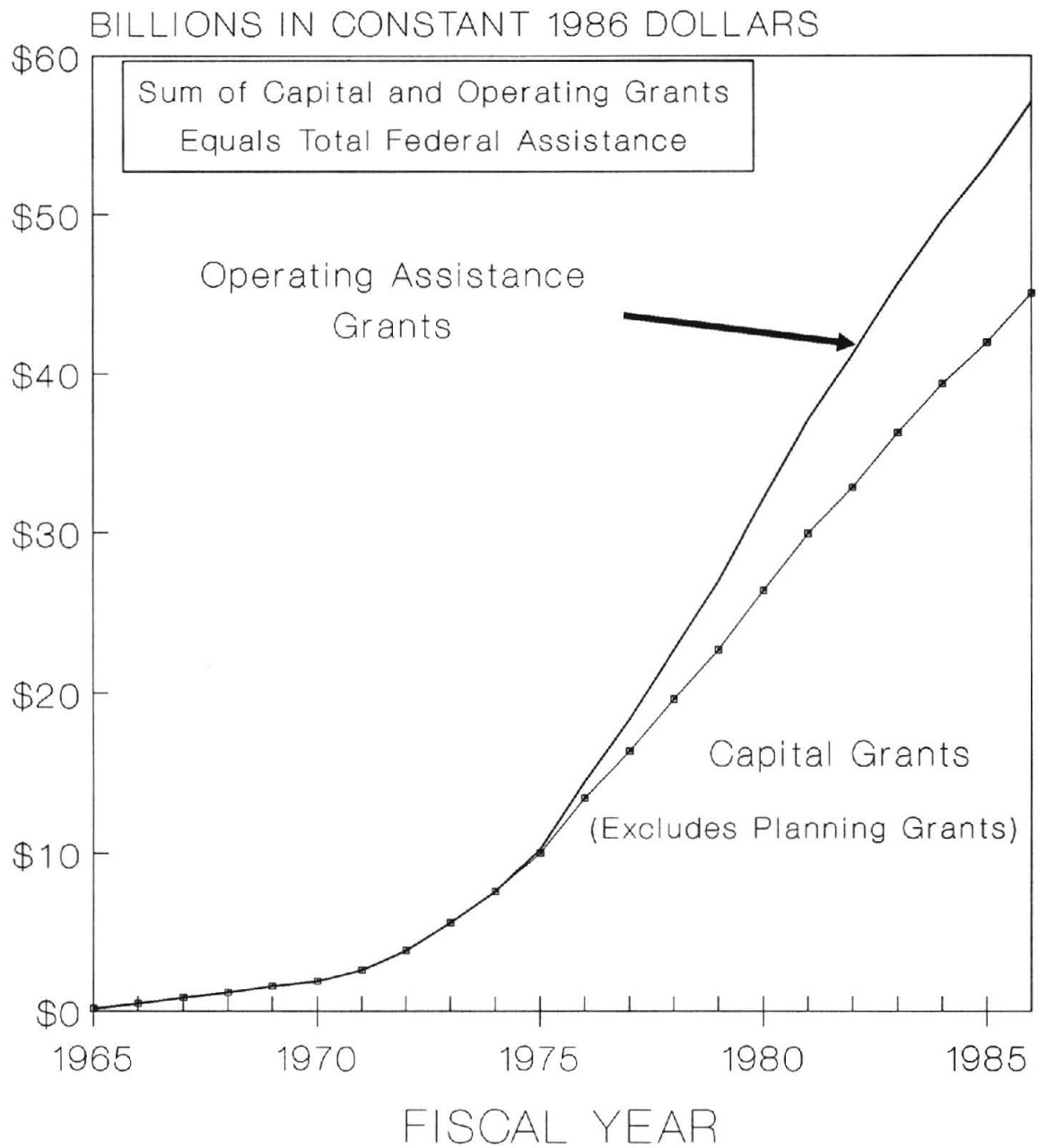
In the years since initiation of Federal involvement in local mass transportation (i.e., from 1964 to 1986), Federal taxpayers have contributed more than $45 billion to the recapitalization, modernization, expansion and operation of mass transit systems and services around the country--$35 billion for capital and $10 billion in operating subsidies. This flow of Federal funds is depicted in Figure 4-7.

Since passage of the Surface Transportation Assistance Act of 1982, Federal operating assistance has essentially been frozen for most areas. New authorizing legislation passed in 1987 (the Surface Transportation and Uniform Relocation Assistance Act) continues these ceilings, although it allows smaller areas to use more of their funds for operating assistance and liberalizes the definition of capital to include some items previously considered as operating expenses. Federal capital assistance has also declined since 1982.

The industry's rising operating costs and declining productivity following the advent of Federal operating subsidies, and the apparent leveling-off of real unit operating costs as Federal assistance has been cut back, raise the question of whether the Federal assistance itself contributed to the continued deterioration in performance. The possibility of such a causal link has been the subject of research, particularly because the same relationship has been seen in other countries as well as in

Figure 4-7

CUMULATIVE FEDERAL TRANSIT ASSISTANCE CAPITAL AND OPERATING GRANTS 1965 - 1986



SOURCE: UMTA GRANT ASSISTANCE PROGRAM STATISTICAL SUMMARY

the United States. For example, one cross-national study [Bly, 1980] found that each 100 percent increase in transit operating subsidy was associated with the following effects:

- a 15 to 30 percent reduction in output per employee,
- a 20 percent increase in the number of employees,
- a 20 to 30 percent increase in employee wages, after adjustment for inflation, and
- a 40 to 60 percent increase in the operating cost for each unit of service.

A study of U.S. transit properties found that each additional dollar of Federal operating subsidy (not including capital investments) per hour was associated with increased operating costs of 62 cents per hour [Pucher, 1982].

Another recent study took a close look at what cost factors account for the increases in transit operating deficits between 1975 and 1984 [Pickrell, 1985]:

- 36 percent was increased labor cost per unit of service,
- 27 percent were the revenues lost by the choice not to increase fares to recover the increased cost of new service (an 8 percent increase in vehicle miles of service),
- 16 percent were the revenues lost by average passenger fare revenue not keeping up with inflation,
- 16 percent were increased fuel and other costs, and
- 5 percent accrued for future use.

In these terms, about half the total deficit--the amount of all subsidies--can be considered as potentially benefitting transit users--the majority of the remainder simply involved increased wages and declining labor productivity. This expenditure,

combined with capital investment subsidies, resulted in only an 8 percent net increase in transit ridership (trip segments).

CONCLUSION

The growing sensitivity to budget deficits and taxes at every level of government makes appropriate a closer examination and reassessment of what should be the level of public subsidy that of mass transit. Such a reconsideration should take account of the opportunities to reduce operating costs by introducing competition and reversing the declines in labor productivity and the revenue-enhancing possibilities of cost-based fare structures. Should there be a desire to continue to subsidize transit, the State and local governments are in a good financial position to increase their support.

CHAPTER 5: TRANSIT OPERATING PERFORMANCE--THE EFFICIENCY AND EFFECTIVENESS OF TRANSIT SERVICE OPERATION

HIGHLIGHTS

- The rate of decline in transit **operating efficiency** since 1980 is significantly less than between 1965 and 1980. And, since 1984, preliminary indications are that real operating costs have stabilized. Nevertheless, the real operating cost to provide a unit of transit service in 1985 was nearly twice that of 1965. Between 1980 and 1985, cost increases were greatest in the largest urban areas. Major reasons for these operating cost trends include:

  - Declining labor productivity. The number of labor hours required to produce a unit of transit service has increased, although the rate of change has slowed.

  - Levels of labor compensation. Average total compensation has increased. In addition, case studies have shown that vehicle operators and mechanics in large publicly operated systems earn 31 to 95 percent more than their counterparts in the private sector.

- Transit **effectiveness**--actual utilization per unit of transit service produced--declined after 1965 and then rebounded after the ridership low in 1972. Between 1980 and 1985 average utilization per unit of service has again declined. Reasons include changes in:

  - The market for transit, described in Chapter 3, reflecting such factors as income, employment patterns and urban development characteristics.

  - Transit's external competition, also described in Chapter 3, such as auto ownership and gasoline price and availability.

  - Important factors in transit service such as a continued decline in service frequency in most urban area types.

- The **operating cost-effectiveness** of transit service has declined 15 percent since 1980. While the rate of increase in unit operating costs has been reduced, the decline in unit utilization has continued, resulting in an increase in operating costs per passenger and per passenger mile.

- The diversity of urban areas and of the transit systems in these areas results in significant differences in these dimensions of transit performance between different regions of the country and urban areas of different size.
- Although there are wide differences in the role and scope of transit service and utilization between different types of urban areas (as discussed in Chapter 3 and illustrated in this Chapter), the performance trends since 1980 have been relatively consistent across all types of areas.

The purpose of this chapter is to discuss, using a variety of indicators, recent trends in the operating performance of mass transportation and to explain what has contributed to the results.

This chapter focuses on national operating performance broken down in accordance with the regional and urban area size classification scheme described in Chapter 2 and Appendix A. The analysis focuses in detail on the operating performance of transit between 1980 and 1985, using data from the Section 15 reporting system (adjusted as described in Appendix A). Data on the performance of individual properties, used to estimate overall performance in the classification scheme, is not presented in this report.

This chapter focuses on three basic dimensions of performance:

- operating efficiency, i.e., the operating cost to produce a unit of transit service;
- service effectiveness, i.e., the use made of the transit service provided; and
- operating cost effectiveness, i.e., the operating cost of the trips made on transit.

Transit service is produced through expenditure of employees' labor, various expendable materials and supplies and capital inputs such as vehicles and facilities. Thus the costs of transit service should be measured by including both operating and capital costs. However, while operating cost data is readily available, data on annualized capital consumption and the carrying cost of the current capital stock is not generally available in any consistent format. Data on recent capital expenditure indicates that it has been about $4 billion to $5 billion per year, from Federal, State and local sources. Of this amount, about three-quarters is used for rehabilitation and replacement of existing facilities and the remaining one quarter for new facilities for expanded service. Thus, recent capital expenditures on rehabilitation and replacement add about 25 to 35 percent to the operating costs reported. However, the amount being spent on new facilities does not account for the carrying costs of these investments, nor does it account for the carrying costs of the capital investments made in the past.

Because of this lack of consistent data, this report measures transit efficiency and cost-effectiveness only in terms of operating costs. This has a number of impacts. First, it understates the total cost per unit of service provided and per unit of service used. Secondly, and perhaps more importantly, it can introduce a bias in assessing the relative performance between different urbanized areas. Rail systems are generally much more capital intensive than bus systems. Neglecting capital cost, both

rehabilitation and the carrying costs of capital investments, makes rail systems appear relatively more attractive than bus systems in a comparison of costs. Since some urbanized areas have relatively more rail service than others, they could appear to have lower costs than other urbanized areas than in reality.

As an illustration, according to a recent study [Federal City Council, 1986], in the year 2000, Washington, D.C., will have replacement and rehabilitation costs that will add 11 percent to bus costs and 46 percent to rail costs. Including the carrying charges of the original capital cost of the rail and bus systems with the replacement and rehabilitation costs would raise the total capital cost of the bus system 31 percent over operating costs, while for the rail system the increase in cost is over four and one half times operating costs.

Despite this factor, results based on comparing the multi-modal areas over 1,000,000 with all bus areas over 1,000,000 should not be interpreted as representing bus versus rail comparisons. This is because the multi-modal areas have large bus systems, and significant new start rail investments have been made in the all-bus cities. Thus, capital expenditures in the multi-modal areas historically have been about 35 percent of operating costs and about the same level in the bus only areas.

A discussion of performance concepts is provided in Appendix A, which also describes the methodology used to select the indicators and the way in which they are presented.

OPERATING EFFICIENCY OF TRANSIT SERVICE PRODUCTION

Efficiency is measured by the cost of resources used to produce a unit of transit service. A unit of transit service is defined as a vehicle (bus, rail car, street car, etc.) operated in revenue service for one hour or one mile. Labor costs make up over 70 percent of the operating cost of transit service, with operator labor accounting for the largest share in bus systems (although maintenance labor has a larger share in rail systems). Since operator labor costs vary on the basis of service hours and since the amount of vehicle miles which can be operated per hour is largely based on external factors such as congestion and urban density, it is preferable to use vehicle revenue hours as the unit of transit service output for purposes of measuring operating efficiency and the productivity of labor[1]. Nevertheless, vehicle revenue hour data is not generally available before 1980

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1 As a caution in interpreting results based on either vehicle hours or vehicle miles under the classification scheme used in this report, it should be noted that there is a significant difference in the capacity and cost of a vehicle revenue hour operated by a bus versus that by a rail car. Buses typically can carry about 40 seated passengers, with perhaps as many as 30 standees. Rail cars vary considerably depending on size, seating configuration and the standards used to calculate the number of standees which could be accommodated, with a total loading of 250 experienced in some places. While it would be preferable to handle this difference by calculating a unit of capacity-hours provided, such as place-hours or seat-hours, there is not currently enough data available to use any measure except vehicle hours and miles in this analysis. In addition, it is vehicle revenue miles which is currently used as an allocation factor for Section 9 formula funds. It should therefore be recognized that use of combined vehicle hour measures will tend to make operations in areas with rail transit look more expensive than they would be in terms of the higher output actually being provided. However, it will have no distorting effect on the operating cost per passenger, discussed in the section on cost-effectiveness.

and thus vehicle revenue miles is used when discussing longer terms trends.

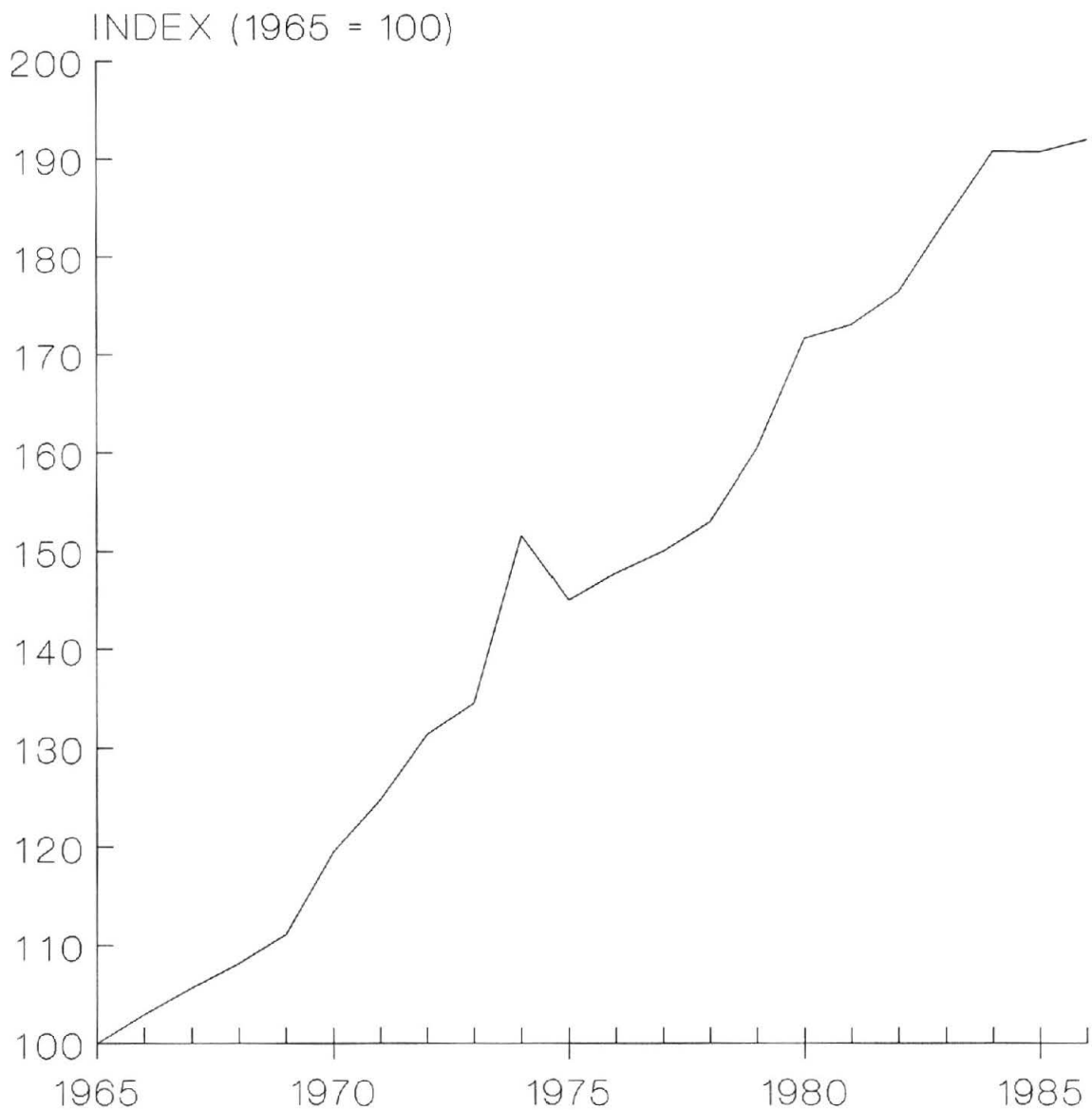
Indicators of Operating Efficiency

Between 1965 and 1980 operating cost per vehicle revenue mile increased at about 3.6 percent per year in real terms, i.e., adjusted for inflation. Between 1980 and 1985, the rate of increase fell to 2.1 percent per year. Between 1984 and 1985, real operating costs did not increase at all and preliminary data from 1986 indicates similar stability. Figure 5-1 displays the operating cost trend after adjustment for inflation and shows that the long-term trend resulted in a real operating cost increase of 92 percent since 1965. Chapter 8 discusses some of the innovative ways in which transit managers are now making efficiency improvements, the adoption of which in recent years can account for some of the slowing in unit operating cost increases.

Data on **operating cost per revenue vehicle hour** is displayed in Figure 5-2. Overall since 1980, it increased in real terms (i.e., faster than inflation) so that, nationally, real operating costs were 16 percent higher in 1985 than they were in 1980. However, operating costs increased less than 1 percent between 1984 and 1985. The effect of adoption of a variety of efficiency measures by operators, such as those described in Chapter 8, could account for this stabilization. The increase has been highest in the Northeast and on the Pacific Coast and in areas over 1,000,000, both multi-modal and bus-only, the groups that already

Figure 5-1

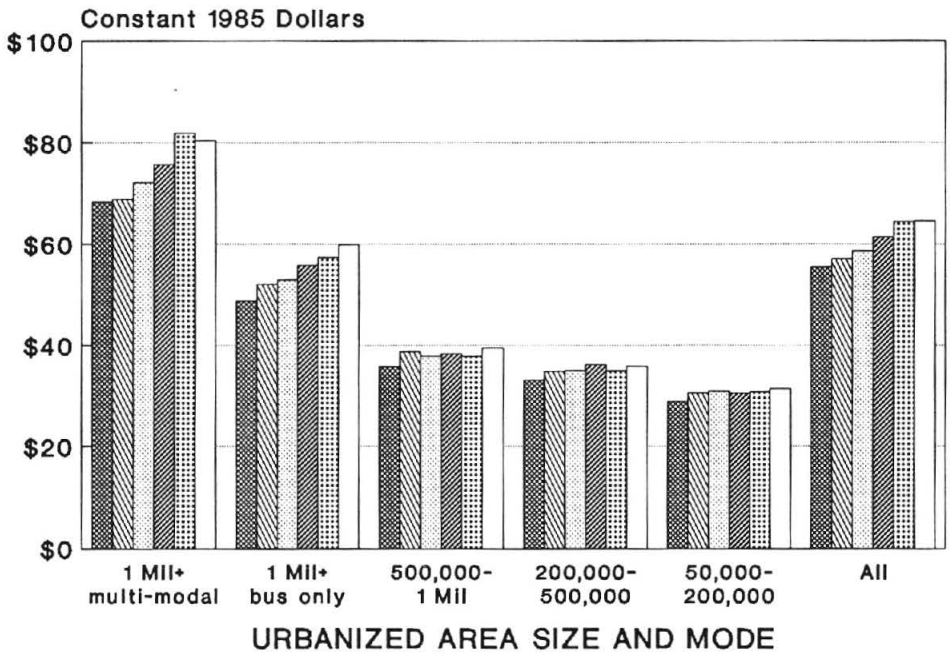
CHANGE IN TRANSIT UNIT OPERATING COST PER VEHICLE MILE* CONSTANT DOLLARS, 1965 TO 1986

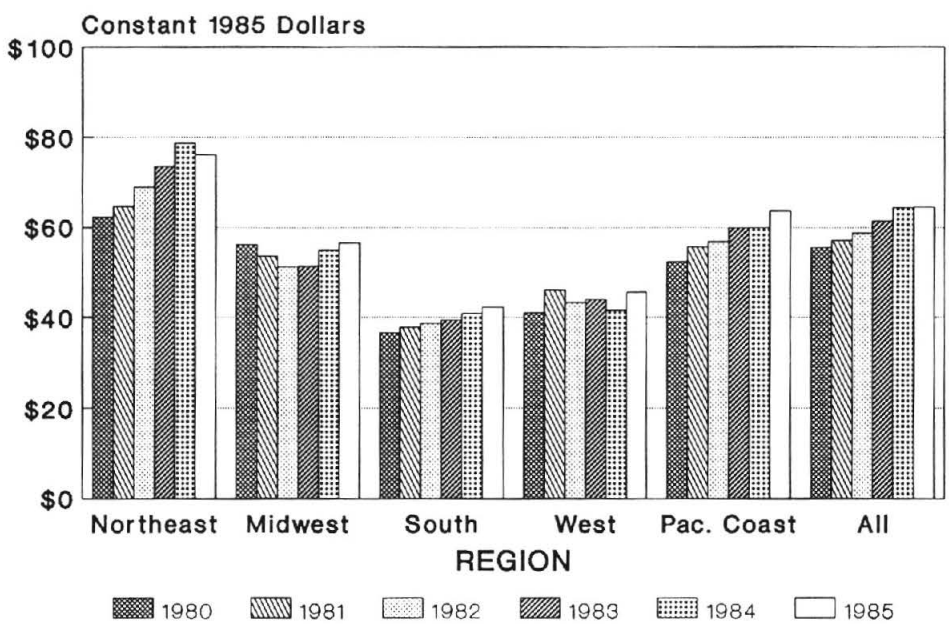


*Vehicle Revenue Miles After 1980
SOURCE: APTA FACT BOOKS; SURVEY OF CURRENT BUSINESS; SECTION 15 AFTER 1980.

Figure 5-2

OPERATING EXPENSE/VEHICLE REVENUE HOUR
1980-1985





SOURCE: UMTA STAFF ANALYSIS OF
1980 - 1985 SECTION 15 DATA

had the highest unit operating costs in 1980. Further comparison of regional trends to the national trend shows that the overall trend encompasses an increasing disparity between the lower operating cost of service in the smallest areas and the higher operating cost of service in the largest areas.

Service was most costly in those areas with rail transit, particularly in the Northeast, primarily because of the higher operating cost of rail vehicle hours. However, operating costs are also high in large area bus systems (both those with or without rail systems), with bus operating costs nearly twice as high in areas over 1 million as in areas under 200,000. Aside from the Northeast, operating costs are highest on the Pacific Coast. Adding capital costs would probably not change these results, as described earlier, despite the higher capital intensiveness of rail systems.

Explaining Patterns and Changes in Operating Efficiency

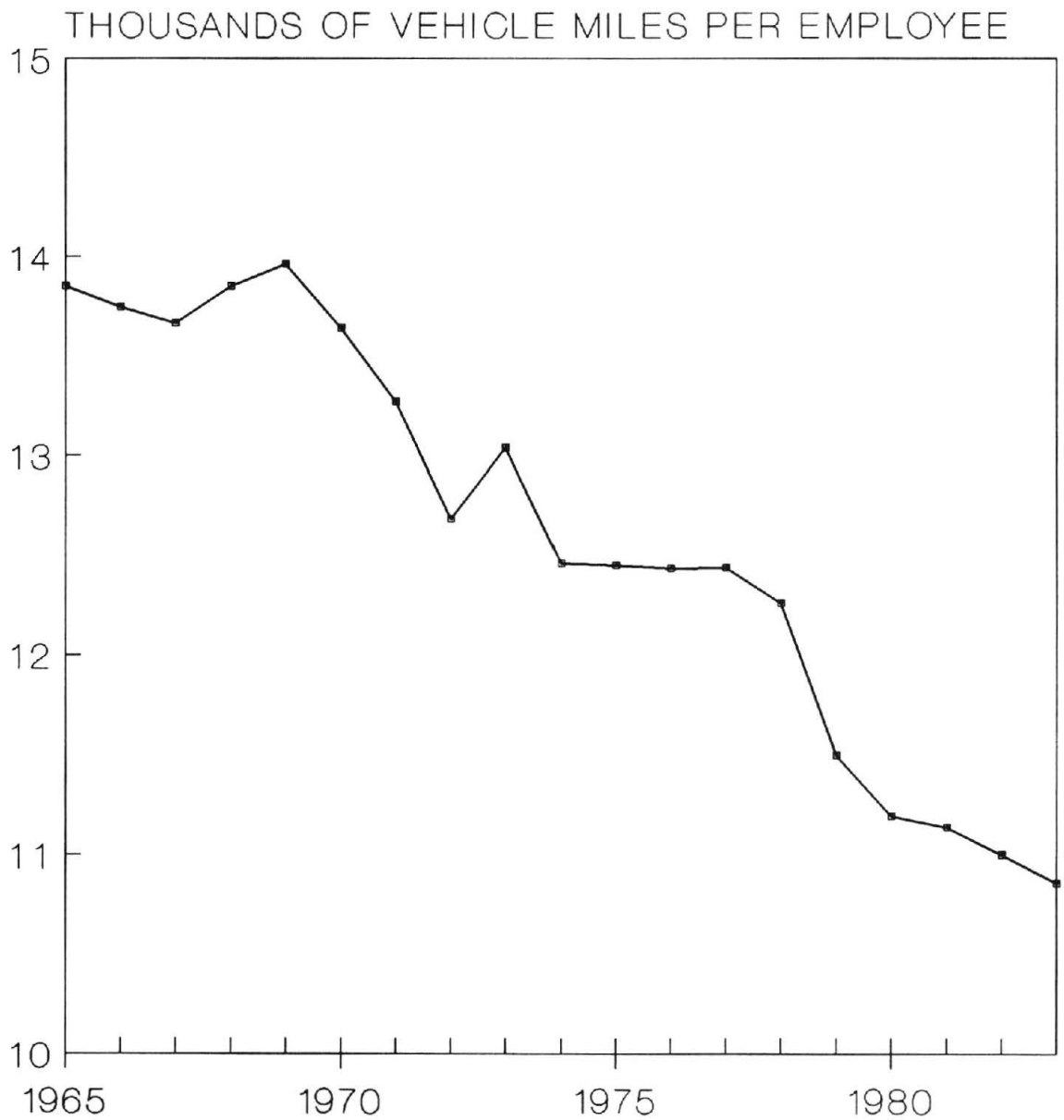
What has lead to this longer term decline and more recent apparent stability in operating efficiency and pattern of increasingly higher operating costs in larger areas? The total cost to operate transit service reflects the amount of labor needed to produce the service, the cost per unit of labor, the amount of capital equipment needed for the service and its maintenance costs, and the cost of other expendable materials and supplies (including fuel) needed to operate the vehicles. Because labor accounts for over 70 percent of operating costs, the

productivity of labor, and its patterns and levels of compensation, represent the most important factors. Trends and patterns in these areas are discussed below. In addition, as discussed in Chapter 4, service costs are affected by the existence of subsidies and they can be effected by capital investment practices, as discussed in Chapter 6.

Labor Productivity. Analysis of APTA data in Figure 5-3 shows that between 1975 and 1980 labor productivity (expressed in terms of vehicle miles per employee) declined 10 percent (after having declined 9 percent between 1970 and 1975). Figure 5-4 shows that since 1980 transit labor productivity in terms of revenue vehicle hours per full-time-equivalent employee has declined another 8 percent. Labor productivity is lowest in multi-modal cities, partly because of the larger amount of labor used to produce a vehicle hour of rail transit service compared to bus. However, labor productivity is also lower in the largest all-bus cities and is equally low for bus operations in the multi-modal areas. The disparity between the areas over 1,000,000 and those under 200,000 is not as great with respect to labor productivity as it is in terms of unit operating costs. This is because some of the cost differential is also accounted for by higher wage rates in the larger areas, as will be discussed below.

Figure 5-3

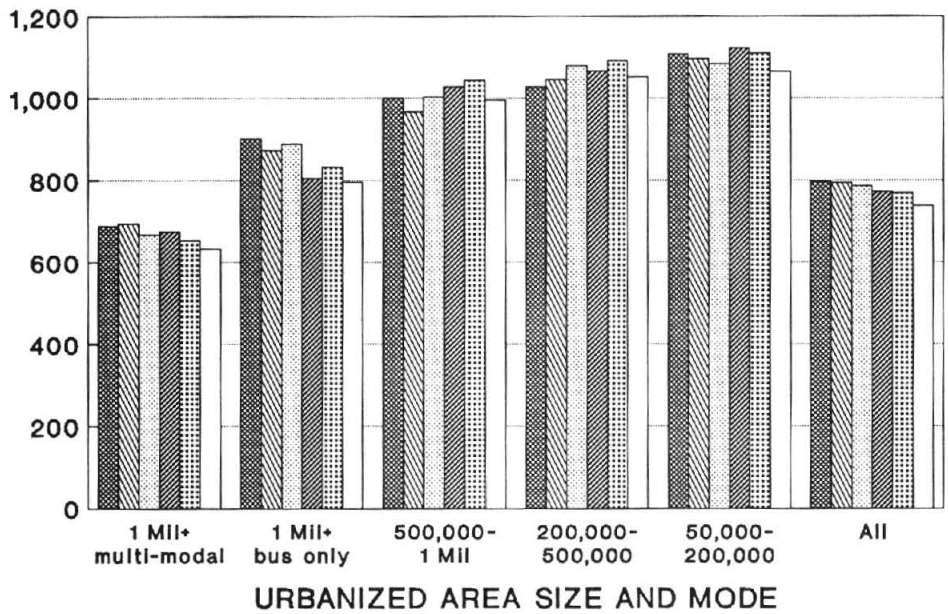
TRANSIT LABOR PRODUCTIVITY: AVERAGE ANNUAL VEHICLE MILES PER EMPLOYEE 1965 TO 1983

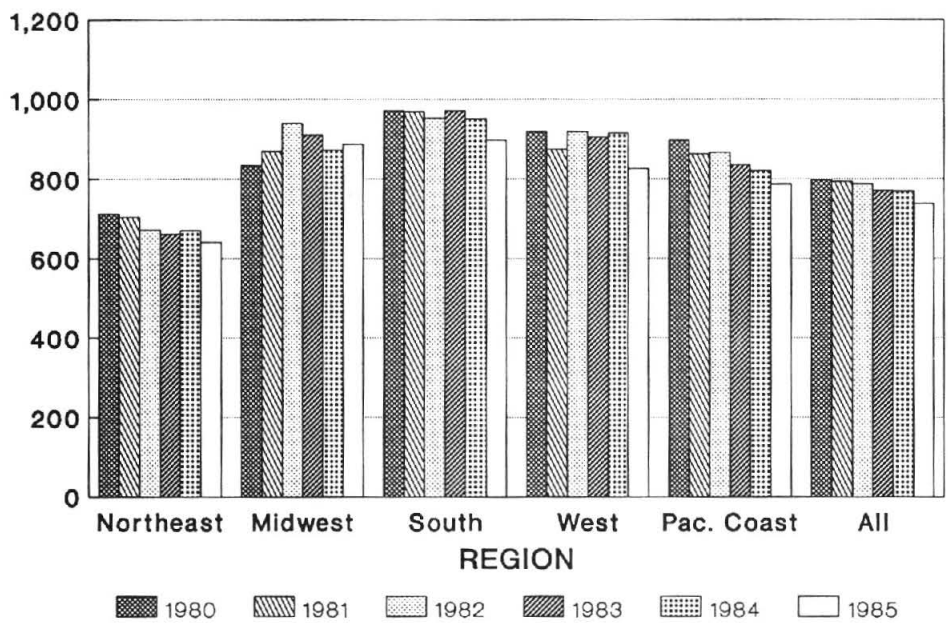


SOURCE: APTA, TRANSIT FACT BOOKS.

Figure 5-4

ANNUAL VEHICLE REVENUE HRS PER FULL TIME EQUIVALENT EMPLOYEE
1980-1985





SOURCE: UMTA STAFF ANALYSIS OF
1980 - 1985 SECTION 15 DATA

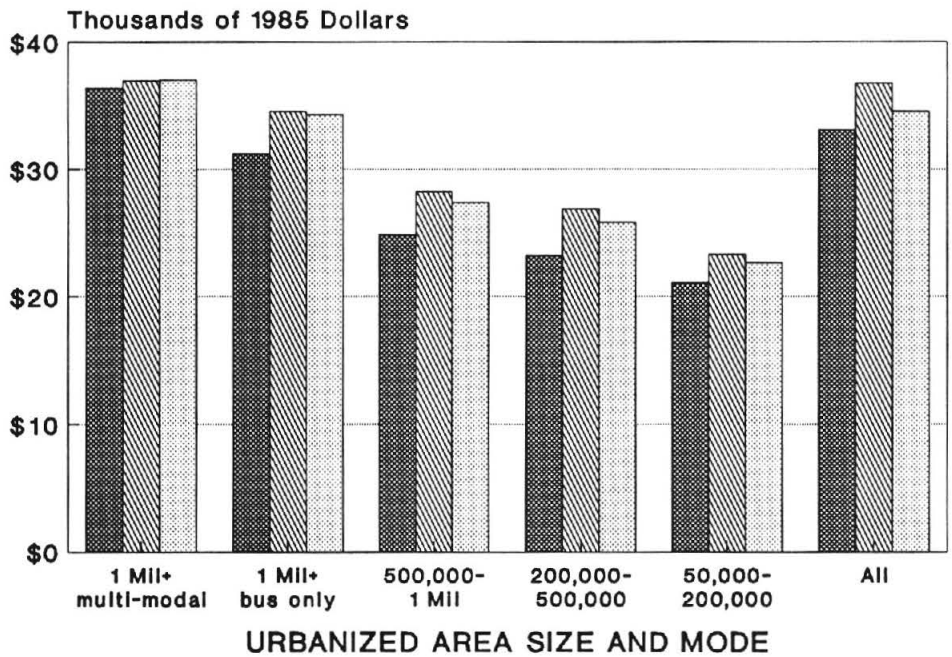
Comparison of Figures 5-2 and 5-4 shows that the highest increases in real operating costs occurred in the areas with the largest declines in labor productivity (the Northeast and the areas over 1,000,000, both multi-modal and bus-only), as well as on the Pacific Coast. Similarly, improvements in labor productivity in the Midwest are matched by the fact that operating costs did not increase in real terms in this region. These results indicate a close correlation between the amount of service produced per employee and operating costs and establishes the importance of labor productivity as a significant determinant of overall operating efficiency.

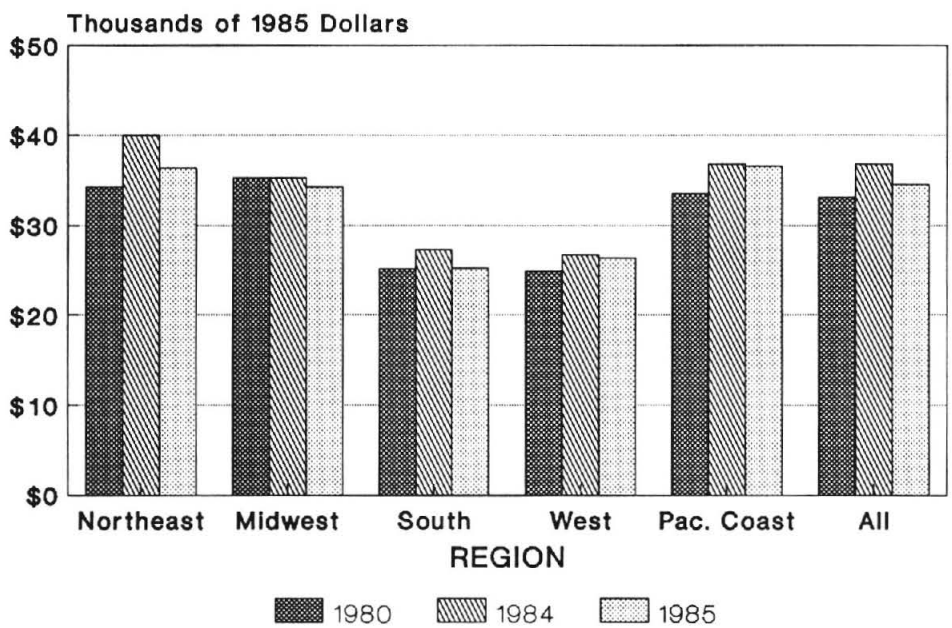
Labor productivity is highly sensitive to the impact of work rules and personnel management and deployment practices which affect the amount of labor required to perform various tasks. While the work rules themselves often have large impacts, the way in which management supervises and motivates employees also can impact labor productivity. Chapter 8 describes some of the steps which operators have taken to improve labor productivity and efficiency.

Labor Compensation. The urban areas over 1,000,000 not only have lower labor productivity than the smaller areas, they also have significantly higher levels of total labor compensation. As shown in Figure 5-5, labor compensation (wages, salaries and benefits as reported in Section 15) per employee in the multi-modal urbanized areas averaged about $37,000, or about 63 percent

Figure 5-5

ANNUAL COMPENSATION PER FTE EMPLOYEE
1980, 1984, 1985





SOURCE: UMTA STAFF ANALYSIS OF
1980 - 1985 SECTION 15 DATA

more than in the smallest urbanized areas. It should be noted that differences in these figures can represent the effects of both different compensation packages for similar employees as well as differences in the composition of the labor force (for example, more highly-paid management personnel). In the bus-only cities over 1,000,000, labor compensation was about 50 percent higher than in the smallest cities. While average compensation is highest in the Northeast, in the Midwest and on the Pacific Coast it is only about 10 percent lower.

Average compensation increased about 4 percent in real terms between 1980 and 1985. The increase was greatest in the Pacific Coast (9 percent). This larger-than-average increase in labor compensation contributed to the higher-than-average increase in real unit operating costs on the Pacific Coast. Average total compensation actually declined in the Midwest, contributing to the stable unit operating costs in that region. Increases in average total compensation were relatively uniform by urbanized area size, except for the multimodal areas over 1,000,000 which had a significantly smaller increase.

While there are generally higher levels of living costs, and therefore wage rates, in the larger cities, that account for some of the differences found above, a closer examination of total compensation shows that transit labor costs are also higher than comparable labor costs in these areas. A recent study by the Urban Institute examined total compensation (including both wages and all current and accrued benefit costs) for a standardized year of a number of transit occupations in comparison with similar occupations in the private sector (both transit and otherwise) in

eight large cities [Peterson et. al., 1986]. The study found that the total compensation of public sector transit bus drivers, on the average for the eight cities, was 31 percent higher than unionized private sector drivers and 91 percent higher than nonunion private sector drivers. For example:

- In Los Angeles, SCRTD bus drivers' total compensation averaged $49,777, 45 percent more than the $34,426 at a unionized private operator in the same area.
- In Washington, D.C., total compensation of bus drivers at WMATA averaged $44,014, 127 percent higher than the $19,418 average paid by a nonunion private operator in the same area.

These findings are summarized in Figure 5-6, which compares total compensation of bus drivers for public and private transit operators, both unionized and non-union, in the eight case study cities.

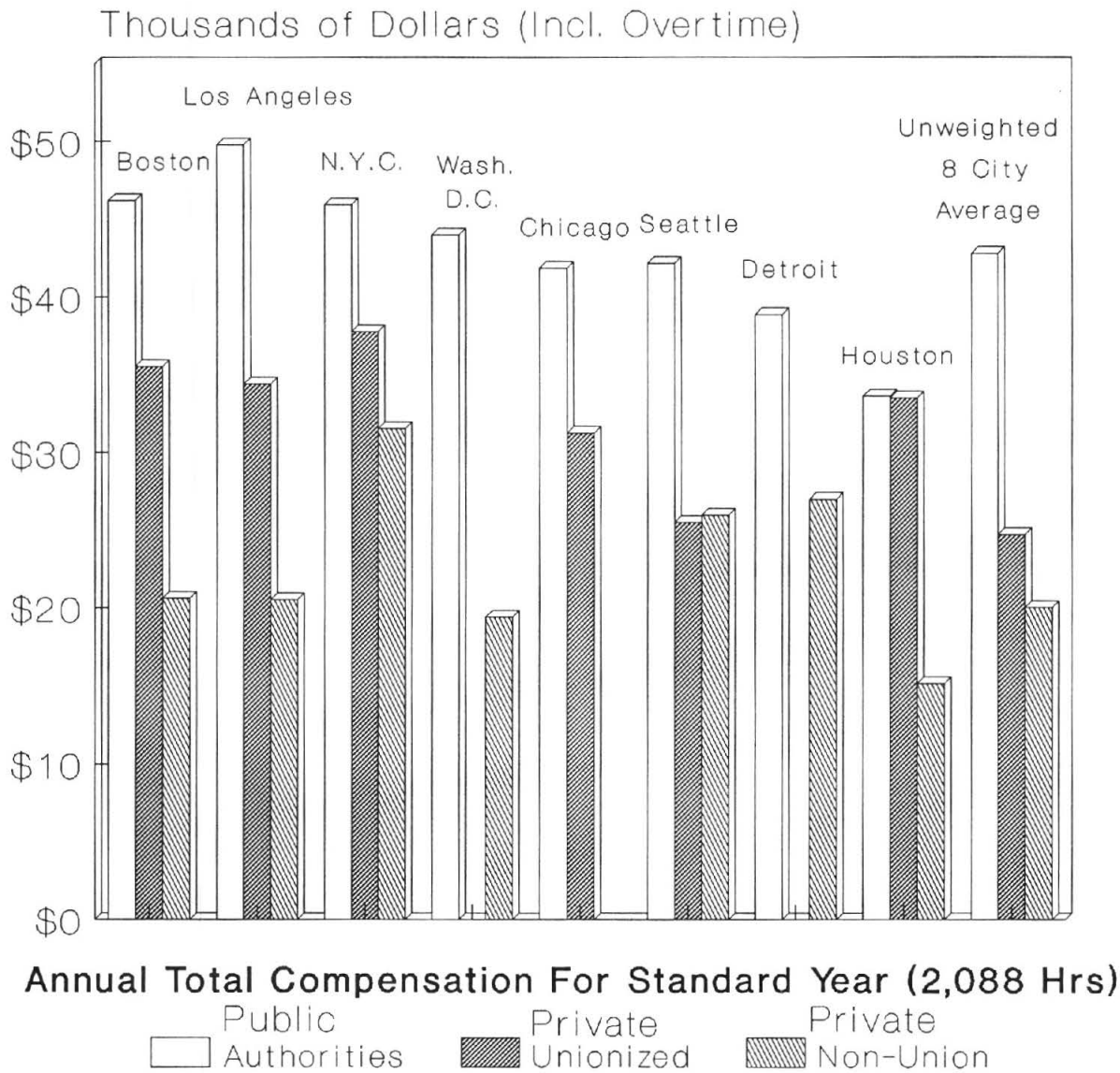
Public agency bus mechanics in the case study cities averaged 47 percent higher total compensation than unionized private sector mechanics and 95 percent higher than non-unionized private sector mechanics. Examples include:

- In Boston, mechanics at the MBTA had average total compensation of $52,593, 87 percent higher than the $28,174 paid to unionized mechanics at private operators.
- In Houston, METRO mechanics were paid an average total compensation of $34,916, 113 percent higher than the $16,398 average at non-unionized private operators.

In all but one city, public agency bus drivers and mechanics earned more than public school teachers with the same number of years of experience, even after teachers' earnings were expanded to impute a hypothetical full year cost to their 9-10 month

Figure 5-6

TOTAL COMPENSATION COMPARISON: PUBLIC VS. PRIVATE BUS DRIVER WITH FIVE YEARS EXPERIENCE, 1985



SOURCE: URBAN INSTITUTE, TOTAL COMPENSATION FOR TRANSIT EMPLOYEES IN LARGE METROPOLITAN AREAS, 1986.

earnings. On average, public agency bus drivers earned 13 percent more than teachers, while mechanics earned 30 percent more.

Along with the declining labor productivity discussed above, these higher levels of compensation suggest that a wide variety of external factors have had a negative impact on the ability of transit management to control employee compensation and work rules through the labor negotiation process. Significant contributing factors include the absence of competition in the structure of transit, the desire of local policymakers to avoid service disruptions and strikes, and the leverage given to labor by Section 13(c) of the UMT Act. Section 13(c) requires that fair and equitable arrangements be made to protect the interests of transit employees adversely affected by UMTA assistance.

Section 13(c) has been used to give organized labor undue advantage beyond the protections of the National Labor Relations Act by allowing labor to hold Federal assistance hostage until their demands are satisfied. While this has not necessarily had a direct impact on the collective bargaining process, the threat of such action has often provided significant leverage to unions in the process as a whole. Although Section 13(c) was originally intended to protect existing workers from a worsening of their position during the era of public takeovers with Federal assistance, it has been used to inhibit innovation, restrict private sector participation, gain new rights, and interfere with the collective bargaining process [CRA, 1986b]. Examples of such abuses of 13(c) include:

- In 1981 the Mid-Ohio Regional Planning Commission developed an innovative proposal to use shared-ride taxis as feeders to the local bus system in areas where conventional bus service would be inefficient. The union refused to agree to this service unless the jobs were reserved for union members. The project was delayed until 1984, when management reluctantly agreed that any successful feeder route would be turned over to the transit authority for operation by its union labor. 13(c) thus delayed initiation of a potentially useful service and allowed organized labor to pursue goals beyond the scope and intent of the law.

- In 1984 Sonoma County Transit submitted its first application for UMTA funds, to replace 10 buses being operated under contract by a private management firm (with union labor). The union has insisted that the 13(c) agreement should provide job protections to the contractor's employees beyond the term of the contract, a condition that is not required by 13(c) and which the county has been unwilling to accept. In the meantime the community has had to make do with the old buses.

- In 1985, Milwaukee County (Wisconsin) applied for an UMTA grant which included funds to purchase five vans to provide feeder service to the fixed-route transit system. The county had intended to contract out the service to nonunion operators, but the union refused to accept any 13(c) agreement in which the union members would not have a right to the new jobs. Since the additional costs that would be required to operate the new service with union drivers would make the service uneconomic, the county deleted the van project from its grant application. 13(c) thus allowed the union to deprive the community of a potentially useful transit service.

- In 1982, the Georgia Legislature amended the Metropolitan Atlanta Rapid Transit Authority (MARTA) Act to limit MARTA's authority to bargain collectively with the local union, specifically prohibiting bargaining about subcontracting of work and assignment of employees, and requiring consent of both parties before an issue could be submitted to arbitration. The union appealed the law, and in 1985, the U.S. Court of Appeals ruled that the law prevented MARTA from complying with Section 13(c), and that the Secretary of Labor could not certify MARTA's Section 13(c) agreement. This required the State to amend the 1982 Act to weaken its provisions in order to be recertified by the Secretary of Labor and be eligible for Federal funding.

- In 1986, the city of Boise, Idaho, put its regular route bus service out for competitive bidding rather than reaward the contract to the previous operator. Although the city and the new contractor were under no obligation to provide Section

13(c) protections to the employees of the previous contractor, the new contractor agreed to give first priority to members of the previous contractor's collective bargaining unit. However, the latter objected to the new contractor's plan to pay lower wage rates and to hire fewer full-time operators, and refused to sign a Section 13(c) certification, and an impasse was reached. In October 1987, UMTA was still unable to issue an operating assistance grant to Boise.

EFFECTIVENESS OF TRANSIT SERVICE

The effectiveness of transit is indicated by the extent to which the service that is produced is actually used. Service effectiveness will be measured here as passenger miles per vehicle revenue hour.[2] Service effectiveness measures the results of service level and deployment decisions made by transit managers in response to the market for transit. It is heavily influenced by the characteristics of the urban environment in which a system operates, which affects total ridership, by local service policies which may call for continued provision of specified levels of service on some routes despite low ridership in order to maintain coverage.

Indicators of Effectiveness

Figure 5-7 shows the change in both ridership and unit utilization since 1965. After 1972, ridership began to rise and,

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2Passenger miles is preferable to passengers alone since it accounts for the lengths of trips (being defined as one passenger riding for one mile). The available passenger data (as reported under Section 15) does not count complete passenger trips, but rather is unlinked trips, which counts each person's transfer between vehicles as a new passenger, thereby effecting the total ridership count.

after some delay, so did unit utilization--as massive increases in Federal, State and local assistance allowed for improvements in capital equipment and facilities, and the maintenance of real fares at near-constant levels. The energy crunch of 1979 stimulated additional increases. After 1980, unit utilization resumed falling as the economy went through a period of recession, energy again became plentiful, and fares were raised and services cut as local and State governments ended attempts to cover operating cost increases entirely through increased subsidies.

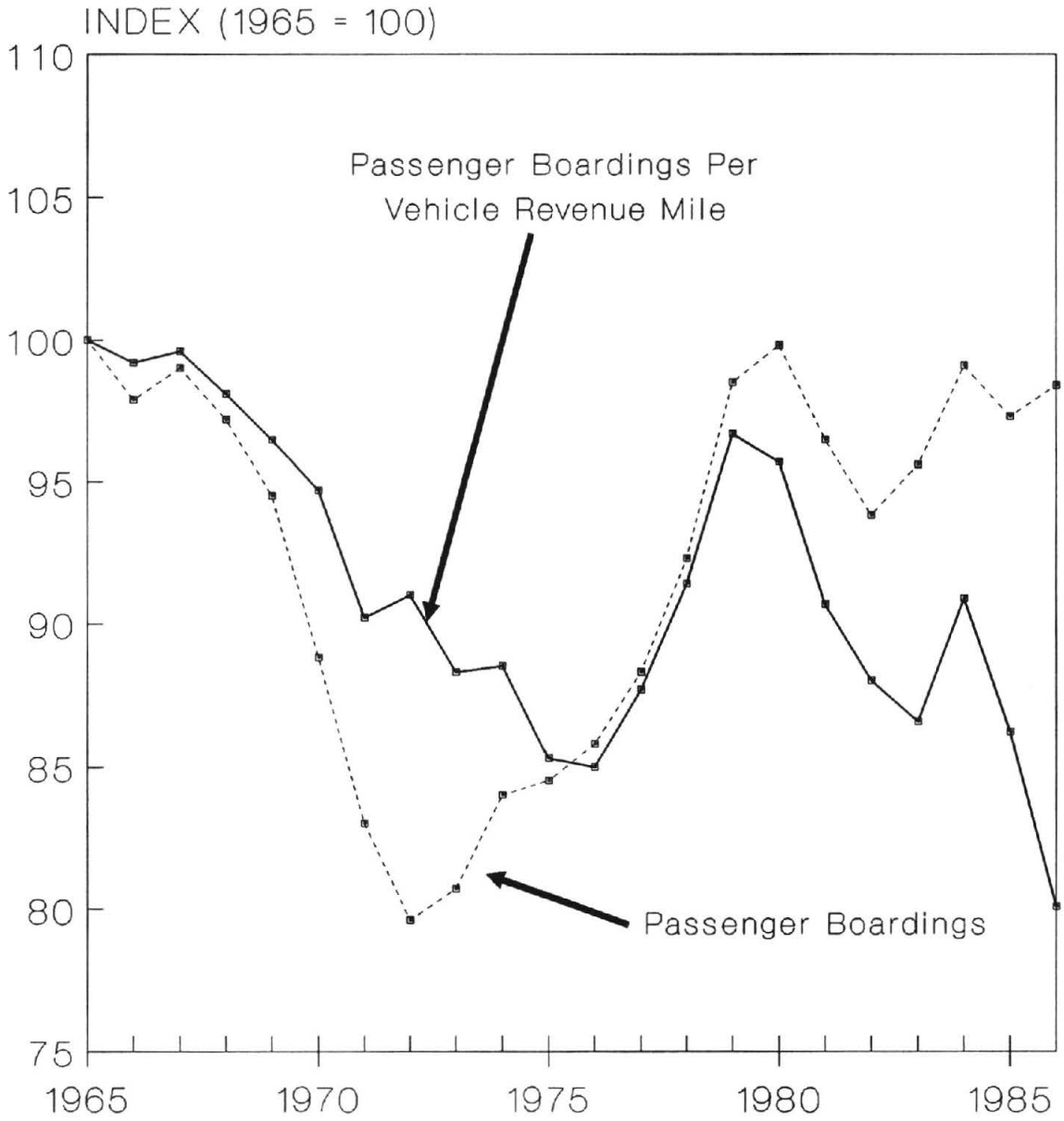
Figure 5-8 shows that effectiveness in terms of passenger miles per revenue vehicle hour has declined overall by 4 percent since 1980. The decline occurred in all areas of the country except the Northeast and in all area size classes except the large, multi-modal cities.[3]

Service effectiveness is highest in the multi-modal cities (particularly New York, Chicago and Boston) reflecting the higher capacity of rail transit service hours as well as a higher propensity to use transit in these cities because they developed high, transit-oriented, densities around their transit systems.

3In terms of passengers per vehicle revenue hour, a pattern of decline in service effectiveness is even more evident. Nationally, this indicator declined 7 percent between 1980 and 1985. Declines in effectiveness using this measure were largest in the smallest areas and in the Midwest and West. Because this measure does not account for longer trips lengths, declines occurred in the Northeast and the multi-modal areas over 1,000,000 on this measure despite increases in these areas when effectiveness is measured in terms of passenger-miles per vehicle revenue hour.

Figure 5-7

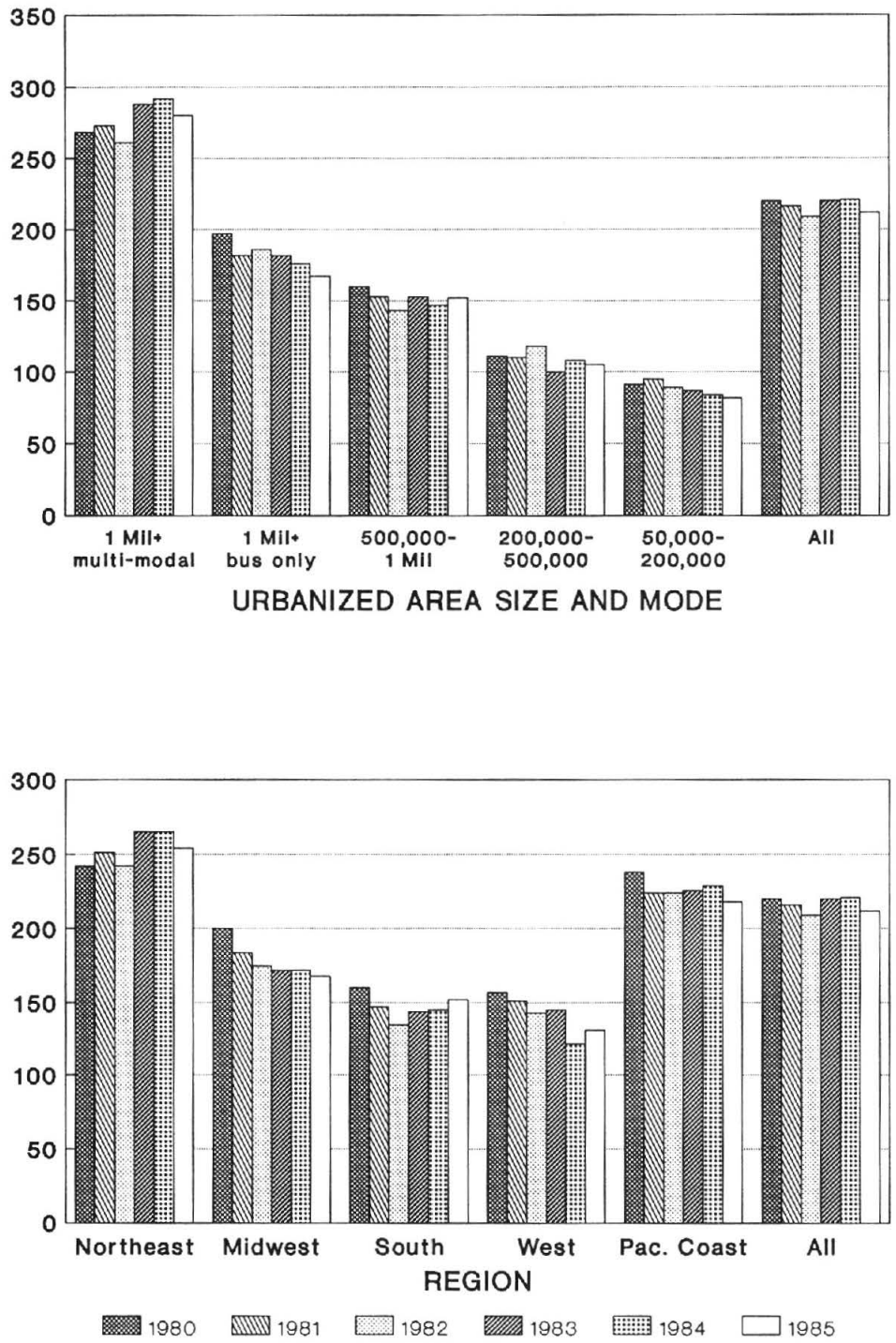
CHANGE IN TRANSIT PASSENGERS AND PASSENGERS PER VEHICLE MILE* 1965 TO 1986



*Unlinked trips excluding commuter rail
SOURCE: APTA FACT BOOKS (TO 1980)
SECTION 15 (1981 - 1986; 1986 PRELIM.)

Figure 5-8

PASSENGER MILES/VEHICLE REVENUE HOUR
1980-1985



Source: UMTA STAFF ANALYSIS OF
1980 - 1985 SECTION 15 DATA

Among bus-only cities, those over 1,000,000 generate about twice as many passenger miles per vehicle hour as cities under 200,000, reflecting their higher density of population and propensity for transit use.

Effectiveness is highest in the Northeast and lowest in the West. Urban area characteristics are more conducive to higher transit use in the dense cities in the Northeast. High use in the Pacific Coast can best be explained by low fares as described in Chapter 4.

Patterns and Changes Influencing Effectiveness

How can these patterns and changes be explained? First, use of transit service is influenced by a number of characteristics of the service: service intensity (how much transit service is provided per person), the coverage of urbanized area by transit service (and thus how accessible it is to potential users) and the frequency of service on the route network (and thus how convenient it is to use). It is also affected by the quality of service provided including its reliability, safety, cleanliness, etc. In addition, a number of external environmental factors such as auto ownership, congestion, parking availability and cost, land use patterns and demographic factors also contribute to the use of transit service. The level and structure of fares charged also can have an effect since it influences the decision to use transit versus its competing mode--the automobile.

Service Deployment Characteristics. Service intensity measures the total amount of transit service provided per potential user and is thus a primary dimension of service deployment. In terms of **revenue vehicle hours per capita**, service levels have declined slightly (3 percent) since 1980.[4] Service is most intensive in the multi-modal cities and least intensive in the smallest cities. Service intensity is highest in the Northeast and lowest in the South. This matches the pattern of service effectiveness shown in Figure 5-8.

A second dimension of service deployment--coverage--may be measured by **route miles per urban area square mile**. This value has increased since 1980, by about 5 percent, as shown in Figure 5-9. While the Midwest showed a small decline, this was offset by increases elsewhere. Likewise, except for a small decline in the cities under 200,000 and no change in the areas 200,000 to 500,000, increases ranged from 3 to 25 percent. Overall, this represents a continuation, albeit at a much slower rate, of the trend described in Chapter 2, in which an increase of coverage (in terms of route miles) of 38 percent is noted between 1970 and 1980. Service coverage is highest in the multi-modal cities over 1,000,000 but is also relatively high in the areas under 200,000 due to their small size. Coverage is highest in the Pacific Coast region reflecting local policy decisions by these

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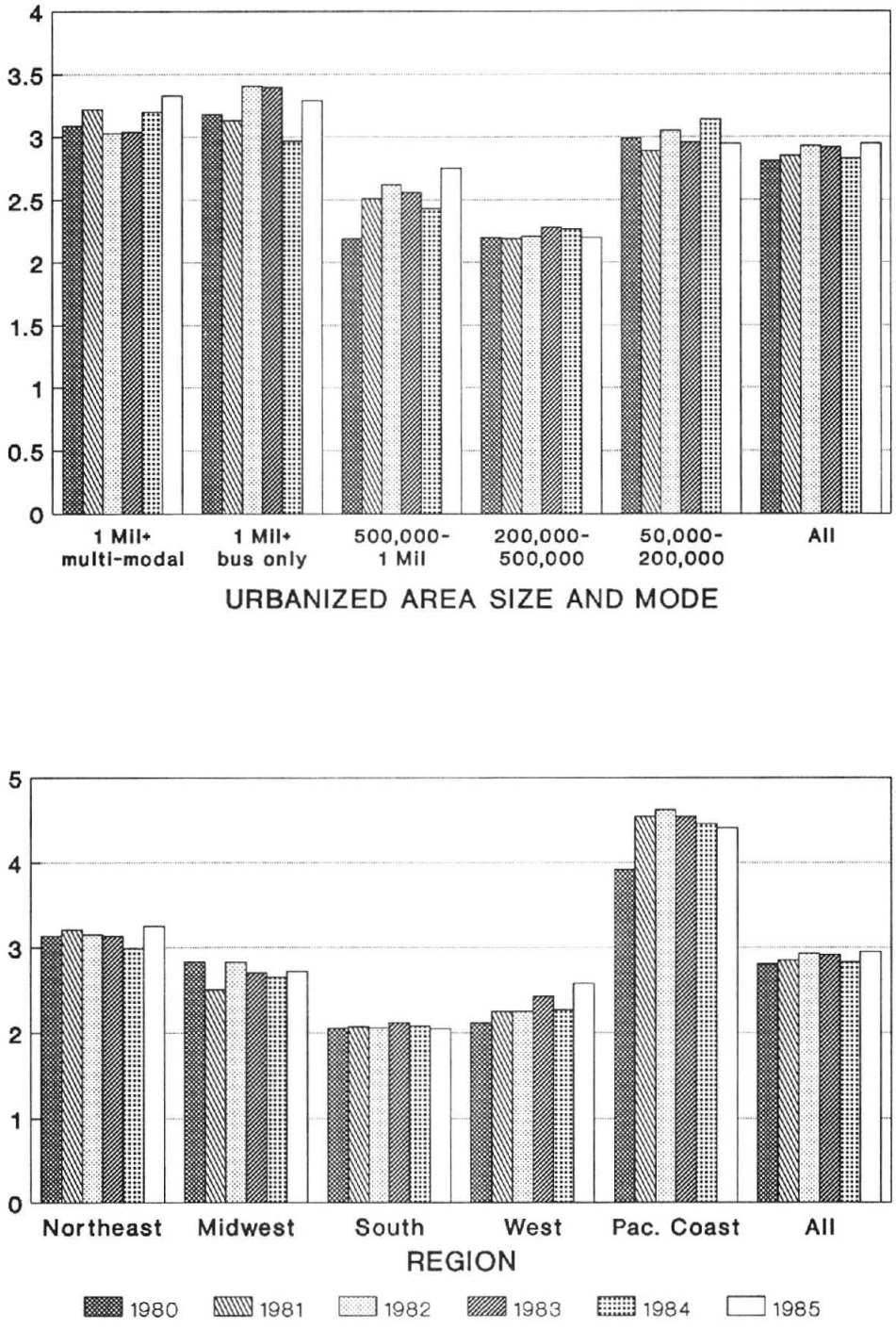
4Increasing speeds (probably the result of dispersing service into suburban areas) have meant that service levels in terms of revenue vehicle miles per capita remained constant between 1980 and 1985.

Figure 5-9

ROUTE MILES PER SQUARE MILE
1980-1985



* Sq. miles in urbanized area as of 1980
SOURCE: UMTA STAFF ANALYSIS OF
1980 - 1985 SECTION 15 DATA

urban areas to provide widespread service. Coverage is lowest in the South.

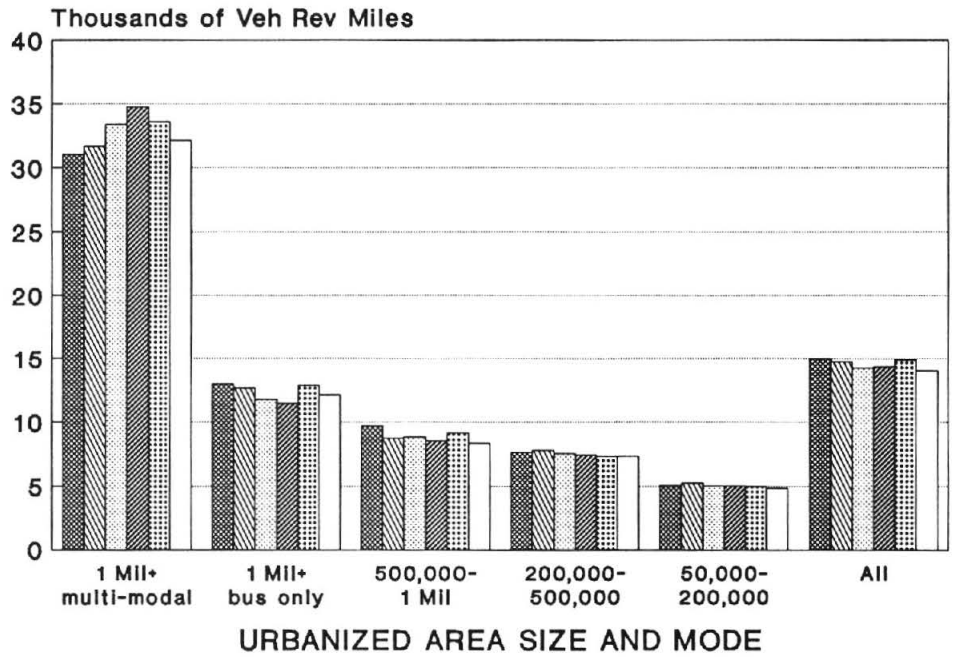
A third dimension of service deployment, the amount of **service per route mile**, gives is related to how frequently transit vehicles pass any given point on a route. In general, service frequency has decreased since 1980, by a total of 6 percent (Figure 5-10). However, transit service frequency increased slightly in the large multi-modal areas, and in the Northeast and West regions. The overal trend represents a continuation, at a much slower rate, of the long term trend of declining frequency shown in Chapter 2.

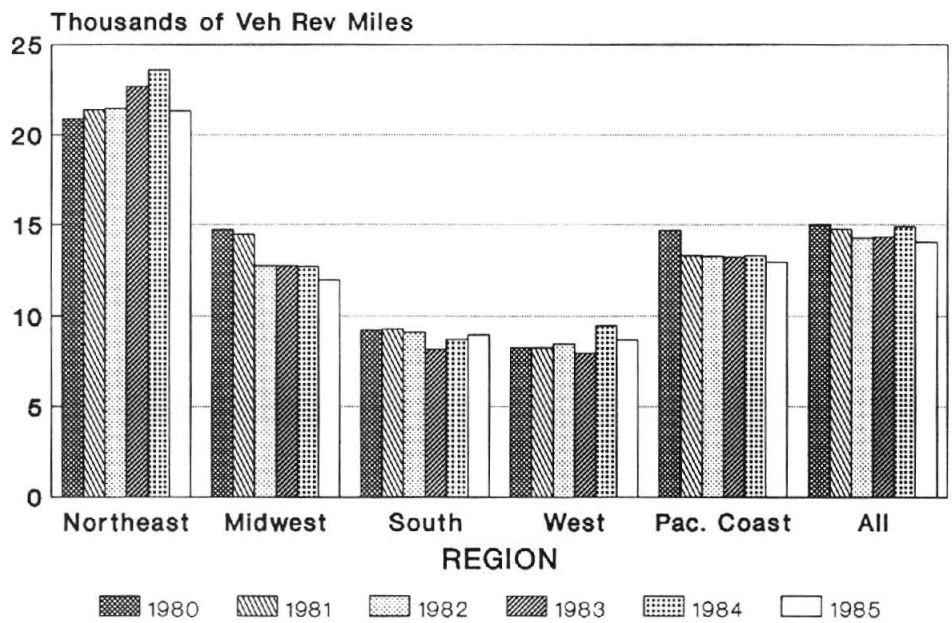
Service frequency is highest in the multi-modal areas--over six times the value in the areas under 200,000. Service is nearly two and a half times more frequent in the Northeast than in the West.

Together, the continued, if slowing, general trends in these last two factors--increased coverage and declining frequency--indicate a spreading of service as transit operators attempt to adapt to the pattern of decentralization prevalent in most urban areas. It could also reflect some reduction of frequencies as operators increase headways on unproductive routes. These trends may also reflect a response to continued political pressures to make service available to as many constituents as possible. The general decline in service effectiveness may also be tied to these trends, since transit service has been spread to parts of urban areas with characteristics not conducive to conventional transit service at the expense of reducing frequency in the more

Figure 5-10

ANNUAL VEHICLE REVENUE MILES/ROUTE MILE
1980-1985





SOURCE: UMTA STAFF ANALYSIS OF
1980 - 1985 SECTION 15 DATA

traditional markets. In any case, effectiveness probably could be improved by deployment of more appropriate service types such as paratransit and ridesharing. Chapter 8 describes some of the measures being taken along these lines. Increased reliance on the private sector and market oriented services, particularly in peak periods, could also reduce the political pressures causing this kind of service dispersion. Chapter 9 provides examples of private sector steps being taken in this area.

Urban Environment. The other factor that helps explain the differences in intensity of service utilization is the urban environment and its effect on the general propensity in an urbanized area to use mass transit. The effect depends to a large extent on factors such as auto ownership, auto congestion, parking costs and development patterns such as the degree of centralization and residential density. The urban area classification scheme used in this report attempts to group urban areas on the basis of size and regional characteristics that are reasonable surrogates for identifying similar transit environments. Figure 3-2 reflected these underlying environmental differences by indicating the amount of transit use in terms of **passenger miles per 1980 urbanized area population.**[5] As the

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5In these terms, transit use declined 3 percent nationally between 1980 and 1985, as gasoline prices declined in real terms and demographic and development patterns continued to shift in a way not conducive to traditional transit use. Given the 6 percent increase in urbanized area population during this period, the decrease in per capita use is in reality closer to 9 percent.

discussion in Chapter 3 indicates, the large, old cities with multi-modal transit systems show over ten times more use per capita than areas under 200,000, because of their historic development around transit, their high density and their obstacles to easy auto use. Bus-only areas over 1,000,000 have over three times higher use per capita than areas under 200,000. Areas in the Northeast show over four times higher use per capita than areas in the West, reflecting the automobile-oriented patterns of development there.

These wide and inherent differences in the underlying urban environment in which transit operates in different cities illustrate that transit service as currently organized cannot provide a uniform, single national solution to mobility needs. Indeed, mobility needs can vary from place to place within urbanized areas. Thus, any Federal assistance program intended to assist in meeting mobility needs must be extremely flexible if it is to be effective. Each locality should be able to deal with its circumstances, problems, and policy preferences in its own way.

THE OPERATING COST-EFFECTIVENESS OF TRANSIT SERVICE

Operating cost-effectiveness relates the operating cost of producing service to the use of that service. This measure bridges the concepts of operating efficiency and service effectiveness described above and provides an overview of how much it costs to attain transit's perceived benefits.

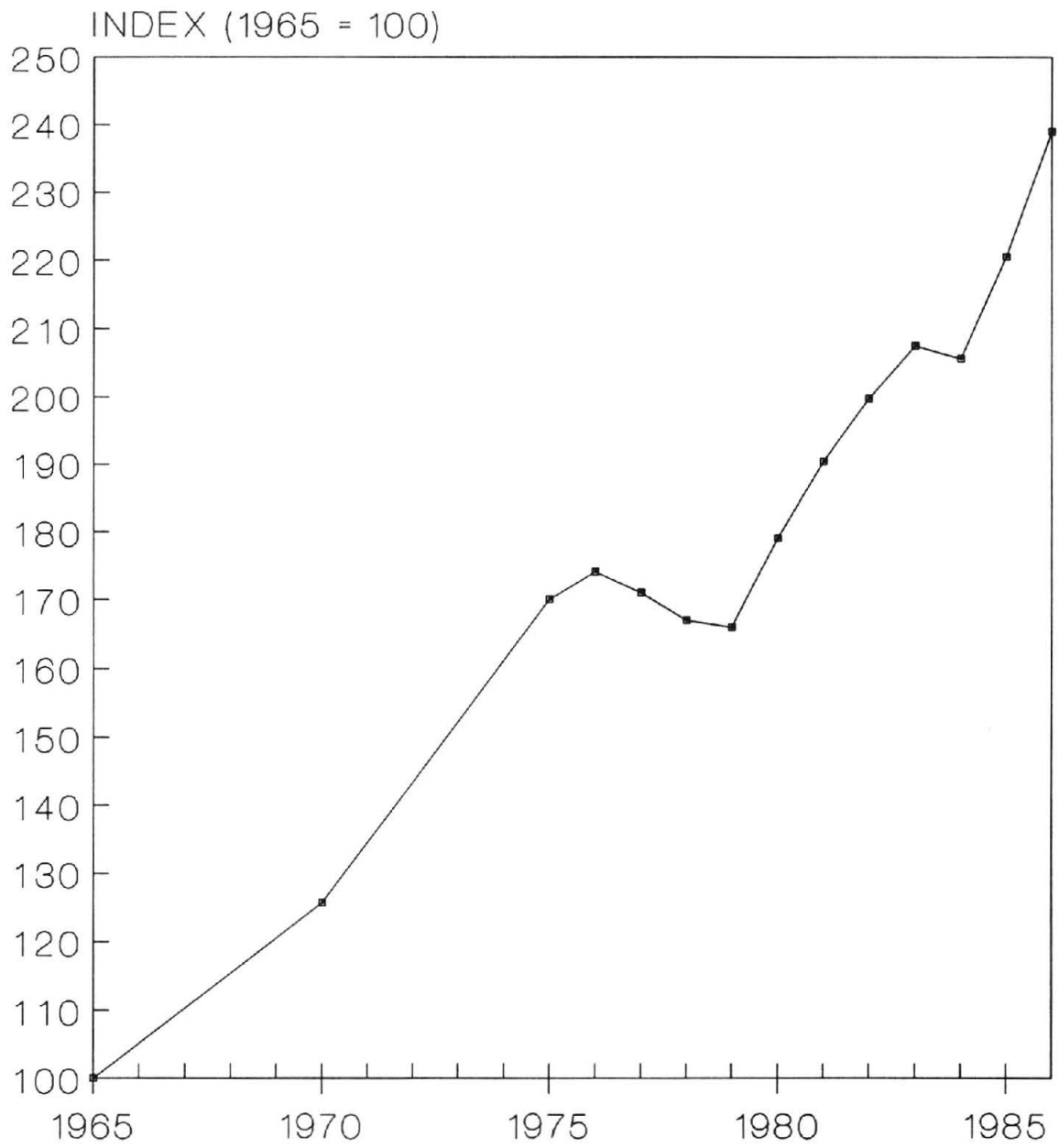
Indicators of Operating Cost-Effectiveness

The long term trend in operating cost-effectiveness is shown in Figure 5-11. Since 1965, operating cost per passenger has increased 139 percent in real terms. Much of this increase occurred before 1976, after which increases in ridership actually caused a stabilization in operating cost per passenger. Since 1980, ridership has declined somewhat, but service was not reduced and although unit operating costs increased at a much slower rate, and may have stabilized since 1984, the result was a further rise in real operating cost per passenger.

Figure 5-12 provides more detail on this trend since 1980. It shows that the operating cost-effectiveness of transit service in terms of **operating cost per passenger mile** has deteriorated since then by 15 percent. This trend reflects the increases (albeit, slowing) in real unit operating costs outlined above, together with declining ridership. This trend also shows up in the breakdown by urban area size and location. Operating cost per passenger mile was lowest in the areas 500,000 to 1,000,000, reflecting a mix of lower operating costs and relatively high ridership. Operating cost per passenger mile was also lower than the overall average in the multi-modal cities, primarily reflecting high utilization, despite their higher unit operating costs. It should be noted that the overall operating and capital cost-effectiveness of transit in these areas could be lower because of the higher capital intensiveness of rail transit. Nevertheless, in terms of historical capital expenditures, capital

Figure 5-11

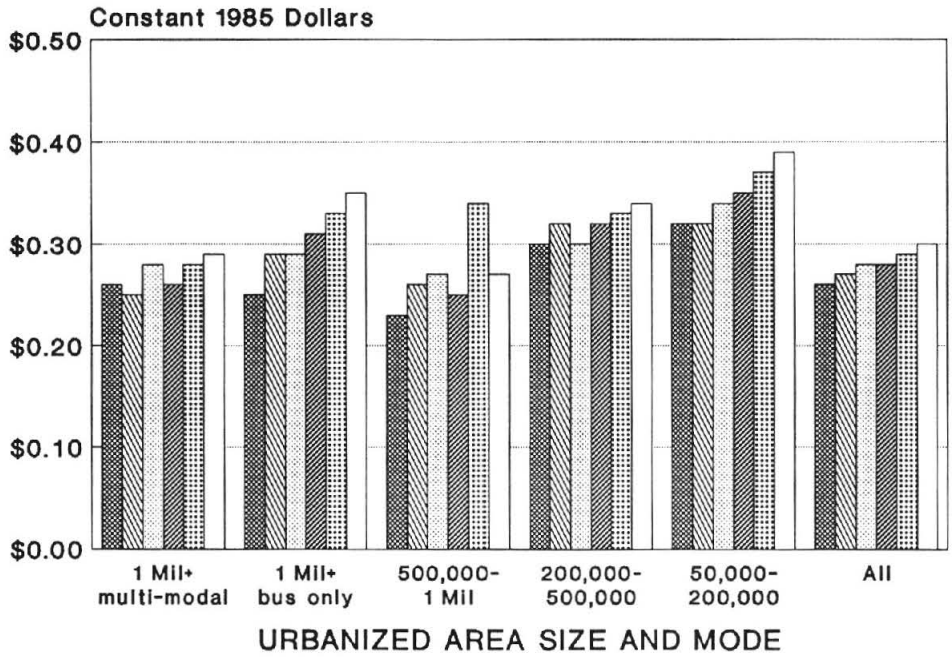
CHANGE IN TRANSIT OPERATING COST PER PASSENGER, ADJUSTED FOR INFLATION 1965 THROUGH 1986

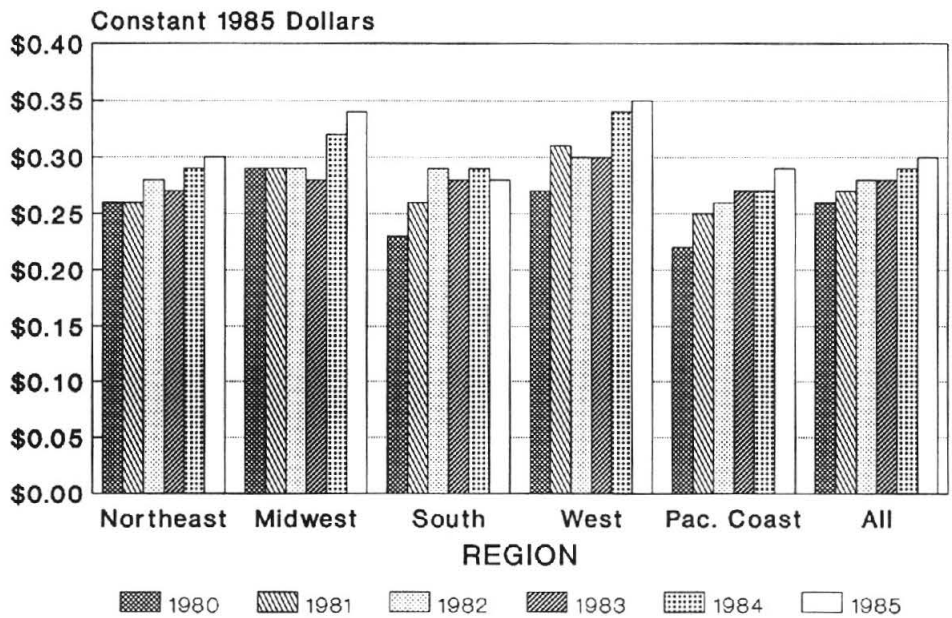


SOURCE: APTA FACT BOOK (1965-1980)
SECTION 15 (1981-1986; 1986 PRELIM.)

Figure 5-12

OPERATING EXPENSE PER PASSENGER MILE
1980-1985





SOURCE: UMTA STAFF ANALYSIS OF
1980 - 1985 SECTION 15 DATA

costs would add about the same proportional amounts to the operating cost per passenger mile for both the multimodal and bus only cities. Operating cost per passenger-mile was highest in the smallest areas, despite their lower unit operating costs, reflecting their much lower transit usage. Differences by geographic location are fairly small.

The fact that the lowest unit operating cost areas register so poorly on operating cost-effectiveness shows that the wide disparities in transit use (effectiveness) are a more significant determinant of the operating cost-effectiveness of transit service than are the smaller disparities in unit operating cost (operating efficiency). This underscores the importance of the measures described in Chapter 8 which enhance cost-effectiveness, such as ensuring that transit service is deployed at appropriate levels and in appropriate forms for the markets it serves and avoiding attempts to try to serve inappropriate markets with inappropriate service forms. In attempting to adapt to the market, reliance solely on conventional service is likely to reduce operating cost-effectiveness, even if the service could be provided cheaply, which it often cannot. Additional reliance on the private sector and the competitive market place can also improve operating cost-effectiveness by reducing operating costs, especially where innovative or non-traditional service using smaller vehicles or taxis is provided.

SUMMARY

This chapter has included a discussion of trends in operating efficiency, service effectiveness and operating cost-effectiveness which imply the need to continue to try to make improvements. Efforts should be continued addressing:

- The need to continue to improve management and labor productivity through measures such as those described in Chapter 8;
- The need to provide incentives for improved performance through more competition, as described in Chapter 9;
- The impact of external forces on the market for transit service by continuing efforts to better tailor services to the changing market, based on cost-effectiveness, as described in Chapter 8, and an enhanced role for the private sector in service provision, as described in Chapter 9.

CHAPTER 6: CAPITAL FINANCING

HIGHLIGHTS

- The current state of the transit industry's plant and equipment is the best it has been since the Federal program began, although problems remain.
- The transit agencies that operate rail systems built before the advent of the Federal assistance program have taken positive steps to either raise additional funds to restore such systems or to evaluate ending service that is no longer cost-effective.
- Market shifts and poor project performance indicate that very few rail projects are warranted outside of those cities that already have substantial transit ridership. However, many areas continue to advance such projects.
- While the bus fleet has been modernized, transit operators continue to maintain bus fleets far larger than needed.

CURRENT STATUS OF TRANSIT INFRASTRUCTURE

The tremendous Federal investment in transit has helped reverse the decline of the transit infrastructure. The nation's bus fleet has been modernized. The average bus in service today is newer than its nearest competitor, the automobile.

A number of new rail systems have been built. While some of these systems have not achieved the level of ridership forecast for them, those in San Francisco, Washington and Atlanta all carry substantial numbers of passengers.

The Federal, state and local investment in modernizing rail systems built before the advent of the Federal assistance program has begun to produce returns. New cars, rebuilt stations and

improved track and signals have increased the comfort, speed, safety and operating efficiency of these systems.

Rail Modernization

The UMTA Rail Modernization study in 1987 marked the first uniform industry-wide assessment of the cost of restoring all the existing rail facilities and equipment in the country. The total cost, over a 10-year period, of rehabilitating and modernizing existing rail systems to a level consistent with current standards of safety, reliability and aesthetics for new rail systems was estimated at $17,876 million in 1983 dollars. These costs include replacing equipment and facilities as required during the next ten years, as well as correcting existing deferred maintenance. In other words, if all the projects contemplated in the report were completed, the nation's rail system would be in "good" condition, as defined in the report, at the end of ten years.

The costs vary widely among the cities (Table 6-1). The cost of modernizing the various New York systems would amount to over half of the total cost. Chicago and Philadelphia properties, with modernization costs of over $2 billion each, represent about half of the non-New York costs. Significant improvements have been made since the restoration costs were estimated in 1984, for example, in the Red Line in Boston and the Market-Frankfort Line in Philadelphia.

Table 6-1

COST FOR RAIL MODERNIZATION
(MILLIONS OF 1983 DOLLARS)

OPERATING AUTHORITY	CAPITAL COST
Rapid Rail	
New York - NYCTA	$6,885
New York - SIRTOA	150
New York - PATH	430
Boston - MBTA	466
Philadelphia - SEPTA	501
Philadelphia - PATCO	95
Chicago - CTA	1,615
Cleveland - GCRTA	140
San Francisco - BART	223
Washington - WMATA	111
Atlanta - MARTA	33
Light Rail	
Boston - MBTA	327
New Jersey - NJTC	9
Philadelphia - SEPTA	394
Pittsburgh - PAAC	81
Cleveland - GCRTA	48
San Francisco - MUNI	131
San Diego - MTDB	7
New Orleans - RTA	26
Commuter Rail	
Boston - MBTA	580
New York - LIRR	1,046
New York - Metro-North	1,151
New Jersey - NJTC	777
Philadelphia - SEPTA	1,238
Pittsburgh - PAAC	18
Chicago - RTA BN	100
Chicago - RTA C&NW	326
Chicago - RTA ICG	384
Chicago - RTA RI	198
Chicago - MR	207
Chicago - RTA N&W	7
Chicago - RTA/NICTD	105
Maryland - MARC	28
San Francisco - CalTrain	42

Source: UMTA, Rail Modernization Study, 1987

The study also crudely assessed the relative cost-effectiveness of the improvements identified on a segment-by-segment basis. Two methods of estimating benefits were used: (1) the number of annual passenger miles traveled on the segment, and (2) a measure developed by the study consultants that adjusted for the operating cost improvements and passenger benefits attributable to the proposed improvements. These two measures were applied to each of the 186 segments and the segments were then ranked according to the resulting "benefit/cost ratio".

This procedure found that different rail line segments have widely differing ratios of benefits to costs. Some projects are disproportionately expensive for their level of ridership, while others have very high relative payoffs.

Because of these differences in project cost-effectiveness, only half of the estimated $17,876 million in total rail modernization cost would be required to achieve 69 percent of the total benefit based on the consultants' measure or, 84 percent of the total benefit when passenger miles are used as the measure of benefit. Similarly, only 75 percent of the total cost estimate could achieve 88 percent (or 96 percent) of total potential benefits (using the consultants method and the passenger mile method, respectively). These findings indicate a need to carefully review the benefits of restoring each individual segment and to consider alternative service methods in lieu of restoring segments with the lowest relative cost-effectiveness.

Federal funding expressly for rail modernization has been around $400 million a year. In addition, approximately one-third of the Federal formula program, around $600 million in FY 1986, is allocated on the basis of rail service factors. If the required local match is added to these Federal funds, about $1,300 million is available annually for rail improvements at current program levels. This amount would be more than adequate to allow the restoration of the segments with over 80 percent of the benefits over a ten year period.

Independent state and local financial support for rail modernization is growing. However, variations in local financial support and differences in the magnitude of the rehabilitation effort required have hampered some transit agencies' efforts to replace their infrastructure.

On an individual city basis:

- New York - In the first $6.5 billion five year plan, now being completed, the Metropolitan Transit Authority has contracted for a total of 1,575 new subway cars and the overhaul of another 1,451, about half the total fleet. It has rebuilt 158 miles of track, over one-fifth of the system. In addition, $2.5 billion is being spent to improve shops, yards and signals. New York is now embarking on the second five year plan.

- Chicago - Completed Phase I of Strategic Planning Management Plan and approved Phase II. The study identified capital funding needs of $380-$530 million annually over the next decade. Available funds are expected to be only $250-$430 million a year. The RTA is currently exploring the alternatives available, including new funding and system pruning. It has also been involved in a number of expansions, including the extension to O'Hare recently opened and the Southwest Corridor Project.

- Boston - The combination of generous Federal assistance and increased state funding has led to considerable progress in upgrading Boston's rail system. Recent accomplishments include the opening of the new Orange line, Red Line station

improvements and the acquisition of new rolling stock for the commuter rail service. With the prospect of additional state funding, the system is planning a number of expansions.

- Philadelphia - A new Pennsylvania state formula for allocating transit assistance will assist the Southeastern Pennsylvania Transportation Authority (SEPTA) in planning for the future. However, SEPTA's capital planning is thwarted by the lack of dependable local support for capital projects. The Philadelphia area provides less in subsidy to transit than any other major transit system. Philadelphia faces over $2 billion in cost to restore the commuter rail and rapid transit systems. Cutbacks in commuter rail service seem inevitable without substantial new funding sources. Despite these problems, the Market-Frankfort line has been much improved.

- Pittsburgh - The new Pennsylvania legislation should also help Pittsburgh, although it receives more local funding than does SEPTA. Pittsburgh has made significant progress and can look to the completion of rail modernization in the near future. The South Hills line has been rehabilitated.

- Cleveland - A local dedicated tax provides ample funding for Cleveland's transit system. However, low ridership calls into question the merit of restoring all the existing lines. Transit ridership in Cleveland has declined 38 percent since 1980.

- Northeastern New Jersey - An ambitious plan for improving the trans-Hudson crossing has been announced. Substantial increases in the state gas tax will be needed to finance these projects. New Jersey has completed several important modernization projects, including the Morris and Essex line improvements and the opening of new maintenance facilities.

- San Francisco - The San Francisco Municipal Railway (Muni) has made many improvements in its light rail system and completely overhauled the cable car system. The peninsula commuter rail service has also been improved. The chief financial issues in the San Francisco Bay area are how to fund existing bus services and the expansion projects being considered by the San Francisco Bay Area Rapid Transit District (BART), not how to restore the existing systems.

New Starts

Since 1970, UMTA has provided over $4.2 billion in discretionary grants for new fixed guideway projects, usually called "new starts". These funds, and funds from Interstate

Transfer and other Federal programs, have allowed the construction of more than 15 projects from Portland, Oregon to Miami. Since many areas are considering building additional fixed guideway projects as a way of solving mobility problems, the performance of those projects that have been completed should be examined. In general, the results have been mixed. While some projects have attracted significant ridership, others carry less than might be expected on a good bus line. Attracting new riders to transit is complicated by declines in downtown employment levels, growing levels of automobile ownership, low levels of existing transit service, and the availability of inexpensive downtown parking.

With the limited Federal funding available, it is essential that those funds be directed to only the best projects. Congress has made this clear by including in the Surface Transportation and Uniform Relocation Assistance Act of 1987 a requirement that Federal new start funds may only be granted to those projects that have complied with the Federal planning process, including alternatives analysis, are cost-effective and have an acceptable degree of local financial support for both operations and capital replacement.

This measure in effect enacts into law what has been UMTA policy since 1984. With the policy now a law, it is expected that any future projects identified by the Congress for funding will be limited to those that comply with the requirements of the new law.

As a result of studies performed as part of the Federal planning process, a number of cities have discovered that new

starts may not be a satisfactory answer to the problem of reducing congestion. For example, Cincinnati, Columbus, and Milwaukee have found that the benefits of proposed new starts would not be commensurate with their cost. In other cities, local leaders have questioned the value of massive investments and their long-term operating costs. Declining Federal support for new starts will make local funding more critical to financing such projects in the future.

Most of the new systems have failed to achieve their predicted ridership levels (see Table 6-2), although some of them do attract substantial ridership. The cost of attracting the ridership must be considered. The actual cost of constructing the projects has often been nearly twice as high as the estimates. Coupled with the overly optimistic ridership forecasts, it is clear that for most of these projects, the capital cost of attracting ridership has been more than four times as high as was originally forecast. Most of these projects enjoyed substantial Federal funding. If that funding were not available, it is doubtful if local officials would have found these projects worthy of construction with local funds.

Since the majority of the capital cost, often as much as 75 percent, has been provided by the Federal government, local areas do not fully consider the true cost of these projects. In particular, the cost of capital is often ignored in assessing the benefit of these projects. Using the example in Chapter 5, the Federal government has committed nearly $5 billion in capital to

Table 6-2
PERFORMANCE OF RECENT TRANSIT PROJECTS

City/Project	Length (miles)	Year Opened	Estimated Cost (in millions)	Actual Cost (in millions)	Forecast Daily Riding	Actual Daily Riding
RAPID RAIL						
Atlanta	27.0	1979-86	$1,376	$2,500	578,000	503,000
Baltimore	14.0	1984-87	450	990	206,500	52,000
Miami	20.0	1984	795	1,050	202,000	36,000
DOWNTOWN PEOPLE MOVER (DPM) SYSTEMS						
Detroit	2.9	1987	119	210	71,000	11,000
Miami	1.9	1986	78	140	41,000	12,000
LIGHT RAIL SYSTEMS						
Buffalo	6.4	1985	213	529	92,000	33,000
Portland	15.0	1986	143	214	42,500	19,000
Sacramento	18.3	1987	87	176	50,000	14,000
San Diego East	4.5	1986		31	6,900	4,500
Santa Clara	20.0	1987	276	498	40,000	11,000
Pittsburgh	10.5			485	67,000	17,500

NOTES:

Atlanta - Cost and ridership forecasts from 1973 Final Environmental Impact Statement (FEIS). Cost is for 50 miles of rail and 14 miles of busway. Forecast and actual patronage includes both bus and rail.

Baltimore - Cost and ridership forecasts from 1972 Draft Environmental Impact Statment (DEIS) and 1973 FEIS.

Miami (Rapid Rail) - Cost and ridership forecasts from 1978 FEIS.

Detroit - Cost (1985 dollars) and ridership forecasts from 1980 FEIS.

Miami (DPM) - Cost (1983 dollars) and ridership forecasts from 1980 FEIS.

Buffalo - Cost (1974 dollars) and ridership forecasts from 1977 DEIS.

Table 6-2 (Continued)

Portland - Cost (1977 dollars) and ridership forecasts from 1980 FEIS.

Sacramento - Cost (1980 dollars) and ridership forecasts from 1983 FEIS.

San Diego - Ridership forecast from 1986 FEIS.

Santa Clara - Cost and ridership forecasts from 1983 FEIS. Actuals based on current Santa Clara County Transit District Budget.

Pittsburgh - Ridership forecast based on 1978 FEIS for Stage 1 only.

Source: UMTA Staff Analysis

the Washington, D.C. Metrorail system. If the average interest on the Federal debt is 9 percent, the annual financing cost of Metrorail is $450 million. Another $2 billion in capital has been provided from local sources, which could add another $180 million a year in finance charges to the project's annual cost. Eventual completion of the system could require as much as $12 billion in capital investment, with annual finance charges exceeding $1 billion. Repair and replacement costs after the system is completed would more the $130 million a year (Federal City Council Study). Current operating cost is less than $200 million a year, and operating costs for the completed system are estimated at $291 million a year. Thus, annual capital costs - interest plus repayment of principal - are far larger than operating, repair and replacement costs for new rail systems.

These capital costs far outweigh any operating savings and call into question the net benefit from the ridership gains that may have been achieved. If these capital costs were fully borne by the local authorities that advocate new rail systems, it is likely that they would be willing to give less capital intensive alternatives closer consideration.

The operating cost savings for rail systems have not proved to be significant. In Washington, D.C., the cost per passenger mile for the rail system is only about 10 percent below the cost for the bus system, despite the fact that the rail system largely serves the more heavily traveled trunk routes while buses operate the less highly patronized, but necessary, feeder services. In a

study of light rail performance, Professor Gomez-Ibanez of Harvard's Kennedy School found that the San Diego Trolley actually had higher operating costs per passenger than the bus routes it replaced. He found the trolley costs per passenger were between $0.96 and $1.02 compared to equivalent bus costs of $0.79 and $0.82.

The availability of Federal discretionary grants for new starts in the future is limited by the projects already selected by Congress, which will consume nearly two-thirds of the available funding through FY 1991, the last year for which the program is authorized.

Between now and then, new starts projects can expect to receive $1.2 billion in Federal assistance, assuming the funds are appropriated. The cost to complete those projects which are already under full funding contract and those earmarked by Congress is estimated by the House of Representatives to be approximately $749 million (Table 6-3), leaving only about $450 million available through FY 1991. The Congress, in a Conference action, included two additional projects, one in Salt Lake City and one in Jacksonville, in the list of earmarked projects.

Set against the available funds are the proposed projects, the so-called "pipeline" (Table 6-4). While many of these projects are of dubious merit and will never be built, the projects being seriously advanced would cost far more to build than is available. UMTA has been attempting to limit the Federal share of the capital cost of these projects to 50 percent or less.

Table 6-3
NEW START PROJECTS
(IN MILLIONS OF DOLLARS)

City and Project	Total Cost	FY 1988 Earmarks	Remaining Section 3 Cost
Atlanta, Phase D	$ 412	$108	$ 16
Los Angeles			
MOS-1	1,260	95	0
MOS-2	1,064	66	477
Miami DPM	240	20	40
St. Louis LRT	344	67	165
Denver Busway	160	16	38
Seattle Tunnel	395	70	13
TOTAL	3,865	420	749

Source: House Report 100-202

Table 6-4

COST OF PROPOSED NEW START PROJECTS
(in millions of inflated dollars)

LIST BY STAGE OF DEVELOPMENT

Area	Corridor	Total Cost
FINAL DESIGN		
Washington	Various	$1,810
PRELIMINARY ENGINEERING		
Atlanta	East	$ 166
Baltimore	Northeast	300
Jacksonville	Downtown Extension	110
Miami	DPM Extensions	240
Portland	Westside	600
St. Louis	Airport	344
Los Angeles	Wilshire (Phase 2)	2,000+
ALTERNATIVES ANALYSIS		
Austin	Northwest/Northcentral	140
Boston	Orange Line Replacement	50
Boston	Old Colony	400
Buffalo	Amherst	390
Cleveland	Dual Hub	500
Denver	North Central (I-25)	160
Houston	System Connector	800
Houston	North Busway Ext (I-45)	94
Milwaukee	Northwest	195
Minneapolis	SW/University	250
Pittsburgh	Spine Line	380
San Francisco	North Concord	800
San Francisco	Colma	80
San Jose	Fremont-South Bay	1,400
Salt Lake City	South (I-15)	200
SYSTEMS PLANNING		
Boston	Bowdoin/Charles Connector	95
Boston	Beyond Lechmere	56
Boston	Circumferential	unknown
Boston	South Boston Piers	300
Buffalo	LaSalle to Tonawanda	183
New York	Oyster Bay LRT	150
New York	Westside	unknown
N. New Jersey	West Shore	400
N. New Jersey	Monmouth-Ocean County	400
N. New Jersey	Riverfront	850

Table 6-4 (Continued)

SYSTEMS PLANNING (continued)

N. New Jersey	Allied Junction	unknown
Baltimore	West Corridor	unknown
Fairfax County	Dulles	unknown
Norfolk	Norfolk to Va. Beach	100
Pittsburgh	South Hills Stage II	300
Pittsburgh	East Busway Extension	29
Atlanta	Medical Center to N. Springs	300
Miami	Metrorail West Line	570
Miami	Metrorail Northeast Line	835
Miami	Miami Beach LRT	unknown
Nashville	Gallatin Corridor	120
Pinellas Co.	Guideway System (55 mi)	900
Chicago	Riverbank	unknown
Dallas	Regional Guideway System	3,000
Dallas	Dallas-Fort Worth	700
Oklahoma City	CBD to Airport	154
Tulsa	Monorail	560
St. Louis	Regional Corridor Study	unknown
Denver	Southwest Corridor	450
Denver	Southeast Corridor	700
Los Angeles	Metrorail Extensions	unknown
Orange County, CA	Santa Ana Corridor Busway	400
Phoenix	Regional Guideway System	unkown
San Diego	Mission Valley/North Corridor	350
San Diego	El Cajon to Santee	60
San Jose	West Valley Corridor	unknown
San Francisco	Penisula Corridor	2,000
San Francisco	Dublin/Castro Valley	200
San Francisco	Muni Extension	75
San Francisco	Marin County/ Hgwy 101	unknown
San Francisco	Oakland Airport Connector	90
Tucson	Broadway Corridor	150
Portland	Airport Corridor	50
Seattle	North, South and East Corr.	4,500
Total Cost - Systems Planning		19,026

Source: UMTA Staff Analysis

Even so, it is clear that if many of these projects are to be built, greater local funding will be required.

The cost of new rail systems must be compared with the cost of providing equivalent service in other ways, for example, by busways. Chapter 7 discusses the advantages of busways and other alternatives more fully.

Bus

The massive public investment in transit equipment over the last twenty years has modernized the national bus fleet. The operators' section 15 reports to UMTA indicate that 38,615 buses are needed to meet maximum service schedules. Within the last three years, 10,900 buses have been purchased for transit use, 3,700 in FY 1986 alone. This has reduced the average age of buses needed to operate maximum service schedules (peak service) to less than six years, even including an additional 20 percent for spare buses.

While the bus fleet has been modernized, many operators continue to maintain bus fleets larger than reasonably required. The ratio of spare buses to buses needed for maximum scheduled service is termed the "spare ratio". The national spare ratio is over 32 percent. In other words, on average, the nation's bus operators have one bus in reserve for every three in peak service. The UMTA spare ratio standard is 20 percent and private operator spare ratios are typically well below 20 percent. Thus, there is considerable over-investment in buses, which may encourage less

rigorous maintenance practices and divert resources that might be better used elsewhere.

The 1985 fleet inventory, reported by operators to UMTA as part of their section 15 reports, indicates that of the total 56,442 vehicles used for motor bus service, 50,888 were reported as active, 2,531 as inactive and in contingency fleets, and 3,554 as being in other inactive statuses. Reported service requirements indicate a need for 38,615 buses to meet maximum service schedules; therefore, the aggregate active vehicle spare ratio was 32 percent for buses (i.e., 12,273 of the 38,615 buses needed for maximum scheduled service). If vehicles owned beyond the 20 percent spare bus guideline published by UMTA are considered as excess, the current ratio of total vehicles to peak vehicles implies that the industry owns almost 10,000 excess vehicles.

It is the large number of spare and/or inactive buses in the nation's bus fleet that give the appearance that the fleet is over-age. In assessing the status of the bus fleet, it is necessary to limit consideration only to those buses used to provide service. While buses twelve years old or more may seem over-age, these buses in most fleets get very limited use. In general, bus operators use their newest buses for all day service, bringing their older buses into service only to meet the peak requirements during rush hours. These older buses may make only one or at most two trips each rush hour. They also provide the spares that are used to replace regular buses during required

maintenance and servicing. A six year average bus age is consistent with regular replacement of older buses as they reach the end of their useful life, which ranges from twelve to over twenty years, depending on operating conditions and maintenance standards.

The twelve year minimum has been accepted by the industry, although individual operators continue to operate buses considerably longer. A few, it should be mentioned, do have difficulty keeping buses in service for the minimum twelve years.

While most operators are in excellent condition, a number of operators have chosen not, or have been unable, to replace aging fleets (see Table 6-5). Average bus age is only an indicator of condition, the operating environment and quality of maintenance can have a tremendous impact on bus life. Operators that find they can operate a bus for longer than average should do so and devote their capital resources to areas of high priority.

The operators listed in the table do not necessarily have particularly worn out fleets. Indeed, MUNI in San Francisco has a particularly rigorous operating environment yet has been able to keep buses on the street longer than other operators and with an improving reliability index.

The point of the table is to indicate that individual operators face very different problems. The national average obscures these differences.

UMTA is taking action to reduce excessive vehicle inventories. The 20 percent spare ratio must be met if grant

Table 6-5

AVERAGE BUS FLEET AGE
BASED ON PEAK SERVICE REQUIREMENT PLUS 20% SPARES

BUS OPERATOR	AVERAGE AGE IN YEARS
Rhode Island PTA	9.8
Albany	9.9
Syracuse	10.2
Memphis	10.8
Miami	11.0
Milwaukee	12.1
Minneapolis	9.2
Austin	9.1
San Francisco - Muni	12.3
Sacramento - RTD	11.0

Source: UMTA Staff Analysis of Section 15 Reports for 1985

applications for buses, either replacements or for fleet expansion, are to be approved. UMTA has set 12 years as the minimum useful life for a bus and requires disposition of excess buses in the absence of an approved contingency fleet.

Bus Facilities

A substantial amount of Federal funds, more than $500 million in 1986 alone, has been directed at constructing or improving bus facilities, including garages, maintenance facilities, passenger shelters, transfer centers and transit malls as well as necessary supporting equipment. Significant progress has been made toward providing efficient, clean, modern facilities to maintain and store the bus fleet and to serve the riding public.

Bus garages and maintenance facilities represent a substantial portion of the total capital required to provide bus service. Bus facilities may cost as much as the bus fleet itself.

It is difficult to generalize about the condition of bus maintenance facilities nationally, but a look at several operators can offer insights into the current situation:

- AC Transit, in the San Francisco Bay Area, has embarked on a $110 million facilities development program following an UMTA sponsored comprehensive facilities technical study, which was completed in 1981. Since then, a new $24 million 200,000 square foot central maintenance and stores facility has been opened. New facilities are under construction for 3 divisions while the current capital plan calls for the rehabilitation of the fourth division garage. All facilities should be completed in the near future.

- SamTrans, in San Mateo County, CA, has two bus facilities, one recently completed (1984) and another under construction. When the North Base is completed, in early 1988, at a cost of

$13 million, there will be adequate new facilities for the entire system.

- Southeastern Pennsylvania Transportation Authority (SEPTA) has upgraded its bus fleet to an average age of 6 years. Now it is turning its attention to improving the bus facilities. In 1986 SEPTA occupied their Allegheny Garage, a $20 million facility, the first new one in Philadelphia in over thirty years. In addition, modernization of one garage is underway and engineering for the rehabilitation of SEPTA's central bus repair and overhaul facility has begun. A site has been purchased for a new facility to replace one that is 75 years old. Reconstruction of four other garages is planned by 1993. These projects will cost over $100 million. SEPTA acknowledges that funding availability will be critical in implementing these projects.

These cases are not a statistical sample. However, they do illustrate the scale of the program that operators have embarked on to restore garage and repair facilities. Properties that are well funded, such as SamTrans, will soon have ample modern facilities. Other properties, such as AC Transit are making considerable progress. Operators like SEPTA, with limited capital funding, must proceed more slowly, rationing funds between bus facilities and other projects .

While there are many old bus facilities still in use, quite a number have been replaced in recent years. At the national level, adequate funding appears to be available to continue to rebuild these older facilities, although particular operators that have limited local funding will continue to have problems.

CONCLUSION

The condition of the nation's transit infrastructure is improving. The nation's transit bus fleet averages 6 years old, consistent with regular replacement of buses when they reach the

UMTA 12 year minimum life requirement. Progress has been made in replacing bus facilities.

Existing rail systems have been upgraded. The improvements are starting to be noticed, as long-term projects are completed. Resources are available to fund the completion of the upgrade of cost-effective segments of the existing transit system.

Major capital investments in new rail systems show a mixed record. In Washington and Atlanta, new rail systems carry large numbers of riders. However, in other cities, ridership has been disappointing. While limited Federal assistance remains available, urban areas that believe they need major transit investments will be providing a greater portion of the funding in the future.

In summary, the nation's transit infrastructure is in good shape and getting better. Individual exceptions remain to the overall picture, reflecting differences in state and local priorities and support for transit. For those agencies faced with unreliable or limited local support, problems may remain.

PART III

PERSPECTIVES FOR POLICYMAKERS

CHAPTER 7 STRATEGIC PLANNING

HIGHLIGHTS:

- Many transit agencies are developing improved financial plans, evaluating service philosophies and examining the costs and benefits of alternative strategies.
- New financing techniques, such as leasing, advanced construction, and private sector funding, coupled with greater flexibility in the use of Federal assistance, give transit operators additional tools for financing transit service.
- The private sector, a primary beneficiary from transit improvements, needs to be involved in planning and providing transit facilities.
- Several new service approaches, including busways, multi-center timed transfer networks and paratransit, offer solutions to the challenges posed by the decentralization of transit markets.

The preceeding chapters have discussed the performance and condition of the transit industry. This chapter and those that follow discuss methods for improving that performance. This chapter considers the advantages of better planning and discusses several operational innovations that could improve transit. The following chapters discuss ways to enhance productivity and the potential offered by the private sector.

PLANNING FOR TRANSIT'S FUTURE

Careful stewardship of the funds available for transit capital improvements is essential, both to generate greater public support and to provide greater benefits. The critical first step in assuring effective transit investments is to insist upon realistic, professional transit financial planning. This means, among other things, conducting planning with a full awareness of the changing local market for transit and a willingess to consider innovative service alternatives.

This theme has been sounded by many industry leaders. UMTA officials have repeatedly called for improvements in transit financial planning. The Congress has also taken a firm stance favoring better financial planning by including a provision in the Surface Transportation and Uniform Relocation Assistance Act of 1987 (section 310) to require "the development of long-term financial plans for regional urban mass transit improvements and the revenue available from current and potential sources to implement such improvements". In addition, Section 303, as mentioned previously, strengthens the requirements that discretionary grants be awarded to cost-effective projects with an acceptable degree of local financial support.

On March 30, 1987, UMTA issued its Financial Capacity Policy, reaffirming that UMTA grants would be made only where the financial ability existed to operate the facilities and equipment to be acquired as well as the balance of the system.

UMTA conducted four seminars around the country to encourage transit agencies to improve their financial planning and to explain the new UMTA policy. During these seminars, a number of industry leaders emphasized that good finanical planning was essential to an operator, whether UMTA required it or not.

UMTA has also made financial planning an emphasis area for the Section 8 planning grants. Most grantees are developing financial plans in response to these efforts as well as their own needs.

UMTA plans to provide additional technical assistance in the form of manuals, seminars and other activities to assist transit agencies and metropolitan planning organizaitons to improve their efforts in the araa.

Transit Financial Planning

In reviewing transit financial planning efforts, several areas of weakness have been identified. Many transit agencies focus on the operating budget, not the combined capital and operating budget. Many government budget procedures encourage this approach, by separating the two areas for annual budget actions. The result has been that capital needs and capital costs may not be fully considered. The Federal grant program has abetted this problem and obscured the true cost of capital by covering 75 or 80 percent of the cost of capital. This can become a problem when it comes time to replace the equipment if the operator does not have Federal funds available.

Since these costs can far exceed operating costs, operators that do not account for replacement costs may find that their public funding partners are not prepared to provide the needed funds. This is currently a problem in several cities with old rail systems. It may soon become one in the new rail cities (e.g. BART, WMATA, Atlanta) as their systems begin to need replacement. WMATA has identified their out-year replacement needs and has begun to include these costs in their planning. This is something other cities may need to do.

Service expansions usually result in increased operating deficits. Since most operators already provide service on their best routes, service expansions usually fail to perform as well as existing service. While such expansions may be justified on other grounds, their long-term financial impact must also be weighed.

Unfortunately, due to the locally perceived low cost of acquiring additional buses and other capital to operate expanded services, these long-term financial impacts may be disregarded. When Federal and state subsidies are considered, some operators can acquire buses without any local funding. However, it can cost over $100,000 a year to operate a bus.

One way to improve transit financial planning is to integrate the efforts of the finance and planning staffs at transit agencies. The Chief Financial Officer at a number of major transit agencies is not involved in long term planning for service expansions and major new capital projects. In developing new starts, planners have the key role. The financial office, usually

focusing on the annual budget, does not review the plans produced by the planners, including the financial plans. Indeed, one recent new start project's financial plan was prepared by a different agency than the agency that will operate the system.

Better financial planning will occur only when the financial staff and the transit planning staff develop short and long range transit plans jointly. Transit planners often have a bias toward expanding operations and an optimistic outlook on ridership. The financial staff, charged with paying the bills and meeting payroll, may inject the needed skepticism into the planning process, forcing the planners to justify their assumptions and forecasts.

In an effort to gather local and Federal support for new start projects, planners often present their projects in the best possible light. Financial officers, who may prefer more conservative assumptions, are not involved in the early stages. In later stages of project development, when the project has already secured "momentum", reservations from the financial staff may be discouraged. The financial officers need to be brought into the planning process at an early stage and need to be given a greater role. The private sector should also be brought into the process.

In some cases, the political consensus necessary to reach agreement on a transit annual budget has been achieved only after the transit agency threatened to shut down critical services or raise fares to unacceptable levels. A solution would be reached,

but decisionmaking under such conditions often led to neglect of all but short-term issues. In particular, capital funding might be reduced to allow continued operations. Under such yearly funding battles, long-term capital planning may have suffered.

Many cities are moving away from this approach, which might be termed crisis-to-crisis planning. The quality of transit financial planning and decisionmaking is clearly improving.

The planning problem facing most cites is to match the existing infrastructure with current demand. This may require politically difficult service abandonments or replacements in some cases. It will also require identifying new funding sources in many of these areas. Despite the difficulties involved, several cities have begun to address the need for long range financial planning. The following are some examples:

- New York is beginning its second 5 year plan. This recently completed package will provide an additional $8.5 billion to New York to restore subway and commuter rail lines. The funding package, put together by a consensus team including investment bankers and other business interests as well as transit and government officials, represents an excellent demonstration of the potential for cooperation in an area where improved transit is in everyone's interest.

  The success of the first five year plan, discussed earlier, has made the development of the second a less difficult process. New York has begun to explore the issue of abandoning lightly used or expensive to restore lines. However, no formal decisions have yet been made. Recent gains in ridership have left some New York subway lines so crowded that capacity expansion is becoming a critical issue. Allocating funds between new investments and existing needs will be a growing problem.

- Chicago is also developing a strategic plan covering long term capital needs. It is currently evaluating priorities for the program. Chicago's goal is to hold operating cost increases to the rate of inflation. If this is achieved, a surplus for capital can be generated by the growth of sales tax revenue beyond inflation. Unfortunately, this alone will

not provide adequate funding. Chicago also must make hard choices in choosing the rail lines on which to concentrate investments.

Illustrating the opportunity for innovation, Chicago recently sold bonds to fund their self insurance fund. This approach will save the RTA money and also has established the RTA as a rated agency with outstanding bonds. They received a Moody's rating of A. We expect more agencies to issue bonds in the future.

- Boston - In recent years, the Massachusetts Bay Transportation Authority has gone from a classic example of crisis-to-crisis financing to one with stable and reliable operating funding and generous state support of its capital needs. This has permited the MBTA to regularize both its capital and operating planning. Currently, the MBTA is developing a financial plan considering both their capital and operating plans for the future and the revenue sources to support it.

  Half of the MBTA's operating deficit is funded by the state and half by the property tax revenues of the communities served by the MBTA. The state levies and collects this tax. Capital support comes from state issued bonds, the proceeds from which are made available to the MBTA.

- Philadelphia must conduct its planning efforts without benefit of a dedicated funding source or significant local financing. The local communities provide less than 10 percent of the annual transit budget. Nearly every other multi-modal operator receives significantly more local support. An UMTA funded study, conducted under the auspices of the Delaware Valley Regional Planning Commission, with active participation of local political leaders, may provide answers to some of the financial questions plaguing Philadelphia. The state recently regularized the funding formula it uses to support transit. Formerly, state funding was adjusted downward if Philadelphia increased its fares. With the highest farebox recovery rate for any major city, Philadelphia's transit operator was punished for its efforts to balance its budget.

  As an example of the financial planning transit operators and local officials face, the operator in Philadelphia inherited a decrepit commuter rail system from Conrail, which could cost more than $1 billion to restore. Financial resources do not exist to fund the restoration and the economic justification of some of the lines is questionable. This will be a critical issue for financial planning in Philadelphia.

- The San Francisco Bay Area, which has done some of the best planning of any area because of the need to allocate state and local funds among a number of competing operators, is currently engaged in a study, with UMTA support, to develop an overall financial plan for the area and to establish regional priorities. Given the ambitious capital improvements being sought for the bay area, a review of potential funding sources and an establishment of priorities is essential.

THE NEED FOR A STRATEGIC APPROACH TO TRANSIT

It is becoming increasingly apparent that major changes are needed in the way public transportation services are financed, structured and delivered. The shift of jobs to the suburbs, the growth in inter-suburban commuting and the increases in private vehicle ownership all make it more difficult for transit to compete with the private automobile and to meet the needs of those that rely on transit. Services have to be basically reshaped to meet the emerging demand patterns. Land use planning and transit planning might be best conducted cooperatively.

Major Capital Investments

Particular attention should be paid to planning for major capital investments. Because of the vast sums of money that would be needed to pay for these projects, it is imperative that the most stringent cost-benefit calculus be applied in evaluating each project's feasibility, and that serious attention be devoted to designing fixed guideway investments that are compatible with emerging demographic and settlement patterns. As pointed out in Chapter 6, ridership and cost forecasts for major capital investments are often very optimistic. Planners and local

officials should remember this when they are evaluating a proposed project.

A recent analysis [Cervero 1987] indicated that in 13 metropolitan areas that are seeking new capital funding there has been a stronger trend toward suburbanization of commuting than in peer cities which are not pursuing rail investments. In addition, transit ridership has dropped in many of these cities.

The rationale for building new fixed guideway systems in an era when commuting continues to suburbanize and transit ridership is declining must be called into question. Better planning, involving all responsible interests could help to assure that transit investments address the real problems of a region.

New fixed-guideway systems are likely to have a positive impact in these places only if land uses such as mixed-use, high density developments are encouraged around station areas. Even so, it will be difficult to attract suburban office workers to new transit projects. Experiences in the Washington, D.C. and San Francisco Bay area, for instance, indicate that fewer than 5 percent of office personnel working near most suburban transit stations patronize rail services. Few suburban office workers opt for rail transit because few lines provide a direct linkage between homes and jobs. Free guaranteed parking spaces also make it difficult for transit to compete with driving to suburban employment centers. Clustering residential development and other auxilary uses around stations, providing direct links between jobs

and homes, may encourage more suburban office workers to abandon their cars.

In responding to the changes discussed above, and the difficulties in developing successful new rail projects, transit planners need to consider a number of innovative approaches as part of their strategic planning.

Busways

The cost and performance of new rail systems must be compared with providing equivalent service in other ways, for example, by busways. A number of busways, bus priority lanes and contraflow bus lanes have attracted and carry tremendous amounts of traffic. The ridership on these facilities, in some cases including vanpools and carpools, is presented in Table 7-1. The Shirley Highway busway carries more people into and out of the Washington region's urban core during rush hours than any of the several rapid rail lines that serve Washington. The Express Bus Lane into New York carries more people across the Hudson during rush hours than any other single facility, despite the fact that it is only one lane.

All of these busways carry more people per lane than a conventional expressway traffic lane. Busways can avoid the tremendous expense of widening urban freeways. In some cases, where widening is impractical, converting lanes to busways can increase overall carrying capacity.

Table 7-1
PERFORMANCE OF BUS GUIDEWAY PROJECTS

City/Project	Length (mi)	Year Opened	Daily Ridership
BUSWAYS:			
Houston			
I-10 (Katy)	11.5	1984	15,900
I-45 (North)	9.6	1979	14,000
Los Angeles			
I-10 El Monte	11.0	1973	43,000
SR-91	8.0	1985	13,200
Orange County, CA			
SR-55	11.0	1985	52,400
San Francisco			
Bay Bridge	2.7	1970	54,050
US 101 (Marin Co)	3.7	1974	13,850
SR 237 (Santa Clara)	4.5	1984	12,870
New York/New Jersey			
NJ Route 495	2.5	1970	65,600
Washington, D.C.			
I-395 Shirley	11.0	1969	63,486
I-66	9.6	1982	31,720

Source: UMTA Staff Analysis

Busways also reduce transit operating cost. They make van and carpools more attractive. Pool vehicles require no public operating funds and can reduce peak bus requirements (see Chap 8). Direct bus operating costs are reduced by increasing operating speeds and reducing maintenance costs for brakes and other components that suffer less wear and tear on busways than in congested mixed traffic. Busways also encourage competitive provision of transit services (Chap 9) since different bus operators may use the same busway.

Another advantage of busways over rail systems is that they allow buses to perform both collection-distribution and line-haul functions while retaining a dedicated transit right-of-way such as rail transit usually provides. This eliminates the need to transfer from a feeder bus to the line-haul rail system and then back to a bus for the trip from the rail station to the ultimate destination.

The Busway in Ottawa, Canada. The most successful busway system in North America is presently taking form in Ottawa, Canada. In the early 1980s Ottawa introduced a timed-transfer network similar to Edmonton's, with the notable exception that a mostly grade-separated, exclusive busway serves as the main-line connector between outlying transit centers and downtown. The transitway operates just like any other rail transit facility, with vehicles, in Ottawa's case buses, stopping at every station. Special ramp access from criss-crossing surface streets is provided at most stations so that feeder buses can connect directly into the main-line without any transfers having to be made.

What makes Ottawa so unusual is that, after completing a detailed alternatives analysis, Ottawa opted for busways over the eminently more popular light rail system technology. Ottawa's primary reason for choosing busways over LRT is compelling: by best estimates, the busway would cost 50 percent less to construct and 20 percent less to operate and would provide roughly the same capacity. Because buses can

also feed into Ottawa's sprawling residential neighborhoods whereas light rail would rely on transfers, the busway was also deemed superior in terms of overall service quality. By all accounts, Ottawa's busway, coupled with supportive programs such as restricted downtown parking, has been an unqualified success. More than 30 percent of all vehicle trips in the region and 60 percent of downtown-destined peak-hour journeys are currently made via public transit, a phenomenal achievement for a medium-sized North American community. Transit's share of shopping trips, moreover, has eclipsed the one-third mark at several retail malls, including the Rideau Centre complex, a major focal point for downtown bus connections.

Restructuring Conventional Transit Services

Meeting the needs of suburban workers will require a major overhaul in conventional fixed-route, set-schedule bus transportation services to make them more competitive with the private automobile. Transit Policy Boards and managers should consider the feasibility of replacing radial systems with grids that can offer high degrees of route interconnectivity to better serve the continuing dispersion of regional commuting. This kind of network eases the burden of transfers from transit vehicle to transit vehicle by reducing waiting time for the next vehicle and provides more direct routing than does a radial system where all trips must pass through the center of the city. Urban villages, office parks, shopping malls, and other activity centers form natural building blocks for creating multifocal, timed-transfer networks. Additionally, systems that combine the line-haul and feeder functions of mass transportation, namely busways, warrant serious consideration as cost-effective alternatives to more rigid fixed-guideway investments.

Multi-Centered Transit Networks and Timed-Transfer Systems

Transit services could be adapted to the polynucleated city by building a network of transit centers that are integrated through timed-transfer scheduling. Many urban bus route structures in the U.S. could be redrawn--at a reasonable cost--to function as time-transfer systems. The payoff in reduced transfer time and increased ridership, particularly among the suburb-to-suburb commute market, could in many cases cover the additional cost.

> Timed Transfers in Edmonton, Canada. Perhaps the timed-transfer system that has been most successful to date operates in Edmonton, the capital of Alberta, Canada. In the mid-1970's, Edmonton Transit redrew its bus routes to feed, in synchronized fashion, into 19 dispersed transit centers. At present, anywhere from five to ten bus routes converge simultaneously on one of Edmonton's transit centers at precise intervals 5 to 33 minutes after the hour during the off-peak and at 15-to 20- minute intervals during the rush hour. Those patrons continuing their trip walk directly to another bus to make their connections, and, like clockwork, buses depart 3 to 5 minutes later. Pulse scheduling and timed transfers have enabled Edmonton Transit to adapt its service to best parallel the area's dominant crosstown commuting pattern. As a result, Edmontonians can today reach nearly 90 percent of a 130 square mile service area within 50 minutes or less during the midday via transit. Over the 1975-1980 period when most of the timed-transfer network was built, Edmonton Transit's ridership rose 45 percent. Although it would be misleading to attribute this increased directly to the timed-transfer program (since a light rail line was also introduced and the region's economy was rapidly expanding during this period), the meteoric rise in ridership was not coincidental.

Judging by experiences in both Ottawa and Edmonton, it is evident that a suburban environment and effective public transit are indeed compatible. Both cities have demonstrated that people will opt for bus transit as long as services compare favorably with the automobile in terms of speed and reliability.

Flexible Mass Transportation

Studies show that timed-transfer systems do not necessarily work well everywhere. Below certain thresholds of passenger demand, more flexible modes of mass transportation are needed, either as feeders into time-transfer centers or else as direct connectors to workplaces and other destinations themselves. Paratransit services, such as shared-ride taxis and private commuter buses, are best suited to providing services in low-demand settings. Besides eliminating the hassle of transferring, paratransit offers some of the flexibility and convenience of the private automobile combined with the mass-carrying features of buses.

One of the chief inhibitors to more widespread operation of paratransit has been government controls over the entry and pricing of these modes. Deregulation could markedly widen the number of service options available to commuters.

Places where restrictions on shared-ride taxis, bus pools and other paratransit options have been eased offer valuable lessons:

> In the city of Chesapeake, Virginia, two lightly used bus routes were replaced by shared-ride taxis in 1979, leading to a 30 percent increase in patronage within one year combined with a 43 percent drop in the average operating cost per passenger.

A growing roster of transit agencies are discovering that paratransit providers are not competitors who "skim the cream" off their business, but rather they are allies who actually skim deficits. Chapter 9 provides additional details on this approach.

NEW FINANCING TOOLS AND TECHNIQUES

The Surface Transportation and Uniform Relocation Assistance Act of 1987 (STURAA) contains several provisions that allow UMTA and its grantees greater flexibility in administering and using Federal capital assistance funds.

Advance Construction Authority

Section 306, Advance Construction Authority, makes certain interest costs eligible for Federal assistance if projects are constructed, with UMTA approval, before UMTA provides such assistance. Among the potential applications of this provision, which applies to both Section 3 and Section 9 grants, are:

- Instead of "saving" Section 9 funds for several years in order to fund a new facility or to make a bus procurement of economical size, the grantee could proceed before the Federal funds were available by borrowing, for later reimbursement by the Federal grant.
- Major capital investment projects could be constructed on the basis of efficient construction schedules, rather than at the rate Federal funds become available.
- It may be possible to enter into contracts for bus procurements with deliveries extending over several years, reducing costs compared to a purchase with current funds and an option clause for subsequent procurements.

Several grantees are interested in using this provision in their financing and procurement strategies. It appears that worthwhile savings can be achieved.

Leasing

Section 308 of the STURAA of 1987 permits leasing costs as an eligible item for Section 9 capital grants, provided leasing is more cost-effective than an outright purchase or construction.

Several advantages have been suggested from using leasing as a procurement method. They include:

- By acquiring vehicles and service by lease rather than outright procurement, a grantee may be able to take advantage of cost savings which it could not implement with its own equipment and employees.
- Greater flexibility in managing cash flow and in financial planning.
- Allowing replacement of older buses with more efficient newer vehicles.
- Obtain service on a temporary basis which would be impractical if it were necessary to purchase vehicles and hire employees.

Debt Financing

A growing number of grantees are issuing debt or otherwise borrowing to facilitate their capital programs. Since grantees and/or their sponsoring organizations are often able to issue tax-exempt debt, such financing can be a low cost way of meeting capital needs.

As local funding becomes more important in transit financing, debt and other financial instruments can be expected to become more important. One advantage of debt financing is that, by becoming an annual charge, the capital cost of a project - the debt service - is perceived as a real cost. Heretofore, the availability and use of capital has generally been considered as "free" or something provided by a one-shot fix, and not budgeted nor considered as a real cost. This is one reason the industry tends to focus on operating cost rather than total cost. It also makes capital intensive projects seemingly more attractive than low capital projects.

Joint development and related activities

In the quest to provide transit infrastructure, joint development has been playing a larger role. It's a role that could easily be expanded further. Joint development, where a real estate developer and a transit agency cooperate to provide a transit improvement that is integrated into a development, has several advantages. First, it can provide a source of funding for transit. Second, carefully conceived, such projects can enhance the value of transit, by generating additional riders. Last, developers are often able to construct the improvements faster and at lower cost than the transit agency.

Perhaps the most successful joint development program has been undertaken by the New York City Planning Department in cooperation with the Metropolitan Transit Authority (MTA). The MTA operates the nation's largest rapid rail system. The system includes a large number of stations built before World War I and in need of rehabilitation and/or reconstruction. As a method for rejuvenating the stations, New York has adopted a program whereby developers seeking to erect new buildings may receive a zoning bonus in return for subway station improvements done as part of their overall construction project. Such a bonus permits developers to build larger buildings than would otherwise be permitted. In return for this benefit, the developer agrees to make station improvements, subject to the overall approval of the MTA and the Planning Department. The program has secured over $100 million in improvements. Moreover, the improvements have

been done by the developer, allowing MTA engineering staff to devote more time to the rail system itself. The developers have been able to complete the projects more rapidly than the public agencies could have, so riders are enjoying the benefits sooner. The increased size of the projects means that potential riders are clustered above transit stations, which should add additional transit riders.

The Washington Metropolitan Area Transit Authority also has an active joint development program that has added $4 million a year to WMATA's revenue stream while creating attractive developments connected to the rail lines. These developments have attracted lunchtime shoppers and visitors as well as additional commuting.

The San Francisco Bay Area Rapid Transit District (BART) has been giving its joint development program greater emphasis as have other operators, including those in Boston, Baltimore and Atlanta.

There are numerous other instances where the development that has occurred around transit stations has provided support for transit operations, either directly or indirectly, by increasing ridership. Some of the approaches that have proven successful and that should be encouraged for any new rail start program are:

- Incentive Zoning. density bonuses, air rights provisions, and mixed use zoning;
- Fiscal Incentives. tax increment financing, tax-exempt bond financing, and creation of enterprise zones; and
- Joint Development and Cost-Sharing. co-development, supplemental property leasing, and land dedication.

All of these measures can attract private capital to station areas and invite the types of land developments that are consonant with successful rail transit operations. Several recent examples of developer contributions are noteworthy:

- In Miami, the developer of Datran Center, a major mixed-use project near the Dadeland South Metrorail station, has agreed to dedicate one acre of land needed for the station site, to construct a 1,000-space parking garage, and to pay an annual rent to the county equal to 4 percent of all gross income from the project.
- The Los Angeles benefit assessment districts are being created around each station of the proposed Wilshire Line to help cover 5 percent of the $3.4 billion project.
- Perhaps the most ambitious approach toward linking new capital rail projects with land development and exacting substantial contributions from developers is being pursued in Japan. There, the cost of suburban rail construction is internalized in the cost of land development. Around greater Tokyo, Osaka, and other major centers, private land companies are linking new satellite communities together as well as with the traditional downtown cores area via rail transit lines. The cost of suburban rail construction is being wholly absorbed as part of the overall development costs of the new towns, just as the cost of roads and other essential features of infrastructure are.

Broadened Eligibility for Capital Assistance

Certain spare parts and maintenance items have been defined as eligible for capital grants in Section 309 of the Act. The new definition allows capital assistance to be used for the purchase of tires and tubes as well as parts and materials costing more than 1/2 percent of the fair market value of the vehicle in which they would be used.

Another provision makes bus and rail car overhauls eligible for capital assistance, although to be eligible a bus overhaul

must extend the economic life of the bus 8 years. No such limit is placed on rail cars.

Taken together, these provisions provide grantees with much greater flexibility in the use of UMTA capital assistance. This added flexibility should encourage grantees to improve equipment maintenance and allow more effective use of available capital funds.

CONCLUSION

Demographic and economic trends which have been changing the market for conventional transit services represent a unique challenge to introduce reforms within the nation's transit industry that could make it more productive and more efficient. The rationale for building rigid, fixed-guideway systems in an era when trip patterns are becoming more and more dispersed needs to be reappraised. If new rail systems are to be built, planners should encourage high-density, mixed-use projects around transit stations. Buses might better compete with private automobiles if traditional radial services are reconfigured into multi-focal time-transfer networks. Busways and expanded paratransit services could also play a prominent role in serving future commute trips.

Greater flexibility in the Federal transit assistance program can assist transit operators in meeting these challenges. Such provisions as advance construction, leasing and broadened definition of items eligible for capital assistance will give the transit financial planner and local officials additional tools.

The private sector can also make a growing contribution to improving the infrastructure. Through the use of joint development, benefit assessment districts and other techniques, private interests should play a greater role in planning, financing and implementing transit improvements.

All of these approaches come together in the increased emphasis on financial planning. Congress has mandated long-range transit financial planning, UMTA has encouraged it and more and more operators are taking steps to improve their financial planning. The growing commitment to improving plans, and giving them greater weight, should assure that transit assets are used more effectively in the future.

CHAPTER 8: IMPROVING TRANSIT PRODUCTIVITY

HIGHLIGHTS

- In numerous cases throughout the industry transit managers and policy boards are achieving significant gains in general productivity, in contrast to the prevailing pattern of decreased productivity up to about 5 years ago.

- The number of paid workforce hours can be more closely aligned with the number of service hours through the employment of part-time drivers and by work rule changes that provide benefits to the all parties. Over the course of two years, Boston was able to increase to 18 percent the proportion of part-time to total surface-operators.

- Absenteeism can be drastically reduced by developing better employee-management contact, with more attention to the specific factors which encourage absenteeism, and with systemwide commitment to better attendance. San Diego was able to reduce absenteeism from 13 to 6 percent in the course of one year.

- Gain sharing as a form of incentive pay promises to help achieve labor productivity improvements by financially rewarding all members of production unit that achieve identified levels of improvement.

- Transit systems are reducing the amount of service needed to achieve their policy goals by better tailoring service to actual demand. For example, Phoenix contracted with a taxicab company to provide Sunday services instead of using the conventional transit fleet.

- Significant productivity improvements can be achieved by working "smarter." Transit properties are committed to better management through computerized scheduling, sophisticated marketing of services and more informed direction of the workforce.

INTRODUCTION

This chapter describes several kinds of productivity enhancing actions that are available to today's transit managers and policy boards. These actions are described in the hope of persuading managers, policy board members and other interested parties that considerable potential exists for transit cost savings through productivity improvements.

In Chapter 5 of this report the term "labor productivity" referred to output per labor hour, which is the generally accepted use of the term. However, the present chapter uses the term "productivity" in a broad sense, referring to all resources that contribute to production and to all desired outcomes of production. Thus, an increase in ridership with no increase in the use of resources would be treated, in the present chapter, as an improvement in "productivity."

This broader definition of productivity is helpful in examining the transit industry for two reasons:

- Transit has undergone a transition from private to public ownership over the last twenty years, leading to institutional change, system redesign, modernization of facilities, recovery from decades of neglected investments and other changes which ultimately arrested a 30-year decline in ridership, but which increased the costs of each unit of service.

- The basic units of input, vehicle drivers and mechanics, and output, vehicle hours or miles, are very narrowly confined by technology, surrounding traffic, daily peaks and valleys in the public's demand for services and other economic realities. Nevertheless, this chapter explores ways in which labor productivity has been improved. But to focus on only the basic physical output ignores the productivity of planners, marketing staff, and support staff that affect "design" and "sales." A concept of productivity to encompass ridership and coverage is therefore desirable.

The present chapter reports on a number of productivity improvements, such as increased use of part-time operators, reductions in absenteeism and work rule changes. A better fit between services and demand have improved cost-effectiveness, as have a better marshaling of resources through better informed and more-in-control management.

The Importance of Monitoring Productivity

A program to improve productivity is unlikely to succeed without powerful tools to monitor its success. The most important tool is measurement itself.

Chapter 5 of this report described the performance of the transit industry as a whole and by region of the country and system size.

Transit managers and policy boards need to systematically measure performance if they are to improve it. For example, transit managers might make use of the same efficiency and effectiveness measures reported in Chapter 5, but developed for individual routes rather than the system as a whole. Governing boards might wish to compare the cost per passenger mile of service from route to route and through time on each route.

It is not always easy to develop useful measures of performance. Often the most useful information is the hardest to measure. "Quality of service," for example, is critical, but very difficult to measure. Quality of service can involve trade-offs, such as increasing frequency (i.e., reducing time between bus departures) by reducing coverage (i.e., proportion of service area supplied with service). Quality of service can include intangibles, like the temperament of vehicle operators, and aesthetics, like the cleanliness of the vehicle. Singly and in combination, these qualities can be difficult to measure effectively.

Information which seems straightforward can be misleading. For example, ridership increases can result from increases in transfers rather than increased patronage. The calculation of impacts of work rule changes can be extremely difficult because of interaction between different work rules and between a given work rule and extraneous influences. For example, the interaction between overtime rules, leave policy and job stress can increase absenteeism and costs while undermining morale.

This chapter discusses experiences in improving transit productivity in terms of paid hours devoted to operating, maintaining and otherwise supporting transit services. Ill-spent time can be recaptured in often surprising ways across all facets of the transit enterprise, including the hours spent by policy board members deliberating policy. For continuity, the material is organized according to the performance classification scheme presented in Chapter 5. That is, productivity actions are classified according to whether they improve efficiency or cost effectiveness.

Whenever possible, this chapter provides detailed information on productivity initiatives by transit systems. It is believed that these details are persuasive.

MINIMIZING HOURS DEVOTED TO SERVICE PRODUCTION: EFFICIENCY

A recent UMTA-sponsored study of Chicago Transit Authority (CTA) bus drivers found that 28 percent of their pay hours were for "scheduled nonproduction hours," i.e., pay hours for which no service to the public was produced. While the number of scheduled nonproduction hours in transit nationwide is unknown, the amount is probably substantial. This is suggested by the fact that although bus drivers nationwide were compensated for approximately 2,000 hours in 1985, the number of vehicle hours per bus driver was only 1,500. Obviously, better control over nonproduction hours would increase system efficiency.

Scheduled nonproduction hours result from "work rules" which determine production and pay hours, rules which are the product of management policies, collective labor agreements, company traditions and public policy. There are rules defining tasks that a job classification may and may not perform, rules affecting rates of compensation for overtime, spread time and premium time, rules for work breaks, rules governing supervision and, in short, rules for most issues in which friction between labor and management has ever arisen. Work rules that are pertinent to improving efficiency are discussed more fully below in connection with specific productivity actions.

Many such work rules may improve the overall productivity of employees by improving morale, health, proficiency and labor-management relations. But some work rules contribute nothing but unproductive costs to the enterprise. For example, it is perfectly reasonable for an employee to receive extra compensation for overtime. In fact, it might even contribute to an employee's own productivity for the employee to receive a higher rate for an extraordinarily long shift or split shift. But, by the same rationale, it is also reasonable for management to eliminate the need for overtime by hiring part-time employees and contracting out for services that would otherwise require overtime and spread time premiums.

Management and employees have a common interest in efficiency. By making the enterprise more efficient there is more

"gain" for fewer hours of work. In fact, putting the principle of "gainsharing" to work for transit (to be discussed later) is an excellent way in which to improve productivity.

The Use of Part-Time Labor

The use of part-time operators (PTOs) has emerged as a widely used productivity action which improves efficiency. In 1978, three major U.S. transit systems--in Seattle, Baltimore and Washington--won through arbitration the right to hire up to 10 percent of their operators as PTOs. Since 1978, contract provisions allowing PTOs have become nearly universal. In July 1984, the American Public Transit Association (APTA) reported that 63 percent of its U.S. member organizations employed part-time operators. The significance of PTOs can be better understood from an appreciation of the costs associated with peaking in the demand for transit services.

The extent of the rush-hour peaks in the demand for transit varies considerably from place to place, both in terms of the peak-to-base ratio and the length of time between the beginning of the morning peak and the end of the evening peak (known as the peak shoulder duration time). These peaking characteristics directly affect the number of vehicle operators necessary to provide service at any given time of day.

Three types of operator work assignments--straight runs, split runs and trippers--generally are required to meet the peaked transit service schedule.

- o "Straight runs" are continuous operating assignments of approximately eight hours duration.
- o "Split runs" are work assignments that are broken into two or more pieces with unpaid time off between each piece. These assignments stem from the unevennness of the service profile.
- o "Trippers" are short-duration assignments that cannot be combined with other assignments to create a full day's work.

This variety of assignments has led, through work rules, to a complicated system of operator compensation and assignment procedures and assignment limitations. One major goal of this system has been to match compensation with the relative burden of the assignment. Thus, for example, runs that require more than eight hours of driving time typically earn overtime pay. Similarly, split runs with a long stretch between first sign-on and final sign-out for the day--spread time--earn a spread premium similar to overtime for all work beyond a designated number of hours.

A second major goal of the work rules has been to specify a minimum payment. Thus, most negotiated work rules guarantee each operator eight hours of daily pay, whether or not she or he actually works the full eight hours. Operators whose assignments add up to less than eight hours receive "guarantee" pay for the difference between their actual hours and the guaranteed minimum.

Most transit labor agreements in the United States embody work rules similar to those just described. As a result, paid hours for transit vehicle operators virtually always exceed hours actually driving the vehicle in scheduled service (or "platform

hours"). The idea behind PTOs is to reduce the ratio of paid to platform hours--and thus reduce overtime, premium and guarantee pay--by assigning peak-hour work to part-time operators, and assigning the more desirable eight-hour straight runs to Full-Time Operators (FTOs).

Transit authorities can realize the cost-saving potential of PTOs in three major ways. First, PTOs may replace FTOs, most likely through attrition, on existing peak-hour runs. Second, PTOs may be (and in some instances have been) used to expand peak-hour service. Such expansion may be prohibitively costly if FTOs are used, but will be relatively less expensive if PTOs can be employed. Finally, PTOs may allow transit agencies to reduce unproductive off-peak service. Excess vehicles frequently are kept in service throughout the day because there is little additional cost involved: since the peak-period full-timer is guaranteed eight hours of pay, management often reasons that she or he may as well be driving for as much of that period as possible. Thus, PTOs may permit agencies to reduce inefficiency by tailoring service more closely to actual demand.

It is important to note that the use of PTOs, and thereby the potential to realize productivity improvements via this mechanism, may be limited by contract language governing the number of PTOs allowable, the number of hours and days worked by PTOs, the length of their assignments, and the type and time of work assignment available to PTOs. The use of PTOs may also be constrained by restrictions on the hiring of PTOs and reduction of FTOs. As a

result of such contractual provisions, transit systems often are prevented from filling all PTO positions up to the level that may be technically allowed in the labor agreement. This is particularly true for transit systems that are either not expanding or are actually contracting their service levels.

A description of the introduction of PTOs in one important transit operation illustrates the issues involved in such a program and the potential benefits.

Introduction of Part-Time Drivers: Massachusetts Bay Transportation Authority (MBTA). In January 1982 the MBTA introduced PTOs on surface bus lines, with the assignment of 20 part-time bus drivers to one of its garages. By spring 1984, the number of PTOs had risen to 333, or approximately 18 percent of the workforce in the surface-operator category. As of 1984, the introduction of this level of PTOs was estimated to provide an annual savings of approximately $5 million through reduction in unproductive paid hours, spread penalties, and fringe benefits. Savings on fringe benefits often occur because part-time operators have retirement, health insurance and other fringe benefits on their full-time job or that of their spouse.

The first 20 PTOs were drawn primarily from the ranks of former FTOs who had been laid off in April 1981. In each quarter through March 1983, an increasing number of PTOs were trained and assigned daily runs of up to 6 working hours per day.

Initially the MBTA faced a number of the restrictive work rules discussed above. The extra pay for the spread penalties and unnecessary cover time added approximately 900 daily pay-hours to the schedule. By scheduling PTOs, the MBTA has been able to eliminate the longer spread penalties and unnecessary cover time. Almost all PTOs have replaced an FTO who had unnecessary paid overtime or who had received large spread premiums. However, this has been accomplished largely by scheduling the majority of PTOs over a 12-to 13-hour day, during which they have an unpaid break of 6 or 7 hours. The peak-period work has not thus far been split into two periods and assigned to different PTOs because of the difficulty of recruiting and training PTOs and because of an objective to maximize cost savings for a given number of PTOs.

The use of part-time operators is not a panacea for the ailments of all financially troubled transit systems. However, the use of part-time operators has the potential to increase transit system productivity and reduce operating costs.

Gain Sharing

In many important ways, the individual employees hold the keys to the details of transit service productivity. Conscientious bus drivers, for example, can markedly improve the performance of the bus system, by their attitudes, behavior and the multitude of decisions they make every working day. Accordingly, to achieve productivity improvements, it is important to enlist the enthusiastic cooperation of rank-and-file employees. Gain sharing might be one way in which to enlist employee cooperation in more productive work.

In the sparce but growing transit literature on the subject, gain sharing is defined relatively narrowly as a group incentive plan that links individual pay to group productivity improvements that lower the cost of producing a fixed amount of transportation. Gain sharing plans therefore do not provide individual pay incentives linked to any measures of individual performance (e.g., attendance). Rather, gain sharing is intended to motivate all employees in the organization, as well as all organization units, to work together to reduce costs. The newness in transit of gain

sharing stands in sharp contrast to a large number of individual incentive pay plans which have existed for a long time in the industry.

In a 1983 American Public Transit Association (APTA) survey of transit properties, only 6 (3 percent) of the 210 incentive pay plans found were gain sharing plans. All six were unionized systems. In a 1984 survey by Scot and Deadrick, only four transit agencies of 222 responses used gain sharing programs, none in use more than five years.

A 1981 General Accounting Office (GAO) study of 36 firms with gain sharing programs found savings averaging 17 percent for the 24 firms which provided financial data. Firms having the plan for the longest duration reported the most impressive results, and most believed the expected benefits of gain sharing were realized. Over 80 percent of the 36 firms involved in the study reported improved labor-management relations as a result of gain sharing. They also reported fewer grievances, less absence and reduced turnover.

A National Academy of Science study of gain sharing in transit concluded, "the literature on transit inventive pay plans suggests that incentives can succeed in transit, but that success is far from certain, and plans will fail unless many preconditions are met."

Considering the use of gain sharing as a tool for operating transit systems more efficiently is a logical step in the current shift from an environment stressing capital expenditures and

transit system expansion, to one of introducing new incentives for both management and labor to reduce the cost of transit operations. On the management side, new forms of transit organization involving competition and deregulation have great potential for reducing transit operating costs. On the labor side, does gain sharing have the same potential for cost reductions? Authoritative answers are not yet in, as we have noted. But the evidence does suggest that, given favorable circumstances, transit gain sharing pay incentive programs can lead to the adoption of cost-reducing or productivity-enhancing actions.

The following list identifies important issues which arise in the development of gain sharing programs.

- All employees should be involved in gain sharing, rather than a select group.
- Gain sharing tends to be introduced only in a crisis, which brings about the shared recognition of the need for action.
- To succeed, gain sharing performance standards must be clear, easily understood and not easily distorted by management or employees.
- Successful plans work best when organized labor is fully involved and committed to their success. Union leaders prefer companywide productivity goals to avoid conflict and controversy among their members. They prefer benefits to be predictable.
- Employees must be convinced that their individual contributions will lead to achievement of the productivity goals, and that the incentive is worth the effort.
- Success depends on the perception of a major organizational effort, involving labor and management, rather than an isolated activity off to one side.
- Successful programs involve working "smarter" not "harder," which means the managers must work closely with employees to see that improvements carry through the organization and

become institutionalized; to do this the management style must be participative rather than authoritarian.

- A rule of thumb in private industry is for the magnitude of gain sharing incentives is 3 percent of base salary, any lower level will justify neither the individual's attention nor the administrative cost of the program.

- In general, as the group size increases the connection between the individual's performance and that of his or her group becomes more remote. Limiting the group size, of course, conflicts with the unions' desire for systemwide performance aggregation.

- The largest transit organizations tend to be the most likely candidates for gainsharing because work rules are the most elaborate, management control is the least effective, and, accordingly, more control is in the hands of employees, as individuals and as groups.

- Unless presented carefully, gain sharing risks being perceived by the public as a camouflaged pay raise without any improvement in service or efficiency.

Reducing Absence

According to a 1986 report, on any given workday about 3 percent of the U.S. workforce is absent from work, a rate that has held steady since the early 1970s. According to the same report, absence in the transit industry has been two to three times the all-industry rate. Individual transit systems have reported even higher rates of absenteeism. Clearly, such rates of employee absence significantly lower transit efficiency and service reliability. Absences entail costs for standby and replacement operators, and additional administrative costs. Moreover, certain characteristics of transit services make them particularly vulnerable to absenteeism.

The latest available estimates of the aggregate costs of transit absenteeism are contained in a 1980 Peat, Marwick, Mitchell and Company study. That study estimated total identifiable costs of operator absence in 1978 to be approximately $294 million, or $2,799 per operator, in 1986 dollars. Absence among other transit employees, although lower, was estimated to increase these costs by approximately one-third. These estimates exclude additional administrative and payroll costs. Individual transit systems have reported more recent estimates which further illustrate the magnitude of potential savings that might be feasible from reduced absenteeism. A report recently prepared for the Southern California Rapid Transit District, for example, estimated that operator absence is costing the authority $18.6 million annually, and that the agency could realize annual savings of at least $4.4 million by adopting measures to improve attendance levels.

In addition to cost impacts, frequent absences also have significant adverse impacts on service reliability. Reliability is reduced by the inability to fill the schedule because of unanticipated operator absence and because of the substitute operators' relative lack of familiarity with the routes.

Finally, excessive absence may have significant adverse effects on employee morale. For example, absence requires more operators to work the extraboard (as stand-by drivers), which is widely disliked.

Programs in a number of cities, notably San Diego, California; Flint, Michigan; Seattle, Washington; Milwaukee, Wisconsin; and Washington, D.C. have yielded startling reductions in absences and corresponding cost savings. The common thread in dealing with absenteeism in all these cases was more effective overall first level supervision and management. This is because high absence is the result of the interaction of many factors which require direct intervention and consistent monitoring by first line supervisors.

In a recent series of studies [Urban Institute, 1987], four factors emerged as particularly significant in accounting for high absences:

1. widespread availability of overtime pay, which diminishes the relative economic benefits of regular attendance;
2. scheduling inflexibility, which reduce the driver's opportunity to take time off when needed;
3. occupational stresses, such as tight schedules, long hours, poor equipment, difficult interactions with passengers, and the threat of physical violence; and
4. lenient eligibility rules for sick leave compensation.

These factors combine to increase the value of leisure time and decrease the value of work time.

The role of management is critical, as suggested in the following passage from a recent study [Perin, 1984]:

> High rates of operator absence are a consequence of the witting and unwitting cooperation of labor and management. Each realizes certain benefits, and to managers, these benefits appear to outweigh their costs. Such benefits may be the essential ingredient of a successful, albeit ad hoc,

optimizing strategy managers have adopted, lacking both the data and more sophisticated techniques for making staffing decisions.

Managers are supposed to influence the elements of the enterprise. How transit managers arrive at their regular and extra-board staffing decisions, whether they track the full range of costs and benefits, the methods they use, and how they analyze their options have significant impacts on operator absenteeism. Interactions of extra-board scheduling and overtime availability affect absenteeism. Despite the widespread awareness that overtime availability and absenteeism may be directly related, it is rare that agencies hold overtime out as an incentive or reward for good attendance or deny it for poor attendance.

Absenteeism may reflect management's degree of influence over the elements that produce transit services, which is suggested by the fact that few employees tend to be responsible for most absences in transit. Accordingly, the most effective strategies for reducing absenteeism emphasize management's comprehensive day-to-day influence on the workforce. First-line managers who secure employee cooperation through policies that reduce job stress while maintaining maximum productive hours--without higher management having to offer workers increasingly generous overtime and leave policies--tend to find absenteeism declines. For upper-level managers, of course, this means taking a hard look at the incentive structure for their first-line supervisors, as San Diego Transit Corporation and other systems have done:

San Diego Transit's Program to Reduce Absenteeism. During the late 1970s and early 1980s, San Diego Transit Corporation (SDTC)--the major publicly owned bus system in San Diego County--underwent restructuring in order to delegate more authority, and to introduce a more participatory style of management.

Under the new system, initiated in 1980, each first-line supervisor participates in what is known as the Group Supervisor Program. The objectives of this program are to:

- o improve system performance through increased management and supervision of operations;
- o delegate authority to the lowest effective level in the Department;
- o reduce operator absence and operating performance problems;
- o improve the consistency and objectivity of performance evaluation and operator discipline; and
- o encourage greater participation in management by salaried employees at all levels.

SDTC introduced its Group Supervisor Program in 1980. Group Supervisors are expected to apply systematic methods to monitor attendance and performance, maintain personal contact to counsel and evaluate employees, and be active in any disciplinary proceedings. The emphasis is on the use of systematic procedures to ensure evenhanded and thorough management influence in the enterprise.

The introduction of a computerized management information system was an essential element of the SDTC's restructuring. The purpose of the system is to provide timely, consistent, complete, and accurate data on the performance of vehicle operators. Data are maintained on attendance, customer relations, safety, and review by the Group Supervisor. Supervisors have been trained in the use of this database and are expected to use it regularly.

SDTC management reports that the program has resulted in many improvements in performance. Between January 1981 and February 1982, workforce absence decreased from 12.9 percent to 6.3 percent. Other improvements claimed for the program include demonstrated personal and professional development of supervisors; greater job satisfaction expressed by supervisors; greater consistency and improved management control; improved work environment for vehicle operators as a result of their greater access to management and reduced

overtime work requirements; and improved use of upper management to ensure consistent policy implementation and to address other management issues.

BETTER TRANSIT SERVICE WITH FEWER RESOURCES: COST EFFECTIVENESS

Better matching of the characteristics and prices of services offered with the public demand for service can significantly increase productivity by reducing the amount of service--and therefore production hours--needed to attract a given level of ridership.

The level and characteristics of service do not always match well the demand for services--nearly empty large buses may be operated in late-night service when it would cheaper to subsidize taxicab rides, for example. Sometimes there are valid policy or operational reasons for these mismatches; in other cases, when these mismatches have been overlooked, they may provide important opportunities for productivity gains.

As they came into public ownership in the late 1960s and early 1970s, mass transit systems in the United States typically expanded services and simplified fare policies. Now transit service operation are influenced by a variety of public interest factors, including basic mobility, rush-hour congestion relief, and social concerns. Continuous or periodic reappraisal of why, when, where and how services are offered, and at what price, would improve policymaking.

Transit agencies can better tailor supply to demand through:

- competitive approaches, such as competitive contracting out of peak services, to bring the forces of competition to bear on tailoring service to demand. This is potentially the most

powerful instrument available to transit managers. Competitive approaches are discussed at length in Chapter 9.

- o more efficient forms of service at different hours of the day or days of the week to match varying ridership levels or contracting with private taxi companies to provide low density service;
- o differential fare structures to better reflect the cost differences of providing service in peak periods or for trips of longer distances, which is discussed more fully in Chapter 4 of this report; and
- o monitoring performance of each route and type of service in the system vis-a-vis ridership, coverage and cost efficiency.

Substitute More Efficient Service Forms

Substitution of more efficient service has occurred or is under active discussion at transit agencies across the United States. However, the extent to which paratransit service (particularly shared-ride cab services, jitneys, and ridesharing programs) has been used to substitute for low productivity transit routes is not known. Since the early 1970's, when UMTA-sponsored research, demonstrations and policy initiatives first began to stress the importance of paratransit in urban transportation, there has certainly been considerable growth in the use and coordination of paratransit services by local transportation authorities. Much of this growth, however, has been the provision of specialized services to special user groups such as the elderly and handicapped, spurred by the requirements placed on transit operators by the 1970 revisions of the Urban Mass Transportation Act and the 1973 Rehabilitation Act. Some of the new paratransit services provided under transit's aegis have represented a way of

expanding service relatively cost-effectively into previously unserved medium- or low-density areas. It appears that relatively little of the transit-sponsored paratransit represents substitutions for service previously operated by scheduled, fixed-route modes.

A detailed description of one recent experience with service substitution would be useful for illustrating how such programs are put into practice:

> Providing Shared-Ride Service on Sundays: Phoenix, Arizona. The City of Phoenix is served by fixed-route buses operating on weekdays and on Saturday. In 1980, the City Council decided to introduce Sunday service. Realizing that demand on Sunday would be insufficient to support economically even a minimal number of buses operating over fixed routes, the Council contracted with a local private taxi operator to provide shared-ride taxi service from 8:00 a.m. to 5:00 p.m. According to an independent UMTA-sponsored evaluation of the program, the average annual subsidy required to provide the service in 1981 and 1982 was $87,470, or about $1,460 per Sunday. This compared to an estimated subsidy of $15,000 per Sunday to provide minimal fixed-route service.
>
> Some special factors in Phoenix helped produce such significant savings, but they are by no means unique. First, the shared-ride taxi service did not substitute for any existing fixed-route bus service, thereby reducing the risk of any Section 13(c) labor protection disputes. Second, the taxi firm was already operating a dial-a-ride service on other days in a couple of suburban communities, and had a ready pool of equipment and drivers to use on Sundays. Third, a very good relationship existed betwen the city and the private taxi operator.

Differentiated Fare Structures

Chapter 4 of this report discusses fare policies and shows that most U.S. transit systems currently charge "flat" or uniform fares. Chapter 4 explains that a shift to variable, cost-based

fares could substantially increase farebox revenue, and at the same time would be more equitable.

Another way of looking as this issue is to note that uniform fares seriously distort the efficient allocation of both capital and operating resources. Uniform fares subsidize long trips far more heavily than short trips. This difference in subsidy levels encourages disproportionately heavy travel on long trips--typically commuter runs--from distant suburbs to central city work locations which, in turn, causes the economically inefficient deployment of vehicles, drivers and maintenance efforts to the more distant segments of the system. Furthermore, the travel patterns encouraged by such unequal subsidies creates political pressure to construct new railways, stations and maintenance facilities that are not economically justified.

Efforts to improve transit productivity, therefore, should seriously consider the introduction of variable, cost-based fares. Where this is not done, transit managers should try to mitigate in their decision-making the economic distortions caused by uniform fare policies.

Adoption of Route Monitoring Standards

Over time, the spatial patterns of travel demand can change significantly in response to demographic change, new employment opportunities, new development patterns, or modifications in service levels on the highway network, to list a few of the important factors. Such changes can lead to increases or

decreases in ridership on existing transit routes, as well as to requests that new routes or services be provided. Without a systematic process for recognizing and responding to these changes, discrepancies can develop between transit demand and supply, leading to reductions in systemwide cost-effectiveness of the service being offered. One approach to avoid this situation is for transit systems to adopt a program for restructuring services periodically to reflect measured utilization and market changes. Such programs typically include a set of performance measures that can be used to evaluate each route on a regular basis. The program can incorporate standards for the continuation of service, and for determining when and where new services or routes should be provided.

Most transit systems in the United States make some adjustments in the amount of service provided, typically on a seasonal basis and when work units are rebid to drivers. A 1982-83 survey of U.S transit systems by Houston Metro found a wide variation in the specific route evaluation practices that are followed, ranging from the formal to the informal. About two-thirds of the transit systems that responded to the survey indicated that various economic and productivity criteria are used to monitor and/or evaluate financial and ridership performance at the route level. Because only a third of the 345 transit agencies in the sample responded to the survey and because systems without route guidelines were presumably less likely to respond, the

proportion of transit systems nationwide with these types of route standards is probably less than two-thirds.

The survey indicated that about one-half the responding systems monitor route-level trends but do not use any disciplined measures to make service adjustments. Most agencies stated that productivity gains were not quantified or systematically measured to assess the effectiveness of their monitoring and assessment programs, and this they recognized to be a weakness that should be corrected.

A detailed description of New York City's monitoring program, in a most challenging transit environment, might be an example other cities could follow:

> Introduction of Bus Route Standards: The New York City Transit Authority. The New York City Transit Authority (NYCTA)--with its subsidiary the Manhattan and Bronx Surface Transit Operating Authority (MABSTOA)--operates bus service on some 200 local and 25 express bus routes, annually serving nearly 500 million passengers. Over the past 10 years ridership has fallen by about 20 percent, while the amount of bus service being provided has decreased only slightly. In light of these trends, a decision was made in 1985 to undertake a comprehensive assessment of bus ridership and service patterns. This had not been done in 30 years, according to one New York transit official.
>
> NYCTA first issued performance measures and collected data for three sets of guidelines to evaluate each of its bus routes: "service change procedures," "route performance indicators," and "span of service and route spacing."
>
> Soon after the program began, service adjustments (mostly reductions) were made on six bus routes. As data on additional routes was collected, service changes were made on 21 bus routes during the months between September 1986 and January 1987. There was a reduction of 23 morning peak buses and 50 afternoon/evening peak buses, with 55 fewer bus operators required to meet the new service schedule, representing a 7.5 percent reduction of service in the entire bus system. Operator pay-hours decreased by 6.1 percent.

Over time, as these performance standards are applied on the remaining portions of the system, the NYCTA projects that it will be able to operate with 400 fewer bus drivers and 200 fewer buses.

Improved Management Influence

Obviously, the categories of productivity potential identified in this chapter overlap and interact. For example, improvement in absent time has an impact on scheduled nonproduction time and possibly even production time. So, too, improvement in all these areas depends on improved management control of the enterprise, as was illustrated with the example of San Diego Transit Corporation. By investing resources and effort in automated information processing and inventory control, more effective interpersonal relations, better communication and other tools at managers' disposal, managers can reduce wasted time and increase the result of other compensated time. The compendium of actions that distinguish effective from ineffective management is too large to fit any category other than "improved management influence" over the production process.

From 1980 to 1985, transit labor productivity declined by 8 percent while, in the bus category, vehicle hours per bus driver stayed constant at 1,500 hours. In the same years, the number of Executive, Professional and Supervisory Personnel in transit bus systems increased from 10,861 to 11,585, a 6.7 percent increase. This strongly suggests that the recorded loss in labor productivity may be related to the changing composition of the transit workforce, particularly in management and professional positions. Furthermore, any improvement this new staffing has

brought to transit may not be reflected in vehicle hour (or mile) per employee since, by definition, these professionals are prone to work on the market side of the enterprise. The impact of the shift to more professional staff, then, should show up in terms of market penetration, ridership and other system impacts on its environment.

What impact, if any, has the increased role of planners, managers, market specialists and other professional workers had on transit performance? This question has only recently been researched in an exploratory manner by the Urban Institute, under UMTA's sponsorship. The Urban Institute studied eight U.S. transit systems to discover the impacts, if any, of their increased professional level staffing.

To select one case, from 1979 to 1985, the Southern California Rapid Transit District (SCRTD) of Los Angeles nearly doubled the number of General Administration Executive, Professional and Managerial personnel, from 206 to 399. This resulted in a 70 percent increase in General Administrative expenses, after accounting for inflation. It is a researchable question whether this investment in management resulted in better overall management and direction for the system.

According to the Urban Institute, the results were very positive. From 1979 to 1985, unlinked passenger trips (i.e., boardings) increased from 344.7 to 497.2 million or 44 percent (and revenue vehicle miles grew 7 percent). This passenger increase was largely the result of a substantial, if temporary,

fare reduction. Nevertheless, it is noteworthy that when the fare reduction ended, causing a 70 percent fare increase, ridership fell by only 6 percent.

From 1979 to 1985 general administration expenditures in constant dollars per passenger trip increased 20 percent. Meanwhile, the expenditures for all other agency costs per trip decreased 11 percent. Thus, over the six years, the real change in all other agency costs was less than the growth in passenger trips. As a net result total expenses were 91 cents per passenger in 1985 compared to 99 cents in 1979, a constant dollar reduction of about 8 percent.

This suggests that hiring more managers resulted in better management of resources to bring about more riders per dollar of cost, a reasonable rough measure of management productivity. The SCRTD provided a detailed account of the role of increased management in bringing about this improved performance, which is distilled below.

> Productivity in Los Angeles. During the period in question, the SCRTD expanded significantly. It increased from an organization that operated 6,408,000 service hours and experienced 344,700,000 boardings in Fiscal Year 1979 to 7,109,000 service hours and 497,158,000 boardings in Fiscal Year 1985, increases of 10.9 percent and 44.2 percent, respectively. Operational efficiency and effectiveness was improved by hiring additional general administrative personnel, a 93.7 percent increase in this category.
>
> The most significant staffing increases occurred in Planning, Transit Police, Data Processing, Local Government and Community Affairs, and Equal Opportunity Departments.
>
> The expansion of the transit police department improved the quality of service and was important because of the extensive service area of the system.

With the shift away from dependence on Federal operating funds to local funds, the RTD also created a Local Government and Community Affairs Department. These personnel work with Los Angeles County and 81 local jursidictions in the County to coordinate the use of local monies generated by a dedicated sales tax, known as Proposition A funds. The coordination includes transfer agreements, bus stop improvements and circulation route contracts.

The significant increase in the SCRTD's Equal Opportunity Departments was a result of Federally-mandated programs.

The Planning Department's staff was also expanded. These positions were added to create a high level computerized planning information support group and to augment the Accessible Service Program. The magnitude and quality of the Accessible Service Program has increased significantly. The computerized planning group enabled the SCRTD to do much more sophisticated planning and increase annual boardings at a faster rate than service hours.

Positions were added in the Data Processing Department as the SCRTD converted to a state-of-the-art on-line management information system (TRANSMIS). These positions supported the expansion in hardware and software, facilitated the TRANSMIS I and II conversion and implemention, and provided microcomputer technical support to all departments at the SCRTD.

The implementation of TRANSMIS greatly enhanced the productivity of maintenance personnel by providing managers with timely, complete computerized bus maintenance data. This allowed the SCRTD to nearly double the number of air conditioned buses and increase by approximately eight times the number of accessible buses while containing the increase in mechanics. Containing the ratio of revenue vehicles to mechanics, a reflection of increased productivity, contributed to an increase in the ratio of general administrative personnel to other personnel at the SCRTD.

Another important factor that increased the ratio of general administrative personnel to other personnel was a decrease in the operator-to-assignment ratio. The rate declined from 1.32 in Fiscal Year 1979 to a budgeted level of 1.30 in Fiscal Year 1985. This increase in productivity is a result of improved supervision and microcomputer analysis performed by general administrative personnel. Since bus operators constitute more than half of the SCRTD's workforce, this factor is a key element in the changing of the ratio.

It would appear from the case of Los Angeles that overall efficiency and productivity can be enhanced by stronger management.

CONCLUSION

Productivity improvement offers the prospect of cheaper and better transit services, without any party suffering in the long run. Three key issues stand out as essential in any effort to improve productivity:

1. Transit management must be deeply involved and committed on all levels and this must endure if productivity initiatives are to take root.
2. Employees must be involved as active participants, requiring managers to adopt a firm but participatory style, seek every opportunity to reward excellence in employees, and eliminate rewards for poor attendance and other demoralizing behavior.
3. All facets of productivity must be carefully measured and systematically monitored over time.

CHAPTER 9: ACHIEVING THE BENEFITS OF COMPETITION THROUGH GREATER PRIVATE SECTOR INVOLVEMENT

HIGHLIGHTS

- Only about 6.7 percent ($740 million) of mass transit costs were contracted with the private sector in 1986, about one-third of which were competitively contracted. However, the private sector has shown a clear ability to provide the full range of transit services at considerable cost savings.

- Private sector involvement in transit service provision includes:

  - offering service under free market conditions, without public subsidy;

  - providing various services under contract--such as individual routes, express services, specialized services, demand-responsive services, night or weekend services--at substantially reduced subsidy requirements because of 10 to 50 percent lower costs than similar publicly provided services; and

  - providing unsubsidized service in competition with the public sector.

- Increased private sector involvement in providing services shows additional benefits beyond cost reductions:

  - stimulating a competitive environment puts pressure on the public provider to improve productivity and cut costs and ensures continued responsivness to market needs;

  - giving the public agencies a flexible means to experiment with innovative services without having to commit labor and capital equipment which would be difficult to withdraw;

  - allowing expansion of service that would otherwise not be feasible; and

  - providing a cost benchmark for comparison with the public provider.

- The private sector is ready and able to take on an added role in nearly every community.

- Private sector transit could be increased by creating a competitive environment for urban mobility, for which the following are important elements:

  - the need for an institutionalized process to foster competition and remove monopolistic aspects of current transit services is an important starting point;

  - the need for State prohibition or other restraints on entering into labor agreements that prevent management from contracting with the private sector for services;

  - the desirability of having separate agencies responsible for service provision and for the public trusteeship of determining what services are required and obtaining them by the most cost effective means.

During most of the 100 year history of mass transit in the U.S., services were provided by private operators under government regulation. The provision of transit services evolved into a public responsibility after World War II, and during the 1960s and 1970s, the present pattern of government ownership, operation, financing, regulation, and administration became firmly established. However, there is potential for much more private sector transit in the near future as the realization spreads that (a) considerable savings are possible, (b) new markets can be developed and (c) the quality of service can be improved while still maintaining full public control of the level and scheduling of service. This chapter will illustrate the variety of private sector roles and the potential savings and other benefits of

greater private sector involvement in providing mass transit service.

COMMUTER SERVICES

As discussed in Chapter 3, conventional transit systems have maintained their share of the rapidly growing markets for work trips between suburban homes and central city work locations only by large service expansion programs. These service expansions helped to run costs up at twice the rate of inflation since 1965. Despite an apparent levelling off of costs since 1984, as discussed in Chapter 5, a great many such commuter services could be provided at lower costs by privately operated bus systems.

Potentially, the private sector could assume a significant share of commuter transit services without public subsidy. One study, discussed below, identified 76 peak-hour express commuter routes served by public systems which could be turned over to private operators at a net saving of at least $27 million in public subsidy [Urban Mobility Corporation, 1985].

Private-for-profit transportation carriers currently provide independent commuter bus service, requiring little or no public subsidies, in at least ten metropolitan areas. These private firms generally provide express service from suburban areas to centralized work centers.

- In the New York metropolitan area, for example, some 1,250 buses operated by 15 different private bus companies transport over 50,000 daily passengers to New York City from surrounding areas such as Westchester County, Long Island and Northern New Jersey. (According to a 1984 survey by the New York Transportation Department).

- In Chicago, seven private bus companies, operating a total of 236 buses, provide daily commuter service for 20,700 riders

through rider organized "bus clubs" or through arrangements with private employers. Service is available on 116 different routes.

- In Los Angeles, 80 private unsubsidized commuter services are currently being operated on 49 routes by a dozen large and small private companies. In addition, several private companies (Hughes Aircraft and Arco) have sponsored publicly unsubsidized bus service for their employees.

- Private express bus services for commuters play important roles also in Connecticut, Boston, Baltimore, Pittsburgh, Norfolk, Dallas, and San Francisco.

Private bus services generally cost much less to operate than publicly owned bus services, especially under competitive circumstances. Competition creates an environment that helps control costs, ensure efficiency, improve productivity, and maximize responsiveness and quality of service. The advantages of competition can be secured by a number of methods, including contracting the services out to competing bidders or simply allowing the private sector to take over selected routes or services.

- For example, the Metropolitan Transit Authority of Harris County (METRO) in Houston, Texas currently contracts 36 percent (74 buses) of its express park/ride bus services. The competitively procurred service constitutes about 10 percent of METRO's peak bus pullouts. The $6 million spent for the contract commuter service in 1986 was 24 percent less than METRO's costs, for a saving of $2 million annually. METRO expects to increase the contract commuter service to 165 buses in 1990.

- The City and County of Los Angeles have undertaken a major effort to contract for the operation of both local and commuter express transit services by competitive bidding. In 1987 contracts were signed for 20 routes, at an estimated saving of $3,225,000 (55 percent) over the cost of the service on the same routes by the public transit agency. The commuter express routes for the County cost 58 percent less than the cost of the service by the public carrier.

There is a large potential for private sector assumption of commuter transit services without public subsidy. One authority has estimated that in just seven urban areas (New York City, Houston, Washington, D.C., Chicago, Philadelphia, Los Angeles and Orange County), private operators could run profitable services on 76 peak-hour express commuter routes currently served by public systems [Urban Mobility Corporation, 1985]. According to this study, this substitution could produce a net savings of at least $27 million in public subsidy.

A conservative extrapolation of these estimates to an additional 17 metropolitan areas would bring the total savings to $70 million. But if extrapolated to include those express services that also operate for a portion of the non-peak period, then the estimates would be doubled, to $140 million.

- Upon evaluating 22 public bus lines, the Southern California Association of Governments (SCAG) concluded that 15 could be turned over directly to the private sector without subsidies, for a savings of $4.5 million. The remaining 7 routes could be operated by private providers under contract at a savings of over $1.2 million, with a total savings of $5.7 million.

OTHER TRANSIT SERVICES

Private operators have also demonstrated their ability to generate similar types of savings with other types of transit services. These include traditional fixed route service that forms the backbone of most public transit systems, and demand responsive or specialized services that are more in tune with the travel demands of lower density areas or offpeak time periods. It

is their ability to tailor their services to specific travel markets that explain much of private providers' lower cost and greater responsiveness to public needs.

Many communities have contracted out all or substantial portions of their transit needs, sometimes to a single provider and sometimes to several different providers. Of 204 transit agencies contracting out for services in 1983, 77 percent were for demand responsive services and 23 percent for fixed route services.

- For example, the Crawford Area Transportation Authority which serves the residents of Crawford County and the small urban area of Meadville, Pennsylvania, contracts for all its public transportation operations, including fixed route service, rural bus service, door-to-door demand responsive, and all bookkeeping and accounting services. For both the transportation and the administrative work, the savings obtained from competitive contracting are approximately one-third of the cost of providing the services in-house.

- In Fairfax County, Virginia, a private operator was selected on the basis of competitive bidding to provide feeder service to the Huntington Metrorail Station. County officials estimate that during 1986, the first year of operation, the net savings to the County were approximately $700,000, reflecting an incremental vehicle-mile cost of $2.00 for the private operator instead of $3.27 charged by the Washington Metropolitan Area Transit Authority for its buses.

Many communities are finding that for low density and low demand routes demand responsive service in lieu of fixed route service is not only a cost-effective means of saving substantial funds but also of providing higher quality service.

- Monmouth County, New Jersey issued requests for proposals for provision of demand-responsive service throughout different areas in the county and issued contracts to four local

taxicab companies. While the in-house cost of the door-to-door service had been $9.72 per trip, the cost fell to $4.22 per trip as a result of the competitive procurement.

- The Ann Arbor (Michigan) Transportation Authority contracted its dial-a-ride evening service to a local taxicab company. The taxicab company extended the service to 6:00 a.m., and provides all aspects of the service--vehicles, drivers, fuel, maintenance, and dispatch, thereby relieving local government of the burden of administering the program. The subsidy per passenger is less than half the level required when the service was provided in-house.

Private firms can provide feeder services as an alternative to expansion of the publicly-operated system.

- Los Angeles issued a request for proposal to provide downtown shuttle service in 1985 and awarded a contract to a paratransit company. While the City had been paying the transit agency $1.4 million annually for the service, not including capital cost, the contract was for $1.3 million, including capital cost. The private operator achieved a 40 percent reduction in the cost of the service and a 15 to 20 percent increase in ridership during the first year.

The private sector has taken the lead in one type of organization which is becoming increasingly important, the Transportation Management Association (TMA). A TMA typically consists of a group of business, developers and major employers who band together to address the transportation problems of a rapidly growing major activity center. More than 30 TMS's have been launched to date in such diverse locations as Tysons Corner (Virginia), Dallas, Los Angeles and New Jersey. They have been highly successful in encouraging and facilitating ridesharing and transit usage among employees, in coordinating parking and work-schedule programs, and in providing for internal circulation and shuttle services.

These examples demonstrate that the private sector, independently and in partnership with the public sector, can provide a full spectrum of local transit services ranging from fixed route service to commuter service, feeder service, low density service and peak-hour supplements. Further, private operators have the ability to meet a variety of different local needs under very different local conditions.

Of particular importance is private operators' capability to maximize the net yields of existing capital and labor resources. Some firms have purchased luxury buses for charter services during the mid-day and weekends and later found that these buses were also attractive to white-collar workers for commuter service during peak travel periods. Provision of transit services has allowed such firms to efficiently utilize available capacity over the entire week.

COST SAVINGS AND OTHER BENEFITS

According to a University of California Study [Roger Teal, 1986], average savings of 30 percent, ranging from 10 percent to 50 percent, are possible through expanded use of the private sector for transit services. This is a conservative estimate because it does not include adjustments for the taxes and user fees paid by the private sector, or the capital subsidy received by the public operators on their vehicles and facilities.

- Estimated cost savings for commuter bus services operated by private contractors in a number of individual cases are 25 percent for Golden Gate Transit in San Francisco; 38 percent

in Los Angeles County; 35 percent in Houston; 58 percent in Cleveland; 51 percent for the Southern California Rapid Transit District in Los Angeles; and 51 percent in Boston.

- Savings for fixed route services in individual cases averaged 22 percent in 18 small municipal systems in California; 62 percent in Phoenix; 37 percent in Yolo County, California; 48 percent in Tidewater, Virginia; 32 percent in two New York City suburban systems; and 34 percent in San Diego County, California.

- Cost savings for general public demand responsive services are 54 percent in Phoenix; 45 percent in Rochester, New York; 49 percent in Orange County, California; 55 percent in Tidewater, Virginia; 12 percent for 4 California municipal systems and 55 percent in San Bernadino, California.

The practice of contracting services to private operators by public operators is quite widespread, involving 7.2 percent of total revenue vehicle hours of service in 1985. This suggests that there is still considerable potential for savings by contracting.

In addition to the lower cost and better quality of services through competition, there are numerous ancillary benefits that, although difficult to quantify, are significant and should not be overlooked.

Competition for transit routes has generated pressures toward more competitive and realistic wage rates by the public operator. This could prove highly beneficial to public operations which have seen large labor cost increases due to higher compensation and lower productivity in the past 20 years.

- In Phoenix, Arizona, for example, after a private firm won the competitive bid for demand responsive services--apparently because of lower wages--the union for employees of the public operator agreed to a more competitive wage rate for drivers of smaller vehicles. The union is now confident

that the new lower labor rate will enable the public operator to provide all similar service in-house in the future.

- Contracting out for services has led to similar concessions in Norfolk, Virginia and San Diego, California. Labor concession in Norfolk included reduced benefits and more flexible work rules in order to compete against private operators.

Localities have indicated a preference for contracting services to private operators because it permits them to experiment with various types and levels of new services with a minimum of risk and without having to build up a large equipment inventory or support staff. Not only would new equipment and staffs be difficult to get approved, but once established they would be virtually impossible to dismantle. This added degree of freedom to experiment with minimum risk has been the reason why many new and creative services have been introduced and new markets developed by private operators in the last few years.

- For example, in the Norfolk- Tidewater region numerous trials have resulted in a mix of cost-effective public/private services made possible only through repeated experimentation with a freedom to fail.

Frequently, regional transit authorities provide public mobility in low density areas whose residents contribute taxes to support the system. This can lead to extremely high per-rider costs, especially if conventional services are offered. Contracting services to a private operator is often a cost-effective means of providing that service.

Private providers have been at the forefront of providing communities with a family of flexible and innovative services

especially suited to meeting the growing needs of lower density suburbs. These services include late night service, holiday and weekend services, feeder service to the main transit lines and service to the elderly and handicapped. Innovations are most needed in the low density surburban services that have been badly neglected since they cannot be effectively served by traditional fixed route, fixed schedule transit service. By taking advantage of their greater management flexibility, private enterpreneurs have been able to assemble a creative variety of service options such as using vehicles of different sizes, incorporating flexible routes and schedules, where necessary, and integrating with other functions (i.e., package delivery, charter bus or exclusive taxi service). By such means, private firms have been able to provide service that is cheaper than can be provided by the public operator.

GROWING INTEREST IN PRIVATE SECTOR TRANSIT

Private operators are not only becoming interested in providing public transit services, but are also willing to invest new capital in capturing this market. In early 1984, there were no private operators interested in marketing their services nationwide. By the end of 1985 there were 13 such companies competing for opportunities, with new additions each month. This does not include a much larger number of regional companies that have entered the market during this period.

Over 90 percent of the respondents to a nationwide survey of private bus companies indicated their willingness to become engaged in the provision of public transit service. Furthermore, in interviews with these companies, there has been a noticeable increase in interest and competition over the past 12 to 18 months.

EXTENT OF CONTRACTING

According to an UMTA-sponsored study, $740 million (about 6.7 percent) of the nationwide total 1986 operating budget, was spent through contracting out for services. Of this, $239 million was competitively contracted. Most of the rest was for large contracts for rail services. For example, the Commuter Rail Division of the Chicago Regional Transportation Authority (RTA) contracted with private rail companies for $180 million in service.

Of 367 transit agencies reporting, 266 (68 percent) engaged in contracting. The breakdown of the competitive contracting expenditures was as follows: transit services, 24 percent; paratransit services, 32 percent; and maintenance services, 45 percent.

OBSTACLES IMPEDING GREATER USE OF PRIVATE OPERATORS

The major obstacles impeding private provision of transit are the consequence of two basic traditions in the provision of public transportation in the United States. One is the commingling of authority to set local transportation objectives with the

responsibility to deliver transit services. The other is the "single provider" tradition. Numerous costly impediments to private sector provision of services flow from these traditions. One visible and significant impediment has been the adoption of labor agreements which restrict management's right to contract out for services.

The principal obstacle to more competition in the provision of mass transit services is the fusion of policymaking and service provision in single areawide transit agencies. Such agencies are the norm thoughout the U.S. Typically, when the decision was made to establish a transportation program, generally in conjunction with UMTA grants to buy out private operators, a public agency was set up to finance and administer the program, and also designated as the sole provider of that service. Public agencies became both the purchasers of service on behalf of the taxpayers, and suppliers of the service. Thus, public transit officials saw themselves both as public policymakers and administrative managers of an operating enterprise.

This practice created an incentive for the public operators to increase their control over all the transit services in an area. As a result, between 1964 and 1981, there was essentially no attempt to encourage private participation.

A growing number of transit officials and legislatures are questioning the wisdom of requiring the prublic sector to perform both the policy and operation roles. A 1983 Advisory Commission on Intergovernmental Relations (ACIR) survey of transit officials

and other State and local officials involved in transit revealed that a majority preferred the concept of setting up a transit funding agency that could allocate funds among competing transit service delivery organizations (public and private) without being encumbered with service delivery duties of its own [Advisory Commission on Intergovernmental Relations, 1983]. Only 15 percent of respondents perceived this suggestion to be disadvantageous.

Many local elected officials no longer see a compelling need for these agencies to remain exclusive service providers for the entire region. They are inclined instead to view the transit agencies as merely one among several potential transportation operators, and to think of themselves as prudent purchasers of service in a competitive market. A continuation of this trend--of separating policy from operation--would be one of the key institutional changes needed to counterbalance the restricted choices of the past few years and bring healthy competition from private providers who are, in increasing numbers, able, ready and willing.

- Minneapolis-St. Paul, Minnesota, has probably taken the most far-reaching steps in the direction of sorting out and separating policymaking from operating responsibilities. A special legislative study commission has concluded that it is inherently wrong for a single agency both to provide transit service and to have a policymaking role that gives it the power to freeze out or discourage competition. A recent act of the State Legislature has separated the operating and policymaking functions, both of which were held by the Metropolitan Transit Commission (MTC). The MTC will retain responsibility for the day-to-day operation of the public bus system in the central city. A new Regional Transit Board will oversee planning, financing and policymaking and will serve as an arranger-of-service for the outlying areas. The Board will purchase service on a competitive bid basis from interested public and private operators, tailoring it to the needs of the individual communities. Thus, when the City of

Minneapolis, required by law to provide shuttle bus service to a new stadium, compared the cost of the services by MTC with those of a private operator, it elected to contract the service to the private operator at a savings of $900,000 per year.

- Another example of a separation of policy and operating roles is the Peninsula Transportation District Commission (Pentran), the public transportation authority serving Newport News and Hampton in southeastern Virginia. The Commission identifies the region's transportation needs and sponsors rathers than supplies services to meet these needs. The Commission coordinates a variety of services and service providers, including employer-based vanpool programs, private commuter buses to employment centers, shared-ride taxi service in low density areas and special services for the handicapped operated by social service agencies. The Commission retains certain system-wide functions, such as marketing and fare setting; all other functions are carried out by the operating elements, both public and private. This freedom to mix and match internally provided service with privately contracted service has saved local taxpayers over 50 percent in cost.

These examples--and others in Dallas, San Francisco and even in London, England--underscore a growing realization that government need not operate all public services, especially when such services can be delivered more efficiently and at a lower cost by the private sector. Furthermore, this division of responsibilities is practical regardless of the size and complexity of transit operations.

Other major obstacles flow from the way many U.S. transit agencies do business. Many labor agreements entered into by these agencies either prohibit or seriously inhibit the contracting out of services. State legislatures, such as those California, Illinois and Massachusetts, have acted to curb such restrictive labor agreements. Also, as discussed in Chapter 5, the labor protection provisions of Section 13(c) of the UMT Act have been

used by unions as leverage against the contracting out of services by local communities which receive UMTA grants.

Much remains to be done in removing these and related obstacles. Paramount in importance, however, is for local elected officials, planners and taxpayers to recognize the rewards of competition in the provision of transit services. In the face of such awareness, the egregious barriers to competition could fall of their own weight.

To foster competition, enterprising governments and agencies should be prepared to:

- Refocus government assistance from financial aid to actions that would foster more competition.
- Add private sector representation to policy decision boards related to the planning and operation of public transportation.
- Couple subsidies with incentives to spend more of the funds on competitive procurement practices.
- Use non-dedicated general revenue funds to subsidize transit, so that transit expenditures could be held in check by elected officials on a regular basis.
- Adopt a "management bill of rights" to protect management duties and responsibilities from being negotiated away in collective bargaining, particularly the right to contract out for services.
- Be consistently enterprising in the quest for competition so that a competitive environment is not eroded by private monopolies, bureaucratic red tape, bidding by unreliable providers, overly restrictive route specifications and other traps.

CONCLUSIONS

A more competitive environment in the mass transit industry would go far toward improving the quality of urban mobility in

America while controlling costs. A rich array of competing public and private services tailored to satisfy an increasingly diversified demand for services is needed, especially in burgeoning suburban areas.

The private sector has risen to the opportunities that have already emerged and is ready and able to take on the challenge in nearly every community across the country. Although there are still obstacles to overcome, most of those obstacles lie within the control of public policy and could be eliminated easily by public officials.

APPENDIX A: TRANSIT PERFORMANCE-- METHODOLOGICAL NOTES AND ADDITIONAL DATA

INTERNAL VERSUS EXTERNAL TRANSIT PERFORMANCE

In Chapter 5, the discussion focuses on the "internal" operating performance of transit--the operating efficiency of its production and effectiveness of its deployment--as opposed to "external" performance--the overall level and quality of this service and the resulting benefits to users and non-users. This section provides more detail on these concepts.

External transit performance is similar in concept to such factors of highway performance as level of service, congestion and ride quality due to pavement condition and geometric characteristics. Resulting highway benefits from improvements in these performance dimensions can include reduced travel time and costs for users and a variety of economic efficiency improvements for non-users. Measurement of these performance indicators for highways is now, after many years of research and training, a well established activity. Much information is also available to support the estimation of user and non-user benefits from changes in highway performance resulting from various types of investment. Measures of external transit performance, on the other hand, are not well established. Conceptually, they would be analogous to the highway measures and might include such factors as coverage, service frequency, service density, travel time, ride quality, crowding and comfort. Resulting benefits from changes in

performance along these lines would include reduced travel time and cost for users and economic efficiency improvements for non-users, much as for highway improvements. The body of knowledge which exists on these subjects is extremely limited, particularly on the impacts on performance and related benefits caused by various investments. Thus, this report provides only limited treatment of the external performance of transit, i.e. aggregate measures of factors such as coverage, service frequency and service density.

The report thus focuses on internal transit operating performance, about which more is known. A significant amount of recent work has been undertaken which addresses various ways of measuring and reporting the efficiency with which transit service is operated and its effectiveness in meeting certain goals. To assess internal performance, the report presents a range of indicators of labor and managerial operating efficiency and effectiveness selected on the basis of this research.

PRESENTATION OF TRANSIT PERFORMANCE DATA

Section 15 Data Adjustment

In 1983, UMTA changed the basis for its annual compilation of the reported Section 15 data from a fiscal year to calendar year basis. This created a discontinuity between the 1983 and prior years' summary reports because data for one-half the properties in the 1983 summary report (those whose fiscal years end between July and December) is two years later than their data in the 1982 summary report.

In order to make a fair assessment of trends and compute accurate performance measures, it has been necessary to adjust for this discontinuity by reconstituting the previously published FY 1980, 1981 and 1982 data into calendar years comparable to the 1983 report. This has been done by substituting the previously unpublished FY 1982 "transition year" data of the properties affected by the shift for their year-earlier data in the published 1982 report and shifting that data back to 1981; the previous 1981 data was shifted to 1980. As a result of this adjustment, aggregate data totals in this report for the years before 1983, while more accurately reflecting the transit universe, will not agree with those of earlier published Section 15 summary reports.

Missing Commuter Rail Data

Commuter rail services were not fully included in the Section 15 reporting scheme prior to 1984. In order to ensure consistency in the data used over the six year time span of the performance measures in this report, none of the data for commuter rail has been included in these computations. The APTA data used for long term trend analysis also excludes commuter rail. Commuter rail data has been included in profiling the current status of the industry.

While this adjustment allows for a valid portrayal of trends in operating performance for transit excluding commuter rail, it introduces a small bias in the patterns of performance. Commuter rail operating costs per unit of service are higher than for other modes. Thus leaving out commuter rail understates overall cost

per unit of service in areas with such service. Because commuter rail trips are very long, the number of passengers per unit of service are much lower than other modes, while the number of passenger miles per unit of service are higher. Thus service effectiveness of transit overall will vary in different ways when commuter rail is included. In terms of operating cost-effectiveness, the long trips lengths will cause similar differential effects when commuter rail is added, depending on whether operating cost per passenger or cost per passenger mile is considered. Overall, commuter rail operating costs amount to about 13 percent of national operating costs, 8 percent of vehicle miles of service, 3 percent of passengers and 16 percent of passenger miles.

Disaggregation Scheme

As noted in Chapter 2, the transit industry operates under widely diverse conditions. Thus a disaggregation scheme was developed to ensure that the data is presented in the most comprehensive and understandable way possible and to avoid masking differences between transit in different kinds of urban areas.

This scheme was selected after review of a number of statistically-developed urban area classification schemes. These previously developed schemes proved to be too cumbersome or difficult to understand or were designed for a different level of performance evaluation. The selected scheme represents a common-sense approach which satisfies the following criteria:

- It provides a small enough number of classes so that each contains enough areas to produce a meaningful value;
- It distinguishes properties and areas based on important policy variables;
- It separates the usually small operators in small urbanized areas from those in large; and
- It is sensitive to differences in urban environment.

The scheme provides for a breakdown by urban area size and modes operated, as described in Chapter 5, and by geographical location. The states included in the Regions used are as follows:

Region Name in This Report	UMTA Regions and States
Northeast	1, 2 and 3
Midwest	5 and Missouri and Iowa
South	4 and Louisiana and Arkansas
West	6 (except for Louisiana and Arkansas), 7 (except for Missouri and Iowa), 8 and Nevada, Arizona and Idaho
Pacific Coast	9 (except for Nevada and Arizona) and 10 (except for Idaho)

Presentation of Performance Indicators

The performance indicators are calculated as weighted (or pooled) averages of urbanized area totals, which are aggregates of all reporting operators in the urbanized area for which both data items in a measure are available (except for commuter rail as explained above). The individual operators reporting may not be the same in each year. All dollar values in the indicators are

reported in terms of 1985 dollars; the GNP Deflator has been used to convert earlier year data to this common base in order to account for inflation.

The use of urbanized area totals was selected over calculating indicators based on individual operators or individual operator-modes, based on two factors:

- For many transit operators, there are significant service interactions between modes due to shared resources (facilities, staff, etc.) and common passenger use. Therefore, it is not really valid to assess the performance of one mode independently of the other. For example, because the service effectiveness of Washington's rail system is dependent in large part on the buses that feed it, it may not be appropriate to evaluate the performance of the bus and rail systems independently.

- Decisions regarding the organizational form of transit operations are a local prerogative. In some urbanized areas, large regional authorities have been formed while in others, transit operations are provided by a number of smaller municipal systems. Such decisions may result in different performance levels but these are a legitimate aspect of transit management and the performance statistics should indicate their performance by property size. Size itself is a function of the decisions made about the amount and coverage of service and the number of systems serving the area.

The primary measure reported for each indicator is the weighted (or pooled) average of urbanized area values for all urbanized areas in a given size and geographic location class. This measure was selected as it is the most appropriate measure to combine statistics from several urbanized areas. Because areas of similar size are grouped, the performance of both large and small systems can be displayed as a weighted average. The weighted average will, within each group, account for the greater importance of larger urbanized areas--an important consideration

in designing policies to maximize benefits and minimize costs nationally.

GLOSSARY

APTA--The American Public Transit Association, a trade association of urban mass transportation operators and suppliers.

CBD--The central business district of an urbanized area as defined by the Bureau of the Census; essentially the central office and shopping core of the area, which may change between different censuses.

Central City--The local political jurisdiction (city) forming the core of an urbanized area; usually containing, under Bureau of the Census definitions, a population of at least 50,000.

Constant dollars--See **GNP Deflator.**

Current dollars--See **GNP Deflator.**

GNP Deflator--An index of the level of overall price changes in the economy (gross national product, GNP) assembled by the Department of Commerce and providing the best measure of inflation for comparison with price or cost changes of individual products or sectors of the economy. By contrast, the **consumer price index (CPI)** measures overall price change for a package of consumer goods purchased by a typical urban resident or worker and therefore does not measure the overall level of price change in the total economy as well as the GNP deflator does. The GNP deflator index can be used to adjust the values in a time series to eliminate the effect of inflation over time and allow a more accurate comparison to be made. This is known as converting **current dollars** (i.e., the actual measured value) to **constant dollars.** The actual measured value is adjusted by using the change in the index between the current year and the desired year of common measurement to remove the distortion caused by inflation during the intervening time period. After adjustment, the adjusted value(s) are referred to as constant measurement year dollars, e.g., constant 1984 dollars. When a time series of values has been so adjusted to remove inflation, the values are often referred to as **real** values or as reflecting a **real** change between two time periods. The index values for the GNP deflator used to make such adjustments in this report are (1972=100):

1965 -- 74.4	1979 --163.4
1970 -- 91.5	1980 --178.4
1974 --115.1	1981 --195.6
1975 --125.8	1982 --207.4
1976 --132.3	1983 --215.3
1977 --140.1	1984 --223.4*
1978 --150.4	1985 --230.6

*For this report, previously computed values in 1984 dollars based on this index value have been escalated to 1985 dollars using a revised 1984 value of 223.8 and the indicated 1985 value.

Linked trip--See **passenger**.

Metropolitan Statistical Area (MSA, formerly SMSA)--As defined and designated by the Office of Management and Budget, an MSA consists of the central county or counties containing an **urbanized area (UZA)** with a population of at least 50,000 and the adjacent or outlying counties which have close economic and social relationships with the central counties. An MSA, in contrast to the UZA, will therefore correspond with existing political jurisdiction boundaries, i.e., the county.

NPTS--The Nationwide Personal Transportation Study, conducted in 1969, 1977, and 1983 by the Bureau of the Census, is the primary source of national data on travel patterns and frequency, transit use for all purposes, and the characteristics of transit users versus all travelers.

Passenger--As reported in Section 15, estimated by APTA, and used in this report, a transit passenger or **trip** is any segment of any trip using a different transit vehicle. These **transit trip segments** are also known as **unlinked trips**, as distinguished from **linked trips**, which represent a single trip regardless of the number of different mode or vehicle changes involved. On average, one linked trip by transit may result in 1.6 unlinked trips, a factor which may have been increasing over recent years as new rail systems began operation and bus systems introduced timed-transfer route patterns. No uniform data is collected on linked trips, which would be a more meaningful measure of transit use than unlinked trips. Data from the **NPTS** differs from APTA and Section 15 in that what it reports as trips is closer to, but not the same as, a linked trip.

Real costs--See **GNP Deflator**.

Section 15--Section 15 of the Urban Mass Transportation Act of 1964, as amended, which requires recipients of Federal transit assistance to be subject to a uniform system of accounts and records and a reporting system. Section 15 reports are used in the apportionment of Federal transit assistance funds and are the primary source of data for this report.

Transit trip segment--See **passenger**.

Trip--See **passenger**.

Unlinked trip--See **passenger**.

UMTA--The Urban Mass Transportation Administration, a component of the U.S. Department of Transportation with delegation from the Secretary of Transportation to administer the Federal transit program under the Urban Mass Transportation Act of 1964, as amended (49 U.S.C. 1601 et seq.), and various other statutes.

UMT Act--The Urban Mass Transportation Act of 1964, as amended (49 U.S.C. 1601 et seq.).

Urbanized Area (UZA)--As defined by the Bureau of the Census, a core urban area of at least 50,000 population and its surrounding area of high residential density. Although this area will include the entire core political jurisdiction, the functional definition of the boundaries of an urbanized area will not necessarily correspond with any jurisdictional boundaries. See also **MSA**.

UZA--See **urbanized area**.

BIBLIOGRAPHY

Altshuler, Alan, James P. Womack and John R. Pucher, The Urban Transportation System: Politics and Policy Innovation, Massachusetts Institute of Technology, Cambridge, MA, 1979.

American Association of State Highway and Transportation Officials (AASHTO), 1987 Survey of State Involvement in Public Transportation, Washington, D.C., 1987.

AASHTO, A Study on Future Directions of Public Transportation in the United States, Washington, D.C., 1985.

American Public Transit Association (APTA), 1987 Transit Fact Book, Washington, D.C., 1987. Plus earlier editions.

APTA, "Transit Fare Summary: Fare Structures in Effect on June 1, 1985," Washington, D.C., 1985.

APTA, Transit Performance and Productivity 1975-1985: Improvements Through the Intergovernmental Partnership, Washington, D.C., 1985.

Bly, P. H., and F. V. Webster, The Demand for Public Transport, Report of the International Collaborative Study of the Factors Affecting Public Transport Patronage, Transport and Road Research Laboratory, Crowthorne, U.K., 1980.

Cevero, Robert B., Intergovernmental Responsibilities for Financing Public Transit Services, research report to UMTA, U.S. Department of Transportation, 1982.

Cevero, Robert B., Martin Wachs, Renee Berlin, and Rex J. Gephart, Efficiency and Equity Implications of Alternative Transit Fare Policies, research report to UMTA by Urban Planning Program, School of Architecture and Urban Planning, University of California, Los Angeles, U.S. Department of Transportation, Washington, D.C., 1980.

Charles River Associates (CRA), "Allocation of Federal Transit Operating Subsidies to Riders by Income Group," draft research report to UMTA, March 1986.

CRA, "Actions Being Taken by Transit Operators to Improve Performance," research report to UMTA, 1983.

CRA, "Some Empirical Evidence of the Negative Impacts of Section 13(c)," research report to UMTA, March 1986b.

Cox, Wendell, The Potential for Optimizing Public Transit Service through Competitive Contracting, research report to UMTA by American Bus Association, June 1986.

Fielding, Gordon J., Mary E. Brenner, Olivia de la Rocha, Timlynn T. Babitsky, and Katherine Faust, Indicators and Peer Groups for Transit Performance Analysis, research report to UMTA by Institute of Transportation Studies and School of Social Sciences, University of California, Irvine, U.S. Department of Transportation, 1984.

Fulton, Philip N., "Public Transportation: Solving the Commuting Problem?", Paper presented at the Transportation Research Board Annual Meeting, January 1982.

Gilbert, C. Gorman, Raymond J. Burby and Charles E. Feibel, Taxicab Operating Characteristics, Report by the Center for Urban and Regional Studies of the University of North Carolina at Chapel Hill, U.S. Department of Transportation, Washington, D.C., 1982.

Joint Center for Political Studies, Inc., Demographic Change and Worktrip Travel Trends, research report to UMTA, U.S. Department of Transportation, Washington, D.C., 1985.

Kemp, Michael A., Carol T. Everett, and Frank Spielberg, The Prospects for Public Transportation in U.S. Cities, The Urban Institute, Washington, D.C., 1982.

Lowrey & Co., "Financial Ratings of Proposed New-Start Fixed Guideway Projects," research report to UMTA, 1985.

Mayworm, Patrick, Armando M. Lago, and J. Matthew McEnroe, Patronage Impacts of Changes in Transit Fares and Services, research report to UMTA by Ecosometrics, Inc., U.S. Department of Transportation, Washington, D.C., 1980.

McDowell, Bruce D., "Governmental Actors and Factors in Mass Transit", Intergovernmental Perspective, Vol. 10, No. 3, Advisory Commission on Intergovernmental Relations, 1984.

National Governors' Association and National Association of State Budget Officers, Fiscal Survey of the States--September 1987, Washington, D.C., 1987.

Orski, C. Kenneth, and Heidi Zukoski, principal investigators, New Directions in Urban Transportation: Private/Public Partnerships, research report to UMTA by the Rice Center, Joint Center for Urban Mobility Research, Houston, TX., U.S. Department of Transportation, Washington, D.C., 1985.

Peat, Marwick, Mitchell & Company (PMM), State and Local Finances Review, research report to UMTA, 1985.

PMM, Study of Operator Absenteeism and Worker's Compensation Trends in the Urban Mass Transportation Industry, research report to UMTA, U.S. Department of Transportation, Washington, D.C., 1980.

Perin, Constance, "The Dynamics of Vehicle Operator Absenteeism", Transportation Research Record 1002: Labor and Manpower Management Issues, Transportation Research Board, National Academy of Sciences, Washington, D.C., 1984.

Perry, James L., and Lyn Long, "Extraboard Scheduling, Worker's Compensation, and Operator Stress in Public Transit: Research Results and Managerial Implications", Transportation Research Record 1022: Labor and Management Issues, Transportation Research Board, National Academy of Sciences, Washington, D.C., 1984.

Peterson, George E., Walter G. Davis, Jr., and Christopher Walker, Total Compensation of Mass Transit Employees in Large Metropolitan Areas, Urban Institute, Washington, D.C., 1986.

Petersen, John E., and Deborah Matz, "Trends in the Fiscal Condition of Cities: 1983-1985," a study for the Joint Economic Committee of the U.S. Congress by the Government Finance Research Center, Government Finance Officers Association, May 1985.

Pickrell, Don H., The Causes of Rising Transit Operating Deficits, Harvard University, Cambridge, MA, 1983. Reprinted by U.S. Department of Transportation.

Pickrell, Don H., "Comments on Federal Operating Assistance for Urban Mass Transit," statement presented to Subcommittee on Transportation, U.S. Senate Committee on Appropriations, May 1, 1985.

Pucher, John, "A Decade of Change for Mass Transit," Transportation Research Record 858, Transportation Research Board, National Academy of Sciences, Washington, D.C., 1982.

Rice Center, Joint Center for Urban Mobility Research, Dulles Corridor Rapid Transit Development Feasibility Report, research report to UMTA, U.S. Department of Transportation, Washington, D.C., 1985.

Ross, Andrew, "Bus Drivers' Burnout--Stress Takes Toll", San Francisco Examiner, Sunday, December 1, 1985, page A-4.

Rural America, Rural and Specialized Transportation: A Preliminary Directory of Operators, report to UMTA, 1985.

Teal, Roger F., Genevieve Giuliano and Edward K. Morlok, Public Transit Service Contracting, research report to UMTA, March 1986.

Teal, Roger F., "Transit Service Contracting: Experiences and Issues," paper presented at the Transportation Research Board, January 1985.

Touche Ross & Co., "Assessment of Transit Industry Capital Investment Practices," draft research report to UMTA, January 1986.

U.S. Department of Commerce, Bureau of the Census, Statistical Abstract of the United States 1985, Washington, D.C., 1985.

U.S. Department of Commerce, Bureau of Economic Analysis, "County and Metropolitan Area Personal Income 1981-84", Survey of Current Business, April 1985, pp. 41-45, Washington, D.C.

U.S. Department of Commerce, Bureau of Economic Analysis, "State Quarterly Personal Income 1978-84", Survey of Current Business, April 1985, pp. 36-38, Washington, D.C.

U.S. Department of Transportation, National Urban Mass Transportation Statistics, annual volumes of Section 15 summary reports and data diskettes, Washington, D.C., 1981 to 1984.

U.S. Department of Transportation, Nationwide Personal Transportation Study, a series of reports by the Federal Highway Administration for the survey years 1969-70 and 1977, Washington, D.C., 1982-1983.

U.S. Department of Transportation, 1983-84 Nationwide Personal Transportation Study: Summary of Travel Trends, Washington, D.C., 1985.

U.S. Department of Transportation, The Status of the Nation's Local Public Transportation: Conditions and Performance, Washington, D.C., 1984.

U.S. General Accounting Office, 20 Years of Federal Mass Transit Assistance: How Has Mass Transit Changed?, Washington, D.C, 1985.

U.S. Senate, Committee on Appropriations, Department of Transportation and Related Agencies Appropriations, Fiscal Year 1986, 99th Congress, First Session, H.R. 3244, Part 1, Hearings Before the Subcommittee on the Washington Metropolitan Area Transit Authority, pages 758-760, Washington, D.C., U.S. Government Printing Office, 1986.

Urban Mobility Corporation, Unsubsidized Transit Services: Potential to Meet Public Needs and Reduce Subsidy Requirements, research report to UMTA, December 1985.

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