

TRANSIT COOPERATIVE RESEARCH PROGRAM

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PB99-124273

TCRP Report 31

Funding Strategies for Public Transportation

Volume 1

Final Report

REPRODUCED BY: **NTIS**
U.S. Department of Commerce
National Technical Information Service
Springfield, Virginia 22161

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REPORT DOCUMENTATION PAGE

**Form Approved
OMB No. 0704-0188**

Public reporting burden for this collection of information is estimated to average 1 hour response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork reduction Project (0704-0188), Washington, DC 20503

1. AGENCY USE ONLY (Leave blank)

2. REPORT DATE
1998

3. REPORT TYPE AND DATES COVERED
Final Report

4. TITLE AND SUBTITLE
TCRP Report 31: Funding Strategies for Public Transportation: Volume 1: Final Report

5. FUNDING NUMBERS
H-7

6. AUTHOR(S) Price Waterhouse LLP, Arlington, VA



PB99-124273

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Price Waterhouse LLP
Arlington, VA

8. PERFORMING ORGANIZATION REPORT NUMBER
Project H-7

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
The Federal Transit Administration
400 7th Street, S.W.
Washington, D.C. 20590

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES Sponsored in cooperation with the Transit Development Corporation

12a. DISTRIBUTION/AVAILABILITY STATEMENT Available
2101 Constitution Avenue, N.W., Washington, D.C. 20418

from: Transportation Research Board

12b. DISTRIBUTION CODE:
unlimited

13. ABSTRACT (Maximum 200 words)
This report addresses the current state of funding for public transportation in the United States, the various circumstances that have contributed to today's funding environment, and specific strategies that transit agencies are pursuing to identify new sources of funding. The report is presented in two parts--a final report and a casebook. The former provides a national perspective on public transportation funding while the latter presents case-level information on innovative methods for generating revenue for public transportation capital and operating costs. The report will be of interest to federal, state, and local transportation officials, policy makers, and professionals concerned with funding for local public transportation services during the past decade and in the near future.

14. SUBJECT TERMS
Planning and Administration
Public Transit

15. NUMBER OF PAGES

16. PRICE CODE

17. SECURITY CLASSIFICATION
Unclassified

18. SECURITY CLASSIFICATION OF THIS PAGE
Unclassified

19. SECURITY CLASSIFICATION OF ABSTRACT
Unclassified

20. LIMITATION OF ABSTRACT

Report 31

Funding Strategies for Public Transportation

Volume 1

Final Report

PRICE WATERHOUSE LLP
Arlington, VA

with

MULTISYSTEMS, INC.
Cambridge, MA

and

MUNDLE & ASSOCIATES, INC.
Philadelphia, PA

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Subject Areas

Planning and Administration
Public Transit

Research Sponsored by the Federal Transit Administration in
Cooperation with the Transit Development Corporation

TRANSPORTATION RESEARCH BOARD
NATIONAL RESEARCH COUNCIL

NATIONAL ACADEMY PRESS
Washington, D.C. 1998

TRANSIT COOPERATIVE RESEARCH PROGRAM

The nation's growth and the need to meet mobility, environmental, and energy objectives place demands on public transit systems. Current systems, some of which are old and in need of upgrading, must expand service area, increase service frequency, and improve efficiency to serve these demands. Research is necessary to solve operating problems, to adapt appropriate new technologies from other industries, and to introduce innovations into the transit industry. The Transit Cooperative Research Program (TCRP) serves as one of the principal means by which the transit industry can develop innovative near-term solutions to meet demands placed on it.

The need for TCRP was originally identified in *TRB Special Report 213—Research for Public Transit: New Directions*, published in 1987 and based on a study sponsored by the Urban Mass Transportation Administration—now the Federal Transit Administration (FTA). A report by the American Public Transit Association (APTA), *Transportation 2000*, also recognized the need for local, problem-solving research. TCRP, modeled after the longstanding and successful National Cooperative Highway Research Program, undertakes research and other technical activities in response to the needs of transit service providers. The scope of TCRP includes a variety of transit research fields including planning, service configuration, equipment, facilities, operations, human resources, maintenance, policy, and administrative practices.

TCRP was established under FTA sponsorship in July 1992. Proposed by the U.S. Department of Transportation, TCRP was authorized as part of the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). On May 13, 1992, a memorandum agreement outlining TCRP operating procedures was executed by the three cooperating organizations: FTA; the National Academy of Sciences, acting through the Transportation Research Board (TRB); and the Transit Development Corporation, Inc. (TDC), a nonprofit educational and research organization established by APTA. TDC is responsible for forming the independent governing board, designated as the TCRP Oversight and Project Selection (TOPS) Committee.

Research problem statements for TCRP are solicited periodically but may be submitted to TRB by anyone at any time. It is the responsibility of the TOPS Committee to formulate the research program by identifying the highest priority projects. As part of the evaluation, the TOPS Committee defines funding levels and expected products.

Once selected, each project is assigned to an expert panel, appointed by the Transportation Research Board. The panels prepare project statements (requests for proposals), select contractors, and provide technical guidance and counsel throughout the life of the project. The process for developing research problem statements and selecting research agencies has been used by TRB in managing cooperative research programs since 1962. As in other TRB activities, TCRP project panels serve voluntarily without compensation.

Because research cannot have the desired impact if products fail to reach the intended audience, special emphasis is placed on disseminating TCRP results to the intended end users of the research: transit agencies, service providers, and suppliers. TRB provides a series of research reports, syntheses of transit practice, and other supporting material developed by TCRP research. APTA will arrange for workshops, training aids, field visits, and other activities to ensure that results are implemented by urban and rural transit industry practitioners.

The TCRP provides a forum where transit agencies can cooperatively address common operational problems. The TCRP results support and complement other ongoing transit research and training programs.

TCRP REPORT 31

Project H-7 FY '95
ISSN 1073-4872
ISBN 0-309-06263-2
Library of Congress Catalog Card No. 98-60092

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The members of the technical advisory panel selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and while they have been accepted as appropriate by the technical panel, they are not necessarily those of the Transportation Research Board, the National Research Council, the Transit Development Corporation, or the Federal Transit Administration of the U.S. Department of Transportation.

Each report is reviewed and accepted for publication by the technical panel according to procedures established and monitored by the Transportation Research Board Executive Committee and the Governing Board of the National Research Council.

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Published reports of the

TRANSIT COOPERATIVE RESEARCH PROGRAM

are available from:

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and can be ordered through the Internet at
<http://www.nas.edu/trb/index.html>

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AUTHOR ACKNOWLEDGMENTS

The research reported herein was performed under TCRP Project H-7 by Price Waterhouse LLP; Multisystems, Inc.; and Mundle & Associates, Inc. Price Waterhouse LLP was the contractor for this study. The work performed by Multisystems, Inc., and Mundle & Associates, Inc., was under a subcontract with Price Waterhouse LLP.

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FOREWORD

*By Staff
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This report addresses the current state of funding for public transportation in the United States, the various circumstances that have contributed to today's funding environment, and specific strategies that transit agencies are pursuing to identify new sources of funding. The report is presented in two parts—a final report and a casebook. The former provides a national perspective on public transportation funding while the latter presents case-level information on innovative methods for generating revenue for public transportation capital and operating costs. The report will be of interest to federal, state, and local transportation officials, policy makers, and professionals concerned with funding for local public transportation services during the past decade and in the near future.

This report is the culmination of the work performed under TCRP Project H-7, *Funding Strategies for Public Transportation*. The project was initiated to examine and summarize trends in public transportation revenue, expenditures, and funding. The objectives of this project were to (1) define and assess the current state of funding, in particular operating funding, for public transportation in the United States; (2) examine the performance of public transportation systems in the United States in light of expanding goals, expressed through recent federal mandates (e.g., the Americans with Disabilities Act of 1990, the Clean Air Act Amendments of 1990, Buy America requirements, and welfare to work legislation) coupled with declining federal assistance for transit operations; and (3) identify strategies transit agencies have been pursuing that address the need to identify new sources of funding for operating and capital expenses.

The findings of this project indicate that, between 1989 and 1994, total operating and capital funding levels for public transportation kept pace with inflation and overall service levels increased. This occurred despite a virtual freeze in federal operating assistance at about \$800 million during a period with 18.8 percent inflation. Many transit agencies in the United States have found alternatives to federal operating funding and have reduced costs. Agencies have turned largely to the farebox and to dedicated funding sources at the state, local, and jurisdictional levels. It is unclear what effect the most recent decreases in federal operating assistance (which are not reflected in the data used for this analysis) will have and whether or not alternative funding sources can continue to make up for a declining federal share. Transit agencies that have increased service levels during the past decade have generally expanded mandated or newer services (e.g., demand response and light rail) at the expense of more traditional modes (e.g., commuter rail, heavy rail, and bus).

The casebook presents 17 case studies of financing techniques used successfully by U.S. transit systems to improve their financial conditions. The cases, which address both capital and operating needs, are presented in two main categories: funds generated through external funding sources and transit-agency-generated funds. The case studies of funds generated through external sources include examples of dedicated local taxes, transit impact fees, creative use of federal funds, state infrastructure banks, and revolving loan funds. The

case studies on transit-agency-generated funds address capital expenditures, fare revenue enhancement, and creative use of transit assets and describe successful experiences with 12 different strategies (e.g., advance construction authority, cross border leasing, partnerships with the community, and leasing right-of-way).

Executive Summary

Research Objectives

The transit industry in the United States has experienced a number of changes in recent years. There have been demographic shifts in transit markets, policy initiatives, and funding changes at all levels — these changes have led to concerns about the ability of transit agencies to remain financially viable over the short and long terms. TCRP Project H-7 was initiated to highlight these issues and suggest solutions to this perceived growing financial “crisis” among U.S. transit agencies.

Over the past 30 years, transit agencies have been supported primarily by federal, state, and local funds, combined with fare revenues. However, many transit agencies believe that operating and capital costs are rising rapidly, in part because of policy goals and mandates, while farebox revenues and public funding — especially federal funding — are not keeping pace. Federal operating funding levels in particular have decreased significantly since 1994 and may be eliminated in 1998 except in the smallest urbanized and rural areas. As a result, many agencies have been compelled to adjust service levels and modify their funding strategies by increasing state and local shares and looking to non-traditional revenue sources.

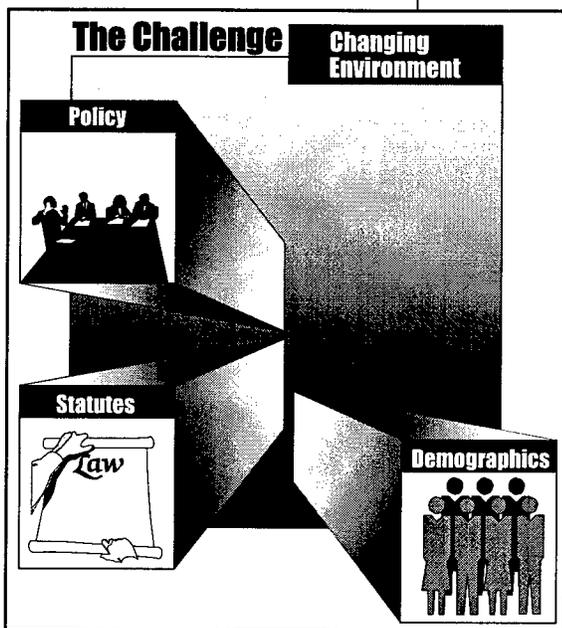
With this background, the objectives of this research project can be summarized as follows:

- **Define and assess the current state of funding for public transportation in the United States.** What trends are apparent in transit funding, particularly on the operating side? How is the funding tracking with the needs experienced by agencies in the face of expanding goals, particularly as expressed through recent federal mandates (e.g., transit access to the disabled)?
- **What have transit agencies had to do in their efforts to achieve these goals, given the funding environment?** What have agencies actually been able to achieve in terms of expanded services that respond to specific mandates as well as changing demographics? What have specific responses been in performance and other measures to the apparent inadequacy of funding for these changes?

- **What specific strategies have agencies been pursuing that address the need to identify new sources of funding?** In particular, are there strategies that have recently been developed or have been successful in the past but could find more widespread use?

In short, the goal of this research was to clarify the financial situation in the transit industry and to explore how the industry is dealing with its circumstances. Through a comprehensive review of the literature, an analysis of available data, the collection of information directly from agencies, and the exploration of industry funding innovations, this research provides findings and case studies that are useful to policy-makers and transit agencies. The former will understand the changing conditions that the transit industry has faced in recent years, and the latter will understand how their peers have reacted and what strategies they have applied.

Changing Market and Policy Environment



While every transit agency operates in a unique transportation and political market, public transportation across the nation has been affected recently by changing demographic (and, thus, demand) patterns, regulations, and statutes. Although transit agencies may support the goals of specific federal regulatory policies, there is significant and justified concern that substantial costs may be incurred without additional resources being made available. All of these have created new financial challenges for individual transit agencies as well as the industry as a whole. Challenges include the following:

- **Changing travel patterns are detrimental to the market competitiveness of transit vis-à-vis the automobile.** Travel is growing in market segments that are difficult or costly to serve by traditional public transportation. Examples include the growth in suburb-to-suburb home-to-work trips, trip-chaining behavior, and the spread of automobile-oriented, low-density suburban developments. "Edge cities" are also highly automobile-dependent and difficult to serve effectively with traditional transit services. The strongest metropolitan growth is occurring in the West and South, while in the Northeast and Midwest growth has slowed. However, all net population growth has been in the suburbs. Only

one-quarter of job growth is occurring in central cities, the traditional commuting market served by transit. It is precisely in suburban job markets, which have seen the majority of growth, that transit already has the lowest overall mode share among the markets it competes in: less than 5 percent versus an 11 percent mode share for central city destinations. Low-density suburban residential and work markets are more costly to serve on a per passenger basis.

Households without vehicles are a much more captive market for transit. However, their number seems to be bottoming out at about 10 percent of all households, in part because the out-of-pocket costs of commuting by automobile (not including maintenance and depreciation, which commuters tend not to consider as part of this cost) continue to decline in real dollars. Of these households, the majority are single-person (most often elderly people and women) and in central cities. In addition, one-half of vehicle-less households have no individuals in the active labor force.

- **Transit has had to comply with new federal regulations such as Buy America Act requirements and drug and alcohol testing.** The FTA, like most other public agencies, became subject to the Buy America Act and, since 1982, has been required to comply for all contracts and purchases, regardless of the amount; however, there is little evidence that these requirements increase transit operating or capital costs although they may limit the agencies' ability to keep costs down.

The Omnibus Transportation Employee Testing Act of 1991 required all FTA grant recipients to establish drug and alcohol testing programs by 1996 (1995 for large operators) in the interest of public safety. This program has had a significant cost impact. The costs for the first 5 years (1995-1999) have been estimated at a total of \$338.5 million, or an average of \$67.7 million per year. To put this average annual amount in perspective, it is equal to 9 percent of total 1994 FTA operating assistance.

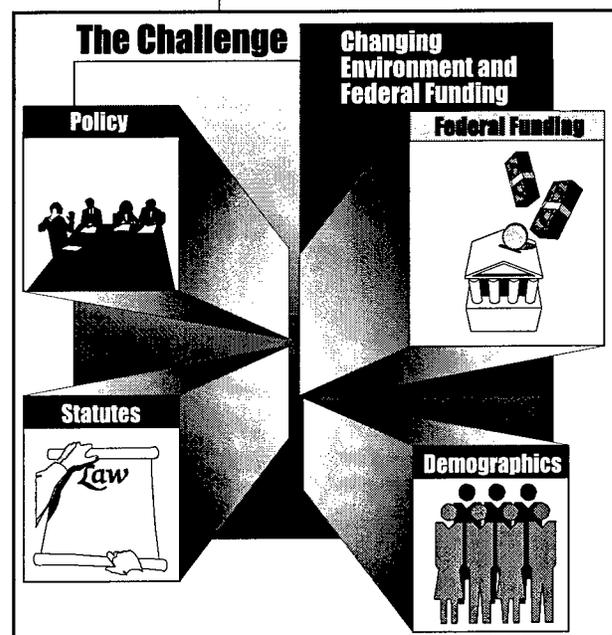
- **The Americans with Disabilities Act of 1990 (ADA) and the resulting USDOT regulations included significant requirements for public transportation providers with implications for increased supply of low cost-recovery transportation services.** These broadly included the following physical, service, and procedural requirements:
 - all new facilities (as well as key stations) and vehicles (or trainsets) must be accessible to people with disabilities;

- paratransit service must be offered to complement a fixed-route transit system;
- printed communication must be provided in accessible formats;
- special fares for users of ADA-mandated services must be no more than double the basic fare; and,
- personnel must be trained to serve passengers with disabilities equitably and to announce major stops.

The ADA requirements expand public transportation's market and bring social and economic benefits at a policy level (which do not appear to yet have been studied). These benefits, however, are balanced against the operating and capital budget impacts, where ADA is primarily evident as a series of costs. One of the more costly impacts for transit agency operating budgets is the rapid expansion of demand response paratransit service. Such service is typically higher quality than fixed-route services — passengers are picked up at their homes, drivers provide assistance to individual passengers, and vehicles must be specially equipped — and therefore costs far more to provide than fixed-route bus service. For example, in 1994, demand response service cost \$13.16 per passenger (on a nationwide basis) compared with \$1.98 for conventional bus, and fares for demand response services recover a much smaller percentage of costs even though they may be set higher than fares for the general public. In addition, although demand response accounted for less than 1 percent of all unlinked passenger-trips in 1994, it represented 4.2 percent of 1994 operating costs. Demand responsive transit ridership is growing rapidly (up 48 percent between 1989 and 1994).

Unfortunately, the data seem to indicate that while demand response usage is growing (measured in revenue-hours or in unlinked passenger-trips), the economic and market performance of this mode is declining. All three measures examined — cost-efficiency, cost-effectiveness and service-effectiveness — worsened since 1989. Although this would appear to indicate that demand response transit service is exhibiting decreasing returns, it is unclear whether the problem is service scale, scope, or density. In addition, these measures do not distinguish between existing and new services. The reason for the poor market performance is not immediately apparent: circuitry of travel paths may be increasing; contract services may be purchased on a per-passenger basis, offering few economies; or many passengers may require personal attention from the driver (*e.g.*, boarding/alighting assistance), limiting the volume of passengers transported per hour.

- **The Clean Air Act Amendments of 1990 (CAAA) and the Energy Policy Act of 1992 will affect transit agencies' costs well into the next century.** The impact of these acts will mainly be felt on the capital expenditure side as lower emission buses using new fuel types are purchased (mostly liquefied or compressed natural gas). These buses, at least initially, are somewhat more costly than conventional buses, and may be purchased sooner than the fleet replacement requirements warrant. In addition, new fueling equipment or facilities are typically required. On the operating side, though, there is no available information to track the incremental costs of using these buses, if any. The CAAA may have other impacts, as state and local officials try to reduce single-occupant vehicle (SOV) usage by expanding rail or rubber-tired transit services.
- **Most recently, 1996 legislation created a major shift in federal welfare policy,** resulting in huge new pressures to match current welfare recipients with jobs to enable them to become self-sufficient. States have been given the responsibility for developing programs to reduce their welfare rolls and, as a result, individuals face the prospect of limited welfare benefits. Somewhat belatedly in the welfare debate, there has been a recognition by federal leaders that one of the most daunting problems facing this so-called "welfare-to-work" effort is transportation. A large proportion of the targeted population has neither the automobiles nor the public transportation service that would allow them to gain access to the job markets. For example, while many welfare recipients who live in older-inner suburbs could look for jobs in the burgeoning retail and commercial markets in newer outer-ring suburbs, they are limited by a lack of transportation options. First, the very-low-density, automobile-oriented outer-ring suburbs may not be served by transit. Second, if there is public transit, travel often requires the job-seeker to endure a very long, indirect commute via the center city — a commute that may be time-prohibitive, especially given parental responsibilities.



The surface transportation reauthorization legislation that is expected to be passed in 1997 may include supplemental funding to address welfare-related transportation needs.

While the research team cannot speculate on the sufficiency of these funds to enhance transit services so as to play a larger role in the success of welfare-to-work, it is certain that agencies will be hard-pressed to support welfare-to-work transit needs given recent overall trends in funding. It is likely that many transit agencies will begin to review and possibly restructure some of their route networks.

Trends in Federal Funding

The history of public funding for transit since the middle of the 20th century has been one of flux. The proportion of support at each of the federal, state, and local levels has varied as has farebox recovery. Most recently, while total non-farebox transit funding has continued to grow faster than inflation (30 percent between 1989 and 1994 compared with 19 percent inflation), federal funding has remained largely constant (total federal funding grew only 8.7 percent from 1989 to 1994), and federal operating funds, in particular, have not increased at all. More recent experience (from 1994 to 1998) has shown continued decreases in federal funding (and federal operating funding in particular). These trends have, in many cases, compounded the financial pressures placed on transit systems through the legislated requirements and policy goals outlined above.

The actual level of federal funding provided can be tracked at the level of FTA obligations, which is what the FTA is actually able to distribute based not only on Federal Transit Act appropriations, but on other legislation (*e.g.*, flexible ISTEA funds) and the federal budget. (Full data were not available at the lowest level of detail — apportionments and outlays.) Total obligations in the operating funding categories have remained within the same \$800 to \$900 million range since at least 1988. In short, operating funding has not been escalated to keep pace with inflation in operating expenditure categories.

The balance of federal obligations each year is for capital programs (planning category funds are a negligible percentage of the total). The total federal capital funding amount has increased steadily since the early 1990s, to more than \$5.4 billion in FY 1995 (composed of a formula portion and a discretionary portion, which fluctuates each year as a function of the fund drawdown needs of the specific capital projects). Capital funding has also benefited from the flexible funding provisions enacted with the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). These provisions allow certain highway funds to be used for transit purposes if they meet ISTEA requirements. Flexible funds, which include the Surface Transportation Program (STP),

Congestion Management and Air Quality (CMAQ), and Interstate Substitution-Highways Program Funds, have become an important component of total FTA capital funding. Of the amount just indicated, flexible funds have risen to \$907 million obligated in FY 1995, or 17 percent of the total capital obligations that year. However, even if this funding continues to increase, it is limited to capital assistance and is unevenly distributed throughout the country.

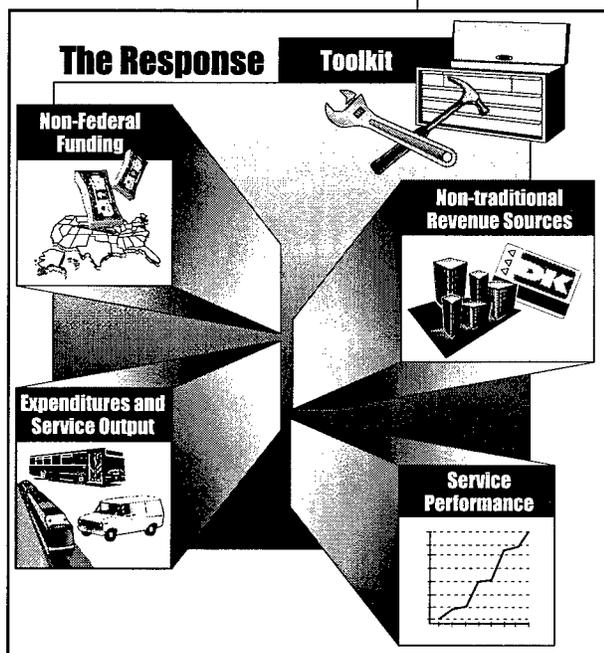
The disaggregate analysis of the National Transit Database (NTD) provided some important additional observations of federal funding for public transportation operations. While for larger agencies federal funding generally accounts for less than 5 percent of total operating funding, the reliance on federal funds increases as agency size decreases, up to nearly 30 percent. Small agencies are therefore more sensitive to changes in federal operating funding. Operating funding changes have varied considerably among agencies: specifically 33 percent have lost funding, the median agency gained 8 percent (which is a real dollar loss), while 25 percent of agencies saw at least a one-third increase. Thirty-three percent of large and medium agencies saw federal operating funding increases, but these increases lagged behind inflation. Because total operating funding has remained relatively stable, increases in operating funding for some agencies were offset by decreases in operating funding for others.

Federal funding is the largest source for capital expenditures although the percentage of total has declined. Federal funds have increased only slightly (and more slowly than inflation) while state and, in particular, local sources have grown rapidly to meet capital needs. Federal non-UZA (urbanized area) formula funds have increased somewhat. Other federal operating support increased 40 percent, but the dollar amounts were less than \$100 million a year. On the capital side, ISTEA's CMAQ and STP funds have begun to be utilized for public transportation projects, as mentioned above.

In conclusion, while federal regulations and policies have created new challenges for public transportation agencies, there has not been a concurrent increase in resources at the federal level, especially compared with inflation. This confirms the often-heard outcry of "unfunded mandates." While many transit agencies have been able to offset real declines in federal operating support from state, local, and other sources, agencies will face a worsening cost-revenue squeeze in the coming years.

Responses to the Financial Environment: Changing Transit Agency Funding, Services, and Performance Characteristics

The transit industry financial environment is undoubtedly weakened by the fact that the factors described above are for the most part, outside the control of transit agency managers. The question the research team has explored is: how have public transportation agencies responded to their changing financial situation? Agencies have sought new sources of financial support at the state and local levels, where the value of the services they provide is most evident. Agencies have sought to reduce the cost of their existing services or to increase productivity. Agencies have curtailed expansion of new services or even cut certain services back in an effort to balance their budgets.



This section examines the evidence for these actions, based primarily on detailed analysis of the NTD data as well as results of the survey of public transportation agencies. The research is not conclusive on the causal relationship (*i.e.*, to what extent was specific agency behavior a function of the changed environment). Yet the findings are instructive in terms of understanding how agencies have "made ends meet" in the recent environment and how they may adapt in the future.

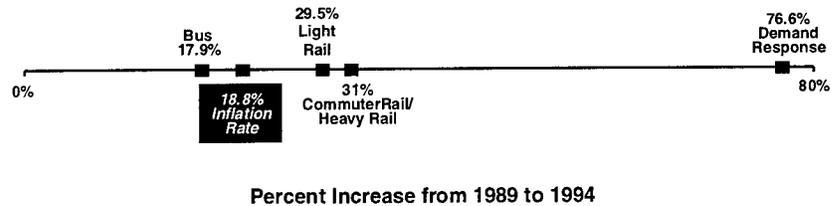
Funding from Non-Federal Sources & Fares

Because federal funding has not kept pace with inflation nor subsidized the costs associated with federal mandates, transit agencies have had to look elsewhere for funding. These non-federal sources appear to have "filled in" the funding gap. Yet the question remains: could the transit industry have captured *more* of the transportation market than it currently has if higher levels of federal and other funding were available for better service levels and quality?

- **Fares have generally kept pace with inflation** — the median fare increase was 20 percent between 1989 and 1994, versus 19.5 percent CPI growth — with larger increases occurring at the medium size agencies (25 percent increase in median). Examining trends by mode, the research team found that agencies without rail service (*i.e.*, those typically with bus and demand response service only) increased fares slightly less than inflation, while all agencies with rail service (most having bus as well)

increased fares well above inflation. For the relatively small number of agencies with demand response service only (*i.e.*, no bus or rail), the median fare increase was very high. See the graphic on Increase in Passenger Fares for a comparison of modes. These fare increases may prove counter-productive in an era when transit is struggling to maintain market share and to continue to serve lower income groups and people with few mobility alternatives (including people with disabilities), and yet may be the only option available to some agencies. The largest fare increases occurred among the modes with the lowest farebox recovery rates.

**Increase in Passenger Fares by Mode from 1989 to 1994
Median System**



- **Dedicated funding for operations** (which includes dedicated taxes and other dedicated funds at the state, local, and agency-jurisdiction levels) has become the **fastest growing component** of operating funding, increased by one-half in the time period analyzed, making it the second largest component in 1994 (\$5.38 billion out of a total of \$17.35 billion) behind farebox revenue (\$6.47 billion). This indicates an interesting and significant shift of funding responsibility directly to the communities that benefit from transit — in most cases, dedicated taxes were voter-approved. By contrast, state and local funding for public transit operations from *general revenue* sources (which is not voter-approved) has actually dropped in nominal dollars.
- State and local funding for capital expenditures has grown well ahead of both federal funding and inflation. Again, **dedicated capital funds** (from dedicated taxes and other dedicated sources at the state, local, and agency-jurisdiction levels) have seen a tremendous jump, **more than tripling** in 1994 from 1989 levels (to a sum of \$1.49 billion in 1994), reaching a magnitude second only to federal capital funding (\$2.33 billion in 1994). It would also appear that voters and communities have found dedicated funding, when related to specific capital programs, to be a reasonable response to declining federal funding for public transportation capital costs. FTA funds increased a total of 6 percent from 1989 to 1994, which was a real decline in comparison with 18.8 percent inflation.

Expenditures and Service Output

Total expenditures for public transportation have increased only slightly faster than inflation on both the operating and capital sides. In general, agencies must adjust their activities and plans so that their budgets balance (with the notable exception of certain agencies who are able to smooth short-term funding changes through the use of debt instruments). Thus, it is natural to see that total expenditures have tracked with total funding (including farebox revenue).

The research team conducted a telephone survey of 29 transit agencies to determine how transit systems have responded to the changing market situation. The survey found that, despite the funding concerns and some specific agencies having to implement major service cuts, transit service, in general, increased from 1989 to 1994. A large part of the expansion was in ADA-mandated paratransit service while, in some cases, there had been rail service expansion (along with a realignment of feeder bus routes). At the same time, it was also evident from the

surveys that some transit agencies have delayed service expansions and investments as a result of the near-term expansion of ADA services. In summary, while the specific experience of different transit agencies has spanned from crisis management to management of difficult funding pressures, transit has in general stayed the course.

Vehicle Revenue-Hours (in millions)

By Mode	1989	1994	% Change
Commuter Rail	6.1	6.2	2.4%
Demand Response	10.7	19.5	82.7%
Heavy Rail	26.2	25.0	-4.6%
Light Rail	1.7	2.3	38.4%
Bus	115.0	122.9	6.8%
Other	2.2	4.2	8.9%
TOTAL	161.8	180.1	11.3%

Transit supply has increased overall and in all regions of the United States as measured in revenue-miles and revenue-hours. (Revenue-hours were reviewed more closely because labor costs are the largest component of operating expenditures.) Revenue-hours increased by 11.3 percent from 1989 to 1994 (from 161.8 million to 180.1 million), as indicated in the table on Vehicle Revenue-Hours. However, this total belies the important differences among modes.

Demand response service increased dramatically — a result primarily of ADA implementation — and light rail saw significant increases as well — a number of medium-sized cities added or expanded this service during the 1980s and 1990s. On the other hand, heavy rail, commuter rail, and small bus systems nationally demonstrated a higher percentage of service reductions (50 percent of heavy rail systems, 30 percent of commuter rail

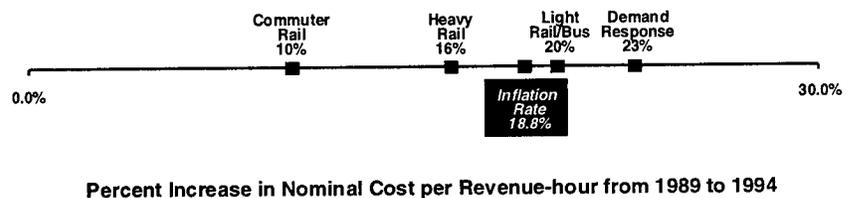
systems, and 41 percent of small bus systems experienced service level decreases). For heavy and commuter rail, these decreases may be tied to reduced ridership and decreased funding in the larger metropolitan areas where they operate. Small bus system service decreases are probably more symptomatic of funding cuts. All told, the medium-sized agencies saw the most consistency in increased service (77 percent experienced revenue-hour increases). Interestingly, this agency type also saw the greatest increase in median fares (22 percent increase for medium-sized agencies versus 17 percent for large agencies and 20 percent for small agencies).

Performance

Transit agency and transit modal performance are summarized in the paragraphs below. In short, funding pressures do not appear to have forced transit agencies to improve cost-efficiency, cost-effectiveness, or service-effectiveness.

- **Cost per revenue-hour** (which indicates cost-efficiency) increased approximately in line with inflation (18 percent from 1989 to 1994 on average for all modes of transit service versus 18.8 percent inflation). However, a look at the distribution showed that cost-efficiency performance differed by mode. The modes which experienced largest the median decrease in efficiency were light rail (20 percent increased cost per revenue-hour) and demand response (23 percent increase), the two modes expanding most significantly, indicating *decreasing* returns-to-scale (*i.e.*, for each additional revenue-hour, the cost for providing the service increases over the previous cost per revenue-hour) or increasing absolute costs. Commuter and heavy rail both saw improvements in cost-efficiency because the cost per revenue-hour of service increased only 10 percent and 16 percent while the inflation rate was 18.8 percent. See the graphic on Increase in Cost per Revenue-Hour for a comparison of modes.
- Overall, **cost per passenger trip** (which indicates cost-effectiveness) increased faster than inflation. The increase was dominated by the worsening performance of demand response (48 percent increase) and bus service (32 percent increase). The average (not median) cost per passenger trip for demand response and bus modes went from \$8.94 and \$1.50, respectively, in 1989 to \$13.24 and \$1.98,

**Increase in Cost per Revenue-Hour by Mode from 1989 to 1994
Median System**



respectively, in 1994. While demand response was unable to benefit from size economies, bus was unable to cut service or other cost elements as fast as ridership declined. Light rail (and commuter rail), on the other hand, appeared to take advantage of increased passenger-trips to reduce average operating costs per passenger in comparison with inflation (*i.e.*, light rail - 12 percent increase, commuter-rail - 10.8 percent increase). The average cost per passenger trip for light rail and commuter rail modes were \$1.30 and \$6.27, respectively, in 1989 and \$1.46 and \$6.94, respectively in 1994.

- Heavy rail cost per passenger trip increased 19.8 percent, only slightly above inflation (18.8 percent) for the same period. Interestingly, while average cost per revenue hour increased only 7.2 percent (compared with increases of 11.2 percent for commuter rail and 19 percent for bus services), median cost per revenue-hour increased 16 percent. This implies that increases in cost per revenue-hour varied more from agency to agency for heavy rail than for either bus services or commuter rail.
- Service-effectiveness, as measured by **unlinked passenger-trips per revenue-mile**, improved overall, especially at the smaller transit agencies. Echoing trends in cost-effectiveness, median results (agency with service-effectiveness measure in middle of sample) for demand response worsened (a 10 percent decrease), while light rail improved (an 11 percent increase). At an agency level, a downward trend in service-effectiveness indicates either that fewer passengers were carried on unchanged service or that service was added in lower-density areas.

It appears that the costlier transit modes to operate (demand response and light rail) are precisely the modes that are being expanded. Light rail has the highest cost per revenue-mile and second highest cost per revenue-hour (although it has comparatively low cost per passenger) while demand response has the highest cost per passenger-trip. More troublesome is that these modes may be exhibiting decreasing returns to scale: unit cost-efficiency measures (cost per revenue-hour) worsened as output increased. Remember that capital costs are not included in these operating performance measures, so that the decreasing average costs normally associated with capital-intensive investments (and which result from the effects of the high initial investment and low marginal cost of transporting each passenger) are not present. Alternatively, new systems brought on line may be starting off with lower cost-efficiency.

Demand response, with worsening cost-effectiveness and service-effectiveness performance, may be subject to the effects

of non-optimal networks and dispersed irregular passenger demand (and in some cases non-optimal purchased service agreements). These trends should be of real concern; it is not clear that increasing returns to scale will be achievable for demand response services designed to satisfy ADA. The average (not median) cost of transporting a passenger on demand response transit increased from \$8.94 to \$13.24, a change of 48 percent — which far outpaced inflation in this 1989 to 1994 period. Similarly, the average revenue-hours per passenger-trip performance measure for demand response increased 26 percent, from 0.29 to 0.37.

Understanding the Implications of the Findings

Over the course of this research project, a picture emerged of the extent to which a funding crisis exists for transit agencies, how agencies have reacted to increased responsibilities and limited funding, and the resulting trends in transit services provided and transit performance measures. The funding limitations have resulted in tougher choices among competing service priorities for transit managers including deferrals in projects and service changes and improvements. This may have resulted in slower growth than would otherwise have occurred, although it has not stifled growth altogether.

The requirements laid out by ADA have led to a channeling of resources and growth to the demand response mode. Unfortunately, among all of an agency's services, demand response is typically among the lowest in terms of cost-efficiency and cost-effectiveness. This situation is making it increasingly difficult for transit to keep pace with its primary competition — the private automobile.

The research team has found that the gap between growing nominal operating expenditures and federal subsidies has been bridged primarily through a rapid increase in dedicated funding sources. These include dedicated taxes and other dedicated funds at the state, local, and agency-jurisdictional levels. Dedicated funds are now the largest funding component behind the farebox. An often expressed concern is that this cannot go on much longer; that states and localities, whether through general or dedicated revenue, will not be able to make up further relative declines in federal support. In 1994, federal operating funding amounted to about \$900 million, while state and local operating funding (including dedicated and general funds) reached \$9 billion. The non-federal subsidies would need to increase an additional 10 percent (above the rate of inflation) to cover the federal share. In fact, recent FTA operating appropriations indicate that future operating funding decreases are likely: 1997

appropriations for operating assistance are \$400 million, with 1998 decreasing to less than half this figure.

Total farebox revenues continue to constitute, on average, just over one-third of transit's total operating funds. While the majority of agencies have continued to increase average fares, only about one-half of the increases have been ahead of inflation. The greatest fare increases were at mid-sized transit agencies at both those providing only demand response service and those with light rail, bus, and demand response services (*i.e.*, those agencies with the lowest farebox recovery). It is not clear from this analysis what direct impact fare increases generally in line with inflation have had on transit's ability to fulfill equity and mobility goals. However, automobile out-of-pocket costs have increased well below the rate of inflation, fueling the perception of transit as a more expensive mode for the markets it serves.

On the capital side, the federal government still maintains the largest funding role, underpinning capital investment in all modes and settings across the country. Thus, capital funding appears stable and is anticipated to continue in the future. However, capital funding is often earmarked for specific projects and is not evenly distributed among agency types and sizes.

The long-term demographic changes in the United States have meant a loss of riders in "traditional" modes (commuter rail, heavy rail, and bus) and in larger and older metropolitan areas. The reason is partly because *both* lower-density residential patterns and more dispersed job growth patterns are harder (or at least more expensive) to serve effectively through the mass transportation of passengers. This loss has likely been compounded by the fact that funding pressures and cost-intensive mandates have made it more difficult for agencies to develop innovative services to respond to the changing demographics of the populations they serve. Those agencies dealing with the need to reduce service levels (*e.g.*, headways) or service quality (*e.g.*, less frequent cleaning) due to funding reductions would clearly have a harder time focusing on service improvements.

Demand response service is almost by definition a less efficient mode than higher capacity, fixed-route/guideway service. Its basic characteristic — reinforced by ADA — is that it serves a more dispersed population that cannot use or has difficult access to a nearby fixed-route, higher capacity mode. Despite the problems inherent in this goal, an increase in efficiency and effectiveness may still be possible in the future (*e.g.*, through new dispatching or vehicle location technology).

Light rail service has grown and attracted new ridership at a faster rate than other modes from 1989 to 1994. Its

effectiveness measures appear to be improving; however, cost-efficiency remains a problem in particular at the newer light rail services. These services may still be in an increasing marginal cost phase, as new systems come on line and expand. (Remember that the efficiency measure includes operating costs only, so that the common notion of decreasing marginal cost in a capital-intensive industry does not automatically apply.) While this mode has experienced an increase in popularity compared with heavy rail and bus service, it requires high upfront capital expenditure and is best suited to relatively high density corridors. On both points above, relating to demand response and light rail modes where most of the service expansion has taken place, the next 5 years of data and experience may see further significant changes.

Implications for Future Strategies

The findings of this research project do not seem to indicate, therefore, that there is an imminent, widespread financial “crisis” in the industry with transit services failing ubiquitously. Nevertheless, it is fairly clear that transit agencies have had to focus their efforts on finding alternatives to federal operating funding and have had to channel much of their limited operating resources into meeting ADA requirements. Agencies that have expanded light rail services also have to deal with the budget consequences of a mode that, while successful in carrying passengers, appears to have some youthful problems of relatively low cost-efficiency. This is not to say that no agency has faced a crisis. The aggregate picture often masks the disaggregate one, namely that there *are* agencies that have had to cut service dramatically or been forced to put off service improvements and expansions that would allow them to keep pace with growing travel needs and maintain their mode share.

Detailed data for the post-1994 period was not available from the FTA at the time of the analysis. As an aggregated level for the years since 1994, federal operating funding has continued at its apparently “frozen” annual level of under \$1 billion, although data on appropriations through 1998 indicate that operating assistance is likely to decrease significantly (1998 FTA Operating Appropriations are \$150 million, or 15 percent of the 1994 level). State and local sources presumably have had to make up the difference, at least covering expenditure increases related to inflation. However, inflation has generally been low (compared to historical levels in the United States) and the economy relatively strong suggesting that dedicated tax sources, which have become so prominent in funding transit, have been robust. The situation may not have worsened since then, at least not for the transit industry as a whole. Nevertheless, the past is not

necessarily a good guide for the future, and the funding picture may worsen. It would be dangerous to conclude that transit as an industry is doing well despite weakening federal funding. A more appropriate depiction would be that it has been able to cope with the past funding decreases and the federal mandates mainly through the increased support of states and localities. Whether or not these funding sources will continue to be able to increase to make up for future declines in federal funding is a critical question.

The most recent challenge to transit agencies, the financial effects of which are not yet evident, is the move to full ADA compliance intended to be completed in 1997. Indications are that some agencies will need more time to fully implement the required changes and services — in particular demand response services. From 1994 through 1997, demand response service and expenditures have continued to increase and have had further impacts on agency budgets.

The case studies (performed as part of this project) of non-traditional and innovative funding strategies point to several strategic approaches for transit agencies to continue to augment their financial resources in the future. (Revenue-enhancement strategies were explored in a separate TCRP Project A-1 [1995].) Some of the strategies can provide significant resources for major expenditure elements, while others provide smaller-scale (in terms of budgetary impact), though certainly helpful, returns. They form part of a menu of funding sources that is inexorably expanding beyond the traditional sources of public support. The case studies are provided in Volume 2, under separate cover in the *Project H-7 Casebook – Funding Strategies for Public Transportation*, and are organized into three groups as follows:

- **Partnerships with the private sector and transit users.** Transit agencies will increasingly work directly with their customers, in terms of tying specific services to funding sources. Whether through direct funding of university area services, partnerships with local businesses, or local, regional, and state taxes, transit agencies can go to the users to find out what kind of service they want, provide it, and ask them to help pay for it. The broad shift in operating funding to dedicated sources at the state and local levels is also reflective of a move closer to the users and beneficiaries of transit service. Partnership with the private sector may be with suppliers (e.g., progress payments for vehicle purchases, compressed natural gas suppliers), investors (e.g., cross-border leases), developers (e.g., turnkey facility development, joint development of stations), and retailers (e.g., credit card fare payment using ticket issuing machines). Partnerships with groups of users

(or indeed entire communities) include impact fees, local sales or utility taxes, direct operating support, and the use of passes such as Denver's "Eco Pass."

- **Utilization of assets to maximize value.** Transit agencies possess a range of assets with substantial commercial value. Both rolling stock and real property often have untapped revenue potential. For example, vehicles possess value for advertising and leasing, stations for joint development and concessions, and rights-of-way for telecommunications infrastructure. The accumulated public investment in these assets can generate private sector benefits from which a portion can be directed back to the transit agencies.
- **Leveraging scarce dollars.** In addition to obtaining value from their assets, transit agencies should be able to take advantage of other financial leveraging mechanisms, many of which have been available to other public infrastructure sectors for some time. These mechanisms include revolving loan funds and credit enhancement as well as advanced construction authority. Most involve the use of debt financing, which is not new to the transit industry, especially among larger agencies. In the future, its use could become more widespread with lower costs. At the same time, agencies will have to take care to not become over-leveraged, putting their future at risk to finance the present.

While researching the case studies as well as during presentations at APTA conferences, we found that many transit agencies of varying sizes were interested in the strategies presented. It would appear that many of these ideas, although not new for federal and national industry observers, still offer substantial potential to agencies across the country. No one strategy will resolve a major funding crisis at a particular transit agency. But where applicable, many strategies could prove to be useful tools to address funding needs — the dissemination of this information is one important goal of this research.

Ideas for Future Research

The findings of this research project also suggest research areas that could provide further benefits to the industry. These are as follows:

- **Development of Econometric Behavioral Models**
The National Transit Database is a very rich, disaggregate source of information on transit agency funding, service, costs, and performance. In this research project, the data were used to observe average figures and the distribution of changes in a number of measures. Econometric models

could be used to better understand transit agency behavior and responses in the recent past as well as to predict transit agency performance. There is sufficiently detailed information in the database, which could be combined with census data, labor statistics and other information, to develop complex multivariate models representing transit agencies and their markets. These models could also examine whether agencies targeted low-productivity and low-revenue routes in making specific service changes.

● **Case Studies of Both Best Performers and Most Troubled Transit Agencies**

In accordance with the working plan for this research project, the case studies were focused on identifying non-traditional and innovative funding practices that could find wider application across the U.S. transit industry. Additional case studies could be undertaken to focus on transit agencies that have fared particularly well or particularly poorly in the recently changing transit market, policy, and funding environment. The objective would be to understand what characteristics of the agencies and what specific actions taken by the agencies have led to one of the extreme results. Lessons could be drawn from this analysis that would be useful both to policy-makers and transit managers.

● **Research on Improving the Performance of Demand Response**

Demand response service has been the fastest-growing segment of transit service in the United States, overtaking all rail modes (individually) in vehicle-hours, although it has remained a distant second to bus service. The findings of this research project indicate that the cost-efficiency and cost-effectiveness of this mode has been worsening (at least through 1994). In addition, the cap on demand response service fares for people who are elderly or have disabilities (*i.e.*, double an agency's fare for the comparable route service) makes it a mode that has a relatively low farebox recovery ratio. Given these facts, it would seem timely and very relevant to explore the fundamental economics of providing this type of service. What drives the higher cost per unit of providing this service, and what can be done to improve cost-efficiency and cost-effectiveness? Can more optimal methods be developed for scheduling pickups and dropoffs? Can different types of contracts be developed to control costs using purchased service providers? It may even be relevant to discuss certain cases in low-density areas where it may be more cost-effective to provide *only* demand response service rather than supplementing fixed-route bus service.

- **Policy and Economic Research into the Appropriate Federal Role in Transit Capital and Operations**

Federal attention to operating funding for transit has clearly waned, while support for transit capital programs has continued. Lower levels of government including states, localities, and transit agencies' own jurisdictions (e.g., regional transportation authorities) have stepped in to largely fill the gap. As transit is often looked upon as a public service, calling for government support, what level of government should that support come from? Should it be state and local government that is most concerned with "purchasing" (through operating support) certain levels of transit service? What is the advantage of capital investment being financed (at least partially) by Congress, while operating support becomes the unique purview of more local levels of government. The answers can be explored through policy/institutional analysis as well as economic analysis. The federal transit funding strategy pursued in recent years may, in fact, be driven by ideology more than sound economic theory and practice. This research might help understand the advantages and disadvantages of this direction for the nation's transportation system.

Chapter I

Introduction

The transit industry in the United States has undergone a number of changes in recent years. These changes have come in many forms — demographic, structural, policy-related, and funding-related — and have led to concerns about the ability of the industry to finance itself currently and, especially, in the future. TCRP Project H-7, *Funding Strategies for Public Transportation*, was initiated to highlight and suggest improvements to the current and anticipated financial situation in the U.S. transit industry.

While there is general agreement that the financial condition of most transit agencies has worsened over the past decade, there is no clear picture of the specific trends that have occurred in response to recent changes. This report discusses the history and potential future of transit funding and reflects the results of the research team's analysis of the actual trends seen in the industry.

Overview of the Transit Funding Environment

Over the past 30 years, transit agencies in the United States have been supported primarily by federal, state, and local funds combined with fare revenues. Recently, many transit agencies have experienced rapidly rising operating and capital costs, in part, because of policy goals and mandates, while both farebox revenues and public funding — especially federal funding — are not keeping pace. As a result, many agencies have adjusted their funding strategies by increasing state and local shares, looking to non-traditional revenue support, and turning to financing approaches less common in the transit industry.

Many transit agencies have had to contend with the costs associated with broadening policy goals. At the same time, elements of transit provision continue to demand more financial resources. The labor-intensive nature of the public transit industry, the increasing maintenance needs of older systems, a growing list of government mandates, and the suburbanization of jobs and residences have combined to burden many agencies' cost and revenue structures. The new markets created, such as

suburb-to-suburb commuting, appear to provide even lower cost recovery than the traditional transit services they are supplementing or replacing. This has led to a general apprehension about the growing gap between operating expenses and revenues.

Given the recent nationwide trend of reduced government financial support for public services, it seems likely that increasing financial needs are further straining traditional funding sources. The annual debate over federal funds and discussion over the future of federal operating funding assistance have only increased the concerns of transit providers and advocates.

Transit agencies are required to comply with a series of unfunded federal mandates at the same time as they are faced with reductions in federal funding. The most commonly cited — and among the most costly — mandates include the Americans with Disabilities Act (ADA) (which requires full compliance by January 1997) and the Clean Air Act Amendments (CAAA). However, they are not the only public policy mandates governing provision of public transportation. At the state and federal levels, requirements include ISTEA-related transit management systems (including congestion management), reduced fares for patrons who are elderly or have disabilities, labor protections, emission reductions, drug and alcohol testing, procurement provisions, and rural intercity bus services. Moreover, transit is being looked at as a key element in the return of welfare recipients to the active labor force across the country in urban, suburban, and rural settings.

Also of significant concern are the implications of new capital investment on existing services. For example, there are suggestions that funds may be diverted from existing services in order to pay for new rail lines or complementary paratransit services. There are long-term financial impacts of trying to serve suburban development. There are also indications that ADA compliance is causing severe hardship for some transit systems. This dispersion of resources across additional services is likely to create long-term financial difficulties for many agencies.

Transit costs have historically been financed jointly by transit users and taxpayers. As these sources appear to become more limited and uncertain, transit systems and government agencies are increasingly interested in alternative sources of funding. Innovative funding practices include the developing of non-traditional revenue sources (*e.g.*, non-farebox revenue from concessions), adopting private sector methods (*e.g.*, turnkey development), securing tax increments, benefit sharing/value capture strategies, use of property rights, privatizing or contracting out services, new fare structures or payment

mechanisms, capitalizing operating costs, subsidies, cross-border and other leasing techniques, and greater use of debt financing. The available techniques can be used for financing capital projects and have applications for operating expenses. The intent is both to make up for public funding deficiencies and better leverage existing revenue sources and assets.

Objectives of this Study

In light of the above issues, the research objectives were defined as follows:

- **Define and assess the current state of funding for public transportation in the United States.** What trends are occurring in transit funding, particularly on the operating side? How is the funding tracking with the needs experienced by transit agencies in the face of expanding goals, particularly as expressed through recent federal mandates (e.g., transit access to those with disabilities)?
- **What have transit agencies had to do in their efforts to achieve these goals given the funding environment?** What have agencies actually been able to achieve in terms of expanded services that respond to specific mandates as well as changing demographics? What have specific responses been to the inadequacy of funding for these changes?
- **What specific strategies have agencies been pursuing that address the need to identify new sources of funding?** In particular, are there strategies that have recently been developed or have been successful in the past that could find more widespread use? The focus is on strategies that generate additional funds for operations or reduce the need for new operating funding.

In short, the goal of this research was to clarify the financial condition in the transit industry resulting from the issues outlined above and explore how the industry is dealing with it. Through a comprehensive review of the existing literature, an analysis of available data, the collection of information directly from agencies, and the exploration of industry funding innovations, this research results in findings and documents that are useful to both policy-makers and transit agencies. The former will understand the changing conditions that the transit industry has faced in recent years; the latter will understand how their peers have reacted, what strategies they have applied, and how successful those strategies have been.

Approach to the Research Project

The research was organized into separate tasks, each of which involved a different form of information collection and analysis, intended to satisfy one or more components of the research objectives. The major task activities were as follows:

- **Comprehensive literature review and collection of data on national trends.**

This entailed a review and summary of existing literature on national trends and future projections in operating and capital funding and expenditures, the impact of federal regulations and mandates, and innovative funding and financing strategies.

- **Examination of the impacts of trends and mandates on transit services using the National Transit Database (NTD) and development of performance indicators.**

This involved an examination of historical trends using the NTD and building upon the information obtained in the literature review. Transit system characteristics and performance measures were developed and analyzed to allow for comparison across the industry. Using the performance measure results supplemented by qualitative analysis, general findings and trends in transit service and financing are presented.

- **Survey of transit agencies, state DOTs, and metropolitan planning organizations (MPOs) to explore what goals and mandates they have had to satisfy and their financial ability to do so.**

In this activity, a survey was conducted to determine the experiences and projected plans of transit systems in responding to their recent financial and operational needs. Price Waterhouse conducted the telephone survey of 29 transit agencies, which included agencies of different sizes, demographic trends, and modes. An overview of these individual stories and a qualitative analysis of the general trends occurring is provided.

- **Identification of successful transit agency funding strategies.**

This activity presents the results of the investigation and exploration of successful innovative and non-traditional financing practices across the transit industry. The research team identified examples of transit systems and communities that have successfully employed innovative practices and developed case studies for each of these, highlighting areas that will be of most interest to other agencies looking to implement similar practices.

- **Additional analysis of NTD information to further examine the impact of transit service trends.**

A more detailed analysis of certain performance measures was conducted to review and provide results on trends at the mode and agency size level.

Most of the tasks were geared toward going beyond the aggregate view of the industry that the literature review provided. The desire was to get behind the averages and understand what specific transit agencies and specific types of transit agencies are experiencing. Because agencies have unique characteristics, respond to different goals, and face various funding pictures, the research team wanted to make more specific and more relevant observations about what agencies have experienced. Policy-makers, planners, and other observers must understand these differences among agencies.

The research approach also was designed to combine primary and secondary information and incorporate direct feedback from transit and other agencies. Thus, the approach included the use of existing reports and studies, an analysis of federally collected transit industry data, and a survey of agencies and a casebook to document specific agency experience and strategies.

The time covered by this study was determined primarily by the information and data available. The majority of research was conducted in calendar year 1996. At that time, the latest NTD data available were through the year 1994. Some sources used in the literature review provided information through 1995. However, the survey responses and most innovative case studies examined reflect attitudes and activities through 1996.

A few additional tasks had originally been envisioned but ultimately could not be performed. These included

- **Analysis of expenditure and funding projections.**

In Task 3, which used the NTD to perform a disaggregate analysis of expenditure and funding data, the research team hoped to analyze projections of future financial data. However, the only forward data available was from APTA, and it presented data in a highly aggregate form (documented in the Task 1 and 2 Technical Memoranda). Data suitable for analysis would have had to have been collected directly from transit agency budgets, 5- and 10-year plans, transportation improvement plans (TIPs), and so forth — an endeavor not envisioned in the scope of this research.

- **Projection of agencies' ability to meet goals and requirements and determine magnitude of shortfalls.**
Using a small but representative sample of agency types (by size, mode type, and location), the research team had hoped in Task 5 to develop a financial model that could project the magnitude of future funding shortfalls under a variety of scenarios. However, two problems arose. First, many agencies were simply not responsive in providing budget and plan data. Second, agency budgets are already adjusted to reflect funding realities, so that revenues and costs equalize, whether through cuts or other management or service changes. In other words, it is hard to gauge the shortfall an agency would face were it able to provide all the service it could in its markets. These issues were raised at the interim meeting and it was agreed by all parties that this activity would not be performed.
- **Analysis of FTA data on actual agency apportionments since the end of NTD horizon.**
To bridge the gap between the last available year of NTD data and the present, it would have been instructive to examine the federal funding actually made available to agencies using the apportionment data. However, the FTA was unable to provide a data file containing this information.

Organization of Report

This report is the culmination of the research and technical analysis undertaken for all tasks and includes material from earlier task reports. However, the report is not organized around the project's defined tasks. Instead, the research team went back to the original problem statement and related questions posed in the working plan and used the results to answer and further explore those issues, drawing on the different analyses and tasks as appropriate. A separate casebook, which offers detailed reviews of specific agency experiences is also provided.

Full documentation on each task has been provided, as indicated in the following table, which ties the various work products to the defined tasks from the working plan. The monthly and quarterly reports not shown in the table had a purely administrative content.

Lists of Deliverables and Associated Tasks

Deliverable	Tasks from Working Plan	Summary
Technical Memoranda 1&2	Task 1 Task 2	Literature Review: Background on Transportation in US Trends in Transit Expenditures Trends in Transit Funding Impact of Federal Regulations and Statutory Mandates Innovative Funding and Financing Strategies
Technical Memorandum 3	Task 3	NTD Analysis: Trends in Revenues Trends in Service Descriptors Trends in Performance Indicators
Technical Memorandum 4	Task 4 Task 5's survey activities	Survey of Transit Operators: Overview of Respondents Examples of Service Expansions and Reductions
Interim Report	Task 6	Summary of Tasks 1 through 4 Progress on Task 5 Work Plan for Task 5 (Survey Results)
Quarterly Progress Report (1/1/97-3/31/97)		Summary and Progress of Tasks 5, 7, 8, and 9 NTD Fare Trend Analysis NTD Operating Revenue Trend Analysis
Final Report	Task 8 Task 9 Task 5's additional NTD analysis (found in Appendix A)	Summary of Findings from all Tasks Technical Appendix including NTD Operating and Capital Revenue Analysis and NTD Performance Indicators Analysis
Casebook	Task 7	Specific Case Studies

This report provides an overview of the literature review and data analysis conducted, a summary of findings in response to the questions posed, and the conclusions reached as a result of this project. A technical appendix, detailing the additional analysis most recently conducted, is provided in this volume. The casebook (containing 17 case studies) is provided as Volume 2 of this report.

Chapter 2

Summary of Transit Revenue, Cost, and Performance Analysis

Background

During the course of this project, the research team collected and analyzed data from a variety of sources, including industry literature, the FTA NTD (formerly Section 15 reports), and direct surveys of transit agencies.

This chapter offers a summary of the analysis we performed to support the review of the financial condition of the transit industry and the impact on transit industry performance.

Assumptions and Definitions

This summary data analysis chapter uses the following assumptions and definitions.

Time Period Analyzed

Our analysis covers the time from 1989 to 1994. We utilized this period because it covers the recent past and is a period during which the industry was undergoing changes in government policy and funding (including ISTEA, ADA, and CAAA). All trends are based on NTD data from the years 1989 and 1994 and did not include data from the interim years (*i.e.*, 1990-1993). Based on review of the data, the trends in the interim years were generally consistent with the "1989 to 1994" results and inclusion of the interim years would not have provided substantial added value. The review did not include the post-1994 period because these data were not available from the FTA at the time of the analysis. However, for certain information and statistics, the report refers to periods other than 1989 to 1994. These references are from the literature review conducted in earlier tasks and are included to provide additional information not available from the NTD.

Inflation Rate

When relevant, the impact of inflation to allow for comparisons between years is included. For all revenues and expenses, inflation is assumed to be 18.8 percent total from 1989

to 1994 or 3.5 percent average annually. These data are based on the Consumer Price Index for All Urban Wage Earners and Clerical Workers as compiled by the Bureau of Labor Statistics. We chose this index for transit system revenues and expenses because wages and benefits make up the largest component of transit operating costs.

For fare data, inflation is assumed to be 19.5 percent total from the 1989 to 1994 period or 3.6 percent average annually. These data are based on the Consumer Price Index for All Urban Consumers as compiled by the Bureau of Labor Statistics. We chose this index for transit fares because it is the measure of the change in average costs to the consumer.

Adjustments to the Data

For the 1991 reporting year, transit systems reported unallocated, joint expenditures, primarily in the area of general administration, in addition to modal expenses. We did not allocate these costs because the NTD data did not provide us with a basis to allocate them among the modes. To provide consistent data throughout the report, we deleted all the unallocated costs from the 1991 results. Consequently, in 1991, total expenditures show allocated costs only and, therefore, may be artificially low.

Definitions

Except where noted, all trend analysis and discussions utilize the following definitions:

Definitions of Agency Size, Modes, Operating Revenues and Capital Revenues

Agency Size	Small	Fewer than 100 revenue vehicles
	Medium	100 to 499 revenue vehicles
	Large	500 or more revenue vehicles
Modes ¹	Commuter rail	Commuter rail
	Demand response	Dial-a-ride, paratransit
	Heavy rail	Heavy rail
	Light rail	Light rail, streetcar
	Motor bus	Motor bus
	— small — large	— 150 or fewer revenue vehicles — more than 150 revenue vehicles
Other	Ferry, cable car, monorail, automated guideway, trolley-bus, aerial tramway, van pool, inclined plane, jitney, publico	
Operating Revenues	Fares	Farebox revenues
	Other revenues	Other transportation, non-transportation revenues
	Federal	FTA formula funds – Section 5/9
	Other federal	Other FTA funds
	State	State government general revenue, grants/reimbursements, and fare assistance
	Local	Local government general revenue, grants/reimbursements, and fare assistance
Capital Revenues	Dedicated	State dedicated taxes, local dedicated taxes, taxes levied by transit system, other revenue/subsidies
	Federal (FTA)	FTA funds, including Section 3, Section 5, 9A, or 9 and others
	Other federal	Other DOT (non-FTA) and other federal
	State	State government general revenue, tolls, taxes, and other
	Local	Local government general revenue, tolls, taxes, and other
	Dedicated	Dedicated state taxes, dedicated local taxes, agency-generated taxes, and other agency-generated funds

Trends in Transit Expenditures

- **The FTA identified total expenditures for public transportation operating and capital expenditures of \$18.6 billion in 1989 and \$21.7 billion in 1993² indicating an average annual growth of 3.9 percent.** According to these data, the split between operating/capital was approximately 75/25 and has remained relatively steady from 1989 through 1993 (between 74-77/23-26).
- **Transit operating expenditures have increased relatively steadily, slightly above inflation, while capital expenditures have increased more sporadically (and have included some decreases) because of variations in the number and timing of capital projects.**
- **From 1989 to 1993, service levels on all modes also increased by 8 percent, as measured in vehicle revenue-hours.** Operating and capital expenditures increases were necessary to support this increase in service levels.

Operating Expenditures

The following table provides a summary of public transportation operating expenditures in the United States from 1989 through 1994, including a categorization by mode.

Operating Expenditure Trends (in billions of nominal dollars)

	1989	1990	1991	1992	1993	1994	% Increase
Commuter Rail	2.07	2.16	2.12	2.17	2.20	2.35	13.9%
Demand Response	0.33	0.39	0.43	0.50	0.56	0.71	118.9%
Heavy Rail	3.70	3.83	3.25	3.56	3.67	3.79	2.2%
Light Rail	0.21	0.24	0.24	0.31	0.31	0.41	96.6%
Bus	7.28	7.78	7.53	8.63	8.87	9.17	25.9%
Other	0.28	0.32	0.29	0.34	0.36	0.40	41.9%
Total Operating Expenditures	13.87	14.71	13.85	15.51	15.97	16.83	21.4%
Inflation (CPI index, 1989 as base) ³	1.00	1.05	1.10	1.13	1.16	1.19	18.8%

- **Operating expenditures have grown from \$13.9 billion in 1989 to \$16.8 billion in 1994, demonstrating growth of about 21.4 percent or annual average growth of 4 percent.** Assuming an inflation rate of 3.5 percent, total operating expenditures seem to have just slightly outpaced inflation. Total operating expenditures reflect both changes in service levels and changes in unit costs.
- **Change in operating expenditures varied significantly across modes.** Both demand response and light rail modes saw increases in operating expenditures of over 90 percent from 1989 to 1994. This magnitude of change is not surprising given the significant expansion of services and revenue-hours these two modes have recently experienced. However, operating expenditures for both modes began from a low base point of \$324 million in total 1989 operating costs for demand response and \$209 million for light rail. Conversely, two of the slower growth modes, commuter and heavy rail, each saw expenditures grow at rates lower than inflation (which was 18.8 percent) for the same period. Operating expenditures for bus, the largest component of transit service in the United States, rose by approximately 26 percent. This limited increase in comparison with inflation may be largely explained by the increase in bus service over the same period (7.5 percent increase in total bus revenue-miles).
- **One factor affecting the level of operating expenses may be changes in categorizations of expenditures.** As the definition of capital expenditures has been broadened, some expenses previously categorized as operating

expenditures may have been shifted to capital expenditures.

- **Despite the large increases in operating costs for demand response and light rail, these two services do not make up a substantial percentage of total transit industry costs.** In 1994, total demand response operating expenditures were \$710 million or 4.2 percent of total expenditures. Light rail expenses in 1994 made up an even smaller amount at 2 percent of total operating expenditures.

Capital Expenditures

- **Public transportation capital expenditures were \$5.7 billion in 1993,** according to U.S.DOT information⁴. During the previous 10 years (1983-1993), capital expenditures increased 55 percent in nominal dollars, which is a limited average annual increase when inflation (of 42.3 percent) over the same period is taken into account⁵.
- **The distribution of capital expenditures varies greatly by transit mode.** In 1993, almost 50 percent of the funds spent on capital programs were for facilities — only 27 percent was spent on rolling stock. However, 50 percent of capital investment in the bus mode is for rolling stock. Demand response service shows 70 percent investment in rolling stock and only 30 percent on facilities/other. By comparison, the rail mode spends the largest share of funds on facilities, which is not surprising given high requirements for basic infrastructure such as stations, track, signals, and so forth. Capital investments tend to be made in large amounts for a few systems at a time and heavy rail and commuter rail account for a large amount of expenditures (62 percent of all capital investment in 1993). Capital expenditure data are heavily weighted toward the New York metropolitan area where 40 percent of all capital expenditures in 1993 were made.

Trends in Transit Revenue and Funding

According to the NTD, overall transit funding was \$17.7 billion in 1989 and reached a total of \$22.8 billion in 1994. This represents an increase of 28.7 percent or about 10 percent faster than inflation. In 1989, the breakdown of funding was approximately 80 percent operating dollars and 20 percent capital dollars. The 1994 split was 75 percent operating (\$17.2 billion) and 25 percent capital (\$5.6 billion) indicating a shift from 1989 to 1994 toward higher levels of capital funding.

Operating Revenue

Transit agencies have adjusted to changing needs and fluctuations in the supply of certain funds by using the range of funding sources available to them. The following table summarizes operating revenue from 1989 through 1994.

- Overall, total operating funding for transit has increased at a rate slightly higher than inflation from 1989 to 1994. Total U.S. operating funds were \$14.1 billion in 1989 and \$17.4 billion in 1994, demonstrating an average annual growth rate of approximately 4.2 percent.

Operating Revenue Trends (in billions of nominal dollars)

	1989	1990	1991	1992	1993	1994	% Increase
Fares	5.11	5.51	5.60	6.24	6.53	6.47	26.4%
Other Revenues	0.72	0.81	0.75	0.60	0.54	0.97	34.3%
Federal (FTA)	0.78	0.75	0.78	0.77	0.78	0.77	-1.2%
Other Federal	0.07	0.07	0.07	0.08	0.13	0.09	40.4%
State	1.78	1.93	3.17	3.68	1.66	1.69	-5.5%
Local	2.03	2.13	3.97	3.38	2.02	1.98	-2.4%
Dedicated	3.62	4.02	1.64	1.71	5.10	5.38	48.8%
Total Operating Revenues	14.12	15.23	15.98	16.45	16.76	17.35	22.9%
Inflation (CPI index, 1989 as base)	1.00	1.05	1.10	1.13	1.16	1.19	18.8%

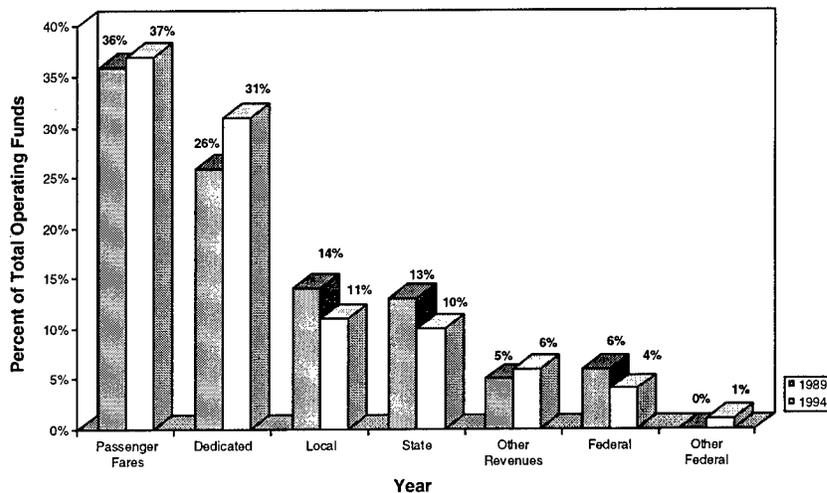
* Note: In 1991 and 1992 only, certain dedicated funds were classified as state or local funds.

- Traditional FTA funding has dropped in nominal dollars. While overall nominal dollars provided by the federal government (including FTA and other federal funds) have increased funds from the formula block grant program have dropped 1.2 percent between 1989 and 1994. Considering inflation of 18.8 percent, the impact of this reduction on the transit industry, with its increasing operating expenditures, is a real is reduction in value of approximately 20 percent. To the degree that there is an increase in the funds supplied by the federal government, it is being delivered by sources outside the FTA. According to the NTD, other federal sources include funding from the Planning Program, 49 USC 5303 (formerly Section 8 of the Federal Transit Act, as amended); Research, Development and Training, 49 USC 5312 (formerly Section 10 of the Federal Transit Act, as amended); and the Nonurbanized Area Formula Program, 49 USC 5311 (formerly Section 18 of the Federal Transit Act, as amended). Dollars from other federal programs rose 40 percent between 1989 and 1994 but the amounts in both years were less than \$100 million for this source (\$70 million in 1989 and \$90 million in 1994).

- **Passenger fares have remained the single largest revenue source**, consistently providing between 35 and 37 percent of total operating revenues from 1989 to 1994. After the farebox, 1989 operating revenues were made up of dedicated taxes (26 percent), local assistance (14 percent), state assistance (13 percent), FTA assistance (6 percent), and other federal assistance (less than 1 percent).
- **Our analysis has revealed some shifts in the structure of public support for transit services from 1989 to 1994.** Dedicated local and state taxes funding have increased, replacing general revenues. In 1994, government assistance broke down as follows: dedicated taxes (31 percent), local assistance (11 percent), state assistance (10 percent), FTA assistance (4 percent) and other federal assistance (1 percent).

Although general state and local funding is on the decline, the increase in dedicated taxes is largely fueled by taxes levied at the state and local level. The results of these shifts in the percentage of total operating funding supplied by different sources are presented in Exhibit 1.

Exhibit 1: Changes in Sources of Operating Funds from 1989 to 1994



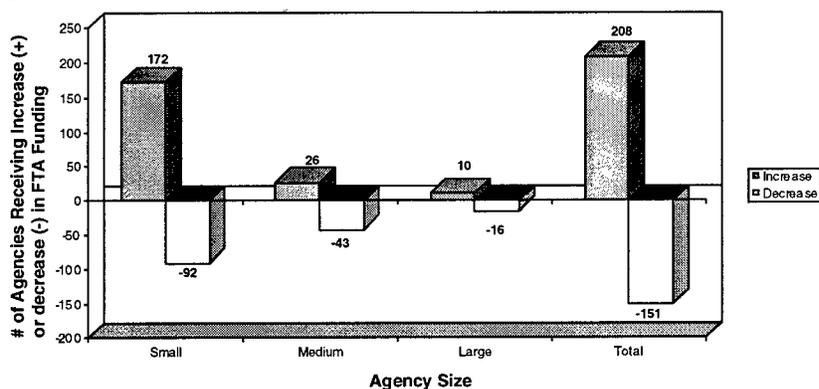
The analysis we conducted indicates a small change from 1989 to 1994 in the level of funding from different sources and a relative decrease in the position of federal (FTA) support from 6 percent to 4 percent. While we were not able to conduct analysis on data post-1994, from other information sources it seems that federal operating funding as a percent of total funding has continued to decrease since 1994.

Operating Revenue by Agency Size

The trend in operating funding indicates an overall increase in sources of funding — federal, state, local, dedicated taxes, and farebox — with a relative shift away from the federal government. However, given the wide range of transit agencies in the United States and the array of funding sources available to them, it would be reasonable to assume that transit agencies of different sizes may have experienced different operating funding trends and our analysis indicates this is the case.

- From 1989 to 1994, traditional FTA operating funding (i.e., operating funds that are matched at a 50 percent rate by local funds) increased at 63 percent of all small agencies, while it increased at only 36 percent of medium-sized agencies and 30 percent of large agencies.

Exhibit 2: FTA Operating Funding Trends
Agencies to Receive Increases or Decreases from 1989 to 1994



Note: Agency numbers include all agencies which reported zero dollars FTA funding in either 1989 or 1994; included as an increase if zero dollars only in 1989, included as a decrease if zero dollars only in 1994.

The median small agency experienced an increase of 8 percent and 25 percent of all small agencies obtained at least 31 percent more FTA funds. On the other hand, the median medium- and large-sized agencies lost 2 percent in FTA funds. These results indicate that additional federal operating funding is not being distributed evenly among all agencies with the increases occurring largely at small agencies. These trends are demonstrated in Exhibit 2.

- For all transit agency sizes, the largest consistent increases in funding were provided by the farebox. This is particularly true for large transit agencies, where over 96 percent achieved farebox revenue increases from 1989 to 1994. However, the medium-sized agencies experienced the greatest increases in dollars from the farebox, as the median agency obtained 34 percent more from the farebox. Even in comparison to the inflation rate of 18.8 percent over this time, this is a large increase. This increase for medium-sized transit agencies seems to be the result of growth in passengers and growth in average fares. Between 1989 and 1994, medium-sized agencies saw an increase in passengers of 10 percent and the median fare of 25 percent.
- Next in magnitude were increases that occurred in state and local funding. Half of all transit agencies also increased their state and local funding by over 25 percent. Although less dramatic than farebox increases, the median state and local funding increases outpaced inflation by a substantial amount.

The growth or reduction in actual operating funding for small agencies is demonstrated in Exhibit 3. This exhibit indicates the percent growth or drop experienced by the middle 50 percent of all small agencies from 1989 to 1994. For example, the median agency obtained an 8 percent increase in FTA funding while the agency at the 25th quartile experienced a 7 percent drop and the one at the 75th quartile showed an increase of 31 percent. This also indicates that 25 percent of all small agencies increased their

federal funding by at least 31 percent.

Capital Revenue

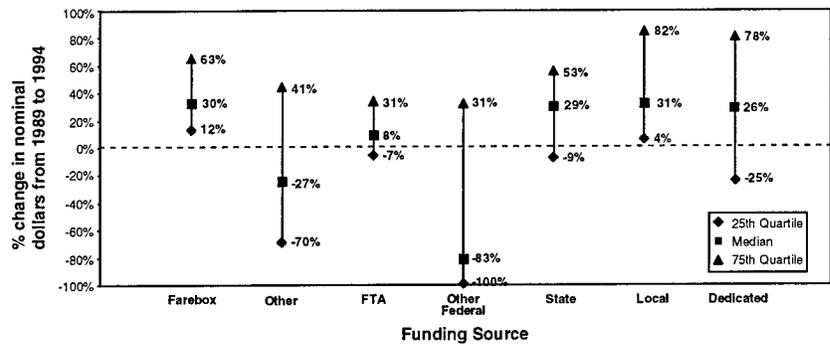
Where total operating funds from all sources have increased approximately in line with the rate of inflation, transit capital funding has increased at a more substantial pace. In 1989, \$3.65 billion was made available for transit capital investment; in 1994, capital funding from all public sources reached a total of \$5.6 billion, indicating an average annual growth of almost 9 percent.

The table below summarizes the trends in capital revenue.

Capital Revenue Trends (in billions of nominal dollars)

	1989	1990	1991	1992	1993	1994	% increase
FTA Assistance	2.20	2.56	2.47	2.50	2.31	2.33	6.1
Other Federal Assistance	0.05	0.07	0.07	0.09	0.08	0.18	275.6
State Assistance	0.46	0.51	0.54	0.63	1.15	0.84	81.5
Local Assistance	0.47	0.66	0.66	0.61	0.92	0.75	58.9
Dedicated Taxes	0.46	0.55	1.35	1.44	1.27	1.49	221.0
Total Capital Revenues	3.65	4.36	5.10	5.28	5.73	5.60	53.5
Inflation (CPI index, 1989 as base)	1.00	1.05	1.10	1.13	1.16	1.19	18.8

Exhibit 3: Change in Magnitude in Operating Funding from 1989 to 1994 Small Agencies



Note: A quartile refers to a quarter of the data points analyzed. Therefore, the 25th quartile is the data point which is greater than or equal to the lowest one quarter of all data points. Conversely, the 75th quartile is less than or equal to the highest one quarter of all data points. The median represents the midpoint of all results.

- **As opposed to operations, capital investment has been largely funded by the government, especially at the federal level.** However, recent increases in capital funding do not seem to be supported by federal sources, with the exception of the relatively small dollars available from other federal sources. In 1989, the FTA provided 60 percent of capital funding dollars, while local government and state government each made up 13 percent. In 1994, that split became 42 percent federal, 13 percent local, and 15 percent state.
- **The most dramatic change seems to be the increased use of dedicated taxes to support capital needs.** In 1989, dedicated taxes made up 13 percent of total capital funding, whereas in 1994, they made up 27 percent. Similar to the operating funding environment, these data

demonstrate a fairly notable shift from reliance on federal funds to dedicated taxes.

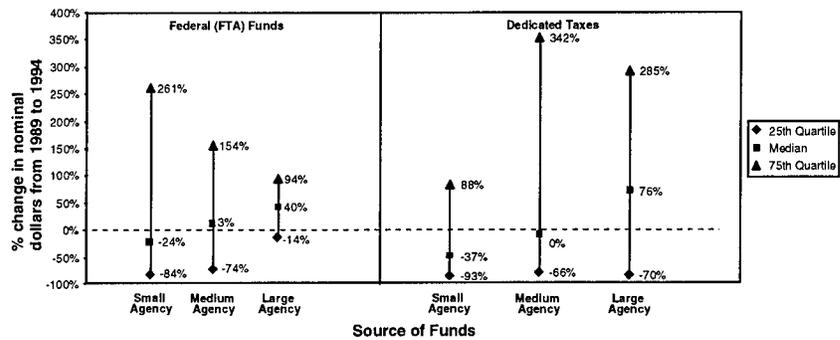
- **There is a relatively large degree of volatility in the magnitude of funding received from each source.** From 1989 to 1994, 25 percent of all agencies received an increase of at least 256 percent in local funding while another 25 percent experienced a decrease of at least 89 percent in local funding. This type of variation occurred with most funding sources. These results are not surprising given the project-driven nature of capital investment. As a project is approved, funding is obtained from potential sources. Once the project is complete, the financial assistance ends resulting in a reduction in dollars from that source. This effect may be compounded in that state and local sources often provide matching funds to federal grants.
- **Other data also indicate a relatively large use of ISTEA-flexed funding.** According to data from the FTA, there are indications that many agencies/localities are participating in this program which allows FHWA monies to be used for investment in transit. Because the ISTEA program began in 1991, it is difficult to determine sustained trends in this area yet, but there is substantial growth occurring, particularly in the Congestion Management and Air Quality Improvement (CMAQ) and Surface Transportation Program (STP) programs. According to the FTA's data, CMAQ funds of \$582 million and STP funds of \$314 million were obligated for FY 1995.⁶

Capital Revenue by Agency Size

- **There is less variation across agency size in capital funding than operating funding.** In the case of FTA funding, from 1989 to 1994, 64 percent of large agencies demonstrated an increase in capital funds as opposed to only 46 percent of small agencies. However, there was a much larger range of change in the magnitude of funding at the small agencies. Twenty-five percent of small agencies received at least a 261 percent increase in capital funding between 1989 and 1994 where 25 percent of large agencies received only a 94 percent increase or more. On the low end, 25 percent of small agencies also experienced at least an 84 percent decrease in FTA funding. Exhibit 4 illustrates the volatility of FTA and dedicated taxes capital funding levels by agency size. Specifically, it shows the percent growth or drop experienced by the middle 50 percent of small, medium, and large agencies from 1989 to 1994.

● Despite the change in magnitude of FTA funding, only a few agencies obtained FTA funding for the first time. Only 12 agencies received FTA funding in 1994 that had not received it in 1989. There was much more change in usage levels in the less traditional non-FTA federal funding. Agencies seem to be using this source but do not maintain it in a consistent manner. Small agencies are experiencing the most volatility in this area with only one agency (out of a total group of over 200) obtaining non-FTA funds in both 1989 and 1994. This is probably because of the nature of capital investment where funding is available only as projects require or qualify for them.

Exhibit 4: Change in Magnitude in Certain Sources of Capital Funding from 1989 to 1994



Note: A quartile refers to a quarter of the data points analyzed. Therefore, the 25th quartile is the data point which is greater than or equal to the lowest one quarter of all data points. Conversely, the 75th quartile is less than or equal to the highest one quarter of all data points. The median represents the midpoint of all results.

Trends in Average Fares

Our analysis of the trends in average fares in the transit industry is based on a categorization by modes which differs from the rest of the report. Because revenue data by mode were not provided in the NTD, it was not possible to analyze fare trends strictly by mode. To address this issue, we established the following distinction between modes⁷:

- HR/CR* Agency operates heavy rail and or/commuter rail, plus others.
- LR* Agency operates light rail, plus others, but no other rail.
- Bus* Agency operates bus, plus others, but no rail.
- DR* Agency operates demand response exclusively.
- Other* Agency operates only those modes other than those above.

This categorization ensures that each agency is represented only once in the analysis.

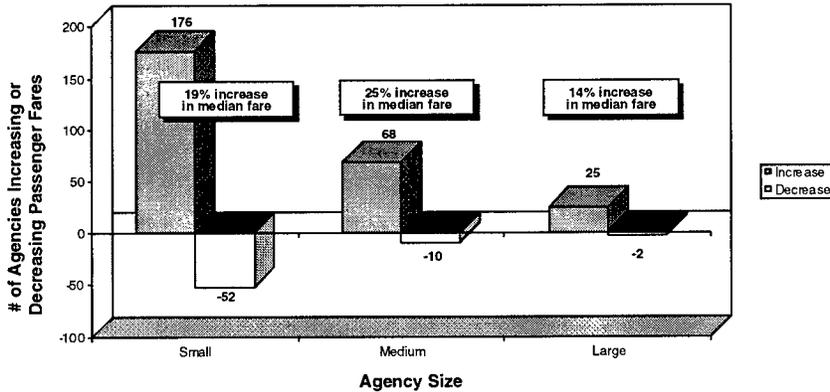
● The average fare per passenger generally increased in all settings and outpaced inflation (except for large agencies). Eighty percent of all agencies increased fares with a median increase in fares of 20 percent. Compared to

the CPI of 19.5 percent⁸ over the same period, this means that half of all agencies increased fares at a rate faster than inflation.

- Larger transit agencies were the most likely to have increased fares while the medium and smaller agencies

had larger percentage fare increases. Medium-sized transit agencies saw the greatest increase in fares with the median increase at 25 percent. This result mirrors the analysis of operating funding sources where the farebox accounted for a large portion of the increase in funds and medium agencies demonstrated the greatest increase in farebox funding. Exhibit 5 demonstrates the results of the number of agencies increasing or decreasing fares since 1989.

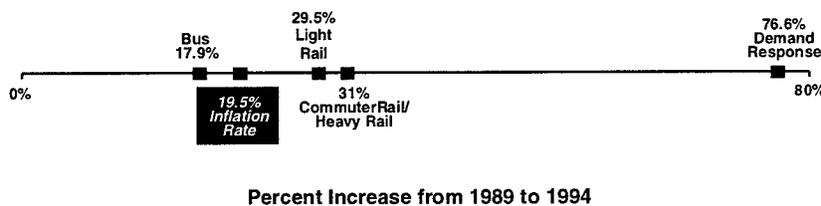
Exhibit 5: Passenger Fare Trends # of Agencies Increasing or Decreasing Fares from 1989 to 1994



- Light rail and demand response transit agencies demonstrated the most dramatic increase in fares.⁹ Over 90 percent of all light rail agencies and 100 percent of all demand response agencies increased fares. These modes were also the only two to show substantial increases in service. It may be possible that, given high demand for these modes, the passenger population was willing to accept increased fares. Demand response and light rail transit are also generally new services; therefore, agencies

may still be adjusting fare structures as they better understand the market. Percentage increases in fares at the median system are presented in Exhibit 6. It can be seen from this exhibit that most agencies, at the median, increased fares at a rate faster than inflation.

Exhibit 6: Increase in Passenger Fares by Mode from 1989 to 1994 Median System



Trends in Service Provision

For the remaining analyses, we return to strict modal definitions described in the *definitions* section of this chapter and on the following page.

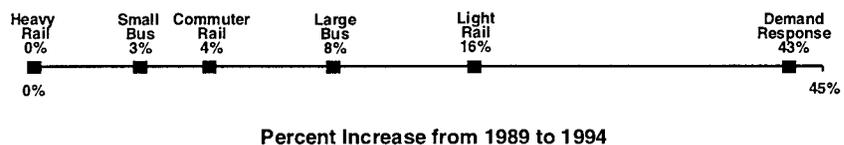
From 1989 to 1994, nationally, transit service, as measured by *revenue-hours*, increased by, on average, 11.3 percent. More

Modes	Commuter rail	Commuter rail
	Demand response	Dial-a-ride, paratransit
	Heavy rail	Heavy rail
	Light rail	Light rail, streetcar
	Motor bus	Motor bus
	— small	— 150 or fewer revenue vehicles
	— large	— more than 150 revenue vehicles
	Other	Ferry, cable car, monorail, automated guideway, trolley-bus, aerial tramway, van pool, inclined plane, jitney, publico

than 50 percent of all transit agencies increased service by at least 12 percent. However, 27 percent of all agencies decreased their revenue-hours, indicating that the majority trend towards increased service is being counterbalanced by a substantial group of transit agencies experiencing service contraction.

- **Growth in this area was highly concentrated in two service modes: demand response and light rail.** Most demand response service providers experienced an increase in revenue-hours. Specifically, 50 percent of demand response agencies increased revenue-hours by more than 43 percent. Light rail service increased at a lower rate, but, even in this group, revenue-hours increased at almost two-thirds of all systems. Understandably, service provision has increased in demand response modes as agencies have implemented their ADA programs. Light rail may also be experiencing growth as it has become a popular option for agencies to implement lower cost rail systems, serving relatively large cities and areas with less density than older rail-served systems.
- **Despite relatively large increases in demand response and light rail transit service, these two modes only accounted for 12.1 percent of total revenue-hours in all systems for 1994.** Heavy rail, commuter rail, and small bus systems experienced the greatest reduction in revenue-hours. Fifty percent of heavy rail, 30 percent of commuter rail, and 41 percent of small motor bus providers decreased service from 1989 to 1994. With heavy rail and commuter rail in particular, the decreases in service may reflect changes in demographics, with populations moving from the older, larger urban areas which maintain commuter and heavy rail systems. Reductions in service may also be occurring as a result of reductions in operating funding. Exhibit 7 demonstrates the percentage changes in revenue-hours by mode from

**Exhibit 7: Increases in Service Levels by Mode from 1989 to 1994
Median System**



1989 to 1994. The increases at the median system were substantial for both light rail and demand response, — 16 percent and 43 percent, respectively.

- **Variations in service provision changes were less marked across agency size.** The most variation occurred with medium-sized agencies which showed the greatest increases with the majority experiencing at least 15 percent more revenue-hours in 1994 than in 1989. It seems reasonable, given recent demographic shifts to medium-sized cities and suburban markets, that increased service is occurring in the medium-sized agencies. It is interesting to note that this medium agency market also saw the greatest increase in fares.

Trends in Cost-Efficiency

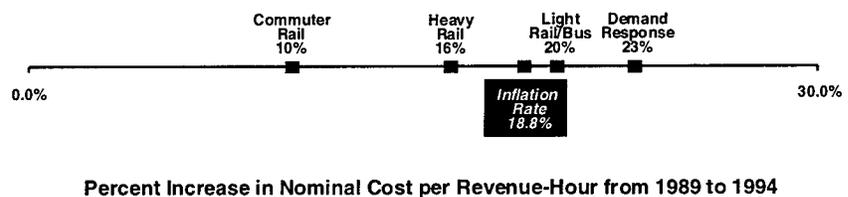
Cost-efficiency indicators measure the relationship between resources expended (costs) and the amount of service provided (service available). We examined two measures of cost-efficiency: *operating costs per revenue-mile* and *operating costs per revenue-hour*. Because these showed similar patterns, this discussion will focus on *operating costs per revenue-hour* as a descriptor for transit system cost-efficiency.

- **Cost per revenue-hour has increased in nominal dollars.** The vast majority of agencies experienced an increase in cost per revenue-hour, and the median agency showed growth of 18 percent or annual growth of 3.4 percent, indicating an overall reduction in cost-efficiency. However, if we consider CPI increases during this time, the cost per revenue-hour at the median agency did not exceed inflation. One-quarter of all agencies were able to keep increases in cost per revenue-hour below 6 percent, considerably less than inflation. However, 25 percent of all agencies saw cost per revenue-hour increase by at least 31 percent, a substantial reduction in cost-efficiency well above the 18.8 percent resulting from inflation.
- **Cost-efficiency trends were varied across modes.** The demand response and light rail modes had relatively large increases in cost per revenue-hour. One-quarter of all demand response providers demonstrated an increase of at least 58 percent in operating cost per revenue-hour with the median agency increasing by 23 percent. Over 50 percent of light rail systems also increased by at least 20 percent. The greatest reductions in efficiency are occurring at the transit agencies with the most growth in service levels. This may indicate that these modes are not able to take advantage of economies of scale in revenue-hours. It

may also indicate that operating costs in these modes may be on the increase independent of the service trends.

- **Heavy rail had more varied results between cost-efficiency and cost-effectiveness than other modes.** Heavy rail cost per passenger trip increased 19.8 percent, only slightly above inflation (18.8 percent) for the same period. Interestingly, while average cost per revenue-hour increased only 7.2 percent (compared to increases of 11.2 percent for commuter rail and 19 percent for bus services), median cost per revenue-hour increased 16 percent. This implies that increases in cost per revenue-hour varied more from agency to agency for heavy rail than for either bus services or commuter rail.
- **Cost per revenue-hour increased less for commuter rail and heavy rail.** The median heavy rail system experienced cost per revenue-hour increases of only 10 percent, while 25 percent of all commuter rail agencies experienced small efficiency improvements. These results demonstrate relatively substantial improvements in cost-efficiency when taking into consideration an inflation rate of 18.8 percent over the same period. Overall changes in efficiency by mode including a comparison to inflation are demonstrated in Exhibit 8. The median system for both light rail and demand response (as well as bus) shows reductions in efficiency which outpace inflation. Commuter rail and heavy rail showed improved cost-efficiency performance when adjusted for inflation.

Exhibit 8: Increase in Cost per Revenue-Hour by Mode from 1989 to 1994 Median System



Trends in Cost-Effectiveness

Cost-effectiveness indicators measure the level of service use (consumption) against resources expended (costs). *Operating cost per unlinked passenger trip* was used as a descriptor of cost-effectiveness.

- **From 1989 to 1994, operating cost per passenger trip increased 28 percent, indicating an overall drop in cost-effectiveness on a national level.** Even when the impact of inflation is incorporated, the average agency experienced almost a 10 percent increase in cost per passenger.
- **The trend in increased cost per passenger is dominated by the effects of the demand response and bus modes.** The average cost per passenger increased 48 percent in

demand response and 32 percent in buses. Similar to the results in cost-efficiency, the demand response mode seems unable to obtain economies of scale from increased passenger loads. This may mean that costs per passenger have increased in the demand response area or that each additional passenger results in less efficient and effective operations.

- **The average cost-effectiveness for light rail improved in comparison to inflation.** Unlike demand response, the average light rail system was able to take advantage of increases in passenger trips to reduce average operating costs, with an average 12.1 percent increase in cost per passenger. When adjusted for inflation at 18.8 percent, the cost-effectiveness of light rail transit improved.
- **The average results for commuter rail also demonstrated effectiveness improvements from 1989 to 1994.** Average cost per passenger increased only 10.8 percent from 1989 to 1994, compared with inflation at 18.8 percent.

Trends in Service-Effectiveness

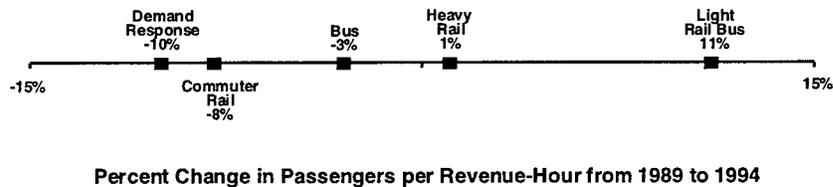
Service-effectiveness indicators measure the extent to which transit service (service available) is used (consumption). Both *passenger trips per revenue-mile* and *passenger trips per revenue-hour* can be used to measure service-effectiveness. Because the trends in these measures were similar, we selected *unlinked passenger trips per revenue-hour* (or passengers per revenue-hour) as a descriptor for agency service-effectiveness.

- **There has been an overall trend of reduction in passengers per revenue-hour.** Almost two-thirds of all transit agencies demonstrated a reduction in their service effectiveness. The median agency saw a loss of 6 percent of passengers per revenue-hour. On the whole, this seems to indicate one of two possibilities: either transit agencies are losing passengers but not reducing service at the same rate or the populations being served are at more remote or lower density locations requiring increased revenue-hours to retain the same passenger population.
- **This reduction in service-effectiveness seems to become more pronounced the larger the agency size.** In the smallest agencies, over 40 percent saw increases in service-effectiveness, compared with 15 percent for larger agencies. Interestingly, service levels at 75 percent of these large agencies have increased over the same period. This may indicate that, because of demographic shifts, large agencies are having to serve less densely populated regions which require more revenue-hours to reach the relatively

more remote locations of the same traveling population. Conversely, population drops or changes in travel mode in these large urban communities may have led to reduced transit passenger levels, while revenue-hours (service levels) at the large agencies that serve these communities have not been adjusted to reflect the change.

- **Service-effectiveness has improved most dramatically in light rail and deteriorated most dramatically in the demand response mode.** Light rail providers have demonstrated an average increase of 27 percent in passengers per revenue-hour and almost two-thirds of all light rail agencies demonstrated effectiveness improvements. Conversely, almost two-thirds of demand response providers demonstrated decreases in effectiveness. Changes in passengers per revenue-hour for the median system of each mode are demonstrated in Exhibit 9. This exhibit illustrates that the only two modes to experience service-effectiveness improvements at the median are heavy rail and light rail. All other median systems experienced reductions in passengers per revenue-hour.

**Exhibit 9: Changes in Service Effectiveness by Mode from 1989 to 1994
Median System**



Agency Input on Impacts of Mandates and Goals

Twenty-nine agencies of varying size, geographic location, and services were surveyed to determine how transit systems have responded to the changing market conditions, particularly in light of the general funding situation. The results of this survey support several of the major trends identified above.

Data were obtained via telephone discussion with agency representatives and, as such, are limited in scope to the information readily made available at the time. Thus, these survey results do not provide exhaustive information on all the trends at each agency. All use of the survey information below is solely for illustrative purposes.

- **Most transit systems identified expansions to their service either to address market changes or respond to external mandates.** Most of the transit agencies surveyed indicated that they underwent service expansions for new markets, particularly the suburban portions of their service area. However, consistent with the trend results, nearly 25 percent of the surveyed systems noted that they had reduced service.

- **There has been some new construction in heavy rail/commuter rail systems, although most increases in service have come through changes to existing services.** In 1993, the Chicago Transit Authority (CTA) opened a new heavy rail line to the airport and the Los Angeles MTA opened the first segment of a new heavy rail line. New Jersey Transit is expanding service through improved connection points and transfer stations.
- **Several new light rail systems have been installed or are being installed in urban/suburban markets.** Between 1989 and 1994, Baltimore, St. Louis, and Los Angeles all opened light rail service. A Dallas light rail system was under construction at the time and opened in 1996. New Jersey Transit is planning the development of two light rail lines.
- **Growth has been particularly marked in the medium-sized urban areas with expanding suburban markets.** Transit providers in Albuquerque, Las Vegas, and Seattle all cited increases in the suburban-to-downtown market. These systems also indicated relatively substantial increases or expected increases in their ridership, service hours, and/or revenues.
- **Significant expansions have taken place in ADA paratransit services in a broad range of market areas.** Increases of over 75 percent in paratransit service levels from 1989 to 1994 were cited by several surveyed agencies, including New Jersey Transit, Corpus Christi RTA (Texas), Wichita WMTA (Kansas), San Carlos SamTrans (California), and Las Vegas Citizen's Area Transit (Nevada).
- **Some of the transit systems contacted noted that they have had to implement major service reductions.** In virtually all cases, these reductions were prompted by reductions in funding. A sample of the agencies which have contracted service or increased headways includes bus service in Philadelphia (SEPTA), bus routes and rail lines in Chicago (CTA), fixed-route service in Wichita (WMTA) and dial-a-ride service in Cheyenne, Wyoming (City of Cheyenne).

Endnotes

- 1 No distinctions were made between purchased transportation and non-purchased transportation in all modes for the purposes of this analysis.
- 2 *1995 Status of the Nation's Surface Transportation System: Condition & Performance*, USDOT, 10/27/95, Exhibit 3-6, p.84.
- 3 CPI Index for all Urban Wage Earners and Clerical Workers from the Bureau of Labor Statistics, using 1989 as base year.
- 4 *1995 Status of the Nation's Surface Transportation System: Condition & Performance*, USDOT, 10/27/95, Exhibit 3-6, p.84
- 5 Based on 1983 to 1993 Consumer Price Index for All Urban Wage Earners and Clerical Workers, from Bureau of Labor Statistics.
- 6 This information was obtained from the FTA Statistical Summary for FY95 ISTEA Flexible Funds from FHWA Obligated in FY95 for Use in Transit Projects. These numbers reflect funds obligated to but not necessarily spent by transit agencies and, therefore, may not reconcile with annual capital funding numbers.
- 7 For the purpose of the fare analysis only, a transit agency which provides light rail, bus, and demand response services was categorized as 'LR' or light rail. This type of categorization allows comparisons to be made between agencies with similar sets of modal service but may cause some distortion with respect to the specific modes. For example, there are 382 transit agencies in the United States that provided demand response service in 1994. Of these agencies, 34 provided only demand response service and are categorized as 'DR' or demand response. All other demand response systems would be captured under other categories, depending on the services provided by the agency. Therefore, when reviewing this information, it must be kept in mind that the mode categories used here are not necessarily representative of the entire range of providers of that mode.
- 8 As noted earlier, for analysis of fares only, we used the Consumer Price Index for All Urban Consumers compiled by the Bureau of Labor Statistics.
- 9 There may be too few observations for meaningful results in demand response — only 17 demand response observations in both 1989 and 1994.

Chapter 3

Findings

In this chapter, we present the interpretation of the findings of this research project. This chapter draws on the work completed in all the project tasks to date, including those which have been previously described in the project technical memoranda and quarterly reports. The chapter is organized into sections on the basis of the research objectives, as presented in Chapter 1, Introduction.

The research culminating in this report has enabled us to piece together the critical elements of a story. This is the recent experience of transit agencies dealing with the dual challenge of (1) changing roles and requirements and (2) decreasing federal funding. The story, related in this chapter, begins with the exploration of the changing environment in which transit operates, in terms of the markets it serves, recent federal policy, and declining federal financial support. The story continues with observations on a variety of elements directly associated with each transit agency's financial and service performance, including non-federal funding sources, expenditures, service output, and performance measures. The goal is to develop an understanding of how transit agencies have fared in the more challenging environment they have been facing.

Using both the aggregate and disaggregate research results, we can trace overall industry trends as well as capture the significant variability in the experience of specific agencies. In other words, there is a substantial distribution of agency experiences around the "average" or "median" trend: some agencies will have fared much better; others will have found maintaining their funding and service to be a real struggle.

The Changing Service Requirements and Federal Funding Environment for Transit in the United States

The history of public funding for transit since the middle of the 20th century has been one of flux. The proportion of support at each of the federal, state, and local levels has varied, as has farebox recovery. Most recently, while total non-farebox transit funding has continued to grow faster than inflation (30

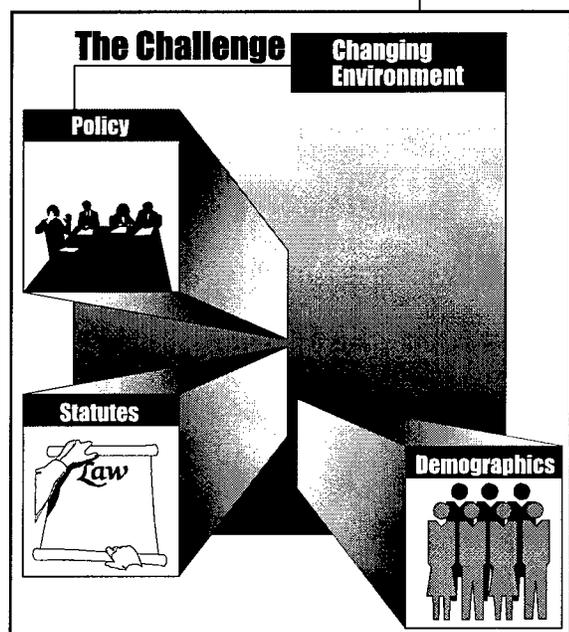
percent from 1989 to 1994, compared with 19 percent inflation), federal funding has largely not increased, and federal operating funds in particular have begun to decrease in nominal terms. At the same time, there have been new financial pressures placed on transit systems, primarily through federal legislation. In this section, we will discuss the changed funding environment facing transit agencies and how their financial operating situation has jeopardized their ability to meet the challenges and service goals.

Changing Roles and New Challenges for Transit

Although every transit agency operates in a unique transportation and political market, public transportation across the nation has been affected recently by changing demographic (and thus demand) patterns, regulations, and statutes. Transit agencies generally support the goals of specific federal regulatory policies; however, there is significant and justified concern that substantial costs are associated with these requirements without additional resources being made available. These changes have created new financial challenges for individual transit agencies as well as the entire industry. The major challenges faced by agencies and their ramifications are discussed below.

- **Changing travel patterns are detrimental to the market competitiveness of transit vis-à-vis the automobile.¹** Travel is growing in market segments that are difficult or costly to serve by transit. Examples include the growth in suburb-to-suburb home-to-work trips, trip-chaining behavior, and the spread of automobile-oriented, low-density suburban developments. Even “edge cities,” which combine residential, employment, and shopping activities, are automobile-dependent in design and difficult to serve effectively with transit.

The strongest metropolitan growth is occurring in the West and South, while growth is slowing in the Northeast and Midwest. However, all population growth has occurred in the suburbs. Only one-quarter of job growth is occurring in central cities, the traditional commuting market served by transit. Suburban job destinations have seen the majority of growth, with central city destinations continuing to slow. It is precisely in suburban job markets that transit has the lowest mode share among the markets it competes in: less than 5 percent, versus an 11 percent mode share for central city destinations (mode share measured for all trip purposes and times of day). Low-density suburban residential and work markets are more financially challenging to serve on a per unit basis.



Transit's customer base is weakening. Households without vehicles are a much more captive market for transit. Their number seems to be bottoming out at about 10 percent of all households. Of these households, the majority are single-person, most often elderly and female, and the majority in central cities. Half of vehicle-less households have no workers. Finally, the out-of-pocket costs of commuting by automobile (not including maintenance and depreciation, which commuters tend not to consider a cost of commuting) continue to *decline* in real dollars.

- **Transit has had to comply with new federal regulations such as Buy America requirements and drug and alcohol testing.** Since 1982, the FTA, like most other public agencies, became subject to the Buy America Act and is required to comply for all contracts and purchases, regardless of the amount. In 1995, the FTA relaxed these requirements — reducing red tape and raising the small purchase threshold to \$100,000.

The Omnibus Transportation Employee Testing Act of 1991 requires all FTA grant recipients to establish drug and alcohol testing programs by 1996 (1995 for large operators), in the interest of public safety. While the costs to the industry of the Buy America requirements (both in terms of price competition and administrative burden) are not available in the literature, the costs of drug and alcohol testing have been studied.² Including some recent exemptions for non-profit agencies and pre-employment alcohol testing, the costs for the first 5 years (1995-1999) of this program have been estimated at a total of \$338.5 million, or an average of \$67.7 million per year. To put this in perspective, the average annual amount is equal to 9 percent of total 1994 FTA operating assistance.

- **The Americans with Disabilities Act of 1990 (ADA), and the resulting U.S.DOT regulations included significant requirements for public transportation providers (with implications for increases in low cost-recovery services).** These broadly included the following physical, service, and procedural requirements:
 - All new facilities (as well as key stations) and vehicles (or trainsets) must be accessible to people with disabilities;
 - Paratransit service must be offered to complement a fixed-route transit system;
 - Printed communication must be provided in accessible formats;
 - Special fares must be no more than double the basic fare for users of ADA-mandated services; and

- Personnel must be trained to serve passengers with disabilities equitably and to announce major stops.

The ADA requirements expand public transportation's market and bring social and economic benefits at a policy level. These, however, are balanced against the operating and capital budget impacts, where ADA is primarily evident as a series of costs.

One of the more costly provisions, and the one with the most impact on transit agency operating budgets, is the requirement to provide paratransit service for passengers unable to access a fixed-route system. Demand response paratransit service costs far more to provide per person than fixed-route bus service and service provision has increased dramatically in the past decade. For example, in 1994, demand response service cost \$13.16 per passenger (on a nationwide basis) compared with \$1.98 for conventional bus. Given the parity of fares for such services, this makes demand response a rather low cost-recovery service. And, although demand response accounted for less than 1 percent of all unlinked passenger-trips in 1994, ridership has grown rapidly (up 48 percent from 1989 to 1994) and represented 4.2 percent of 1994 operating costs.

Thus far, data on the overall costs of compliance (including capital costs) is based on projections and anecdotal evidence (reviewed in Tasks 1 and 2: Technical Memorandum); some estimates of average annualized costs do exist. The present research shows more clearly the potential significant and continuing impact on transit agency operating budgets. The data indicate that, while demand response usage continues to grow, the economic and market performance of this mode is declining. All three measures examined — cost-efficiency, cost-effectiveness, and service-effectiveness — worsened since 1989. This appears to indicate that demand response service is exhibiting decreasing returns, although whether the problem is service scale, scope, or density is unclear. In addition, these measures do not distinguish between existing and new services. The reason for this situation is not immediately apparent: circuitry of travel paths may be increasing; contract services may be purchased on a per-passenger basis, offering few economies; or many passengers may require personal attention from the driver (*e.g.*, boarding/alighting assistance), thereby limiting the volume of passengers transported per hour.

- **The Clean Air Act Amendments of 1990 (CAAA) and the Energy Policy Act of 1992 will affect transit agencies well into the next century.** The impact of these acts will mainly be felt on the capital expenditure side, as lower emission buses using new fuel types are purchased (mostly liquefied or compressed natural gas). Generally,

these buses are initially somewhat more costly than conventional buses and they may have to be purchased sooner than the fleet replacement requirements warrant. In addition, new fueling equipment or facilities are typically required. On the operating side, there is no information available to track the incremental costs, if any, of using these buses. The CAAA may have other potential impacts as state and local officials try to reduce single-occupant vehicle usage by expanding rail or rubber-tired transit services. These too have not yet been quantified. However, the current trends in the cost and revenue performance of different modes can serve as a guide to the potential impacts of service expansion and to the need for additional public funding support to achieve the aims of the CAAA.

- Most recently, 1996 legislation created a **major shift in federal welfare policy**, such that there are huge new pressures to match current welfare recipients with jobs to enable them to become self-sufficient. States have been given the responsibility for developing programs to reduce their welfare rolls, and individuals face the prospect of limited welfare benefits. Somewhat belatedly in the welfare debate, there was a recognition by the Administration and the Congress that a daunting problem facing this so-called "welfare-to-work" effort was transportation. Many of the targeted population have neither automobiles nor access to the public transportation that would allow them to reach the job markets. For example, while many welfare recipients live in older inner suburbs, jobs are available in the burgeoning retail and commercial markets in newer outer ring suburbs. However, the very-low-density, automobile-oriented outer ring suburbs may not be served by transit. In addition, even if there is transit, it often requires the job-seeker to make a very long commute on a radial line to the center city and then back to the outer ring — a commute that may well be time-prohibitive given parental responsibilities.

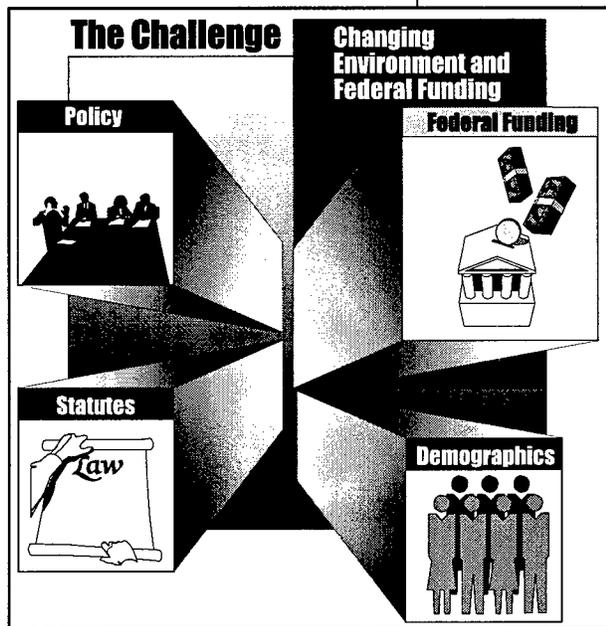
The surface transportation reauthorization legislation expected to be passed in 1997 may include a supplemental level of funding to address welfare-related transportation needs. While we cannot speculate on the sufficiency of these funds to enhance transit services so as to play a larger role in the success of welfare-to-work, it is certain that agencies will be hard-pressed to support the program's transit needs given recent overall trends in funding. It is likely that many transit agencies will begin to review and restructure some of their route networks.

Declining Federal Funding for Operations and Capital Programs

The typical transit agency might be proud to rise to the challenges of the policies outlined in the preceding paragraphs. However, to do so would, in most cases, require additional financial resources. The difficulty for agencies is that they have simultaneously been faced with reductions in traditional federal financial support, in particular for transit operations. The mandates and programs may increase certain agency costs (at least in the near term) while agencies (and their sponsoring states and localities) are finding themselves having to scramble to develop funding sources as the federal government reduces its support.

Total Federal Transit Act appropriations had recovered from a low of \$3.0 billion in 1990 to just over \$4.5 billion in FY 1995, a

level not seen since 1983 (in unadjusted nominal dollars), although for FY 1996, levels were again reduced (to \$4.1 billion). However, the actual level of funding provided can be more closely tracked at the level of FTA obligations, which is what the FTA is actually able to distribute based not only on Federal Transit Act appropriations, but on other legislation and on the federal budget.³ Total obligations in the operating funding categories have remained within the same \$800 to \$900 million band since at least 1988. That is, operating funding has not been escalated to track with inflation in operating expenditure categories. If federal operating support had kept up with inflation between 1989 and 1994, FTA operating funds would have been \$930 million in 1994, instead of the \$770 million actually distributed in 1994.



The balance of obligations each year is for the capital programs (planning category funds are a negligible percentage of the total). This capital amount has increased steadily since the early 1990s, although the discretionary portion (as opposed to the formula portion) fluctuates each year as a function of the fund drawdown needs of the specific capital projects. Capital funding has also benefited from the flexible funding provisions enacted with the Intermodal Surface Transportation Efficiency Act (ISTEA). Flexible funds (from the STP and CMAQ programs under ISTEA) have become an important component of total FTA capital funding. They have risen to \$907 million obligated in FY 1995, or 14 percent of the total for that year.⁴ However, even if this funding continues to increase, it is limited to capital assistance.

The following observations are based on the disaggregate analysis of NTD data from 1989 to 1994:

- The analysis confirms that total federal operating funding has been essentially unchanged in nominal dollars, with an increase of 1.1 percent over 5 years, demonstrating a decrease in actual value, compared to the 18.8 percent rate inflation over the same period.
- While for larger transit agencies, federal funding may account for less than 5 percent of total operating funding (including fares), the reliance on federal funds increases as agency size decreases, up to nearly 30 percent. Small agencies are more sensitive to changes in federal funding, and these changes in funding have varied considerably among transit agencies: one-third have lost funding, the median agency gained 8 percent (which is a real dollar loss) and 25 percent of agencies saw at least a one-third increase. Only one-third of large and medium agencies saw federal funding increases; however, these increases were less than inflation.
- Federal funding is the largest source for capital expenditures, although its percentage of the total has declined. Federal funds have increased only slightly (and at a rate slower than inflation), while state and, in particular, local sources have grown rapidly to meet capital needs. (See discussion of Funding from Non-federal Sources below.)
- Federal non-urbanized area formula funds (funds for cities with populations of less than 50,000) have increased. Other federal operating support increased 40 percent, but the amounts were less than \$100 million a year. On the capital side, ISTEA's CMAQ and STP funds are being flexed. While the figure for annual outlays (cash disbursements) is not available, funds obligated have risen to almost \$900 million in FY 1995 (outlays will follow as capital expenditures on multi-year projects are made).

In the past several years, the FTA has been adjusting the definition of allowable operating and capital expenditures in an effort to reduce the effects of diminishing public funding on transit agencies' operations. For example, certain categories of work and materials used in bus maintenance programs are now allowable capital expenditures. Although this "capitalization of operating expenses" has brought some relief, it is a double-edged sword. It may relieve pressure on the operating budget in the short term, but in the long term it may tie up an increasing portion of formula funding for capital investments. In addition, if agencies' capital expenses are bonded, they are financing short-term costs over 30 years with interest.

In conclusion, while federal regulations and policies are creating new challenges for transit agencies, there has not been a concurrent increase in resources—indeed, federal funding has lost value to inflation. This confirms the outcry of “unfunded mandates” and shrinking federal support for transit. While many transit agencies have been able to offset real declines in federal operating support from state, local, and other sources, those that have not will face a worsening cost-revenue situation in the coming years.

Responses to the Financial Environment: Changing Transit Agency Funding, Services, and Performance Characteristics

The environment described thus far has created a feeling in the public transportation industry that there is a looming financial crisis. This perspective is fueled by demographic changes, new statutes and regulations, and insufficient federal funding support. The crisis feeling is compounded by the fact that most of the factors are outside the control of transit agency managers.

The question is: how have transit agencies responded to this financial situation? An agency might seek out new sources of financial support at the state and local levels, where the value of the services they provide are most evident. An agency may seek to reduce the cost of their existing services or increase productivity. An agency may curtail expansion of new services or even cut certain services back, in an effort to balance their budgets. This section examines the evidence for any of these actions.

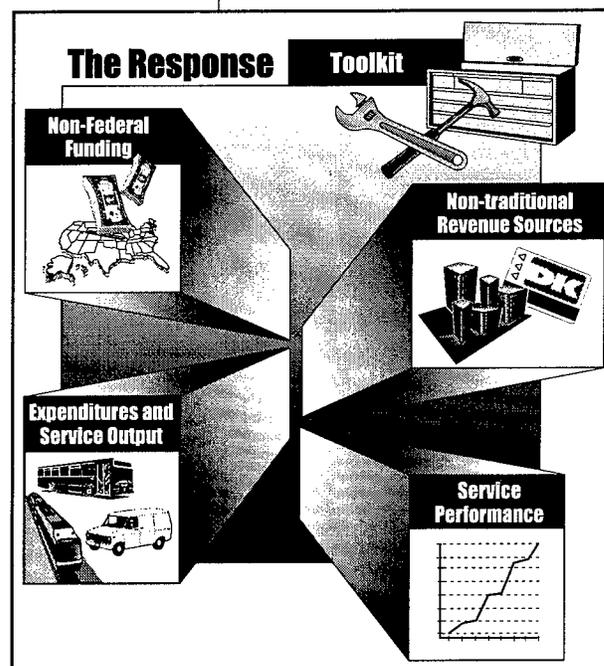
The findings are based primarily on the detailed analysis of the NTD data. The research is not conclusive on the causal relationship; that is, the analysis undertaken for this project does not necessarily imply that the changes in non-federal funding, service levels, and performance measures described below follow from the environmental changes. More detailed econometric analysis would be required to understand the causal relationship. Nevertheless, the findings below are instructive in terms of understanding how agencies have “made ends meet” in the recent environment and how they may adapt in the future.

Funding From Non-Federal Sources and Fares

As federal funding has failed to keep pace with inflation and the needs created by federal mandates have increased, transit agencies have had to look elsewhere for funding. To date, these non-federal sources appear to have filled the funding gap. What is not clear is how much more of the transportation market transit

could capture if sufficient funding were available for better service levels and service quality, at the same or lower fares. Non-federal funding sources have become the primary source of operating income for most agencies.

- Fares have generally increased at a rate far faster than inflation with larger increases occurring at medium and smaller agencies. This may be due to the fact that federal funding is a larger proportion of total funding at smaller agencies, where the revenue impacts of federal cuts are greater. These fare increases are counter-productive in an era when transit is struggling to maintain market share and to continue to serve lower income groups and people with few mobility alternatives.
- General state and local funding for transit operations has dropped in nominal dollars. Instead, dedicated funding for operations (which includes dedicated taxes and other dedicated funds at the state, local, and agency-jurisdiction levels) increased by 50 percent in the period of analysis, making it the second largest in 1994 behind farebox revenue. This indicates a significant shift of funding responsibility to the communities that benefit from transit because, in most cases, dedicated taxes have to be voter-approved.
- State and local funding for capital expenditures has grown well ahead of both federal funding and the rate of inflation. Again, however, dedicated capital funds (from dedicated taxes and other dedicated sources at the state, local, and agency-jurisdiction levels) have seen a tremendous jump, more than tripling from 1989 to 1994, reaching a magnitude second only to federal capital funding. It would appear that voters and communities have found dedicated funding, when related to specific capital programs, to be a good alternative to federal funding which has declined in real terms.



Expenditures and Service Output

- Transit expenditures have increased only slightly faster than inflation on both the operating and capital sides. Agencies adjust their activities and plans so that their budgets balance (with the notable exception of certain agencies who can smooth short-term funding changes through the use of debt instruments). Thus, it is natural to see that total expenditures have tracked with total

funding. Operating expenditure percentage increases (21.4 percent) have indeed approximately tracked funding percentage increases (22.9 percent) although, in absolute magnitude, reported operating expenditures have consistently lagged reported funding by several hundred million dollars.

- The survey of transit agencies found that, despite the funding concerns and specific agencies' service cuts, service (measured in revenue-hours) was continuing to expand. From 1989 to 1994, the median growth level was 16 percent in light rail, 43 percent in demand response, and 4 percent in commuter rail. Other modes demonstrated lower or zero growth at the median. Clearly, a large part of the expansion was in ADA-mandated paratransit service, although, in some cases, there has been an expansion in rail service along with a realignment of feeder bus routes. At the same time, agencies have had to delay service expansions and investments as a result of the near-term expansion of ADA services. In summary, although the specific experience of different agencies has spanned crisis management to managing difficult funding pressures, transit has, in general, stayed the course.
- It is unclear whether agencies have been able to maintain their market shares and fulfill their missions. The funding pressures make it difficult to continually adapt to changing travel patterns and service quality demands. As a result, transit agencies are less able to be proactive and high-profile in their communities as planning and development continue. Census data (1990 compared with 1980) show that all population and most employment *net* growth is occurring in lower-density suburban locations to the detriment of traditionally center-city-oriented transit systems.⁵
- Transit supply has increased overall and in all regions, measured in revenue-miles and revenue-hours. However, this total belies the important differences among modes. Demand response service increased dramatically — a result primarily of ADA service implementation — and light rail increased as well — as a number of medium-sized cities added or expanded this service, popular with the public and with politicians. On the other hand, heavy rail, commuter rail, and *small* bus systems demonstrated the greatest reduction in service provided. For the former two, this may be tied to reduced ridership and funding in the larger metropolitan areas where they operate and *from* which residential population is shifting. The latter is probably more symptomatic of funding cuts. All told, the medium-sized agencies saw the most consistency in

increased service. Interestingly, this agency type also saw the greatest increase in median fares.

Performance

- It appears that the costlier modes to operate (demand response and light rail) are the modes experiencing growing service. However, these modes appear to be exhibiting decreasing returns to scale: unit cost-efficiency measures (the cost of operating service per revenue-hour of service) are worsening as output increases. For light rail, this may be related to the startup phases of the younger systems. Capital costs are not included in these operating performance measures so that the decreasing average costs normally associated with capital-intensive investments (and which result from the effects of the high initial investment and low marginal cost of transporting each passenger) are not present. Alternatively, new systems brought on line may be starting off with lower cost-efficiency.

Demand response, whose cost-effectiveness (the cost of operating service per passenger served) and service-effectiveness (the number of passengers served per revenue-hour of operations) performance is also worsening, may be subject to the effects of non-optimal networks, dispersed and irregular passenger demand, and growing length of individual passenger trips. These trends are of real concern; it is unclear whether increasing returns to scale will be achievable for demand response services designed to satisfy ADA.⁶ From 1989 to 1994, the average (not median) cost of transporting a passenger on demand response has gone up from \$8.94 to \$13.24, an increase of 48 percent — far ahead of inflation. Similarly, the average revenue-hours per passenger-trip performance measure for demand response has increased 26 percent, from 0.29 to 0.37.

- Light rail, however, is showing improvements in effectiveness. Ridership is growing as new services are being implemented.
- Another significant trend is that larger agencies have not been able to cut service as fast as their ridership losses thus worsening their cost- and service-effectiveness.
- The decreasing availability of public funds does not appear to have had as much of a positive impact on cost-efficiency, cost-effectiveness or service-effectiveness as one would have imagined. This is clear because there have been few distinct improvements in any of these performance measures. This may not be surprising — such

improvements in a public-sector industry rarely happen in a short time. On the other hand, there *have* been some clear changes in certain specific areas that seem to correspond with trends in service provision.

- Additional disaggregate analysis of the NTD in a future project could examine more closely the following postulated transit agency behavior:
 - Cutting low-productivity services,
 - Cutting low-revenue routes, and
 - Cutting service on high overhead modes or cutting overhead costs.

Strategies for Public Transportation Funding

One of the goals of this research project was to explore in greater detail a number of specific strategies that transit agencies have undertaken in response to the increased financial pressures, particularly with respect to funding operations. We have developed 17 case studies of strategies that have proven successful.⁷ The case studies are provided under separate cover in the *Project H-7 Casebook—Funding Strategies for Public Transportation*.

Some of the cases represent innovative approaches used by several agencies; others have been used more often but could be pursued by other agencies. Some of the cases involve revenue enhancement; others get at the operating funding needs issue through operating cost reduction or capital expenditures that allow for lower ongoing operating costs.

The cases can be organized into three groups as follows:

- **Leveraging limited funding.** This group includes new uses of FTA funding (*e.g.*, advanced construction authority and progress payments) and low-cost financing through revolving loan funds and state infrastructure banks. In addition, since the passage of ISTEA, use of flexible highway funding for transit purposes has been increasing.
- **Use of assets to maximize value.** A number of cases show how agencies can use the commercial value inherent in transit rolling stock and real property to generate additional revenue streams. These cases include advertising on vehicles and at stations/shelters, parallel leases along rights-of-way, joint development of residential and commercial spaces at major stations, and concessions for station commerce.
- **Partnerships with the private sector and transit users.** The theme here is partnerships. First, the partnerships may be with the private sector, in the form of suppliers (*e.g.*,

progress payments for vehicle purchases and compressed natural gas suppliers), investors (*e.g.*, cross-border leases), developers (*e.g.*, turnkey facility development and joint development of stations), and retailers (*e.g.*, credit card fare payment using ticket issuing machines). Second, the partnerships may be with groups of users or entire communities that value transit services. This second group includes impact fees, local sales or utility taxes, direct operating support, and the use of passes (*e.g.*, Eco Pass).

These strategies have varying potential for helping to alleviate operating funding pressures: some have a large magnitude (*e.g.*, sales tax) while others are more marginal (*e.g.*, advertising revenue). Some have less direct budgetary impacts (*e.g.*, joint station development) while others may be “only the tip of the iceberg” (*e.g.*, asset value maximization). Finally, some are simultaneously addressing recent federal mandates (*e.g.*, natural gas bus facilities) or policy shifts (*e.g.*, increased use of private sector partnerships).

While researching the case studies as well as during presentations at APTA conferences, we found that many transit agencies of varying sizes were interested in these strategies. It would appear that many of these ideas, if not new for federal and national industry observers, still offer substantial potential to agencies across the country. Although no one strategy will resolve a major funding crisis at a particular agency, each could prove to be a useful tool to address funding needs.

Endnotes

- 1 This discussion is based on data in *Commuting in America*, Eno Transportation Foundation, 1996.
- 2 TCRP J-6, referenced in Tasks 1 and 2: Technical Memorandum, p. 54.
- 3 The actual disbursements are termed apportionments (for formula funds) and outlays (for discretionary funds) and can be still slightly lower than obligations. However, full data were not available at this level of detail.
- 4 Funds are flexed to a specific FTA capital program so that the total FTA capital funds obligated amount mentioned earlier includes flexible funds. Actual outlays of obligated funds will not all occur in the obligation year.
- 5 Eno, 1996, op. cit.
- 6 There may be opportunities for greater efficiency in the case of general public dial-a-ride services. Further research could be done on these returns to scale and efficiency issues.
- 7 We have deliberately left out farebox revenue enhancement strategies which were explored in TCRP Project A-1 TCRP Report 10, "Fare Policies, Structures, and Technologies," Transportation Research Board, Washington, D.C. (1996).

Chapter 4

Implications of the Findings for the Transit Industry

This chapter summarizes the transit funding, service, and economic “picture” and discussing the implications for future funding strategies and ideas for future research.

Summary of the Transit Financial Situation and Transit Service Trends

There have been recent decreases in funding for many transit agencies in the United States. The funding limitations have resulted in tougher choices among competing service priorities for transit managers, including deferrals in projects and service changes and improvements. This has resulted in slower growth than would otherwise have been anticipated but has not stifled growth altogether.

The requirements laid out by ADA have led to a channeling of resources and growth to the demand response mode. Unfortunately, among all of an agency’s services, demand response is typically among the lowest in terms of cost-efficiency and cost-effectiveness. This situation is making it increasingly difficult for transit to keep pace with its primary competition — the private automobile.

The insecurity in the annual level of federal operating and capital funding works against proactive service and capital planning, at least for agencies that have had a relatively greater reliance on federal funds. Despite the promise of ISTEA’s intermodal approach and flexible funding, an agency in, say, 1992, looking forward, might have had to become more cautious and reactive in its approach, focusing on meeting recently imposed federal mandates. This approach might work against improvements in modes that involve greater financial commitments, such as all aspects of rail and major bus programs, including intermodal stations.

We have found that, despite the real decline of federal funding for operations, the gap between funding and growing nominal operating expenditures has been bridged primarily through a rapid increase in dedicated funding sources. Dedicated

funds are now the largest funding component behind the farebox. However, an often expressed concern is that states and localities, whether through general or dedicated revenue, will not be able to make up further relative declines in federal support.

In response to this concern, one must consider two issues:

- Whether or not the federal government should be providing operating support to transit (*i.e.*, whether it is appropriate for this funding responsibility to be increasingly “devolved” to states and municipalities. This issue is not examined here).
- Whether or not states and localities can afford to take over the federal role. In 1994, federal operating funding amounted to about \$900 million, while state and local operating funding (including dedicated and general funds) reached \$9 billion. The state and local involvement needs to increase a further 10 percent (above the rate of inflation) to cover the federal share. However, the hundreds of state and local entities that are affected have varying abilities to pay, particularly in this era of tightening state and local budgets and may experience significant hardship.

Fares continue to make up, on average, just over one-third of total operating funds. While the majority of agencies have continued to increase fares, only about one-half of the increases have been ahead of inflation. The greatest fare increases were at medium-sized agencies, at both those providing only demand response service and those with light rail, both of which already have low farebox recovery. It is unclear what direct impact fare increases (generally in line with inflation) have had on transit’s ability to fulfill equity and mobility goals. However, we do know that automobile out-of-pocket costs have increased well below inflation. This helps to explain why there is a perception that transit is becoming a more expensive mode for the markets it serves.

On the capital side, the federal government still maintains the largest funding role, underpinning capital investment in all modes and settings across the country. Federal capital funding has continued to increase (albeit at a rate slower than inflation) and is anticipated to remain strong in the future.

The long-term demographic changes in the United States have meant a loss of riders in “traditional” modes (*i.e.*, commuter rail, heavy rail, and bus) and larger and older metropolitan areas. The reason is partly because lower-density residential patterns and more dispersed job growth patterns are harder (or at least more expensive) to serve effectively through the mass transportation of passengers. This loss has likely been compounded by the fact that funding pressures and fairly narrow mandates have made it more difficult for transit agencies to

develop the kinds of new services needed to respond to the changing demographics of the populations they serve. Those agencies dealing with the need to reduce service levels or service quality due to funding reductions would clearly have a harder time focusing on service improvements.

Demand response service is, almost by definition, a less efficient mode than higher-capacity, fixed-route/guideway service. Its basic characteristic — reinforced by ADA — is that it serves a more dispersed population that cannot use or has difficult access to a nearby fixed-route, higher-capacity mode. Despite this inherent problem, an increase in efficiency and effectiveness may still be possible.

Light rail service is growing and attracting new ridership at a faster rate than other modes and its effectiveness measures appear to be improving. Nevertheless, cost-efficiency remains a problem. Costs do not appear to be entirely under control, at least with respect to the newer light rail services. These services may still be in an increasing marginal cost phase, as new systems come on line and expand.

In these two modes where the fastest service expansion has taken place, the next 5 years of data and experience may show further significant changes.

Implications for Future Strategies

The findings of this research project do not seem to indicate that there is an imminent, widespread financial crisis in the U.S. transit industry with transit services failing everywhere. Nevertheless, there has been a clear trend of reductions in the real value of federal funding available for public transportation. Transit agencies have responded to this potential crisis by focusing their efforts on finding alternatives to federal operating funding and have channeled much of their limited operating resources into meeting ADA requirements. Agencies that have expanded light rail services have to deal with the budget consequences of a mode that, while successful in carrying passengers, appears to have some youthful problems of relatively low cost-efficiency. This is not to say that no agency has faced a crisis. The aggregate picture often masks the disaggregate one; some agencies have had to cut service dramatically or have been forced to put off service improvements and expansions that would allow them to keep pace with growing travel needs and to maintain their mode share.

For the years since 1994, we observe from published FTA data that federal operating funding has continued at a level under \$1 billion. State and local sources will presumably have made up

the difference, at least covering expenditure increases related to inflation. However, the rate of inflation has generally been low (compared to historical levels in the United States) and the economy has been relatively strong, suggesting that dedicated tax sources, which have become so prominent in funding transit, have been robust. The financial condition may have remained largely stable since 1994, at least for the industry as a whole. Nevertheless, the past is not necessarily a good guide for the future, and the funding picture may worsen. It would be dangerous to conclude that transit as an industry is doing well despite decreasing federal funding. A more appropriate depiction would be that it has been able to cope with the funding issues and the federal mandates — mainly with the increased support of states and localities. Reliance on dedicated tax-based sources means that the industry will be less sheltered from future economic cycles.

The most recent challenge to transit agencies is the move to full ADA compliance that was intended to be completed in 1997 and the financial effects of which are not yet evident. Indications are that some agencies will need more time to fully implement the required changes and services, including demand response services. From 1994 through 1997, demand response service and expenditures increases will have continued.

The case studies of non-traditional and innovative funding strategies have pointed to several strategic approaches for transit agencies to continue to augment their financial resources in the future. Some of the strategies can provide significant resources for major expenditure elements while others provide smaller-scale (in terms of budgetary impact) rewards.

- Transit agencies should continue communicating more directly with their customers about tying specific services to funding sources. Whether through direct funding of university area services, partnerships with local businesses, or local, regional, and state taxes, transit agencies can go to the users to find out what kind of service they want, provide it, and ask them to help pay for it. The broad shift in operating funding to dedicated sources at the state and local levels also reflects a move closer to the users and beneficiaries of transit service.
- Transit agencies possess a range of assets with substantial value to other, typically private, parties which should be tapped. Such assets include vehicles (for advertising and leasing), stations (for joint development and concessions), and rights-of-way (for telecommunications infrastructure). The accumulated public investment in these assets has the potential to generate private sector benefits, which can be directed back to the transit agencies.

- In addition to leveraging value from their assets, transit agencies should take advantage of other financial leveraging mechanisms, many of which have been available to other public infrastructure sectors for some time. These mechanisms include revolving loan funds and credit enhancement as well as advanced construction authority. Most involve the use of debt financing, especially among larger agencies. In the future, its use could become more widespread and at lower cost. At the same time, agencies will have to take care to not become over-leveraged, putting their future at risk to finance the present.

The implication of our review is *not* that federal operating support need not increase. Indeed, with more substantive funding tied at a *minimum* to the increasing levels of automobile usage and funding, transit services in all settings around the country could be improved and broadened. Transit could play a much larger role in relieving congestion, improving air quality, and providing mobility to both transit-dependent and discretionary transit users. Increasing operating funding from current levels might provide the opportunity to meet such goals.

Ideas for Future Research

The findings of this research project also point to a number of research areas that could produce additional benefits to the industry.

Development of Econometric Behavioral Models

The National Transit Database is a very rich, disaggregate source of information on transit agency funding, service, costs, and performance. Despite some problems, including imperfect reporting, it represents an almost complete sample of U.S. transit agencies.

The findings provided in this report are factual, based on the data analysis, but do not go so far as to develop causal relationships or econometric models. Such models could be used to better understand agency behavior and responses in the recent past as well as to predict future transit agency performance. There is sufficiently detailed information in the database, which could be combined with census data, labor statistics, and other information, to develop complex multivariate models representing transit agencies and their markets. While studies have been performed on transit agency cost structure and cost curves as well as on ridership and revenue elasticity, a future study could attempt to model transit agencies' performance in the broader context of their demographic, financial, and institutional environment.

Case Studies of Best Performers and of Most Troubled Agencies

The case studies focused on identifying non-traditional and innovative funding practices that could find wider application across the U.S. transit industry. Additional case studies could be undertaken with a similar knowledge-sharing objective. These cases would focus on agencies that have fared particularly well or particularly poorly in the recently changing transit market, policy, and funding environment. The objective would be to understand what characteristics about the agencies and specific actions taken by the agencies have led to either result. Lessons could be drawn from this analysis that would be useful to policy-makers and to transit managers.

Criteria for selection of these case agencies could focus on various definitions of success or failure. For example, an agency may have been particularly adept at attracting state and local financial support. Another may have experienced extreme declines in ridership. The National Transit Database could be used to identify case agencies in two ways: first, by identifying agencies with particularly high or low values of key measures, and second, by identifying agencies with particularly high or low values of *changes* in key measures over the period of analysis.

Research on Improving the Performance of Demand Response

Demand response service has been the fastest-growing segment of transit service in the United States, overtaking all rail modes (individually) in vehicle-hours, although remaining a distant second to bus. Its growth has been spurred by the requirement to comply with ADA, specifically the requirement that disabled-accessible transit service be provided to all potential patrons within 3/4 miles of fixed-route service. Demand response service is typically provided by vehicles much smaller than standard buses, with pickups and dropoffs based on the specific needs of the customers within the agency's service area.

The findings of this research project indicate that the cost-efficiency and cost-effectiveness of this mode has been declining (at least through 1994). This is a troublesome fact, given that, by 1997, all agencies will have had to comply with ADA, in most cases implementing some form of demand response service. In addition, the cap on demand response service fares (double an agency's fare for the comparable route service) makes it a mode that has a relatively low farebox recovery ratio. Given these facts, it would seem timely and very relevant to explore the fundamental economics of providing this type of service. What drives the higher cost per unit of providing this service and what can be done to improve cost-efficiency and cost-effectiveness? Can more optimal methods be developed of scheduling pickups

and dropoffs? Can different types of contracts be developed to control costs using purchased service providers? It may even be relevant to discuss certain cases in low-density areas where it may be more cost-effective to provide *only* demand response service rather than using it to supplement fixed-route bus service.

Policy and Economic Research into the Appropriate Federal Role in Transit Capital and Operations

Federal involvement in operating funding for transit has waned, while support for transit capital programs has continued. Lower levels of government, including states, localities, and transit agencies' own jurisdictions (*e.g.*, regional transportation authorities) have stepped in to fill the gap. In some ways, transit begins to look more like other modes of transportation that involve government investment, such as highways and airports/airways. For these modes, the federal role is primarily in allocating general and dedicated revenue for purchasing and maintaining capital assets around the country (*e.g.*, highways and airside safety functions) usually through state DOTs and other local entities. The federal role in actually operating service is minimal.

Transit, however, is not directly comparable to the other modes. Indeed, transit is often looked upon as more of a public service which calls for government support. The real question is, what level of government should that support come from? Should it be state and local government that is most concerned with "purchasing" (through operating support) certain levels of transit service? What is the advantage of capital investment being controlled (at least partially) by Congress, while operating support becomes the unique purview of lower levels of government? The answers can be explored through a policy/institutional analysis lens as well as an economist's lens. The federal transit funding strategy actually pursued in recent years may not reflect sound theory and practice. This research can help us understand the appropriate direction for federal funding policies for the nation's public transportation systems.

Appendix A

Background

This technical appendix serves as an addendum to the data in the Technical Memoranda for Tasks 1-4. This technical appendix provides detailed information on the additional National Transit Database (NTD) analyses performed in support of the final report.

Data Source

All data was obtained from the NTD (formerly Section 15 reports). The NTD, administered by the Federal Transit Administration (FTA), provides detailed summaries of financial and operating data submitted to the FTA by the nation's mass transit providers.

Period Analyzed

Our analysis covers the period from 1989 to 1994. We used this period because it covers the recent past and is a period during which the industry was undergoing changes in government policy and funding (including ISTEA, ADA, and CAAA). All trends are based on the experiences recorded between the end-years of 1989 and 1994 and did not include trends in the interim years (*i.e.*, 1990 to 1993). Based on our review of the data, the trends in these years were generally consistent with the "1989 to 1994" results, and inclusion of the additional years would not have provided substantial added value. Our review did not include the post-1994 period because these data were not available from the FTA at the time of the analysis.

Use of Nominal Dollars

All financial data and statistics are based on nominal dollars and are, therefore, not adjusted for inflation.

Purpose of Analysis

In the review of the results provided by Tasks 1-4, we determined that it would be valuable to conduct more detailed analysis of a few of the more interesting and relevant measures. In Tasks 1-4, emphasis was placed on the *average* result of a particular measure. While averages are informative to draw general conclusions, we decided to perform additional analysis which would provide information at a more disaggregated level.

To do this, we performed analysis using the SAS statistical program. Analysis was conducted on a number of indicators and measures. We summarized the results of the SAS programming for each measure in a table format, as listed below:

- Passenger Fares — Table A-1
- Operating Revenues/Funding — Table A-2
- Capital Revenues/Funding — Table A-3
- Service Level (*i.e.*, Vehicle Revenue-hours) — Table A-4
- Cost-Effectiveness (*i.e.*, Operating Costs/Vehicle Revenue-hour) — Table A-5
- Service-Effectiveness (*i.e.*, Unlinked Passenger Trips/Vehicle Revenue-hour) — Table A-6

For Passenger Fares, the table provides the following general statistics on total passenger fares per unlinked passenger trips for 1989 and 1994:

1. N — number of systems on which analysis was conducted
2. Mean — average passenger fare (calculated as total farebox revenue/total unlinked passenger trips)
3. Standard Deviation — indicating the spread of the distribution of fares from the mean, either positive or negative
4. Median — value of the central point, where there are an equal number of fares with a value higher and lower than this point
5. Maximum — maximum passenger fare charged
6. Minimum — minimum passenger fare charged
7. % Missing — percent of all systems with no data on passenger fares
8. % Change — percent change between 1989 and 1994 in above categories

For all measures *except* Passenger Fares, the information presented in these charts provides the following general statistics for 1989 and 1994:

1. Number of systems for which selected measure is zero in 1989 only
2. Number of systems for which selected measure is zero in both 1989 and 1994
3. Total Number of systems (N) on which analysis was conducted — this number is the net of items 1 and 2 above
4. Increase in number of users of revenue source (for capital and operating revenue measures only) — indicates number of systems for which measure increased from zero in 1989
5. Magnitude of Change for 25th quartile — indicates percent increase in the selected measure from 1989 to 1994 for the system whose measure falls at the 25th percentile mark of all agencies
6. Magnitude of Change for median — indicates percent increase in the selected measure from 1989 to 1994 for the system whose measure falls at the median of all agencies
7. Magnitude of Change for 75th quartile — indicates percent increase in the selected measure from 1989 to 1994 for the system whose measure falls at the 75th percentile mark of all agencies
8. Number per Direction of Change (Up) — indicates number of systems for which the selected measure increased from 1989 to 1994
9. Number per Direction Change (no change) — indicates number of systems for which the selected measure was the same in 1989 and 1994
10. Number per Direction of Change (Down) — indicates number of systems for which the selected measure decreased from 1989 to 1994

Please find all the tables on the following pages.

Table A-1: Analysis of Fare

Stratum	Year	N	Mean	Std. Dev.	Median	Max	Min	%Miss.	Notes
Overall	1989	405 \$	0.64 \$	0.96 \$	0.41 \$	9.75 \$	0.00	18%	
	1994	388 \$	0.74 \$	1.00 \$	0.49 \$	8.94 \$	0.00	20%	
						% Up	% Down		
	% Change	333	n.a.	n.a.	20%	80%	20%	42%	Mean is skewed by a few very high changes
	Change in Mean		16%						
	Change in Median				20%				
HR/CR	1989	26 \$	1.29 \$	0.13 \$	0.68 \$	6.15 \$	0.31	19%	
	1994	23 \$	1.44 \$	1.14 \$	0.89 \$	4.15 \$	0.19	18%	
						% Up	% Down		
	% Change	20	21%	17%	17%	95%	5%	29%	Only one reduction: -4.5% at NY-PATH. Highest change is +57% at NYCTA.
	Change in Mean		12%						
	Change in Median				31%				
LR	1989	7 \$	0.48 \$	0.16 \$	0.44 \$	0.78 \$	0.32	0%	
	1994	13 \$	0.58 \$	0.14 \$	0.57 \$	0.86 \$	0.39	0%	
						% Up	% Down		
	% Change	13	28%	22%	26%	92%	8%	0%	Only one reduction: -4.3% at St. Louis Bi-State Highest change is +80% at Galveston Island Transit
	Change in Mean		21%						
	Change in Median				28%				
Bus	1989	332 \$	0.57 \$	0.82 \$	0.39 \$	7.58 \$	0.000	14%	
	1994	315 \$	0.62 \$	0.89 \$	0.46 \$	8.94 \$	0.00	16%	
						% Up	% Down		
	% Change	281 \$	41%	214%	19%	78%	22%	25%	Std.dev. reflects impact of several high outliers.
	Change in Mean		9%						
	Change in Median				19%				
DR	1989	34 \$	0.78 \$	1.65 \$	0.47 \$	9.75 \$	0.01	42%	
	1994	32 \$	1.37 \$	1.62 \$	0.83 \$	7.11 \$	0.03	49%	
						% Up	% Down		
	% Change	17	n.a.	n.a.	62%	100%	0%	73%	Too few obs for meaningful results. Highest change is +80% at Galveston Island Transit.
	Change in Mean		75%						
	Change in Median				76%				
Other	1989	6 \$	1.30 \$	1.05 \$	1.28 \$	3.17 \$	0.11	14%	One missing
	1994	5 \$	0.92 \$	0.54 \$	0.88 \$	1.65 \$	0.40	50%	
						% Up	% Down		
	% Change	2n.a.	n.a.	n.a.	100%	0%	80%		Too few obs for meaningful results.
	Change in Mean		n.a.						
	Change in Median				n.a.				

Table A-1: Analysis of Fare (continued)

Stratum	Year	N	Mean	Std. Dev.	Median	Max	Min	%Miss.	Notes
Overall	1989	405 \$	0.64 \$	0.96 \$	0.41 \$	9.75 \$	0.00	18%	
	1994	388 \$	0.74 \$	1.00 \$	0.49 \$	8.94 \$	0.00	20%	
						% Up	% Down		
	% Change	333	n.a.	n.a.	20%	80%	20%	42%	Mean is skewed by a few very high changes
	Change in Mean		16%						
	Change in Median				20%				
Small	1989	299 \$	0.56 \$	0.86 \$	0.38 \$	9.75 \$	0.00	19%	No clear modal pattern.
	1994	278 \$	0.68 \$	0.97 \$	0.45 \$	8.94 \$	0.00	22%	No clear modal pattern.
						% Up	% Down		
	% Change	228	n.a.	n.a.	20%	77%	23%	36%	Skewed by very high outliers.
	Change in Mean		12%						
	Change in Median				19%				
Medium	1989	82 \$	0.89 \$	1.28 \$	0.47 \$	7.58 \$	0.11	18%	Among the highest are suburban/express buses and commuter rail (e.g., Metra).
	1994	82 \$	0.89 \$	1.14 \$	0.58 \$	7.88 \$	0.06	19%	
						% Up	% Down		
	% Change	78	32%	43%	22%	87%	13%	23%	About 25% have over +50%, 5% have over +150%.
	Change in Mean		-1%						
	Change in Median				25%				
Large	1989	24 \$	0.78 \$	0.78 \$	0.54 \$	3.49 \$	0.32	0%	Max: NY Metro-North. Min: SF MUNI.
	1994	28 \$	0.85 \$	0.85 \$	0.61 \$	4.15 \$	0.27	7%	Max: NY Metro-North. Min: San Antonio VIA
						% Up	% Down		
	% Change	27	21%	20%	17%	93%	7%	10%	Dallas DART shows 31% drop.
	Change in Mean		9%						Largest increase of 65% at Minneapolis-St. Paul.
	Change in Median				19%				

Notes: N represents non-missing observations used in calculations.

% Missing indicates percentage of all observations for that year that had missing data, thus preventing calculations.

Since FARE uses unlinked trips, agencies with relatively higher transfers per passenger will show lower FARE. (e.g., NYCTA basic fare is \$1.50, but FARE is \$0.89.)

Greater use of discount passes lowers FARE. (e.g., from 1989 to 1994 e.g., WMATA FARE is \$0.91, with few free transfers.)

The above two comments apply equally in an aggregated manner for the above tables.

A std. dev. larger than mean indicates skewness on high end (because values < 0 are impossible).

HR/CR Agency operates Heavy Rail and/or Commuter Rail, plus others.

LR Agency operates Light Rail, plus others, but no other rail.

Bus Agency operates motor bus, plus others, but no rail.

DR Agency operates demand response exclusively.

Other Agency operates only modes other than those above.

Large Total vehicles in service (i.e., not including spares, etc.) 500 or over.

Medium Total vehicles in service (i.e., not including spares, etc.) 100 to 499.

Small Total vehicles in service (i.e., not including spares, etc.) less than 100.

Table A-2: Analysis of Operating Revenues

		Changes in Each Source										
		# with funding source			Growth (new user since 1989)	For Agency with Funding Source in 1989 and 1994						% neither year
		1994 Only	Neither Year	Net Total (N)		Magnitude of Change			Number per Direction of Change			
						25 th Quant	Median	75 th Quant	Down	Unchanged	Up	
Overall	Fares	49	7	360	14%	12%	31%	61%	13%	0%	88%	2%
	Other	19	37	360	5%	-62%	-23%	44%	61%	0%	39%	9%
	FTA (secs. 5, 9)	15	57	344	4%	-8%	5%	26%	44%	0%	56%	14%
	Other Federal	32	263	121	26%	-100%	-48%	47%	62%	0%	38%	63%
	State	48	165	203	24%	-9%	29%	63%	28%	0%	74%	40%
	Local	30	147	239	13%	-1%	27%	76%	26%	0%	74%	35%
	Dedicated Taxes	43	101	272	16%	-20%	24%	71%	33%	0%	67%	24%
Small	Fares	44	6	248	18%	12%	30%	63%	14%	0%	86%	2%
	Other	17	37	244	7%	-70%	-27%	41%	60%	0%	40%	12%
	FTA (secs. 5, 9)	10	34	254	4%	-7%	8%	31%	36%	0%	64%	11%
	Other Federal	20	211	67	30%	-100%	-83%	31%	64%	0%	36%	71%
	State	39	116	143	27%	-9%	29%	53%	27%	0%	73%	39%
	Local	22	92	184	12%	4%	31%	82%	23%	0%	77%	31%
	Dedicated Taxes	33	80	185	18%	-25%	26%	78%	34%	0%	66%	27%
Medium	Fares	5	1	85	6%	15%	34%	55%	12%	0%	88%	1%
	Other	2	0	89	2%	-49%	-16%	95%	56%	0%	44%	0%
	FTA (secs. 5, 9)	2	22	67	3%	-10%	-2%	12%	64%	0%	36%	24%
	Other Federal	10	39	42	24%	-100%	-23%	47%	60%	0%	40%	43%
	State	6	37	48	13%	-51%	28%	88%	33%	0%	67%	41%
	Local	2	45	44	5%	-37%	23%	64%	34%	0%	66%	49%
	Dedicated Taxes	6	20	65	9%	-36%	21%	56%	37%	0%	63%	22%
Large	Fares	0	0	27	0%	13%	27%	42%	4%	0%	96%	0%
	Other	0	0	27	0%	-43%	-29%	-1%	81%	0%	19%	0%
	FTA (secs. 5, 9)	3	1	23	13%	-10%	-2%	5%	70%	0%	30%	4%
	Other Federal	2	13	12	17%	-96%	-39%	174%	58%	0%	42%	48%
	State	3	12	12	25%	1%	12%	80%	17%	0%	83%	44%
	Local	6	10	11	55%	-3%	6%	14%	27%	0%	73%	37%
	Dedicated Taxes	4	1	22	18%	11%	23%	50%	14%	0%	86%	4%

Notes: Results above could be misleading: do not interpret to mean all agencies saw drop in all categories.

For an individual agency, one category could drop while another rises.

Also, absolute magnitudes may show increasing overall operating revenues, however a particular category's percentage dropped because another category sky-rocketed or began.

Agencies with only 1989 or only 1994 entry in NTD are excluded from analysis. If agency had source in 1994 only, no % change calculation was possible. The occurrence of such agencies is noted in chart.

There were observations showing a -100% percentage change, indicating cessation of a revenue source.

Mean is not shown for the following reason: every category of funding has outliers that result in a skewed distribution with high mean and meaningless standard deviation

Table A-3: Analysis of Capital Revenues by Size Type
Changes from 1989 to 1994

		Changes in Each Source										
		# with funding source			Growth (new user since 1989)	For Agency with Funding Source in 1989 and 1994						% neither year
		1994 Only	Neither Year	Net Total (N)		Magnitude of Change			Number per Direction of Change			
						25 th Quant	Median	75 th Quant	Down	Unchanged	Up	
Overall	Federal (FTA)	12	3	305	4%	-79%	-8%	211%	52%	0%	48%	1%
	Federal (Other)	38	281	21	181%	-100%	-100%	-100%	81%	0%	19%	83%
	State	41	113	174	24%	-97%	-56%	149%	63%	0%	37%	34%
	Local	57	87	181	31%	-89%	-22%	256%	54%	0%	46%	27%
	Dedicated	88	156	93	95%	-86%	-18%	199%	54%	0%	46%	46%
Small	Federal (FTA)	11	2	212	5%	-84%	-24%	261%	54%	0%	46%	1%
	Federal (Other)	32	205	7	457%	-100%	-100%	-100%	86%	0%	14%	84%
	State	32	89	112	29%	-98%	-65%	114%	63%	0%	38%	38%
	Local	45	54	130	35%	-92%	-19%	280%	52%	0%	48%	24%
	Dedicated	57	128	56	102%	-93%	-37%	88%	57%	0%	43%	53%
Medium	Federal (FTA)	1	1	68	1%	-74%	3%	154%	50%	0%	50%	1%
	Federal (Other)	3	61	7	43%	-100%	-100%	-100%	100%	0%	0%	86%
	State	6	20	44	14%	-93%	-55%	130%	66%	0%	34%	29%
	Local	7	26	38	18%	-73%	-24%	129%	61%	0%	39%	37%
	Dedicated	21	26	24	88%	-66%	0%	342%	50%	0%	50%	37%
Large	Federal (FTA)	0	0	25	0%	-14%	40%	94%	36%	0%	64%	0%
	Federal (Other)	3	15	7	43%	-100%	-100%	141%	57%	0%	43%	60%
	State	3	4	18	17%	-79%	-35%	210%	56%	0%	44%	16%
	Local	5	7	13	38%	-98%	-25%	295%	54%	0%	46%	28%
	Dedicated	10	2	13	77%	-70%	76%	285%	46%	0%	54%	8%

Notes: If agency had source in 1994 only, no % change calculation was possible. The occurrence of such agencies is noted in chart.

There were observations showing a -100% change, indicating cessation of a revenue source.

Mean is not shown for the following reason: every category of funding has outliers that results in a skewed distribution with high mean and meaningless standard deviation.

Federal (FTA) includes all funds from FTA and UMTA. Federal (other) includes other DOT funds and other (non-DOT) federal government funds.

Table A-4: Analysis of Service Levels
Changes from 1989 to 1994

		Changes in Service Levels							
		# with service (revenue-hours)		For Agency with Service Provided in 1989 and 1994					
		1994 Only	Net Total (N)	Magnitude of Change			Number per Direction of Change		
				25 th Quant	Median	75 th Quant	Down	Unchanged	Up
by Mode	Commuter Rail	0	0	-4%	4%	9%	30%	0%	70%
	Demand Response	2	267	5%	43%	120%	20%	1%	79%
	Heavy Rail	0	12	-10%	0%	6%	50%	0%	50%
	Light Rail	0	14	-11%	16%	84%	36%	0%	64%
	Motor Bus - Total	1	349	-5%	5%	20%	38%	2%	60%
	Small	1	266	-7%	3%	18%	41%	3%	56%
	Large	0	83	-2%	8%	23%	28%	0%	72%
	Other	0	30	-8%	10%	247%	33%	0%	67%
	Overall	3	682	-3%	11%	48%	30%	2%	68%
by Agency Size	Small	1	295	-2%	11%	31%	28%	2%	70%
	Medium	0	88	1%	15%	43%	23%	0%	77%
	Large	0	27	0%	10%	26%	26%	0%	74%
	Overall	1	411	-2%	12%	32%	27%	1%	72%

Notes: Analysis by mode considers each agency mode separately; therefore, each mode at each agency is considered a separate and unique observation.

Analysis by size considers each agency once by size only (size is determined by fleet size)

If agency had information in 1994 only, no % change calculation was possible.

There were observations showing a -100% change, indicating cessation of service.

Mean is not shown for the following reason: every category of funding has outliers that results in a skewed distribution with high mean and meaningless standard deviation.

Table A-5: Analysis of Cost-Efficiency Levels
Changes from 1989 to 1994

		# of Agencies with Zero Revenue-Hours		Net Total with \$ and Rev-Hrs in Both Years (N)	Changes in \$/Revenue Hour Levels					
					For Agency with Service Provided in 1989 and 1994					
					Magnitude of Change			Number per Direction of Change		
					25 th Quant	Median	75 th Quant	Down	Unchanged	Up
by Mode	Commuter Rail	0	0	10	-4%	10%	23%	30%	0%	70%
	Demand Response	2	1	265	2%	23%	58%	24%	0%	76%
	Heavy Rail	0	0	12	2%	16%	29%	25%	0%	75%
	Light Rail	0	0	13	3%	20%	31%	15%	0%	85%
	Motor Bus - Total	1	1	346	11%	20%	32%	9%	0%	91%
	Small	1	1	263	11%	20%	34%	8%	0%	92%
	Large	0	0	83	8%	18%	30%	10%	0%	90%
	Other	0	0	29	-5%	21%	58%	34%	0%	66%
	Overall	3	2	675	7%	20%	38%	16%	0%	84%
by Agency Size	Small	1	0	294	7%	19%	32%	14%	0%	86%
	Medium	0	0	88	6%	15%	28%	13%	0%	88%
	Large	0	0	27	6%	14%	24%	11%	0%	89%
	Overall	1	1	409	6%	18%	31%	14%	0%	86%

Notes: Analysis by mode considers each agency mode separately; therefore, each mode at each agency is considered a separate and unique observation

Analysis by size considers each agency once by size only (size is determined by fleet size)

If agency had information in 1994 only, no % change calculation was possible.

There were observations showing a -100% change, indicating cessation of service.

Mean is not shown for the following reason: every category of funding has outliers that results in a skewed distribution with high mean and meaningless standard deviation.

Table A-6: Analysis of Service-Effectiveness Levels
Changes from 1989 to 1994

		Changes in Passenger Trips /Revenue Hour Levels									
		# of Agencies with Zero Revenue-Hours		Net Total with S and Rev-Hrs in Both Years (N)	For Agency with Service Provided in 1989 and 1994						
		1989 Only	1994 Only		Magnitude of Change			Number per Direction of Change			
				25 th Quant	Median	75 th Quant	Down	Unchanged	Up		
by Mode	Commuter Rail	0	0	10	-21%	-8%	12%	60%	0%	40%	
	Demand Response	2	3	263	-25%	-10%	10%	63%	0%	37%	
	Heavy Rail	0	0	12	-15%	1%	11%	50%	0%	50%	
	Light Rail	0	0	14	-6%	11%	14%	36%	0%	64%	
	Motor Bus - Total	3	2	342	-13%	-3%	10%	56%	0%	44%	
	Small	3	2	259	-13%	-2%	12%	53%	0%	47%	
	Large	0	0	83	-13%	-6%	5%	65%	0%	35%	
	Other	0	1	28	-21%	-2%	25%	50%	0%	50%	
	Overall	5	6	669	-20%	-5%	11%	58%	0%	42%	
by Agency Size	Small	2	2	291	-17%	-5%	10%	59%	0%	41%	
	Medium	0	0	88	-19%	-7%	1%	73%	0%	27%	
	Large	0	0	27	-15%	-8%	-3%	85%	0%	15%	
	Overall	2	3	406	-17%	-6%	8%	64%	0%	36%	

Notes: Analysis by mode considers each agency mode separately; therefore, each mode at each agency is considered a separate and unique observation

Analysis by size considers each agency once by size only (size is determined by fleet size)

If agency had information in 1994 only, no % change calculation was possible.

There were observations showing a -100% change, indicating cessation of service.

Mean is not shown for the following reason: every category of funding has outliers that results in a skewed distribution with high mean and meaningless standard deviation.

Appendix B

Summary of Relevant Findings on Commuting Patterns in the United States

This brief appendix highlights key points on changing demographic and employment patterns in the United States. The findings, presented below in bullet-point format, are drawn from the text of *Commuting in America II*, a report published by the Eno Transportation Foundation in 1996, subsequent to the completion of the literature review which was part of Tasks 1 and 2 of this Research Project. The Eno report uses the 1990 census to observe changes in commuting patterns (by mode) since the 1980 census, along numerous dimensions, including population growth and migration trends, household characteristics, demographic groups, job markets, and mode characteristics. The report provides additional information to support the findings of this Research Project, specifically with regard to the changing demand for transit in metropolitan versus suburban markets, and in different regions of the country.

The data below refer to 1990, except for observations on growth and change, which relate to the period 1980 to 1990. Where appropriate, page number references to the Eno report are given in square brackets.

- All metropolitan growth has been in the suburbs; none at all in the central cities. Suburban share of metropolitan population grew to 62 percent, and grew to 47 percent of total national population (non-metro is the third group). Central city share is down to 29 percent; non-metro is at 24 percent. [p. 18-19]
- Western metro areas growing much faster than eastern - some medium eastern even declining. [p.20]
- West and South have highest growth rates. Northeast and Midwest (the other two of four regions) grew, but at slower rates. Evidence of lessening (although still strong) of shift to sunbelt that has dominated growth since 1950s. [p.21-22]

- Immigrants represent 40 percent of total growth in the decade, and 80 percent are labor-force additions, adding immediately to transportation demand. They are located in 55/45 central cities/suburbs, and many start without vehicles. [p.22-4]
- Suburbs house half of all workers, and over 1/3 of all jobs (central city about 1/3). Growth in job locations was as follows: suburbs 49 percent (for same-metro-suburb residents), 16 percent other suburbs, 15 percent Central City, 8 percent other C.C. (i.e. commuting to other nearby metro area), 12 percent non-metro. All the high-growth metro areas were in the South and West.
- Household structure, workers per household, workers per family and vehicle ownership per household trends all point to the following key points:
[p.29-33]
 - 70 percent of workers live in households of 2+ workers. Thus it is less likely for workers to be close to work, and carpooling w/in households.
 - Vehicles per household up to 1.66, while persons per household declining. But rate of growth of vehicles is slowing; evidence for nearing saturation. Vehicles per worker is up to 1.3; i.e. majority of workers have vehicle available.
[p.34-37]
 - Households without vehicles continues to decline, to 11 percent in 1990; however, decline is slowing. (Thus for non-work trips, less and less likely to use transit.) In absolute numbers, vehicle-less households has been constant around 10 million, including 5.3 million workers.
 - Of the vehicle-less households, they tend to be single-person households, most often elderly and women. Half of vehicle-less households have no workers. In metro areas, population growth was ahead of vehicle growth, but nationally was opposite. Most vehicle-less households are in central cities (59 percent), 18 percent inner suburbs, 11 percent in small urban areas, rest in rural and farm.
- Hard to separate vehicle commuting costs from vehicle costs for all purposes. However, major component of per mile cost is fuel. Gas and oil cost per mile has declined from 9 cents (in high cost 80-82 period) to 5.5 cents in 1992 (in *constant* 1990 \$). In terms of adding additional costs of commuting to this, commuters typically do not consider depreciation, etc. What about tolls and parking? Both are significant issues in the largest metro areas, but nowhere

else. We do know that 23 percent of all vehicle-miles households are for commuting. [p.38-43]

- (There were no transit-specific data on the cost of travel time differences between modes.)

[Following taken from section starting p.70 on Commuting Patterns and Trends]

- 50 percent of workers live in suburbs, 28 percent in central cities, and 22 percent in nonmetropolitan areas.
- Of central city commuter residents, 75 percent work in central city, 19 percent in suburbs.
- Of suburban commuter residents, 27 percent work in central city, 62 percent in suburbs.

[4 bullets below, *which are direct quotes*, refer to growth from 1980 to 1990, with final 1990 figure given.]

- Suburb-to-suburb commuting, with 44 percent of metro commuting, accounted for more than 58 percent of the growth.
- Commuting from central city to suburb, which had an 8 percent share in 1990, accounted for 12 percent of the total increase in metro commuting.
- Commuting from central city to central city, which represents 28 percent of all commuting, accounted for only 10 percent of the overall increase in commuting.
- The “traditional” commute (suburb to central city), with 16 percent of total, accounted for about 20 percent of the growth in commuting.
- Of the above categories, the two with central city destinations grew slower than in previous years, while the two with suburban destinations grew faster than previously.
- However, orientation to central city is still a function of metropolitan area size. Separating out areas with populations below one-half million, one finds that the central city destination is still dominant. The larger the metro area, the greater the share of suburb-to-suburb commuting, with the exception of areas over 3 million, where the central city destinations reach 45 percent. The suburb-to-central city share remains constant across all sizes.

[Below starting p.80 on Modal shares by flow pattern.]

- 56 percent of central city workers are central city residents, 74 percent of suburban workers live in the suburbs (of that metro area).
- For central city destinations, drive-alone private auto is dominant, with *at least* 60 percent of mode share in all

origin categories. Transit has more than just a few percentage points only for central city and other-metro-area origins.

- Among central city destinating transit riders excluding commuter rail, about 80 percent live in the central city area. Only between 10 and 15 percent commute from suburbs. On the other hand, for commuter rail (and regional Amtrak) passengers to central cities, 80 percent live in suburbs of the same or another metro area (40 percent each).
- For suburban job destinations, transit has under 5 percent of the mode share.
- About 40 percent of transit users to suburban job destinations live in the central city, and about half commute from suburbs.
- Transit's largest mode share is for commuting to central city destinations: 11 percent.