SOME CONSIDERATIONS OF EQUITY IN FINANCING AND PROVIDING TRANSIT SERVICE IN TEXAS

by

Dock Burke

Katie N. Womack

Joanne Saunders

Technical Report 1078-1F
Technical Study Number 2-10-84-1078
The Issue of Equity in Texas Transit Finance

Sponsored by

Texas State Department of Highways and Public Transportation
in cooperation with
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Urban Mass Transportation Administration

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TEXAS TRANSPORTATION INSTITUTE
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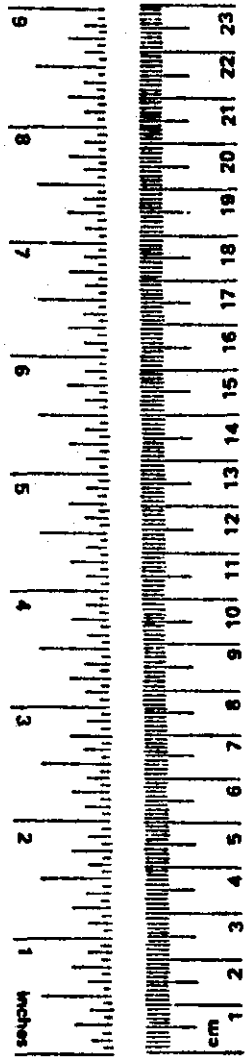
METRIC CONVERSION FACTORS

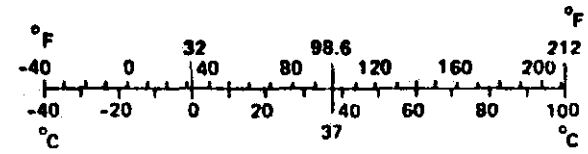
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.

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EXECUTIVE SUMMARY

This report applies to Texas results from transit equity research done elsewhere in the U.S., principally by J. Pucher and S. Rock. Texas transit characteristics, ridership, and financing mechanisms, are used to develop an understanding of the equity implications of trends in the Texas transit industry.

The equity outcome of transit finance and operations is empirically determined by the distribution of transit benefits and the distribution of transit financing burdens. Texas data on subsidies, benefits, and finances tend to reflect and coincide with the larger national description of transit. The following conclusions are valid for U.S. and Texas systems:

- Transit subsidies tend to be distributed progressively.
- When adjusted for trip difference, subsidy benefits are distributed less progressively due to:
  (1) relative cross-subsidization of longer trips;
  (2) cross-subsidization of peak-hour trips; and
  (3) cross-subsidization of suburban passengers.
- The burden of transit taxes is progressively distributed-largely a result of Federal income taxes.
- State and local taxes for transit tend to be regressive.
- Transit fares are very regressive.
- Net trends in transit finance are presently toward more regressive structures.
- Choosing new revenue sources, or replacing one with another, has implications for the distribution of revenue burdens.

IMPLEMENTATION

Transit policy makers need to be aware of the direction of impacts created by their decisions. Equity considerations are part of transit service and finance changes. The information in this report will assist decision makers in defining the equity effects of impending changes in transit service and revenue outcomes.

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I. Introduction

Urban transit systems in Texas have had difficulty recovering operating expenses since before they were taken over by municipal governments. Current farebox revenues contribute slightly less than one-half toward the full cost of paying for transit. Because transit systems are not able to operate solely on revenue generated by its users, non-user subsidies must be provided. With increased reliance on financial assistance from various levels of government, questions arise as to who is bearing the financial burden of public transit and what benefits accrue to them.

This study was undertaken for the purpose of examining trends in U.S. and Texas transit financing mechanisms, focusing on equity implications. The analysis begins with an overview of several characteristics of the U.S. transit industry. Chapter II is an examination of the concept of equity applied to mass transit, and a review of relevant research in this area. The third chapter addresses the equity issue as applied to transit in Texas.

Characteristics of U.S. Transit Systems

The transit industry in the U.S. has undergone a dramatic change in the past several decades. This change resulted mainly from shifts in public policy. Three significant aspects of this transformation were identified by Pucher in 1982 (Pucher, 1982a).

First, there were changes in the institutional framework of the industry accompanied by a broadening of transit service objectives. Public ownership, public management, regional consolidation, and public regulation increased. Along with this public takeover came the belief that transit was a public service to be provided by local government agencies. Transit operators were given responsibility for achieving a wide range of social, economic, and environmental goals such as decreasing pollution and congestion, conserving energy, and improving mobility for the disadvantaged.

According to Pucher, another significant change during this time was that transit became increasingly dominated by bus service while other modes suffered decreases in ridership and hours of service. In metropolitan areas, ridership and service followed the shift of population from the city to the suburbs.

The third and most dramatic change in U.S. transit during these years was the increase in costs and subsidies. Both capital and operating costs skyrocketed for all modes of transit. This forced federal, state, and local governments to increase subsidies in order for transit systems to continue operations.

The first federal aid available to transit systems came in 1964 with the Urban Mass Transportation Act which also created the Urban Mass Transportation Administration (UMTA). This subsidy was for capital expenditures and is now given on a 75 percent federal, 25 percent local matching basis. In 1973, Congress extended this aid to include transit operating costs on a 50-50 matching basis. A few years later the Surface Transportation Act of 1978 was passed to increase mass transit spending by 17 percent per year for 1978 through 1987. The most recent legislation, the Surface Transportation Act of 1982, dedicated one cent per gallon of an increased motor fuels tax to urban mass transit for at least four years, 1983 through 1986 (Beinke, 1984; Mendez, 1984).

There is some question as to whether these trends in the transit industry and the design of the transit subsidy program itself are responsible for small ridership gains and rapidly increasing costs. When costs are being financed by government subsidies there is little incentive for a transit system to use those subsidies efficiently.

The results of an analysis comparing financing and operating variables of different bus systems across the country (Pucher, 1982a) suggested that public ownership, public management, and tax earmarking tended to have an inflationary impact on transit costs. Also, the higher the percentage of costs financed by subsidies, the greater the increase in costs. This implies that subsidization in itself may encourage productivity declines and cost escalation.

At any rate, government financial assistance is now a de facto part of the operation of transit service. From 1970 to 1979 subsidies for all transit modes in the U.S. increased eleven-fold. Subsidies to Texas transit increased at an average annual rate of 28 percent from 1973 to 1978 (in 1972 constant dollars, Womack, 1981).

Although federal subsidies were achieving record high rates of increases until earlier this decade, the transit industry is now faced with a dramatic reversal in the role played by the federal government in public transportation via substantially reduced grants. Subsidy growth and the changes in federal policy have stimulated major changes in the sources of these funds. This translates into use of various forms of taxes in greater proportion at the state, county or regional, and local level. Several studies have been conducted recently that focus on the effect of these various funding sources and are described in the following chapter.

II. The Issue of Equity and Transit Finance

According to the benefit principle of taxation, a service should be paid for by those who use or benefit from the service. Riders are the direct benefactors of transit. However, indirect benefits also accrue to non-riders. For example, when urban congestion is reduced, all commuters benefit. Downtown landowners, businesses, and transit employees also benefit indirectly from the provision of transit service.

Related to the issue of benefit distribution is the issue of the distribution of costs. Often neglected in most evaluations of transportation finance is the question of how different income groups are affected by different funding sources. In economic terms, the differential tax incidence of one source is compared with the incidence of another source to determine this effect. Incidence refers to who ultimately bears the burden of a tax, that is, who pays. It is important to examine this distribution of costs, together with the distribution of benefits to properly address the issue of equity of transit financing mechanisms.

Tax Equity

Most would agree that the tax system should be equitable, i.e., that each taxpayer should contribute a "fair share" to the cost of government. But there is no such agreement about how the term "fair share" should be defined. In particular, two main schools of thought have developed.

One approach rests on the so-called benefit principle. According to this theory, dating back to Adam Smith and earlier writers, an equitable tax system is one under which each taxpayer contributes in line with the benefits received from public services.

The second school of thought is based on the principle of ability-to-pay. With this approach, the tax problem is viewed independent of expenditure determination. As such, a certain amount of revenue is needed. Taxpayers are levied amounts to be

paid according to their individual abilities to pay the tax.

Neither approach is easy to interpret or implement. For the benefit principle to be operational, expenditure benefits for particular taxpayers must be known. For the ability-to-pay approach to be applicable, how the ability is to be measured must be known. These are formidable difficulties and neither approach wins on practicality grounds. Moreover, neither approach can be said to deal with the entire function of tax policy. The benefit approach, ideally, will allocate that part of the tax bill which defrays the cost of public services, but it cannot handle taxes needed to finance transfer payments and serve redistributional objectives. It assumes that a "proper" state of distribution exists in the first place. This is a serious shortcoming especially since, in practice, there is no separation between the taxes used to finance public services and the taxes used to redistribute income. The ability-to-pay approach better meets the redistribution problem, but it leaves the provision for public services undetermined.

Although problematic in practice, the benefit principle and ability-to-pay principle have both been analyzed as they apply to transit subsidization. The following is a summary of findings from research that has examined: 1) the benefits derived from subsidized transit, and 2) the distribution of the tax burden.

Subsidy Benefits

Since it is extremely difficult to measure the benefits of subsidization to non-transit users, most studies on the subject focus on user benefits. The distribution of these benefits can be related to the income distribution of transit riders. An UMTA study by Pucher (1981) measured the extent to which different income groups have benefited from and paid for transit subsidies. An assignment of subsidy expenditures by income class was made using disaggregate data on transit subsidy expenditures by type of transit service and on income distribution of transit riders by type of service. The study showed that transit riders in the late

1970's had lower incomes on average than the general population. Income distribution differed significantly, however, for riders of different transit modes. Bus riders had the lowest incomes of any mode's users and commuter rail passengers had the highest, with subway riders in between. A comparison of this information to the extent to which each transit mode is subsidized, shows that the types of transit most used by low income groups are the least subsidized and those most used by the affluent are the most heavily subsidized. The average per-trip operating subsidy has been much higher for commuter rail and rail rapid transit passengers than for bus riders. From 1965 to 1979, bus riders accounted for 73 percent of total transit ridership and received only 24 percent of capital subsidy funds, compared to 27 percent of transit ridership for rail rapid and commuter rail which received 76 percent of capital subsidies.

Assuming that trips within all modes are equally subsidized, the distribution of subsidies among income classes was estimated (Pucher, 1981). The results indicated that the distribution of subsidy benefits is somewhat progressive. Those with incomes below $6,000 received a slightly higher percentage of subsidy funds than their proportion in the population and those with incomes above $25,000 received a smaller percentage. However, 62 percent of subsidy benefits went to those with incomes of $10,000 or more, suggesting that these subsidy programs do not primarily benefit the poor. [See Table 1.

Several studies have indicated that transit subsidies are <u>not</u> distributed equally within each mode. It has been shown that long-distance riders are more subsidized that short-distance riders, peak-hour riders are more subsidized than off-peak riders, and passengers in suburban areas are more subsidized than inner-city passengers. In all three cases, the higher subsidized riders have significantly higher incomes on the average than the less subsidized riders (Pucher, 1981).

There are also variations in subsidy distribution among different metropolitan areas. Comparing transit rider and auto user incomes by size of metropolitan area showed that the general

Table 1. Distribution of Transit Subsidies
(1978 Dollars)

Subsidy	Income Class					
	Below $6000	$6000-9999	$10,000 14,999	$15,000 19,999	$20,000 24,999	$25,000+
Operating	23%	17%	19%	15%	11%	16%
Capital	18%	16%	23%	15%	12%	16%
TOTAL	21%	17%	21%	15%	11%	16%
(% of Population)	16%	14%	21%	18%	13%	18%

Source: Pucher (1981; 1982a)

population in smaller SMSAs had lower incomes and that transit riders' incomes were dramatically lower. This may result from differences in the quality and quantity of transit service and the cost of auto use in different size metropolitan areas. Generally, there is a positive correlation between transit rider income and the level of subsidization in each area. The higher the rider incomes, the higher the per capita transit operating subsidy. According to Pucher (1981), this may be due to the fact that extensive, high quality transit systems are both more costly to run as well as more likely to attract affluent passengers.

Those who benefit from transit subsidies include many others in addition to transit patrons. Transit riders benefit primarily from better transit service and lower fares. In a more general sense, the contribution of public transit to local and regional economics is also of enormous importance. Transit is a $12.5 billion a year industry, making it the equivalent of the total annual sales of both American Motors and Chrysler Corporation combined. As a result, transit investments have created or maintained nearly one million jobs and generated tens of billions of dollars of business revenues every year.

It is important to note that transit investments not only benefit industries supplying materials and services directly to the transit industry, but also generate substantial revenues in every business sector within the national economy. Both transit capital and operating spending are a source of livelihood for thousands of firms. Purchase of their goods and services together with the expenditures of some 200,000 transit employees touch nearly every business sector within the U.S. economy.

The results of a 1984 study (National Impacts of Transit Capital and Operating Expenditures on Business Revenues, APTA) show that each $100 million in capital investments for the modernization of rail transit systems is estimated to generate $315 million in business revenues. Each $100 million spent on new rail systems creates $307 million, and on bus projects, $350 million. (See Table 2.)

Table 2. Total Business Revenues Generated by $100 Million Transit Capital Investments by Major Industries ($ million)

Industry	Rail Modernization	New Rail Starts	Bus and Facilities	Average[a]
Construction	$ 75.0	$ 71.0	$ 44.9	$ 62.1
Motor Vehicles	35.5	16.1	82.0	50.2
Wholesale and Retail Trades	25.8	22.8	27.7	26.0
Primary and Fabricated Metals	18.9	21.3	33.5	25.2
Business and Professional Services	14.9	33.0	10.2	16.6
Transportation	11.4	19.6	11.9	13.2
Food Products	14.2	12.6	12.5	13.2
Real Estate	11.7	11.3	10.4	11.1
Chemical Products	11.2	9.3	10.7	10.6
Other Businesses	96.7	89.9	106.0	99.2
TOTAL	$315.3	$306.9	$349.8	$327.4

[a]The average figures are computed assuming past expenditure patterns; i.e., 40% spending on rail modernization, 20% on new start and 40% on bus and bus facility projects.

Source: American Public Transit Association (1984)

Transit operating expenditures also create equally significant impacts on business. As shown in Table 3, $100 million of transit operating spending generates $305 million in business revenues.

At the local level, it is clear that downtown landowners and businesses benefit from transit service due to increased accessibility to the downtown area. Land values and rents are generally higher where there is easy access to some form of transit. Businesses can more easily attract customers and employees if located near transit stops. Since downtown land and business owners usually have above-average incomes, this proportion of subsidy benefits would accrue to the upper end of the income spectrum.

Transit services also provide conservational and environmental benefits to society in terms of reduced congestion, less air and noise pollution, more compact land use patterns, and reduced energy use (Mendez, 1984). Analyses have shown, however, that these benefits have been insignificant in most cities. Whatever social and environmental benefits do exist would be evenly distributed over all income levels (Pucher, 1982a).

Subsidy Tax Costs

It is important to examine the distribution of tax costs as well as benefits to assess the net redistributive impact of the transit program. If tax financing is progressive, it should offset subsidy benefits accruing to those in high income groups. If it is regressive, it would increase any inequities in the distribution of those benefits.

There have been three major trends in transit financing since 1970 (Pucher, 1981):

1) The transit financing burden has been increasingly shifted to the federal government.
2) More and more cities have earmarked region-wide sales taxes specifically for transit support.

Table 3. Total Business Sales Generated by $100 Million of Transit Operations Spending

Industry	Sales Generated ($ million)
Transportation	$100.0
Wholesale and Retail Trades	22.8
Petroleum and Chemical Products	17.7
Facilities Maintenance and Repair	14.5
Utilities	12.4
Food Products	12.1
Business and Professional Services	11.2
Motor Vehicles and Parts	7.0
Other Businesses	107.7
TOTAL	$305.4

Source: American Public Transit Association (1984)

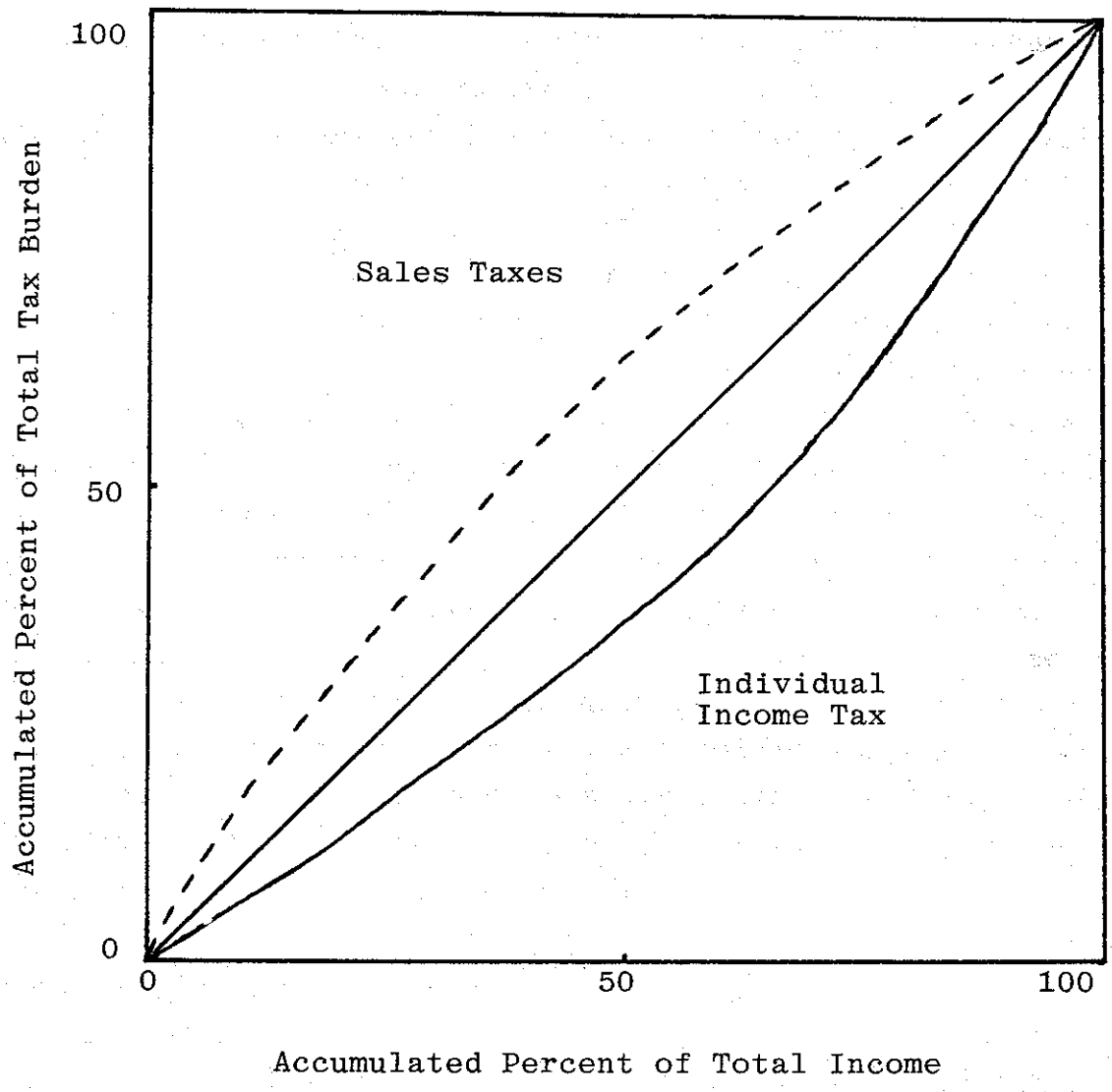
3) Transit riders have financed a decreasingly small percentage of operating costs through fares.

The study by Pucher in 1981 evaluated the distribution of tax costs by income level. First, the tax mix used to support transit subsidies was calculated. Then, a set of estimates of general tax incidence was updated for computing transit-specific tax burdens. Using data on transit taxation by level of government and tax type, the revised general tax distributions were weighted and totaled to calculate the distribution of tax burdens for transit subsidization. The results showed that the overall burden of transit taxation is progressively distributed. Low-income groups pay a lower percentage of their income for transit taxes than high-income groups. This is primarily due to the progressivity of federal income and corporation taxes. These taxes offset the regressivity of state and local taxes (especially sales and property tax). Other studies have found similar results (Pucher 1982a; Pucher 1982b).

In comparing the distribution of transit tax burden for various metropolitan areas, many differences were found. Various areas differ in the composition of financing by level of government, differences in specific tax mechanisms used at state and local levels, the jurisdiction of local transit taxes, and the bases of state and local taxes. With few exceptions, all of the urban areas examined financed transit with regressive taxation, especially those that relied entirely on local sales and property taxes. Nevertheless, this state and local regressivity is more than offset by federal tax progressivity (Pucher, 1981; Pucher, 1982b). Figure 1 illustrates the regressive nature of the sales tax and the progressive nature of the individual income tax.

There are three main types of inequities in transit finance that put an unfair burden of transit costs on low-income and minority riders:

Figure 1. Tax Burden Representation



1) More heavily subsidized transit modes and routes used more by affluent riders.
2) Cross-subsidies within each mode and route from low-income short-distance, off peak riders to affluent long-distance, peak hour riders.
3) State and local transit subsidies financed by regressive taxation.

These inequities are not deliberate, but rather unintended side effects of pursuing goals such as maximizing transit ridership and reducing the congestion of auto use.

Some would use these discriminatory impacts as a reason for doing away with transit subsidies altogether, but this would cause even more hardship for the poor. Instead, the transit subsidy program should be revised. Following are some recommendations for improving the equity of the subsidy program (Pucher, 1982b):

1) Increase fares for commuter rail service. This would decrease the amount of subsidy needed for the more affluent riders.
2) Put a hold on construction of new multi-billion dollar rail transit systems which benefit the affluent.
3) Impose peak hour surcharges and distance-based fares on all transit modes.
4) Set up a program of discount transit passes for the poor and improve service in low-income neighborhoods.

Tax Incidence

Another way to analyze the transit equity problem is to more closely examine the different transit funding sources and possible alternatives to determine which are regressive and which are progressive. Research by Steven Rock (1981; 1982; 1983) produced consistent results over time. All three studies used data from the Bureau of Labor Statistics (BLS) Consumer Expenditure Survey.

This survey contains information on consumption expenditures by detailed items and income for 40,000 U.S. families and is considered the most complete data source available for this type of information.

The first study (1981) compared the tax incidence of two funding sources, the sales tax and motor fuel tax. Using the BLS data, the relative percentage of income paid as sales or motor fuel tax for 10 income deciles was calculated. The results showed that both sources were regressive. The calculations indicated that those with the lowest income paid between two and three times as much of their income in sales tax as those with the highest income. And, the lowest income groups paid over three times as much in gasoline tax as the highest income groups.

The second study (1982) used the same data, but a different technique to calculate the results. An S-index measure of progressivity was used which was developed by D.B. Suits (1977). Computing the S-index requires that the percentage of each tax or expenditure item paid by each population decile be compared with the percentage of total family income received by the decile. Mathematically, the index (S) is calculated as follows:

$$S = 1 - \frac{L_x}{5000}$$

where

$$L_x \quad \sum_{i=1}^{10} \quad \frac{1}{2} \left[T_x(y_i)+T_x(y_{i-1})\right](y_i-y_{i-1})$$

and Tx (Yi) is the accumulated percentage of total burden for given tax x, associated with the accumulated percentage of income (y) represented by population decile i. The index was calculated for 19 funding sources by ranking families by income and determining the cumulative percentage of burden associated with

the cumulative percentage of income. The index ranges from +1 (indicating maximum progressivity) to -1 (maximum regressivity). The results showed that most household-based funding sources were regressive. Especially regressive were the household tax, cigarette tax, lottery, and public transit fares. Progressive alternatives were taxes on parking, state and local income, and stock transfers. Table 4 lists the S-index values for several selected taxes.

Table 4. Calculated S-Index Values for Selected Taxes

Theoretical maximum progressivity	+1.00
U.S. Corporate Income Tax	+ .36
U.S. Personal Income Tax	+ .19
State/Local Income Tax	+ .18
New Car Excise Tax	- .04
Sales Tax (w/ exemptions)	- .09
Sales Tax (w/o exemptions)	- .13
Gasoline Tax	- .16
User Car Tax	- .17
Public Transportation Fares	- .26
Theoretical Maximum Regressivity	-1.00

Source: S. Rock (1982; 1983)

The third study compared 16 funding options as to their relative regressivity. Consumer expenditures by income levels were evaluated and expenditures as a percentage of income were calculated. Then percentage expenditures by each income level relative to the highest income level were calculated. The results were identical to the previous study. It was also mentioned that few consumer expenditures are large enough to raise reasonable sums of funding through household-based taxes. Sources of adequate funding potential were: a general sales tax, a specific excise tax on gasoline, utilities, motor vehicles, and income

taxes. It was suggested that a decrease in federal funding would lead to the use of more regressive funding sources and increase the reliance on business-based taxes, service cutbacks, and fare increases.

Summary

Equity within the field of urban transportation can be described in terms of three different systems:

1) Fee for service -- service to each according to their financial contribution.
2) Equality in service distribution -- to each an equal share of public expenditure or level of public service.
3) Distribution according to need -- to each a share of public expenditure or service based on need, with revenues drawn from those in least financial need. (Altshuler, 1979)

In the past it was generally viewed that within each metropolitan area, transit service should be distributed equally with low-income sectors receiving their "fair share" as in the second system. More recently, however, emphasis has been put on the third system of distributing service according to need, focusing particularly on the mobility deficits of the physically handicapped, the elderly and the poor. This type of service distribution corresponds to the ability-to-pay principle of taxation. Nonetheless, studies of the benefits and tax burdens of transit subsidy allocations among income classes have led to the following general conclusions:

- Overall, transit subsidization redistributes income from high-income to low-income classes, but is not very effective in targeting benefits to the poor.
- Long-distance, peak-hour, suburban trips are more heavily subsidized and have significantly higher income riders

than their converse.

- Of the three modes (bus, commuter rail, and rail rapid transit), buses transport the largest percent of riders, transport the lowest income riders, and receive the least amount of capital subsidy.
- The transit industry generates indirect benefits to the local, state, and national economy in terms of jobs created and business revenues from operating and capital investments.
- Federal income and corporate taxes are progressive (i.e., higher-income groups pay a higher percentage of their income). State and local taxes, especially sales and property taxes, are regressive (i.e., higher-income groups pay a lower percentage of their income). Since more transit subsidy is generated at the federal level, the overall burden of transit taxation is progressively distributed.

III. Implications for Texas Transit

Existing characteristics of the Texas transit industry were examined to find relevant points of comparison with transit equity research. As a first step, background information for the Texas transit industry described the historical development of the state's transit funding mechanisms.

Characteristics of Texas Transit

The Texas transit industry followed the same trends as the U.S. with the change from private transit companies to publicly owned systems. This mass conversion from private to public operation took place largely in the 1960's and 1970's, ending with Port Arthur in 1979. Now, all 18 major public transit systems in Texas are publicly owned. These transit systems are all bus systems. Until recently, rail systems had not been considered viable or necessary in Texas cities. However, in 1983 both Houston and Dallas proposed to build rail systems. The Houston plan for a 75-mile heavy rail system was rejected by the voters, but Dallas voters approved the creation of a metropolitan transit authority which plans to build a 140-mile rail system along with an expansion of bus service (Goldsack, 1985). Other cities that are currently planning, proposing, or considering light rail systems include San Antonio, Austin, Galveston, and Houston (Bullard, 1985).

Texas transit also followed the national trend of declining ridership from the 1950's until the mid-1970's. From 1974 to 1982 statewide transit use increased an average of 3.6 percent per year (Mendez, 1984). However, this increase was not nearly enough to offset the rapid growth of transit capital and operating costs during this time.

Between 1977 and 1981 alone, transit operating expenses increased 161 percent while operating revenues increased only 66 percent. For 1981, public subsidies covered 62.4 percent ($114.7 million) of statewide transit operating costs. Operating

subsidies required for Texas systems quadrupled between 1977 and 1981 (Beinke, 1984).

Capital expenditures for buses, buildings, etc., have also increased over the years, but are of less local concern because of the substantial state and federal aid committed to these expenses. From 1977 through 1981 Texas systems spent $167.5 million for capital costs. However, more than half of that expenditure was by the Houston (METRO) and San Antonio (VIA) metropolitan transit authorities for improvements and expansion of service. Most of this capital subsidy was provided by the federal government--$132 million. Over $22 million came from state government funds (Beinke, 1984).

Texas cities were first authorized to accept federal UMTA funds for transit aid in 1969. In that same year the Texas legislature created the Texas Mass Transportation Commission (TMTC) to assist in obtaining federal funds and to oversee the development of public transportation in the state. The legislature abolished the TMTC in 1975 and delegated its responsibility to the Texas Highway Department which was renamed the State Department of Highways and Public Transportation (SDHPT). The SDHPT appropriated funds for direct financial assistance to local transit. This state aid provided up to 13 percent of the required 20 percent local match for federal capital aid.

In recent years, many Texas cities have been exploring alternative ways for providing transit service and funding to their rapidly growing urban populations. In response, the Texas legislature in 1973 enacted a statute authorizing metropolitan areas with at least 1.2 million people located in the central city to create a regionwide transit system, or metropolitan transit authority (MTA). Given this population requirement, Houston was the only city large enough to be eligible to create an MTA. However, in later legislative sessions, the population figure was reduced so that now eight Texas cities have had the opportunity to vote on MTA organization.

The original legislation gave cities the authority to levy a special motor vehicle emissions tax to provide funding for the MTA's. In 1977, this legislation was amended to permit an MTA, with voter approval, to levy any tax that is constitutional in Texas, except a property tax. It was specifically mentioned that cities could impose up to a one percent sales tax, if voters approved (Vernon's Civil Statutes, 1984).

Today, six of the 18 major transit systems in Texas are MTA's that receive between 1/4 to one percent dedicated sales tax to fund their operations. This tax has proved to be a very reliable and substantial source of income. In 1983 the Houston MTA collected $157.8 million and the San Antonio MTA received $23.6 million in tax revenue (Texas Transit Statistics, 1983).

At first, it was questionable whether or not voters would approve an increase in local sales tax. Table 5 shows that six of ten proposed tax increases have been approved to date.

A recent Texas survey (Bancroft, 1984) showed that a small majority of those polled would rather spend money on roads instead of mass transit. However, in the three largest metropolitan areas of Dallas-Fort Worth, Houston, and San Antonio where traffic is a major problem, highway construction did not win a majority.

The fact that voters are willing to support an increased tax, even though they personally may not benefit from it, suggests that the public realizes that there are mobility-disadvantaged members of society that desperately need some form of mass transit.

Transit User Benefits in Texas

The purpose of this discussion is to examine the distribution of benefits to users. This can be done by identifying classes of users according to trip length. In the absence of primary data from transit users and suppliers in Texas, census data is used to substantiate the proposition that higher income and longer work trips are positively related.

Table 5. Regional Transit Authorities in Texas

Transit Authority	City	Date of Referendum	Election Results (%) Yes	No
Houston Area Rapid Transit Authority (HARTA)	Houston	October 1973	25	75
VIA Metropolitan Transit	San Antonio	March 1978	66	34
Metropolitan Transit Authority (METRO) of Harris County	Houston	August 1978	60	40
Lone Star Transit Authority	Dallas-Ft. Worth	November 1981	40	60
El Paso Transportation Authority	El Paso	November 1981	44	56
Dallas Area Rapid Transit (DART)	Dallas	August 1983	60	40
Fort Worth Transportation Authority (FWTA)	Fort Worth	November 1983	56	44
Capital Metropolitan Transportation Authority	Austin	January 1985	59	41
Corpus Christi Regional Transportation Authority	Corpus Christi	August 1985	65	35
Arlington Transportation Authority	Arlington	August 1985	44	56
El Paso Rapid Transit Authority	El Paso	November 1985	49.7	50.3

Source: Bullard (1985)

To put Texas "travel to work" patterns into perspective, briefly note the following U.S. information. Data from the 1979 Journey to Work Supplement, sponsored by the U.S. Department of Transportation, give an overview of transportation modes, travel times, and travel distances for the U.S. as a whole.

- Of all householders in the U.S., 69 percent drove to work alone in 1979, 17 percent rode to work in carpools, and six percent used public transportation.
- Of all householders in the U.S. who used some form of public transportation to get to work in 1979, 50 percent lived in the Northeast Region of the country.
- The rates of driving to work alone and of using public transportation were essentially the same in 1979 as they were in 1974.
- Average distance to work was about 11 miles among householders in the U.S. in 1979, while average travel time was approximately 23 minutes.
- The distance of the typical trip to work increased slightly between 1975 and 1979. However, there was no corresponding increase in average travel time.
- Median family income for householders who used an automobile or truck to get to work was about $19,400 in 1979, compared to $14,000 for those who used public transportation.
- Male householders were more likely to drive to work alone or with a carpool than female householders; women were more likely than men to use public transportation to get to work in 1979.

The distribution of transportation mode for work trips by residents of metropolitan and nonmetropolitan areas shows a striking difference for the use of public transportation. In central cities of SMSA's in the U.S. in 1979, almost 15 percent of the householders rode public transportation to work, compared to four percent for those in the suburbs, and only one percent for

those residing in nonmetropolitan territories. These differences are, for the most part, a reflection of the greater availability of public transportation within the largest cities as compared to suburbs and nonmetropolitan areas.

Additionally, the Journey to Work survey of 1979 showed that the rate of driving to work alone was highest in the suburbs (73 percent) where incomes and private vehicle ownership are highest. Driving alone was the lowest in central cities (63 percent) where vehicle ownership is lowest and alternative means of transportation are most readily available.

Compared to all U.S. householders, those who are Black or are of Spanish origin were more likely to take a bus, subway, or carpool to work, and less likely to drive alone or work at home in 1979. There is also some evidence that Blacks and Hispanics rode commuter trains to work less frequently than other householders.

Texas journey to work data for 1980 can be summarized as follows:

- Of the 6.3 million Texans over 16 who had a job in 1980, 55 percent drove to work alone and 2 percent used some form of public transportation.
- 3.15 percent of the total urban working force in Texas used the bus to get to work in 1980. 92 percent of these users lived in the central city area.
- The average travel time to get to work in 1980 was 21.3 minutes. 18 percent of the working force took less than 10 minutes to get to work.

Data can be specified in more detail for two Texas cities (Dallas and Ft. Worth) that were included in the 1981 Annual Housing Survey [see Table 6]. In Dallas, 3.6 percent of the working population used transit to get to work. Although detailed income data at this level are not available, these users can be classified into two groups - owner occupied householders (OOHH) and renter occupied householders (ROHH). The median income for

Table 6. Travel to Work Characteristics for Texas and Selected Parts

	TEXAS		FT WORTH						DALLAS	
	Urban Central City	Urban Fringe	Total OOHH[a]	Total ROHH[b]	Hispanic Households OOHH	Hispanic Households ROHH	Black Households OOHH	Black Households ROHH	Total OOHH	Total ROHH
MEANS OF TRANSPORTATION										
Drive Alone	58.37%	58.38%								
Public Transportation	4.21%	.91%	1.4%		1.1%		5.2%		1.3%	2.3%
MEDIAN DISTANCE TO WORK	20.8 minutes (mean)	23.1 minutes (mean)	12.6 miles	8.8 miles	12.5 miles	7.2 miles	10.7 miles	9.2 miles	13.7 miles	8.9 miles
MEDIAN INCOME	$15,930	$23,011	$26,700	$14,100	$22,600	$13,600	$16,500	$8,400	$29,800	$15,500

[a] Owner occupied households
[b] Renter occupied households

these two groups is quite distinct - $29,800 for the former and $15,500 for the latter.

As expected, the lower income ROHH group uses public transportation in greater proportion (2.3 percent) than the higher income OOHH group (1.3 percent). Additionally, lower income householders in Dallas travel less distance (8.9 miles) to work than higher income householders (13.7 miles).

In Ft. Worth the pattern holds true. Homeowners in 1981 had a median income of $26,700, compared to the renter's median income of $14,100. In this city the median distance to work for all homeowners was 12.6 miles and for renters, 8.8 miles. Only one percent of the employed Ft. Worth homeowners used transit as their principal means of getting to work, while 2.3 percent of the renters relied on bus transportation.

The relationship between user and income (and implicitly, between trip length and income) is further pronounced by the characteristics of Black and Hispanic householders. The median income for Black Ft. Worth homeowners in 1981 was $16,500. For Black renters, median income was $8,400. Black workers in Ft. Worth were much heavier users of mass transportation for work trips than the working population as a whole. Over five percent of the Black population listed the bus as their principal means of transportation to work, compared to 1.4 percent of the total population listing the same. Furthermore, the difference in the distance to work between the two income groups, OOHH and ROHH, was not as distinct as the difference for the overall population. 10.7 and 9.2 were the median number of miles to work for Black homeowners and renters, respectively.

In 1981, there were 18,300 housing units in Ft. Worth occupied by an employed person of Spanish origin. Only 1.1 percent of this group listed mass transportation as their principal means of getting to work. However, it is important to note that this ethnic group more closely approximates (than Blacks) the median income for the city - $22,600 for OOHH and $13,600 for ROHH. Distance from work for this group showed the discrepancy between higher income homeowners (median=12.5 miles)

and lower income renters (median=7.2 miles).

Figure 2. Summary of Texas Transit Ridership

- Ninety-two (92%) percent of transit riders lived in central city areas in 1980.
- Expansion of ridership depends upon establishing more routes connecting outlying areas with central cities.
- Suburban households have 40 percent higher incomes compared to those in cities.

Trends in Texas Transit Revenues

The primary purpose of any examination of revenue sources for transit systems is to determine who is paying, either in the form of farebox charges or tax payments. From such an examination, the type of payments can be characterized as regressive, neutral, or progressive in their impact upon the distribution of incomes. Three important and interrelated characteristics help describe the financing of the transit industry. First, much of the burden of subsidy (operations and capital) have been borne by expenditures of the federal government. Currently, of course, a backlash exists in which federal contributions are being absolutely reduced.

Second, and very important to the future of transit in Texas, regional sales taxes earmarked for use by transit are becoming more widely used. This is reflected in Table 7 and is likely to continue as an ever increasing contributor to transit finance.

Finally, farebox revenues, the third major source of transit finance, continue to provide an important (roughly 30 percent) share of the total. In the realization of reduced federal operating assistance, transit systems are likely to be more aggressive in employing strategies to increase the farebox share of revenue [see Table 8].

Table 7. Texas Transit Revenues
1978 - 1982

	Percentage of Total Transit Revenues				
Revenue Source	1978	1979	1980	1981	1982
Farebox	38%	35%	31%	30%	28%
Charter and Other Operating Income	9%	8%	8%	8%	7%
Federal Operating Assistance	24%	11%	17%	18%	17%
Local Operating Assistance	29%	16%	44%	44%	48%

Source: Womack (1982)

Table 8. Recent Fare Changes

System	Date	Basic Fare Before	Basic Fare After
Abilene	10-1-84	.50	.60
Amarillo	7-26-82	.40	.45
Austin	10-83	.40	.50
Beaumont	1-84	.40	.50
Brownsville	83	.35	.50
Corpus Christi	8-81	.35	.50
Dallas	1-84	.70	.50
El Paso	5-82	.35	.50
Ft. Worth	10-1-82	.60	.75
Galveston	10-12-81	.50	.60
Houston	3-1-84	.40	.50
Laredo	7-1-81	.35	.50
Lubbock	6-1-82	.50	.75
Port Arthur	8-81	.40	.50
San Angelo	81	.30	.40
San Antonio	9-1-80	.25	.40
Waco	10-83	.50	.60
Wichita Falls	12-3-82	.45	.75

Summary

Using the results produced by previous research, it is clear that the equity outcome of transit finance and operations is empirically determined by: (1) distribution of transit benefits and (2) distribution of transit financing burdens.

While the Texas data on subsidies, benefits, and finances tend to reflect and coincide with the larger national description of transit, there are some important distinctions; as summarized in Figure 3.

Figure 3. Summary of Selected Texas Transit Characteristics

- Texas transit finance trends have paralleled those in the U.S.
- Operating subsidies - federal and local funds - increased 30% during the 1977-81 period.
- Since 1977, regional sale tax mechanisms have been approved in Houston, San Antonio, Dallas, Forth Worth, Austin, and Corpus Christi.
- Two other cities - El Paso and Arlington - are eligible and likely to establish MTA's under existing legislation.
- Fare increases have been used recently to try and boost revenues.
- Federal operating assistance is becoming a smaller contributor.

When the distinctions are included along with the equity analyses of the transit industry, the following conclusions remain valid when describing the Texas systems:

- Transit subsidies tend to be distributed progressively.
- When adjusted for trip difference, subsidy benefits are distributed less progressively due to:
  (1) relative cross-subsidization of longer trips;
  (2) cross-subsidization of peak-hour trips; and
  (3) cross-subsidization of suburban passengers.
- Burden of transit taxes is progressively distributed - largely a result of Federal income taxes.
- State and local taxes for transit tend to be regressive.
- Transit fares are very regressive.
- Net trends in transit finance are presently toward more regressive structures.
- Choosing new revenue sources, or replacing one with another, has implications for the distribution of revenue burdens.

IV. Summary and Conclusions

Changes in the institutional framework of the transit industry have resulted from shifts in public policy that specifically impact funding mechanisms. This, in turn, has had a direct effect on those who pay for transit ultimately, and those who benefit directly and indirectly as a proportion of those who pay. This report examined these effects which have been termed an equity issue in transit finance.

Earlier this centery the scope of the nation's transit service objectives was broadened extensively. Privately-owned transit companies, struggling to survive financially, were converted to public properties. This activity reflected a public policy toward the notion that transit was a public service to be provided by local government agencies. More recently, this notion has been extended such that the policy now emphasizes the provision of transit service according to need, focusing particularly on the mobility deficits of the physically handicapped, the elderly, and the poor.

Corresponding to the shift from private to public ownership was a dramatic increase in transit costs and subsidies. In 1964 the Urban Mass Transportation Act established federal aid for capital improvements on a 75 percent (federal)/25 percent (local) matching basis, and later operating assistance was provided on a 50/50 matching basis. Also at the federal level, the Surface Transportation Act of 1978 increased total spending by 17 percent, and the revised Act of 1982 dedicated one cent per gallon of an increased motor fuels tax to urban mass transit.

A third industry transition that occurred was correlated with urban growth patterns. Transit became increasingly dominated by bus service while other modes suffered decreases in ridership and hours of service.

Today, buses transport the largest percent of riders and the lowest income riders. Yet, bus systems receive the least amount of subsidy. Furthermore, other modes (commuter rail and rail rapid transit) are more heavily subsidized and transport a more

affluent population. In addition, it has been shown that more subsidy goes to long-distance, peak-hour passengers in suburban areas.

There have been three major trends in transit financing since 1970: 1) the transit financing burden has been increasingly shifted to the federal government; 2) a greater number of cities have earmarked region-wide sales taxes specifically for transit support; and 3) transit riders have financed a decreasingly small percentage of operating costs through fares. Thus, the overall burden of transit taxation is progressively distributed due to the prominence and progressivity of federal income and corporate taxes. These taxes offset the regressivity of state and local (especially sales) taxes. Therefore, transit subsidization redistributes income from high-income to low-income classes. However, because of the distribution by mode and within mode services, the redistribution is not very effective in targeting benefits to the poor.

The transit industry is now faced with a dramatic reversal in the role played by the federal government in public transportation via substantially reduced grants. This translates into use of various forms of taxes in greater proportion at the state, county or regional, and local level. These taxes tend to be more regressive.

The Texas transit industry has paralleled the historical trends of the U.S. industry. Specifically, public ownership has evolved to the fullest extent; service has developed in terms of exclusive use of buses for suburban/inner-city route configurations; and ridership and financing trends have virtually paralleled those in the U.S.

Legislation in the 1970's has enabled Texas cities to initiate taxing mechanisms at the local and regional levels to support transit. Six cities have approved between 1/4 to one cent additional sales tax to finance transit expenditures.

Another response to rising costs and potentially reduced federal assistance has been fare increases. Measures such as these (regional or local sales taxes and fare increases) tend to

be regressive. Less regressive actions that would improve the distribution of revenue burdens include the following:

1) Increased fares for commuter rail service.
2) A hold on construction of new rail transit systems which benefit the affluent.
3) Peak hour surcharges and distance-based fares on all transit modes.
4) A program of discount transit passes for the poor and improved service in low-income neighborhoods.

REFERENCES

1. Altshuler, Alan. The Urban Transportation System, Massachusetts: MIT Press, 1979.

2. American Public Transit Association, National Impacts of Transit Capital and Operating Expenses, 1984.

3. Bancroft, Bill, ed. "Majority of Texans in Urban Areas Ask for Increased Spending on Transit", Inside Texas Poll, March 12, 1984.

4. Beinke, Janet. "Financing Public Transit", Texas Research League Analysis, Vol. 5 Number 1, January 1984.

5. Bullard, Diane and Lisa G. Nungesser. Texas Public Transit Reference Manual. Texas Transportation Institute, Report 1082-1F, in review.

6. Goldsack, Paul J. "Subways of the World," in Mass Transit, Vol. 12, December, 1985.

7. Mendez, Maria. "Can Mass Transit Deliver in Texas?", Fiscal Notes, 84:3, March 1984.

8. Pucher, John. "Equity in Transit Finance", Journal or the American Planning Association, Vol. 47, October 1981.

9. Pucher, John. "A Decade of Change for Mass Transit", Transportation Research Record, 858, 1982a.

10. Pucher, John. "Discrimination in Mass Transit", Journal of the American Planning Association, Vol. 48 Number 3, Summer 1982b.

11. Rock, Steven M. "Income Equity of Two Transit Funding Sources", Transportation Research Record 791, 1981.

12. Rock, Steven M. "Applying S-Index to Transportation Financing Alternatives", Transportation Research Record 858, 1982.

13. Rock, Steven M. "New Funding Sources for Public Transit: Who Pays?", Transportation Research Record 900, 1983.

14. Suits, D.B. "Measurement of Tax Progressivity", American Economic Review, Vol. 67 Number 4, September 1977.

15. Texas Transit Statistics, State Department of Highways and Public Transportation, 1983.

16. Vernon's Civil Statistics. State Department of Highways and Public Transportation, 1983.

17. Womack, Katie N. and Dock Burke. Revenues and Subsidies of Public Transportation in Texas, TTI Report 1060-1F, 1981.