PROCEEDINGS

OF THE 39TH ANNUAL MEETING OF THE

TRANSPORTATION RESEARCH FORUM

Montreal, PQ, Canada
October 16 - 18, 1997

Volume 2

IS PUBLIC TRANSIT A GOOD INVESTMENT?

by

John Semmens
Arizona Department of Transportation
Research Center
1130 N. 22 Ave.
Phoenix, AZ 85009
phone: 602-407-3137
FAX: 602-256-6367
e-mail: jsemmens@dot.state.az.us

ABSTRACT

Governments at all levels have been assiduously applying funds to public transit systems. After 30 years of federal involvement, over $150 billion of tax dollars have been spent to expand and maintain public transit systems. Up to this point, no comprehensive analysis of this investment has been made. This paper has compiled data from a variety of sources into formats not generally available in order to try to answer the basic question of whether public transit is a good investment.

From a financial perspective, public transit expenses consistently exceed revenues from customers. This raises the question as to whether transit is adding to or subtracting from the overall well-being of the economy. An analysis of what the economic impact might have been if the federal funds invested in transit had been invested in business tax cuts instead is undertaken. The result of this hypothetical alternative use of these funds indicates that the 30 venture into subsidizing public transit has cost the economy seven million jobs.

The negative economic consequences of using scarce resources to prop up financially unprofitable transit rebut the contention that such spending is a net benefit to lower income segments of our society.

Instead, the availability of subsidies seems to have facilitated growing inefficiencies. Transit costs per passenger have risen at nearly four times the pace of inflation since 1965. The cost per passenger mile now exceeds the cost per vehicle mile to operate an auto.

The declining operating performance, the deepening annual financial deficits, the minimal social benefit, and the negative impact on economic growth all support the conclusion that public transit has not been a good investment of tax dollars.

WHAT KIND OF RETURN-ON-INVESTMENT HAS TRANSIT GENERATED?

Since the federal government became involved in subsidizing local public transit in 1965, it has poured over $70 billion into these systems. Over this same time period, local governments have put over $85 billion into subsidizing these systems. How good of an investment has this been? What kinds of return have we gotten on this substantial commitment of taxpayer funds?

From a purely financial standpoint, the returns have been solidly negative. The gap between expenses and revenues has gotten larger every year. By 1995, the annual deficit exceeded $16 billion (see Figure 1: Public Transit Financial Results and Table 1: Transit Financial Performance Since 1965).

As an investment, public transit generates a poor rate-of-return.

DOES FEDERAL AID INCREASE TRANSIT COSTS?

Federal subsidies of local transit have come attached to rules that have helped to increase the cost of running these systems. On the one hand, section 13(c) of the UMTA obstructs labor cost savings in federally subsidized transit. This federal rule prohibits changes in working conditions that would result in worsening the position of any employee. For example, federally subsidized transit systems may not attempt to save money by replacing full eight-hour per day employees with part time workers. Neither may federally subsidized transit systems substitute split shifts for straight eight-hour shifts (Arizona Department of Transportation, 1986, p. 7).

On the other hand, the Davis-Bacon Act helps raise the cost of transit construction by prohibiting competitive bidding on labor costs for federally aided projects. All bidders on a federally assisted bus terminal or rail station construction project, for example, would be required

to pay the "prevailing wage" in the region where the work takes place. Transportation economist Gabriel Roth estimates that Davis-Bacon rules make federally aided construction projects about 28% more costly than they otherwise would be (Henderson, 1997, p. 7).

The availability of federal money and the "strings" that it is attached to help to increase the cost of operating public transit.

HOW INFLATED ARE TRANSIT COSTS?

Providing transit services has become increasingly costly on a per passenger basis. The cost per passenger trip on transit has risen from around 18 cents in 1965 to nearly three dollars by 1995 (see Figure 2: Transit Cost Per Rider). Monetary inflation has raised the general price level by about 400% since 1965. However, transit's per rider costs have risen by more than 1500% during this period (American Public Transit Association, Transit Fact Book, various years).

The increase in transit costs has out-paced inflation, indicating that public transit has become increasingly inefficient in accomplishing the task of providing passenger transportation.

WOULD TRANSIT RIDERS BE WILLING TO PAY THEIR OWN WAY?

Revenue from paying customers stands as a measure of the value they place on the service. When these revenues are sufficient to cover the cost of providing this service we have proof that a genuine need, as perceived by the customer, is being fulfilled. When the revenue from customers is insufficient to cover the cost of providing the service we lack proof that a genuine need is being fulfilled. The profit that a business makes is verification that it is efficiently meeting customer needs. The losses accruing to public transit are a verification that the assertions of a vital need being met are unsubstantiated. In 1965, passengers paid 99% of the cost of their own transit

transportation. By 1995, passengers were paying only 33% of the cost of their own transportation (American Public Transit Association, Transit Fact Book, 1979, 1996). The unwillingness to ask transit riders to pay the full cost of the service is evidence that those operating these systems do not really believe that the service is worth what it costs to provide.

The objective evidence indicates that neither transit riders nor transit providers value the service at what it costs to provide it. Perpetual deficits mean that all of these public transit systems are converting resources from more valued uses into less valued uses. Individuals would not voluntarily waste their resources in this way. Consequently, the only way that public transit has been able to survive in its present form has been to force non-riders to bear increasingly larger shares of the cost.

Though transit patrons are not being asked to pay the full cost of their rides, it seems unlikely that they would be willing to do so if asked.

HOW DO TRANSIT COSTS COMPARE TO AUTO COSTS?

So inefficient is public transit that it now costs more per passenger mile to travel on transit than it does to travel by car. By the mid 1980s, the cost per passenger mile for transit rides began to exceed the full cost of owning and operating a car. Currently, the cost per passenger mile on transit is about 58 cents (American Public Transit Association, Transit Fact Book, 1996). The per vehicle mile full cost of operating a car is about 41 cents (see Figure 3: Transit vs. Auto Cash Costs Per Person Mile).

So, not only does using transit require customers to walk to stations, wait in the hot sun or rain, for a bus or train that may or may not be on time, and perhaps ride standing, this lower

quality of service now has a greater total cost per person mile than the comfort and convenience of riding in a car.

WOULD EXPANDING SERVICE IMPROVE FINANCIAL PERFORMANCE?

Sometimes it is argued that public transit does so poorly because it is not extensive enough. The idea is that ridership would be greatly expanded if hours or locations served could be expanded. Would-be transit passengers may be deterred by the lack of service to selected areas of the city or by the lack of service at selected times. If transit service were expanded perhaps these would-be passengers would use transit. This argument is not without plausibility. It is theoretically possible that an unserved latent demand for public transit is out there waiting for the proper threshold of transit service before venturing onto a bus or train.

However, actual expansions of transit service thus far have been followed by decreasing passenger load factors. Since 1965, bus miles of service rose from 1500 million to around 2200 million in 1995. Heavy rail vehicle miles of service rose from under 400 million to over 500 million. Light rail vehicle miles of service were around 40 million in both 1965 and 1995 (American Public Transit Association, Transit Fact Book, 1979, 1996). If the latent demand theory were correct, adding more service should have boosted the number of passengers by a percentage larger than the percentage increase in vehicle miles of service. This did not happen. In 1965, there were 7.9 billion passengers on these three transit modes. In 1995 there were 7.8 billion passengers (American Public Transit Association, Transit Fact Book, 1979, 1996). The theory that adding more public transit service would stimulate demand is not supported by the evidence.

The evidence supports a contrary theory. Namely, that at any given point, the public transit that already exists is already serving the highest demand segments of its potential market. Expansion of service will inevitably be aimed at market segments with lower inherent demand. Consequently, it would be hypothesized that the number of passengers per vehicle mile would decline as transit service is expanded. This is, in fact, what has happened. In 1965, there were 4.0 passengers per vehicle mile. By 1995, passengers per vehicle mile had fallen below 3.0 (American Public Transit Association, Transit Fact Book, 1979, 1996).

Previous expansions of transit service have worsened its financial performance. Future expansions are likely to have a similar result.

WHAT IS TRANSIT'S IMPACT ON THE ECONOMY?

While the financial and operating statistics for public transit systems are not encouraging, it is sometimes argued that transit's stimulation of other economic activities pushes the community's benefit into positive territory. The American Public Transit Association has published a pair of reports purporting to show that money spent on public transit generates a non-financial return that more than offsets the poor financial performances of the transit. In 1984, the APTA issued a report entitled *National Impacts of Transit Capital and Operating Expenditures on Business Revenues*. This report asserted that for every dollar spent on rail transit, an additional $3.15 in revenues to other businesses was produced. In the case of money spent on bus transit, an additional $3.50 in revenues to other businesses was claimed (American Public Transit Association, *National Impacts*..., 1984, p. 2).

In 1991, APTA issued another report--*Transportation Spending and Economic Growth: The Effects of Transit and Highway Expenditures*--claiming that spending on transit had a long term benefit/cost ratio of 3.29 (Aschauer, 1991, p. 10). That is, every dollar spent on transit would generate $3.29 in long term benefits.

These claimed benefits from transit expenditures sound impressive. However, APTA's analysis suffers from neglecting to disclose two highly pertinent facts. First, the analyses are based on correlations of transit expenditures and historical growth of the economy. Correlations do not prove cause-and-effect. They merely demonstrate that two things seem to be happening simultaneously. The simultaneous growth of transit spending and the U.S. economy could be, and is probably more accurately explained by inverting APTA's presumed cause-and-effect. That is, rather than the growth of transit outlays explaining the growth in the economy, it is the growth in the economy that explains the growth in transit outlays. The hypothesis that spending on trains and buses that have carried a dwindling share of urban travelers has played a significant role in the post-World War II growth of the U.S. economy is weak. A more reasonable hypothesis is that the robust economic growth over these years has provided the means for both federal and local governments to spend more on public transit. Growth of income, sales, and property values during this timeframe provided targets for the imposition of taxes with which to subsidize money-losing ventures in public transit. Far from being a source of economic prosperity, public transit has survived by living off the wealth generated by more productive segments of the society.

The second highly pertinent fact APTA overlooked is the issue of "opportunity cost." Opportunity cost is a term used by economists to account for the alternative uses of resources. Money spent on public transit can be shown to employ workers in the construction of rail lines,

the driving of buses, etc. This first round of spending furthers subsequent rounds as these directly employed workers spend their wages at supermarkets, department stores, etc. Transit, though, is not the only investment that generates this kind of "ripple effect." All economic activity generates "ripple effects." Before we can conclude that the "ripple effects" of public transit expenditures are an advantage for the economy, we need to consider them in comparison with the effects of alternative uses for the money spent on transit.

Taking the 30 years of investment in public transit of only federal tax dollars as our starting point, we find that public transit spending since 1965 can, generously, be credited with assets and activities that currently support about 900,000 jobs (American Public Transit Association, Transit Fact Book, 1996, p. 100). This sounds pretty good until it is compared with the outcomes that might have been achieved if the funds put into profitless public transit had been used in some other ways. If the annual federal expenditures that were made on transit had, instead, been "spent" on a cut in corporate tax rates, the economy could now theoretically support seven million more jobs than it currently does. The outcomes of two possible alternatives to transit investments that could have been made are shown in Table 2: Impacts on the U.S. Economy of Alternative Investments.

Analyses like these are only rough estimates. Everything except the "test variable," in this case the way $70 billion could have been invested, was "held constant." In the real world everything cannot be "held constant." Nevertheless, the important comparison is the relative magnitudes of the impacts of each alternative. Given the unprofitable financial performance of public transit over this 30 year period, it seems clear that in terms of economic growth, we would have been considerably better off if a number of plausible alternatives to spending the $70 billion

in federal taxes on public transit had been implemented instead. Therefore, when opportunity cost is taken into account, there can be no question that putting money into unprofitable public transit lowers the economic growth rate, consumes capital, exterminates job opportunities, and worsens the budget deficit of the federal government.

Public transit has been a beneficiary of U.S. economic growth rather than a cause of the growth. On balance, expenditures on transit have reduced rather than increased economic well-being in the U.S.

IS TRANSIT SUCCESSFUL ANYWHERE?

An important part of the enthusiasm for increased transit investment in any particular city is the reputed success of transit elsewhere. An objective evaluation of transit in other cities yields little evidence in support of this enthusiasm. In city after city, public transit is a financial failure. As Table 3: Statistics for Major Transit Systems (1994) shows, every single one of these transit systems operates at a loss. This requires taxpayers to contribute the majority of the funding to keep these systems running. In no case do riders pay even half of the cost of their own transportation. The highest rider shares of payment are achieved in New York City at 36%. The "success" of public transit is not that it offers cost-effective transportation, but that it has been able to secure continued subsidies from federal and local taxpayers.

No major public transit system in the U.S. even comes close to covering its costs from paying customers. In sum, there are no successful public transit systems.

IS TRANSIT THE VICTIM OF INEQUITABLE SUBSIDIES?

Could it be that the poor financial performance of public transit is due to inequitable public policies favoring the automobile? In absolute dollar terms, the amount of public sector expenditures on roads is substantially larger than for public transit. For 1995, we find government, at all levels, spending over $92 billion on roads (Federal Highway Administration, 1995, p. IV-8). During this same year, we find government, at all levels, spending over $24 billion on public transit (American Public Transit Association, Transit Fact Book, 1996, p. 53). The ratio of spending may be four to one in favor of roads, but the ratio of use is far higher. In 1995, there were over 3.7 trillion person-miles of travel (Federal Highway Administration, 1995, p. V-92). For this same year, there were 41 billion passenger miles of travel on public transit (American Public Transit Association, Transit Fact Book, 1996, p. 80). So, of government expenditures on roads and transit combined, transit receives about 20% of the outlays, but provides barely 1% of the total passenger travel. Of course, this comparison does not include the use of roads to move freight--another considerable benefit that would appear to merit a share of the public expenditures on roadways. On a total government outlay basis, public transit appears to be the recipient of more than a fair share.

Beyond the issue of total outlays is that of the source of the outlays. The beneficiaries of public transit pay only about 33% of the cost of their trips transit (American Public Transit Association, Transit Fact Book, 1996, pp. 58 & 64). Highway users, on the other hand, pay about 66% of the amount governments spend on roads (Federal Highway Administration, 1995, p. IV-8). This figure for highway users does not include taxes levied on vehicle owners that are deposited in "general funds" at the state and local levels. For example, the sales taxes paid for the purchase of autos and auto supplies go into state and local general funds. In addition, some states

levy taxes on the value of autos. Only a portion of this tax goes into highway users funds, the rest goes into the general funds. When these other taxes assessed on autos are considered, it appears that road users pay about 150% of the cost of roads (Dougher, 1995).

Public transit systems receive more than a proportionate share of government expenditures while its beneficiaries pay less of the cost for what they get than do highway users.

HOW MUCH DOES TRANSIT CONTRIBUTE TO CLEAN AIR?

Even if public transit fares poorly in terms of the financial and economic outcomes, can it make a cost-effective contribution to the mitigation of other societal problems? Let's consider the question of traffic congestion and the air pollution it generates. Transit helps to reduce the impact, but not by very much and not at a reasonable price. Given the higher carrying capacity per bus or train, it would certainly seem that transit could provide some significant environmental benefits. The problem is the gap between theoretical capacity and actual ridership. Public transit ridership falls far short of its theoretical capacity. Average load factors of 20% are typical transit (American Public Transit Association, Transit Fact Book, 1996, pp. 80-81). As a result, the pollution reduction likely to be attained by transit investments is small and the cost per unit of air quality improvement is large. Results from a study done for the Phoenix metropolitan region is shown in Table 4: Emissions Reductions Policies Ranked by Cost-Effectiveness. Considering costs to the users as well as to the public sector, transit ranked below several other traffic congestion mitigation measures (Rowell, 1997, p. 40). While results in other cities are not likely to be identical, they are likely to be similar in terms of the order of magnitude for the various measures.

The improvement in urban air quality that has been achieved over the last two decades--carbon monoxide, parts per million have dropped by about 50%, ozone, nitrogen oxide, sulfur dioxide and PM-10 have declined by about 60% (Federal Highway Administration, Air Quality Fact Book, 1994, p. 9)--owes little to public transit. Public transit ridership has remained near the 8 billion trips per year level for the last three decades. The credit must go to improvements made in automobiles. On a per vehicle mile basis, a car built today emits 97% fewer hydrocarbons, 97% less carbon monoxide, and 90% less nitrogen oxide than a car built in 1970 (Bast, 1994, p. 12). As newer vehicles have replaced older, more polluting vehicles, this has led to total vehicle emission reductions. With fleet turnover, urban air should continue to improve despite an increase in vehicle miles of travel. Further, new "cold start" emission control devices may reduce vehicle emissions by another 70% below the levels projected under existing technology ("1996 Discover Awards," July 1996).

In the aggregate, public transit makes a very small contribution to clean air. Investment in transit is not a cost-effective air quality improvement strategy.

ARE THE POOR TRANSIT'S MAIN CUSTOMERS?

A second major societal benefit claimed for public transit is its role in serving the poor. The idea is that by providing transportation to the urban poor, transit enables them to hold jobs or otherwise ameliorate the deprivations of poverty. However, transit's part in uplifting the poor is minor. Among the poorest segments of the U.S. population, a majority of the travel is in cars. In the $15,000 and under annual income category, 80% of the travel is in cars. Less than 10% is via public transit. Further, those with incomes under $15,000 constitute a minority of transit riders

(Pisarski, 1996, p.56). The most costly and worst performing segments of most transit systems, and the area in which many of the additions in service have occurred are the long-haul routes that extend into the suburbs to serve the more affluent employees of downtown businesses (Regional Public Transportation Authority, 1996, p. 28 and Federal Transit Administration, Transit Profiles, 1995, p. 193). Far from being a program oriented toward helping the poor, most of the expense in public transit is incurred serving those who would appear quite capable of bearing the cost of their own transportation (Congressional Budget Office, 1983, p. 49). Worse still, the negative impact on employment opportunities caused by three decades of public transit financial losses has retarded the growth of jobs that could have significantly improved the earning abilities of the lower income groups.

Public transit is not an effective means of assisting the poor to escape poverty.

CONCLUSION

Public transit is not a good investment. Ridership has fallen from a 30% share of urban travel in 1945 to a 2% share today (Altshuler, 1977, Pisarski, 1996, Federal Highway Administration, 1995, and American Public Transit Association, Transit Fact Book, 1996). The billions of tax dollars invested in public transit systems have not reversed its long term decline. Each new increment of tax subsidy has merely deepened the deficits. The diversion of resources from more productive uses to subsidize profitless public transit imposes real losses on the economy, both at the national and local level. Compared to more productive uses of these funds, transit investments reduce economic growth, cost jobs, and lower the standard of living.

REFERENCES

"1996 Discover Awards: Automotive and Transportation," *Discover* (July 1996).

Altshuler, Alan, "Changing Patterns of Policy: The Decision Making Environment of Urban Transportation," Public Policy (Spring, 1977), pp. 171-203.

American Automobile Association, *Your Driving Costs* (1995).

American Public Transit Association, *National Impacts of Transit Capital and Operating Expenditures on Business Revenues* (1984).

American Public Transit Association, *Transit Fact Book* (various years).

Arizona Department of Transportation, *Trends in Transit Privatization* (April 1986).

Aschauer, David, *Transportation Spending and Economic Growth: The Effects of Transit and Highway Expenditures* (American Public Transit Association, 1991).

Bast, Joseph *et al.*, *Eco-Sanity* (Lanham Maryland: Madison Books, 1994).

Congressional Budget Office, *Public Works Infrastructure: Policy Considerations for the 1980s* (April 1983).

Dougher, Rayola, *Estimates of Annual U.S. Road User Payments vs. Annual Road Expenditures* (American Petroleum Institute, March 1995).

Federal Highway Administration, *Highway Statistics* (various years).

Federal Highway Administration, *Transportation Air Quality Fact Book* (1994).

Federal Transit Administration database, internet < http://www.fta.dot.gov>

Federal Transit Administration, *Transit Profiles: Agencies in Urbanized Areas Exceeding 200,000 Population* (December 1995).

Henderson, Rick, "Spinal Tap," *Reason* (April 1997).

Pisarski, Alan, *Commuting in America II* (ENO Transportation Foundation, 1996).

Regional Public Transportation Authority, Phoenix, Arizona *Short Range Transit Plan FY 1996-97 through 2000-01*(1996).

Rowell, Matthew *et al.*, *The Cost Effectiveness and Magnitude of Potential Impact of Various Congestion Management Measures* (Arizona Department of Transportation, March 1997).

TABLES

Table 1: Transit Financial Performance Since 1965
($ in millions)

				Federal Aid		
Year	*Revenue*	*Costs*	*Net*	*Operating*	*Capital*	*Total*
1965	$1,444	$1,454	$-10		$51	$51
1970	$1,707	$1,996	$-289		$133	$133
1975	$2,043	$3,752	$-1,709	$302	$1,287	$1,589
1980	$2,805	$6,711	$-3,906	$1,121	$2,791	$3,912
1985	$5,276	$14,077	$-8,801	$881	$2,510	$3,391
1990	$6,786	$17,979	$-11,193	$765	$2,380	$3,145
1995 (estimate)	$8,100	$24,700	$-16,600	$770	$3,630	$4,400
30 year Totals	$111,073	$267,777	$-156,704	$15,966	$54,399	$70,365

Source: *Transit Fact Book* (American Public Transit Association, 1979), pp. 21-22; *1996 Transit Fact Book* (American Public Transit Association), p. 53 & 58.

Table 2: Impacts on the U.S. Economy of Alternative Investments ($ in billions)			
	Public Transit	*Corporate Tax Cut*	*Capital Gains Tax Cut*
Amount Invested	$70	$70	$70
Current Value of Residual Assets	$13	$115	$230
Impact on Gross Domestic Product	$52	$460	$920
Number of Jobs	900,000	8 million	16 million
Federal Taxes Generated	$10	$85	$175

Sources: *Economic Report of the President* (February 1996); *Statistical Abstract of the U.S.* (1995); *1996 Transit Fact Book* (American Public Transit Association).

Table 3: Statistics for Major Transit Systems (1994) ($ in millions)							
	financial data				passenger travel		
City	*passenger revenue*	*total expenses*	*net*	*% paid by riders*	*miles (millions)*	*trips (millions)*	*mi/trip*
Atlanta	$75.1	$279.1	($204.0)	27%	591.6	142.7	4.1
Baltimore	$89.8	$312.8	($223.0)	29%	530.0	107.1	4.9
Boston	$196.0	$905.6	($709.6)	22%	1366.5	398.8	3.4
Buffalo	$21.0	$81.8	($60.8)	26%	88.8	30.6	2.9
Chicago	$527.4	$1,594.0	($1,066.6)	33%	3104.4	542.2	5.7
Cleveland	$42.9	$222.4	($179.5)	19%	270.2	60.2	4.5
Dallas	$22.0	$376.9	($354.9)	6%	247.6	54.4	4.6
Denver	$26.5	$229.4	($202.9)	12%	236.3	62.7	3.8
Honolulu	$24.6	$145.9	($121.3)	17%	385.4	78.4	4.9
Houston	$41.9	$297.0	($255.1)	14%	480.4	83.8	5.7
Los Angeles	$235.7	$925.1	($689.4)	25%	1706.1	437.7	3.9
Miami	$62.4	$238.7	($176.3)	26%	389.7	83.4	4.7
Minneapolis	$47.0	$169.7	($122.7)	28%	262.9	65.6	4.0
New York	$2,921.2	$8,011.7	($5,090.5)	36%	14498.6	2505.5	5.8
Philadelphia	$259.7	$871.8	($612.1)	30%	1333.3	329.5	4.0
Phoenix	$15.3	$63.8	($48.5)	24%	129.1	33.3	3.9
Pittsburgh	$55.3	$264.0	($208.7)	21%	316.4	76.0	4.2
Portland	$29.4	$244.5	($215.1)	12%	258.9	63.8	4.1
Sacramento	$15.4	$82.4	($67.0)	19%	102.9	23.8	4.3
San Diego	$44.4	$180.7	($136.2)	25%	327.0	68.6	4.8
San Francisco	$232.9	$1,115.2	($882.3)	21%	1584.9	362.9	4.4
San Jose	$18.8	$213.8	($195.0)	9%	190.5	45.4	4.2
Seattle	$71.0	$474.1	($403.1)	15%	599.2	95.7	6.3
St. Louis	$23.7	$127.1	($103.4)	19%	211.9	48.2	4.4
Washington, DC	$309.4	$903.2	($593.7)	34%	1515.9	340.2	4.5
Source: Federal Transit Administration database, internet < http://www.fta.dot.gov>							

Table 4: Emissions Reductions Policies Ranked by Cost-Effectiveness
(near term annual impacts for Phoenix region)

Policy	Cost	Pollutants Removed		Cost/Ton
	millions of $	tons/year	percentage	$ per ton
Compressed Work Week	nil	5,218	1.40%	nil
Signal Synchronization	8.5	8,461	2.27%	1,011
Telecommuting (1 day a week)	3.4	1,691	0.45%	2,038
HOV Lanes	32	5,218	1.40%	6,133
Parking Management	58	5,181	1.39%	11,195
Bus Service	66.5	2,077	0.56%	32,017
Rail Transit(20 mile, at grade)	56.6	150	0.04%	377,333

Source: Matthew Rowell, *et al.*, *The Cost Effectiveness and Magnitude of Potential Impact of Various Congestion Management Measures* (Arizona Department of Transportation, March 1997), p. 40.

FIGURES

Figure 1: Public Transit Financial Results

Figure 2: Transit Cost per Rider

Figure 3: Transit vs. Auto Cash Costs per Person Mile

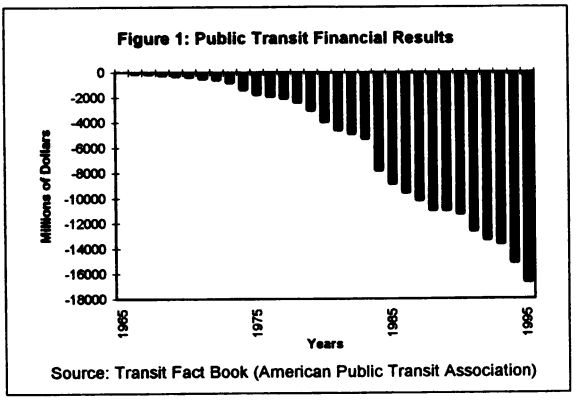
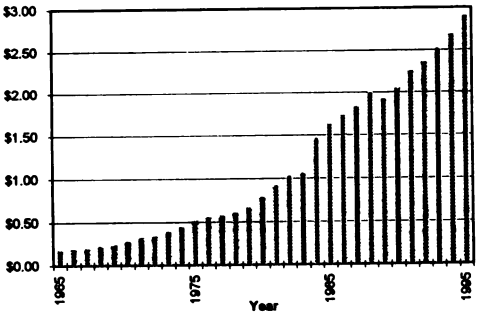
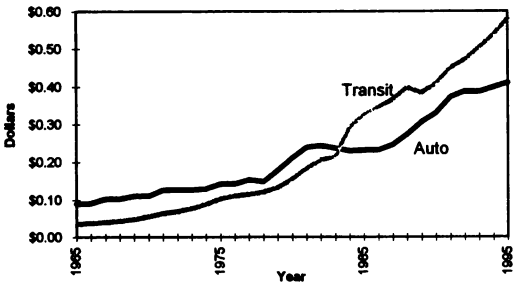


Figure 2: Transit Cost per Rider



Source: Transit Fact Book (American Public Transit Association)

Figure 3: Transit vs. Auto Cash Costs per Person Mile



Sources: Transit Fact Book (American Public Transit Association)
Your Driving Costs (American Automobile Association)