HIGHWAY REVENUES UNDER CHANGING ECONOMIC CONDITIONS

by

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PREFACE

The authors wish to express their appreciation to the members of the State Department of Highways and Public Transportation, especially Mr. Marcus Yancey, Assistant State Highway Engineer, who provided valuable guidance to this study. Also, Mr. Phillip Wilson, State Planning Engineer, and Mr. Charles Davis and Mr. Robert Hamner of the Planning and Research Division assisted the study in numerous ways, especially through making available various reports and data.

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Summary

The three primary sources of revenue for the State Department of Highways and Public Transportation (previously the Texas Highway Department) in the past have been federal funding, license fees, and motor fuels taxes. In 1974, these three sources alone accounted for over 93 percent of all revenues. With rising fuel prices at least two of these primary sources, license fees and fuels taxes, may not continue to increase, and in fact may even decline in the future.

Revenues from license fees may show a decline as the price of fuel increases for two reasons. First, the number of registrations in the various classes may decline as the price of fuel increases. Second, the average fee paid in the various classes may fall as the price of fuel rises.

Economic theory tells us that the number or quantity of a good purchased will depend upon its price, the income of buyers and the price of other related goods. The number of registrations of vehicles therefore will depend upon the number of people living in Texas, the income of those people, the price of vehicles, and the cost of operating those vehicles. As the number of people living in Texas and the income of those people rise, vehicle registrations will rise, so long as the cost of buying and operating those vehicles does not rise. If the population and its income do not rise, but the price of owning and operating vehicles does rise, then the number of vehicles owned and registered will fall. Since fuel is necessary to operate motor vehicles, as the price of fuel rises, so does the cost of owning and operating a vehicle and hence the number of vehicles owned and operated may fall. Of the various classes of registrations, it was found

in our research that those which may be expected to have fewer registrations as the price of fuel increases are:

- passenger cars
- motorcycles
- commercial trucks
- truck-tractors
- motor buses
- farm truck-tractors
- trailers

Another economic variable which may cause the number of passenger car registrations to decline is the price of automobiles. Historically, as the real price of automobiles has decreased, the number of passenger car registrations has risen. Although price information on other types of vehicles such as trucks, truck-tractors, and motor buses was not available for this study, it is very likely that registrations in these classes would fall as their respective prices rose.

The second impact on revenues from license fees that may result from rising fuel prices, that of declining average license fees will result from the type of vehicle owned and registered. As the price of fuel rises, people may shift from the ownership of large, heavy vehicles to smaller, lighter weight vehicles. This is because, generally speaking, smaller, lighter weight vehicles get better gas mileage. Based upon this research, the classes of registrations that may be expected to have lower average registration fees in the future due to rising fuel prices are:

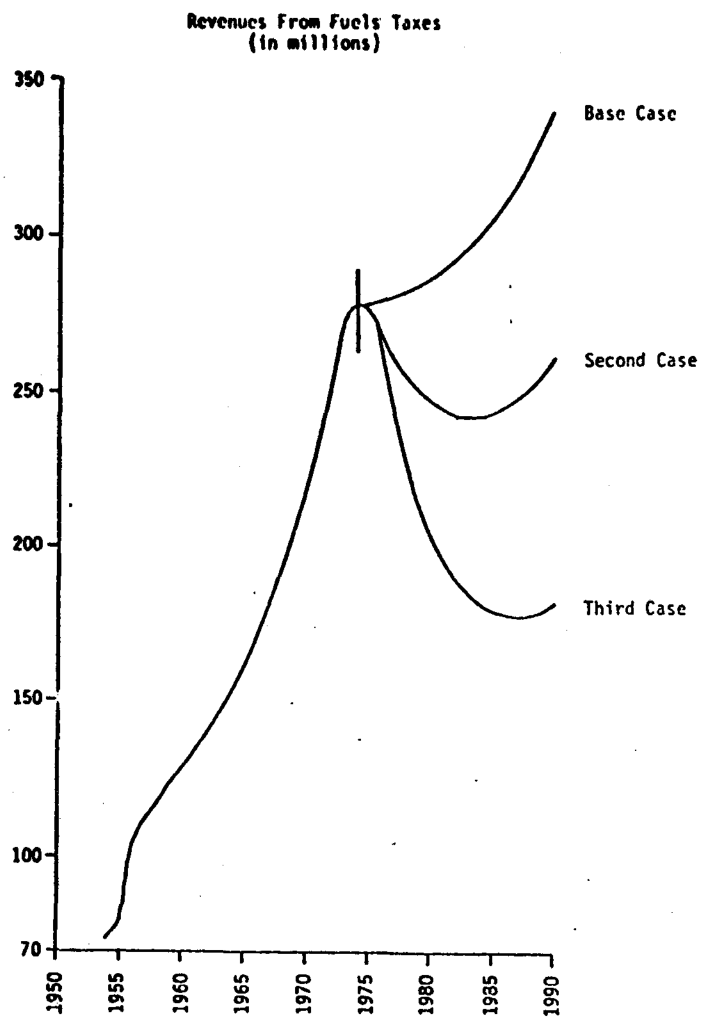
- farm-trucks
- city buses
- passenger cars

The average license fee of each of these three classes of vehicles historically has risen as the real price of gasoline fell and incomes in the State rose; these three classes showed a statistically significant increase in average license fees as the real price of gasoline fell, the average license fees of other classes may also fall if the price of fuel continues to rise.

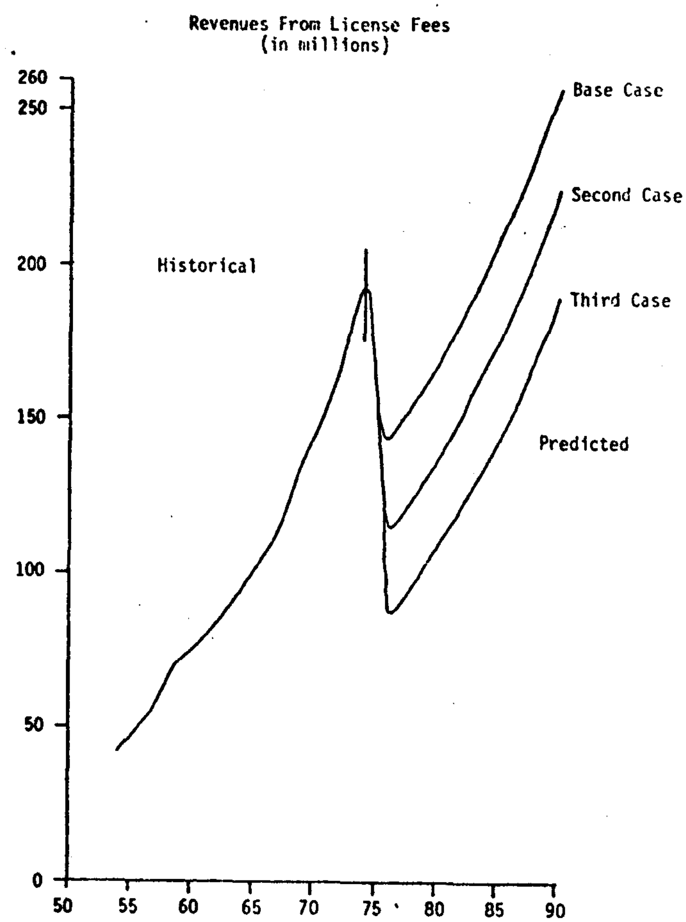
The other source of revenue that will be affected by rising fuel prices is that from fuels taxes. The demand for fuel primarily depends upon the real price of fuel and the incomes of the individuals in the market, rising as income rises and falling as the real price of fuel rises. Based upon historical data for Texas, the short-run price elasticity of fuel in Texas is between -.35 and -.39. That is, in a period of about a year, a ten percent increase in the real price of fuel would cause fuel consumption to fall between 3.5 and 3.9 percent. The long-run price elasticity of fuel consumption was found to be between -1.28 and -3.18, thus, over a period of several years the same ten percent rise in the price of fuel would cause fuel consumption to decline between 13 percent and 32 percent (depending upon the number of years considered). The short-run income elasticity for fuel consumption was found to be between .22 and .37 implying that a ten percent increase in real income would increase fuel consumption by between 2.2 and 3.7 percent. The long-run income elasticity of fuel consumption was found to be between 1.22 and 2.01. These results imply that for fuel consumption (and subsequently revenues from the fuels taxes) not to decline in the future, total real disposable income in the state will need to grow at a rate of between 1.02 and 1.6 times the rate of increase in real fuel prices.

Using the results of the analysis contained within the report, future revenues from license fees and fuels taxes may be estimated under different scenarios about future incomes and prices. Such estimates are based upon the implicit assumption that people will respond to future changes in income and prices as they have in the past and may be accepted as reasonable estimates only if that implicit assumption holds. To illustrate the impact of rising fuel prices on future revenues from license fees and fuels taxes, three scenarios were considered. The Base Case Scenario portrays revenues if the real price of gasoline does not increase past that which is anticipated by the end of the current year (57 cents per gallon in current dollars).

The Second Case Scenario reflects revenues assuming that the real price of gasoline will increase 15 percent in 1976 and the Third Scenario indicates the impact of a 30 percent increase in the price of gasoline coupled with a three percent rise in the price of automobiles. All three scenarios assume a one and one-half percent annual growth rate in real personal disposable income and are based upon the Census Bureau's projection Series I-D for Texas population.



The increases in fuel prices assumed in the second and third scenarios could be the result of many events, such as decontrol of old oil prices, increases in the price of OPEC oil imports, increased taxes on fuel at either the national or the state level, increased tariffs on imported oil, or any combination of these events. Given the results of this analysis, estimates of future revenues could be made for other scenarios (e.g., a 50 percent increase in the price of gasoline and a 20 percent increase in automobile prices).



At this time, the Base Case Scenario appears to be the most likely to develop in the near future. One other point needs to be made: the drop in revenues from license fees is probably exaggerated since it implicitly assumes a one year adjustment period to new prices. More realistic estimates using a partial adjustment model (as used to project fuel consumption) are currently being developed.

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INTRODUCTION

Recent changes in the world energy market, brought dramatically into focus by the the Arab Oil Embargo, have had a significant impact on individuals and institutions throughout the nation, and it appears evident that more changes are on the horizon. The purpose of this report is to determine how these changes are going to affect the State Department of Highways and Public Transportation.*

In order to determine how changes in the energy market will affect the Highway Department's revenues, it was first necessary to review past revenues and the sources of past revenues. From inspecting past sources of revenue, those sources of revenue that were most likely to be significantly affected were indentified and attention was focused on analyzing these sources. Although the fuels taxes were the most evident sources of revenue that would be affected, it was expected that federal funding and revenues from license fees would also be affected by changes in the energy market. Therefore, our analysis was narrowed down to three sources--the three sources which conveniently happen to compromise the bulk of the Department's revenues. Since federal funding is to a great extent determined outside of the State, more extensive analysis was given to the fuels taxes and registration fees.

The data used in conjunction with this report was gathered from various sources, primarily documents published by the U.S. Department of Labor, the U.S. Census Bureau, the Federal Highway Administration and the State Department of Highways and Public Transportation. Other unpublished information was furnished by the State Department of Highways and Public Transportation.

*Note: During the course of this study the Texas Highway Department was expanded and is now the State Department of Highways and Public Transportation. The analysis in this report is, however, based upon the past revenues of the Texas Highway Department.

PAST SOURCES OF REVENUE

As Table 1 indicates, the three major sources of revenue for the Texas Highway Department are fuels taxes, license fees and federal funding. (For detailed breakdown of historical revenues see Table 2).

TABLE 1

Percentage Breakdown of 1974 Revenues by Source

Source	Revenue	Percent of Total
Motor Fuels Taxes	$279,878,000	37.8%
Federal Funds	216,777,000	29.3
License Fees	193,090,000	26.0
Certificate of Title Fees and Office and Sundry	6,975,000	0.9
Texas Highway Beautification and Railroad Crossing Safety Funds	5,250,000	0.8
County and Other Funds	38,607,000	5.2
Total	$740,577,000	100.0%

In 1974, the gasoline taxes accounted for 37.8 percent of total revenue, federal funding accounted for 29.3 percent and license fees accounted for 26 percent. Thus combined, the three sources accounted for over 93 percent of all revenues.

Other sources of revenue, such as title fees, outdoor advertising fees and the sales tax on lubricants represent only a minor portion of the Highway Department's funds and, while they may be affected by changing economic conditions, the major impact on revenues will clearly be due to the impact of changing economic conditions on license fees, gasoline taxes and federal funding.

Table 2

Highway Department Revenues

Year Ended August 31st	Net License Fees	Gasoline Taxes	Certificate of Title Fees	Depository Interest on State Highway Fund	Office & Sundry	Federal Funds
1954	41,699,845	74,088,176	452,993	217,169	1,219,373	28,458,048
1955	47,770,062	78,412,270	567,089	240,330	1,231,585	43,576,682
1956	52,421,154	104,902,385	996,381	463,361	1,320,766	51,018,147
1957	56,091,985	111,199,204	891,730	672,059	1,607,648	69,449,060
1958	66,172,670	117,293,033	872,650	1,222,223	2,021,842	111,973,910
1959	71,349,920	124,282,198	908,754	736,473	2,572,126	164,919,802
1960	75,797,411	129,946,823	535,733	938,651	2,921,305	185,785,948
1961	78,020,878	133,845,802	510,851	899,271	4,810,554	135,987,906
1962	83,932,944	138,601,914	471,307	972,562	3,917,177	136,218,783
1963	88,719,671	144,688,056	1,033,933	797,547	3,045,444	160,720,500
1964	94,539,995	153,396,104	1,118,200	1,607,571	3,182,355	196,279,390
1965	99,923,269	161,922,944	1,146,061	1,904,639	3,544,004	211,559,429
1966	107,474,836	171,552,004	1,203,191	2,899,413	3,402,029	181,790,030
1967	112,451,527	181,290,749	1,220,032	3,831,948	3,681,313	203,568,583
1968	125,647,784	190,504,674	1,259,092	4,207,227	4,278,743	229,760,781
1969	138,793,277	208,418,115	1,327,962	4,790,983	5,060,590	189,955,923
1970	145,534,966	221,582,428	1,340,966	3,898,471	4,500,815	228,346,707
1971	152,695,699	236,750,678	1,410,427	3,058,858	4,931,463	273,456,240
1972	164,957,456	255,204,950	1,587,216	3,094,619	4,948,350	236,597,918
1973	179,189,682	275,189,769	1,709,579	4,860,346	3,576,225	215,511,466
1974	193,089,716	279,877,975	1,753,779	11,076,522	5,221,252	216,777,537

Source: <u>Texas Highway Department Biennial Reports</u>

Table 2 (Continued)

Highway Department

Year Ending August 31st	Farm to Market Road Fund	County Funds	Other	Sales Tax on Lubricants	Outdoor Advertising License Fees	Highway Beautification	Railroad Grade Crossing Safety	Total Revenues
1954	12,987,742	2,157,526	2,183,081					163,457,952
1955	15,039,494	813,100	2,829,649					190,480,263
1956	16,217,982	466,196	3,618,728					231,425,102
1957	20,224,530	672,494	5,723,852					266,532,562
1958	11,485,013	640,701	4,117,127					315,799,169
1959	16,652,839	866,828	2,664,509					384,953,450
1960	15,105,715	710,521	3,930,283					415,672,389
1961	14,878,250	1,104,501	2,328,483					372,395,495
1962	13,310,635	513,109	2,951,225					380,889,655
1963	13,254,245	383,756	6,404,125	2,877,984				421,925,262
1964	14,251,261	1,206,263	8,293,882	1,573,440				475,448,462
1965	16,205,562	1,600,175	5,680,553	1,648,944				505,135,581
1966	19,829,647	952,044	6,751,205	1,683,264				497,537,663
1967	19,868,844	1,776,710	8,044,147	1,723,755				537,457,608
1968	18,000,894	875,658	5,486,531	1,749,888				581,771,273
1969	20,068,363	730,818	6,773,054	2,528,568				578,447,652
1970	15,960,765	837,832	13,234,463	2,697,372				637,934,786
1971	15,000,000	637,621	14,026,457	3,202,940				705,206,382
1972	15,000,000	690,652	9,611,921	3,942,080				695,987,412
1973	15,000,000	369,765	6,731,393	4,244,700	126,503	2,000,000	250,000	708,759,428
1974	15,000,000	453,984	7,459,150	4,575,527	41,603	5,000,000	250,000	740,577,045

Source: Texas Highway Department Biennial Reports

REVENUES FROM LICENSE FEES

Texas law requires that vehicles must be registered annually. Vehicles are registered by class and registration fees are assessed by class and weight. The fees are collected by County Tax Collectors within each county. The first $50,000 of fees collected by the Tax Collectors goes to the County Road and Bridge Fund. Thereafter, until the amount deposited to the credit of the County Road and Bridge Fund reaches $175,000, fifty percent of the fees collected goes to that fund. The rest of the amount collected for vehicle registration goes to the State Highway Department.

This source of revenue for the Highway Department depends upon the number of vehicles registered in each class and the average license fee of each class.

Table 3 shows the number of vehicles registered in the various classes for the years 1954 to 1974. As the table indicates, registrations in most classes have steadily risen over time. This has largely been due to increasing population, rising incomes and in many cases declining real fuel prices. Of the various classes, some will be more affected by changing fuel prices than others. For instance, one would expect that the number of passenger cars would more likely be affected by fuel prices than the number of house trailers. Therefore, only those that appear to be significantly influenced by the changing fuel prices are discussed in this report.

To determine whether or not a class of vehicles was influenced by fuel prices, economic theory and least squares regression analysis were used. Economic theory tells us that the number of a particular good

Table 3

Vehicle Registrations

Year	Passenger Cars	Commercial Trucks	Farm Trucks	Truck-Tractors	Farm Truck Tractors	Trailers	House Trailers	Motor Buses
1954	2,731,690	430,650	243,666	34,200	1,036	156,331	21,575	1,770
1955	3,012,538	516,247	206,413	38,468	1,041	182,524	23,049	1,477
1956	3,152,181	554,195	184,707	43,389	1,026	211,346	24,412	1,278
1957	3,240,164	561,254	180,899	44,951	1,061	236,786	27,583	1,279
1958	3,298,119	571,694	188,449	44,868	1,161	264,324	26,647	1,296
1959	3,416,032	610,433	193,935	44,664	1,229	297,103	29,065	1,133
1960	3,524,249	632,387	191,700	49,366	1,237	323,514	27,432	1,216
1961	3,598,746	648,854	196,596	47,597	1,273	335,165	26,310	1,243
1962	3,795,430	698,166	200,489	49,539	1,298	364,138	27,852	1,226
1963	3,985,162	741,606	203,720	50,273	1,245	379,520	29,057	1,207
1964	4,179,092	802,885	207,875	51,977	1,301	403,113	31,930	1,193
1965	4,345,267	863,324	202,834	52,322	1,282	421,113	35,655	1,172
1966	4,456,883	918,827	203,138	54,550	1,327	442,921	39,511	1,171
1967	4,588,363	969,113	200,197	54,712	1,322	470,910	44,503	912
1968	4,729,481	1,038,411	198,440	55,395	1,665	486,271	60,245	1,036
1969	4,996,344	1,154,330	197,882	59,723	1,425	523,894	84,339	839
1970	5,150,154	1,224,419	194,345	60,026	1,575	563,772	107,448	936
1971	5,256,283	1,286,373	188,629	61,662	1,687	595,218	131,984	1,004
1972	5,533,969	1,388,108	187,889	70,765*	1,810	660,673	153,011	1,000
1973	5,806,892	1,524,531	190,593	77,808*	2,192	698,159	167,313	1,085
1974	6,022,913	1,663,830	199,827	85,410*	1,702	761,669	171,446	1,090

Source: Texas Highway Department Biennial Reports.

* Includes Classes "Truck Tractors" and "Combinations".

Table 3 (Continued)

Vehicle Registrations

Year	City Buses	Motor-cycles	Tractors	Farm Trailers	Machinery	Disaster Relief	Soil Conser-vation	Permit License Oil Machinery	Private Buses
1954	2,899	26,850	289	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1955	2,541	28,840	273	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1956	2,492	30,538	317	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1957	2,336	35,241	374	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1958	2,292	39,165	407	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1959	2,225	46,982	401	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1960	1,851	47,001	436	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1961	1,806	45,539	438	8,679	87	N.A.	N.A.	N.A.	N.A.
1962	1,979	46,519	1,431	144,219	17,203	16	N.A.	N.A.	N.A.
1963	1,787	45,896	1,434	133,656	11,908	44	N.A.	N.A.	N.A.
1964	1,248	49,123	1,389	134,982	13,317	55	739	1,467	N.A.
1965	1,191	55,918	1,468	123,301	14,109	60	896	1,653	N.A.
1966	1,122	73,083	1,317	129,231	15,304	68	959	1,672	N.A.
1967	1,146	85,890	1,380	170,965	16,252	88	1,004	1,723	N.A.
1968	1,025	90,441	1,410	96,884	17,431	87	1,038	1,697	N.A.
1969	1,239	107,006	1,369	109,815	18,480	96	1,108	1,618	N.A.
1970	1,216	141,354	1,107	101,872	19,449	109	1,096	1,432	N.A.
1971	1,045	179,054	1,023	107,406	20,188	121	1,157	1,431	N.A.
1972	847	218,489	964	115,563	21,331	110	1,159	1,408	N.A.
1973	832	236,657	1,022	128,278	23,354	115	946	1,313	4,921
1974	657	286,849	887	142,414	25,201	131	904	1,355	7,907

Source: Texas Highway Department Biennial Reports.

purchased (in this case registered) will depend upon the number of people in the economy, the income of those people, the price of the good and the prices of other goods. Thus, each class of registrations was modeled using this information and always including the price of gas. Then using historical data for Texas, each model was estimated using the Cochrane-Orcutt iterative procedure to obtain unbiased least squares estimates of the coefficients of the independent variables (population, income, the price of gas). Then based upon the results of regression analysis, the classes of vehicles most affected by changes in the price of gas were chosen for further analysis.

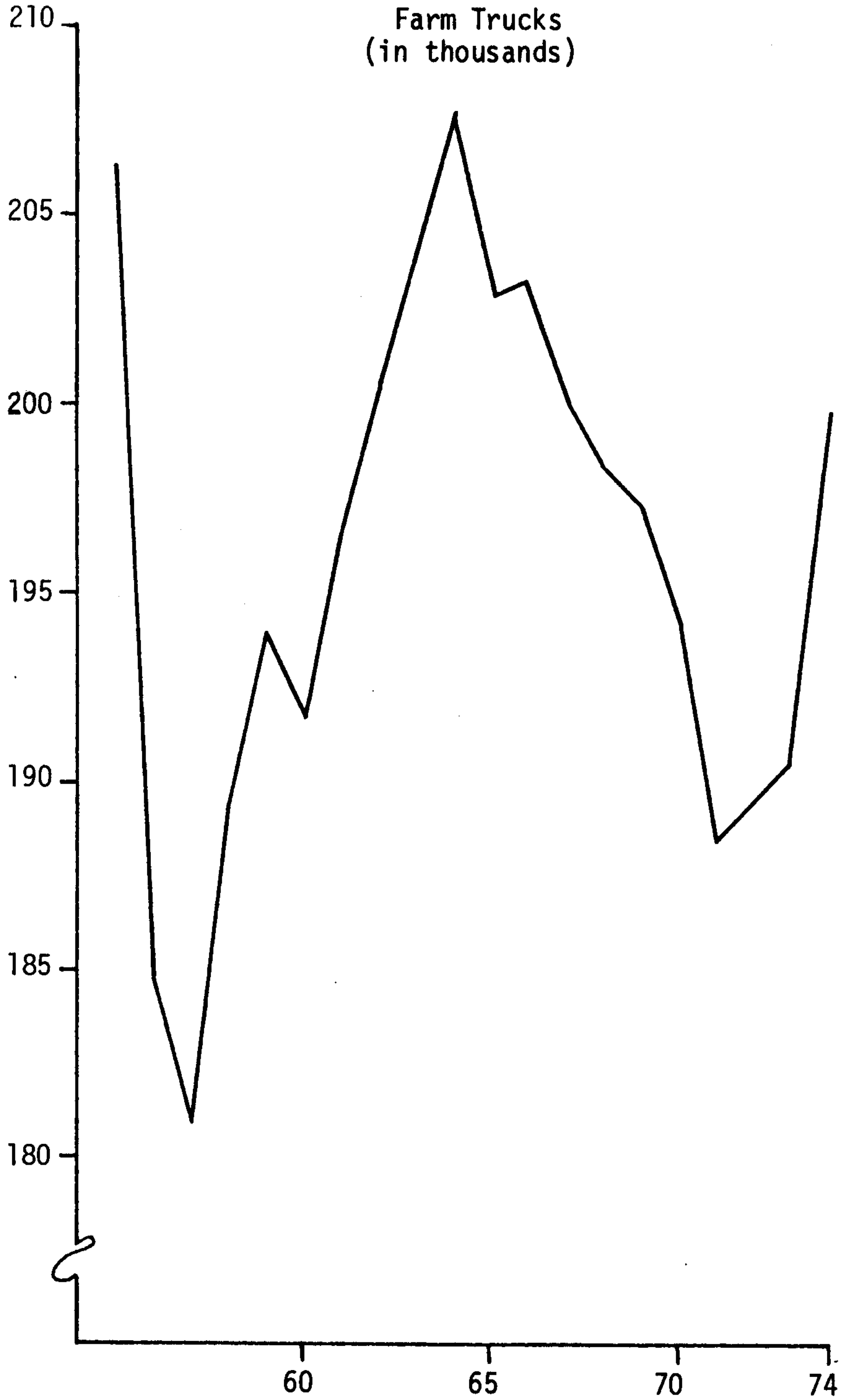
Classes that did not appear to be influenced by the price of fuel included "farm trucks," "tractors," "house trailers," city buses," and "farm trailers." The farm related classes are dependent largely on farm incomes and show a somewhat erratic pattern over the period studied, 1954-1974 (see Figures 1,2,3). House trailer registrations were more dependent upon the price of housing and the cost of rent, as would be expected. The decline in city buses appeared to be dependent only on income, falling consistently as income and consequently, the value of time rose (See Figure 4).

The classes that definitely appeared to be influenced by the price of gas were "passenger cars," "motorcycles," "truck-tractors," "motor buses," "farm truck-tractors," "and trailers." All of these classes showed a statistically significant negative correlation with the price of gas (i.e., registrations rose when the price of gas fell).

The model estimated for the class "passenger cars" was

$$PCH = \beta_0 + \beta_1 DYHH + \beta_2 PN + \beta_3 PGR$$

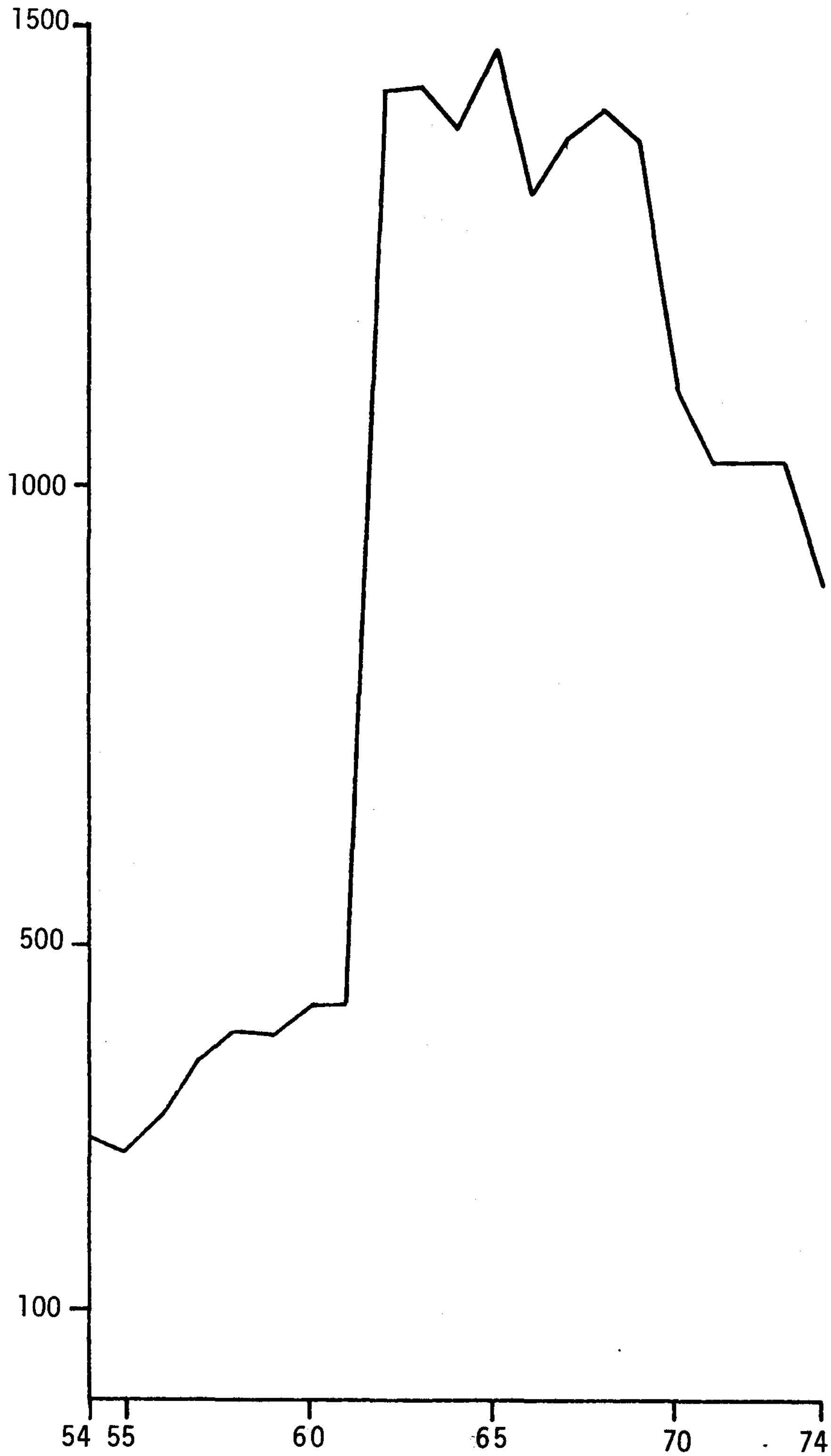
Figure 1



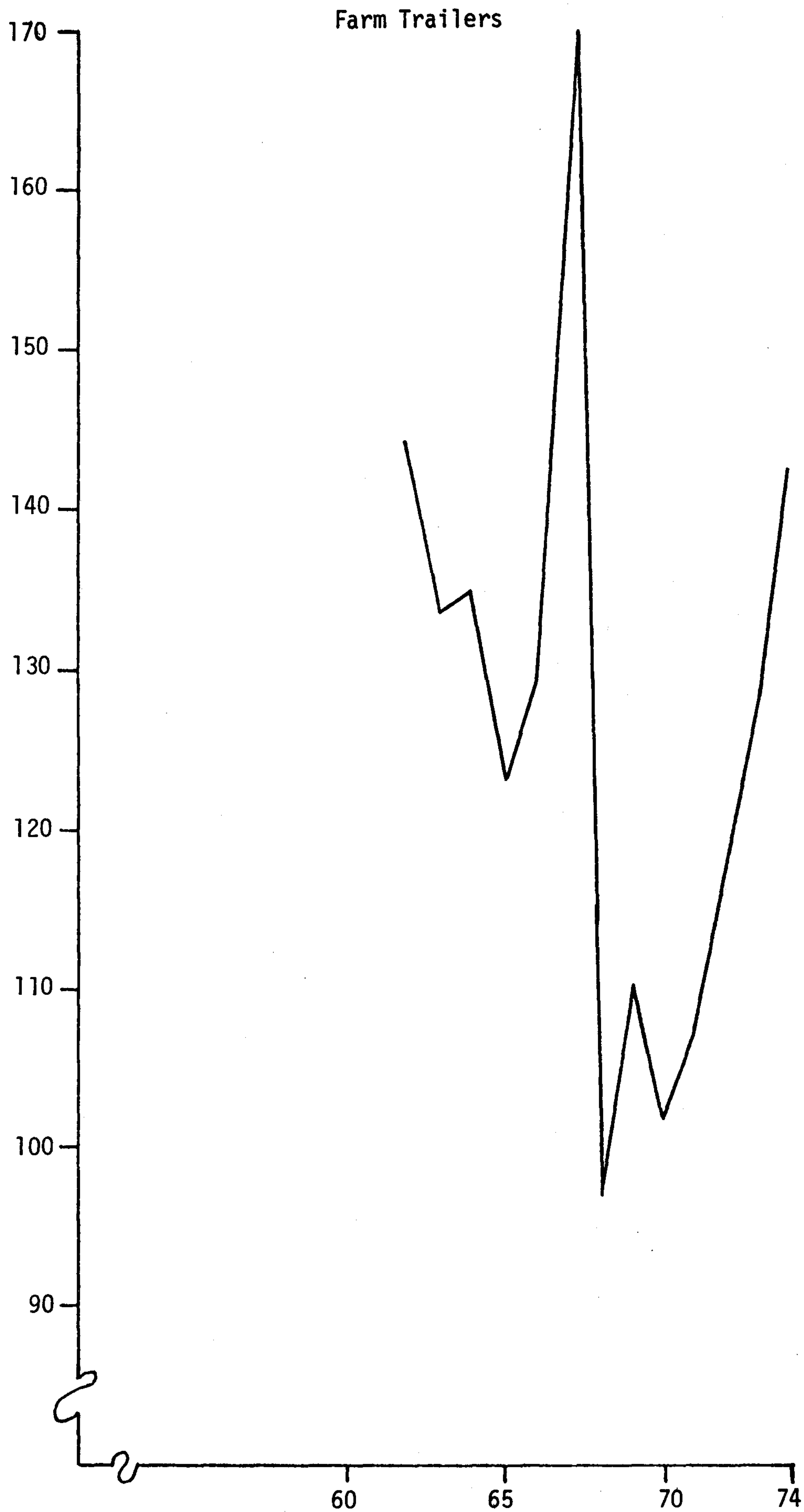
Source: Texas Highway Department Biennial Reports.

Figure 2

Tractors



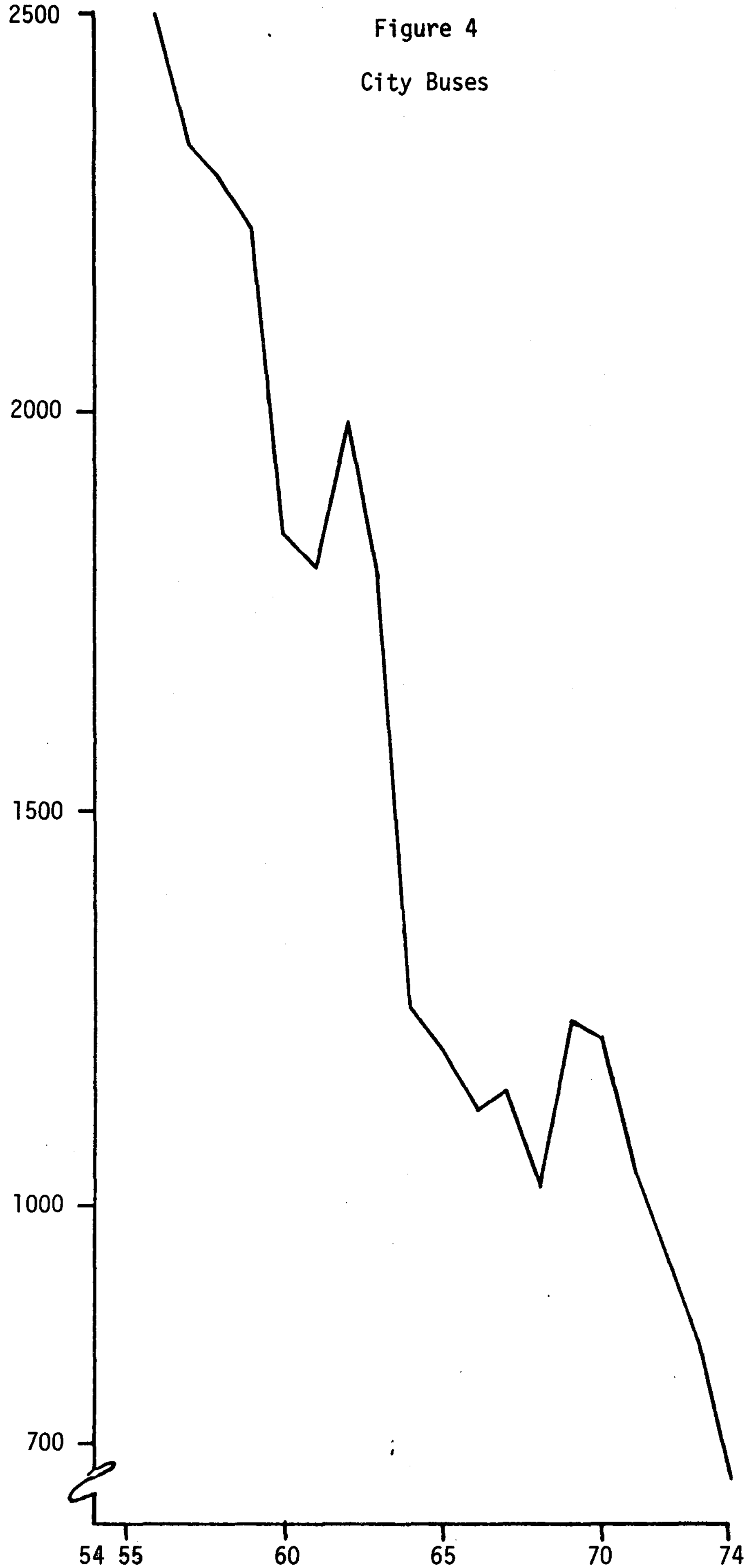
Source: Texas Highway Department Biennial Reports.



Source: Texas Highway Department Biennial Reports.

Figure 4

City Buses



Source: Texas Highway Department Biennial Reports.

where PCH = Passenger car registrations per household

DYHH = Real household disposable income in 1967 dollars

PN = Price index for new automobiles, 1967 base

PGR = Real price of gasoline in 1967 cents.

The least squares regression results were:

	Coefficients	*t*-statistic
β_0	1.81879	7.79385
β_1	.000075	17.6979
β_2	- .330179	2.41360
β_3	- .021925	5.30882

R^2 = .9821

β_1 indicates that for a real increase in disposable household income of one dollar, the number of passenger cars per household would increase by .000075. Although this may seem insignificant, given a real increase in household disposable income for all households in Texas for the year 1973, the additional one dollar of income would have increased total passenger car registrations by approximately 275. The sign of β_2 indicates that as the price of a new car increases the number of passenger cars per household, and subsequently passenger registrations for the state, would fall. The sign of β_3 indicates that as the real price of gasoline increases the number of passenger cars per household will fall. The magnitude of the price coefficient indicates that if the real price of gas were to rise by one cent the number of passenger cars per households would fall by about .02, or two percent.

The model estimated for the class "motorcycles" was

$$MCH = \beta_0 + \beta_1 DYHH + \beta_2 PN + \beta_3 PGR$$

where MCH = Motorcycles per household

DYHH = Real disposable household income, 1967 dollars

PN = Price index of new cars

PGR = Real price of gas in 1967 cents.

The least squares estimates of the β coefficients were

	Coefficients	*t*-statistics
β_0	-.05407	.9134
β_1	.00000988	6.25578
β_2	.0932026	2.31320
β_3	-.00305414	3.15811
	R^2 = .9726	

The sign of the intercept term, β_0, indicates that not all households own motorcycles on the average. As would be expected, the sign of β_1 is positive indicating that the number of motorcycles per household increases as real household disposable income increases. The sign of β_2 indicates that as the price of new cars increases the number of motorcycles will increase, implying, as one might expect, that motorcycles are substitutes for cars. The sign of β_3 indicates that as the real price of gas increases, the household ownership of motorcycles will decrease. However, it is interesting to note that the size of the β_3 coefficient for motorcycle ownership is less than the β_3 coefficient for passenger cars. This is most likely due to the fact that motorcycles usually have a greater fuel efficiency than passenger cars, thus the cost of travel by means of motorcycle will be less affected by changes in the price of gas than the cost of travel by means of passenger cars.

These two equations indicate that the number of passenger car and motorcycle registrations will probably not continue to expand as rapidly in the future as they have in the past if gasoline prices increase in real terms in the future. Therefore, revenues from the number of motorcycle and passenger car registrations will not expand as rapidly in the past and may even decline if the growth in the number of households and household disposable income do not increase rapidly enough to offset rising real gas prices.

The model estimated for commercial truck registrations was

$$CT = \beta_0 + \beta_1 TSYR + \beta_2 PGR$$

where CT = total number of commercial truck registrations

TSYR = total state personal income in 1967 dollars x 10^6

PGR = price of gasoline in 1967 cents.

The least squares estimates of the β coefficients were:

	Coefficients	*t*-statistics
β_0	1243760.0	7.40506
β_1	33.7698	36.9997
β_2	- 41914.1	8.37104
	R^2 = .9966	

β_1 indicates that for every one million dollars of increase in real state personal income the number of commercial trucks will increase by about 34. β_2 shows that commercial truck registrations given a one cent increase in the real price of gasoline in 1967 terms, the number of commercial truck registrations would fall by 41,914. However, since historical price data was not available for commercial trucks, the variances of the β coefficients will be biased; however, the bias will be upward such that the usual tests of significance for β_1 and β_2 will be too conservative. In the case of the estimated regression, this poses no real problem, as the tests of significance, the *t*-statistics, are highly significant and the upward bias of the variances implies that given the inclusion of commercial truck prices the *t*-statistics (at least theoretically) would have been greater.

The model estimated for "truck-tractors" was

$$TT = \beta_0 + \beta_1 TSYR + \beta_2 PGR$$

where TT = number of truck-tractor registrations

TSYR = total state personal income x 10^6 in 1967 dollars

PGR = real price of gas in 1967 cents.

The estimates of the coefficients were:

	Coefficients	*t*-statistics
β_0	141114.0	11.5722
β_1	0.653137	11.1243
β_2	- 3480.41	9.51952

R^2 = .9752

As with the previous models, the β coefficients indicate that the number of registrations will rise as income rises and fall as the price of gas rises. This is also found to be the case for "farm truck-tractors."

The model estimated for farm truck-tractors was:

$$FTT = \beta_0 + \beta_1 TSYR = \beta_2 PGR$$

where FTT = the number of farm truck-tractor registrations.

TSYR = total State personal income x 10^6 in 1967 dollars

PGR = real price of gas in 1967 cents

The regression results were

	Coefficients	t-statistics
β_0	.4276.13	5.02487
β_1	.0180696	4.07802
β_2	- 111.903	4.40213
	R^2 = .8953	

The model estimated for "motor buses" was:

$$MBUS = \beta_0 + \beta_1 DYHH + \beta_2 PGR + \beta_3 HH$$

where MBUS = the number of motor bus registrations

DYHH = real disposable household income in 1967 dollars

PGR = real price of gas in 1967 cents

HH = number of households in the state

The least squares regression estimates of the coefficients were:

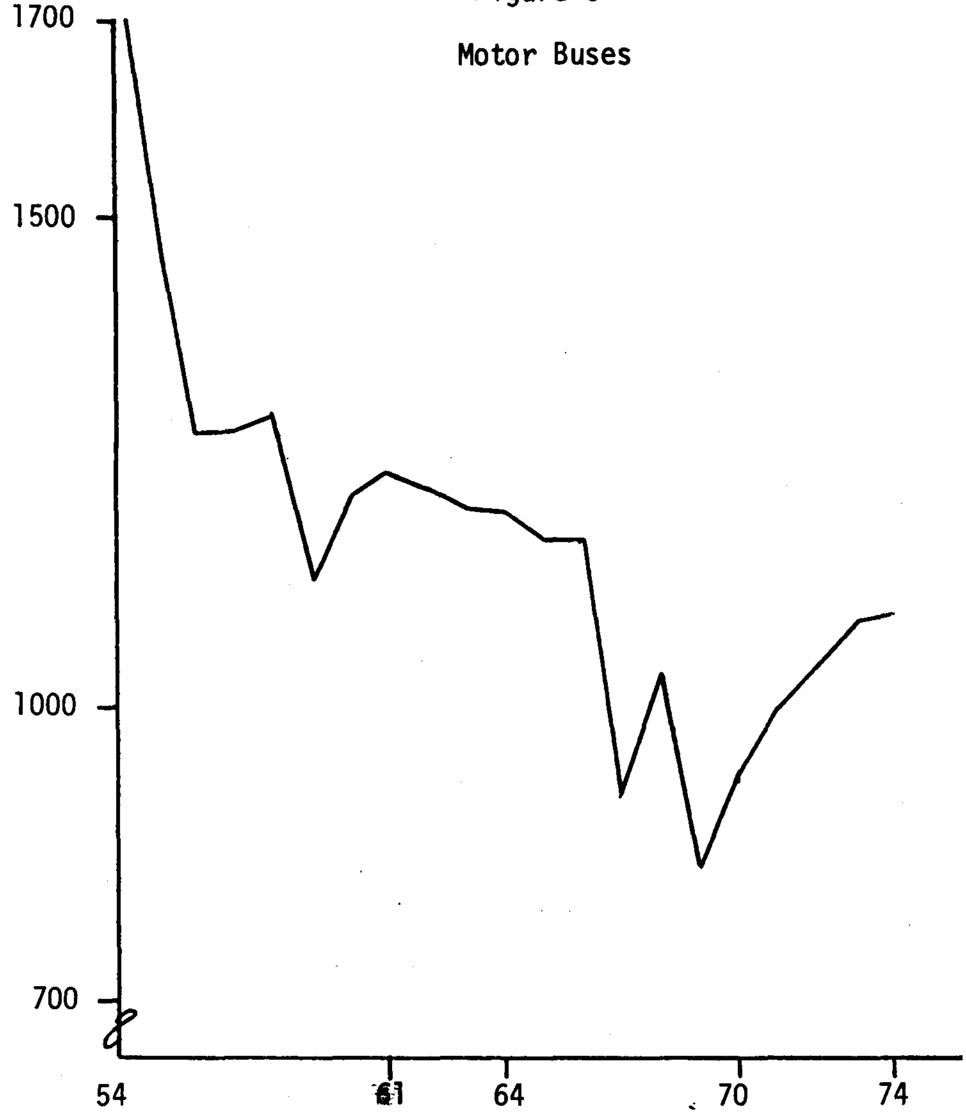
	Coefficients	*t*-statistics
β_0	2514.42	3.02404
β_1	- .206595	3.76956
β_2	- 38.2679	2.31181
β_3	.000409	1.62840

$R^2 = .8290$

The β_1 coefficient indicates that based on past events the number of motor bus registrations has fallen as household incomes have risen. This has occurred for two reasons. First, as household incomes rise, households can afford to shift from travel by means of bus to travel by means of private car, thus lessening the demand for motor buses. The second reason pertains to the value of time. As household incomes rise, the marginal value of time to the household increases. Thus, due to scheduling of bus travel, the full cost of bus travel (i.e., the fare for the bus ticket plus the expected time delay caused by scheduling rather than continuous bus arrivals and departures multiplied by the marginal value of time) increases, therefore lessening the demand for motor buses. As with the previous models, the coefficient of the price of gas is negative indicating that as the price of gas increases, the number of motor bus registrations may be expected to decline. It must be noted here that all analysis has been based on historical events, and this is of particular importance in the case of buses. The number of motor buses in Texas has shown a great deal of variation over time (see Figure 5) and although the general trend has been downward it may not be so in the

Figure 5

Motor Buses



Source: <u>Texas Highway Department Biennial Reports</u>.

future. If the price of gas and the price of private passenger cars climb faster than income in the future, there may be a substitution from private passenger car travel back to bus travel, thus motor bus registration could increase over time. This substitutability is not reflected in the model for motor bus registrations since adequate data on bus fares, scheduling frequencies and the full cost of automobile travel were not available and would be necessary to estimate the degree of substitutability between private passenger car travel and bus travel.

The foregoing discussion clearly indicates that total vehicle registrations will most likely be affected by rising fuel prices in a negative manner, falling as fuel prices increase. This indicates that revenues from the number of vehicles registered may be expected to fall in the future if gas prices rise sufficiently. In addition to the possible decline in revenues due to fewer registrations, average license fees for different vehicle classes may fall as gasoline prices increase. The average license fee of most registration classes represents the mean of the weight distribution for that class as fees are assessed according to weight in most classes. Historically,average license fees have shown a general upward trend, i.e.,average vehicle weight has been increasing over time (See Table 4). Since there is a general relationship between vehicle weight and fuel efficiency, with rising fuel prices one would expect a shift from heavy vehicles with low fuel efficiency ratios to smaller cars with higher efficiency ratios, thus reversing the past trend of rising average license fees. To determine which registration classes would be affected by changing fuel prices, the same prodedure was followed as that used to determine numbers of registrations in classes that would be affected by changing fuel prices. Average license fees for each class were regressed against

Table 4

Average License Fees

Year	Passenger Cars	Commercial Trucks	Farm Trucks	Truck-Tractors	Farm Truck Tractors	Trailers	House Trailers	Motor Buses
1954	12.42	34.79	10.67	129.23	43.15	40.61	9.70	507.13
1955	12.51	33.32	11.02	132.02	44.88	40.32	10.20	599.47
1956	12.83	34.65	11.96	134.72	46.85	38.79	11.22	310.51
1957	13.20	35.26	12.38	140.19	47.68	36.69	12.51	306.71
1958	14.98	38.85	13.89	160.40	52.69	37.28	14.02	342.22
1959	15.28	38.48	13.90	161.61	52.64	35.86	14.40	325.78
1960	15.52	38.48	14.38	185.56	54.86	34.31	14.80	213.08
1961	15.69	37.93	14.49	199.47	56.28	33.36	14.34	220.58
1962	15.64	37.14	14.48	210.42	58.61	32.50	14.42	228.33
1963	15.64	36.54	14.46	222.58	62.12	32.48	14.81	229.44
1964	15.63	35.58	14.60	233.00	64.21	32.26	14.79	230.11
1965	15.67	35.02	14.83	244.76	65.86	32.18	15.20	255.31
1966	16.07	35.03	15.17	285.65	71.43	32.86	15.60	261.19
1967	16.20	34.81	15.50	271.69	73.35	31.57	15.97	257.04
1968	17.56	34.78	16.29	279.66	64.56	33.50	16.25	237.98
1969	17.85	34.33	16.84	284.68	79.31	34.04	18.18	286.76
1970	18.04	34.09	17.13	291.91	81.03	32.98	19.20	266.16
1971	18.23	33.88	17.04	299.50	84.78	32.94	21.27	274.45
1972	18.41	32.77	18.26	490.69*	86.98	10.08	21.67	278.69
1973	18.62	32.63	18.10	497.22*	78.42	9.43	21.70	255.20
1974	18.80	32.49	17.92	490.93*	103.53	9.53	21.09	250.04

Source: Texas Highway Department Biennial Reports

* Weighted average of classes "Truck-Tractors" and "Combinations."

Table 4 (continued)

Average License Fees

Year	City Buses	Motor-cycles	Tractors	Farm Trailers	Construction Machinery	Disaster Relief	Soil Conser-vation	Permit License Oil Machinery	Private Buses
1954	66.10	4.28	12.89	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1955	69.70	4.23	13.53	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1956	72.68	4.20	14.76	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1957	73.96	4.18	10.81	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1958	83.21	4.65	11.46	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1959	83.35	4.61	11.37	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1960	84.75	4.72	11.98	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1961	85.81	4.74	12.57	5.00	5.00	N.A.	N.A.	N.A.	N.A.
1962	86.89	4.70	9.32	5.00	5.00	5.00	N.A.	N.A.	N.A.
1963	90.08	4.70	9.71	5.00	5.00	5.00	N.A.	N.A.	N.A.
1964	84.25	4.66	10.35	5.00	4.99	5.00	100.82	4.83	N.A.
1965	88.36	4.62	10.63	5.00	4.99	5.00	101.55	4.94	N.A.
1966	83.04	4.72	10.30	5.00	4.99	5.00	103.61	4.96	N.A.
1967	89.87	4.83	10.73	5.00	4.99	5.00	105.66	4.98	N.A.
1968	87.96	4.84	11.33	5.12	5.28	5.29	108.44	5.33	N.A.
1969	97.28	5.43	11.81	5.31	5.36	5.30	109.31	5.29	N.A.
1970	92.18	5.48	19.90	5.32	5.43	5.30	110.46	5.36	N.A.
1971	96.28	5.48	17.58	5.34	5.38	6.11	109.45	5.03	N.A.
1972	105.82	5.50	12.97	5.35	5.45	5.30	110.87	5.32	N.A.
1973	95.07	5.50	13.10	5.35	5.43	7.41	112.77	5.32	57.83
1974	103.34	5.59	13.77	5.35	5.45	5.29	115.92	5.43	54.98

Source: Texas Highway Department Biennial Reports an income variable and the price of gas.

Of all the classes of registration types only three classes appeared to be significantly affected by the price of gas: farm trucks, city buses, and passenger cars. All were positively correlated with the income variables used, either real personal disposable household income (DYHH) or real personal disposable income per capita (DYPC) and all were negatively correlated with the real price of fuel (PGR).

The model estimated for farm truck average license fees was

$$LFT = \beta_0 + \beta_1 DYHH + \beta_2 PGR$$

where LFT = average license fee for farm trucks.

The estimates of the β coefficients were:

	Coefficients	*t*-statistics
β_0	13.4203	4.70965
β_1	.0010394	9.89577
β_2	- .191614	2.42806
	R^2 = .9659	

The β_0 coefficient or intercept term reflects the fact that there is a minimum registration fee. The β_1 coefficient indicates that as real personal disposable household income increases by one dollar, the average license fee for farm trucks will increase by about one tenth of one cent. The β_2 coefficient shows that a one cent increase in the price of gas would lower the average license fee for farm trucks by about nineteen cents.

The model estimated for average city bus license fees was:

$$LCB = \beta_0 + \beta_1 DYHH + \beta_2 PGR$$

where LCB = average license fees for city buses.

And the regression results were:

	Coefficients	t-statistics
β_0	122.241	4.54733
β_1	.002976	4.19894
β_2	- 1.83621	2.4025
	R^2 = .7168	

The model estimated for average passenger car license fees was:

$$LPC = \beta_0 + \beta_1 DYHH + \beta_2 PGR$$

and the regression results were:

	Coefficients	t-statistics
β_0	13.6278	4.43222
β_1	.00092	5.92835
β_2	- .13593	1.64380
	R^2 = .9536	

The foregoing statistical analysis indicates that although not all average license fees are affected significantly by changing fuel prices, those that are may be expected to fall as fuel prices rise. Thus, the State Highway Department's revenues from vehicle registrations may very likely decline if the real price of gas rises, especially if the growth in population and real income in the state do not continue to increase as rapidly as they have in the past. This decline will result not only from fewer vehicle registrations, but also from smaller average license fees resulting from the ownership of smaller vehicles.

REVENUES FROM FUEL TAXES

As mentioned earlier, fuel taxes account for a major portion of the Highway Department annual revenues. Texas has two separate fuels taxes, the Motor Fuel Tax and the Special Fuels Tax. The Motor Fuel (gasoline) tax applies to all products known or sold as gasoline and the Special Fuels Tax applies to liquefied gas and distillate fuel. Both taxes are excise taxes levied upon the sale of these fuels on a per gallon basis. The Motor Fuel tax is five cents per gallon and the Special Fuels tax is five cents per gallon on liquefied gas and six and one-half cents on distillate fuels used for the propulsion of motor vehicles upon public highways of the State. For buses owned by a transit company that serves a town or city, the Special Fuels tax is four cents per gallon on liquefied gas and six cents per gallon on distillate fuel. Of the total gross revenue collected from the two taxes, approximately 74 percent goes to the State Highway Department, with one percent of the gross going to the State Comptroller, 25 percent going to the available Free School Fund, and $7,300,000 going to the County and Road District Highway Fund. Thus, it is clear that as total fuel consumption rises, the revenue accruing to the Highway Fund will also increase and this has been the case in the past. Rising fuel consumption in the past may largely be attributed to rising income and declining real fuel prices. This may not be the case for the future, as fuel prices may very likely increase in the future.

To estimate the impact of changing fuel prices on the demand for fuel, usually the concept of price elasticity is used. Price elasticity measures the percentage change in the quantity demanded relative to the percentage change in price. This concept is readily illustrated mathematically. If at the original price, p_1, the quantity demanded is q_1 and the price changes to p_2 and quantity demanded changes to q_2, then the price elasticity of demand would be:

$$\frac{\frac{q_2-q_1}{q_1}}{\frac{p_2-p_1}{p_1}} \text{ or more generally } \frac{\frac{\Delta q}{q}}{\frac{\Delta p}{p}} .$$

The concept of elasticity may be applied to changes in gasoline consumption resulting from changes in the price of gasoline, the price of automobiles, the price of automobile maintenance, and changes in income. Furthermore, the elasticity concept may be applied to different adjustment periods, such as one month, one year, or several years. This is because changes in the consumption levels of gasoline require time. Usually, short-run (generally considered to be one year or less) changes in quantity demanded of any good are less dramatic than are long-run changes due to the time involved in changing consumption patterns. In terms of elasticities, this means that short-run elasticities are more inelastic (less responsive) than are long-run elasticities. For instance, if the price of gasoline were to rise, in the short run a consumer may lower his consumption of gas by reducing the number of miles he drives and by changing the way in which he drives. However, in the long run, he may change his residence so as to lower the number of miles he must drive to work, he may purchase an automobile with greater fuel efficiency, change the way in which he drives, and reduce the number of miles traveled by automobile.

Recently, several studies have been conducted to estimate the demand for gasoline in the United States. Phillips[1] in 1972, Houthakker and Verleger[2] and Verleger and Sheehan[3] in 1973 used very similar techniques in estimating the demand for gasoline. All three studies were cross-sectional or mixed cross-sectional/time series studies conducted on U.S. data. The type of model used in each of these studies is referred to as a "flow-adjustment" or "dynamic partial adjustment" model. This type of model assumes that consumers do not instantaneously adjust to a change in the price of gas but rather gradually adjust their consumption over time until their "optimal" level of consumption for the new price, given their income, is attained. Most studies that have been done on the demand for gasoline are of this nature and yield both a short-run and a long-run price elasticity for gasoline. A common characteristic of all of the studies that have been done using this type of model is that the short-run price elasticity is consistently lower (less elastic) than the long run price elasticity (See Table 6). However, estimates of elasticities vary a great deal between studies, the estimates of the short-run elasticity for the U.S. varies from -0.06 to -0.83 and estimates of the long-run price elasticity for the U.S. vary from -0.07 to -0.92.

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[1]Louis Philips, "A Dynamic Version of the Linear Expenditure Model," Review of Economics and Statistics, Vol. LIV, November, 1972, pp. 450-458.

[2]H. S. Houthakker and P. K. Verleger, "The Demand for Gasoline: A Mixed Crossectional and Time-Series Analysis," Preliminary Paper, May, 1973.

[3]P. K. Verleger and D. D. Sheehan, "A Study of the Quarterly Demand for Gasoline and Impacts of Alternative Gasoline Taxes," DRI Special Study for the EPA and CEQ, December, 1973.

In addition to these estimates, there are estimates of the short-run (-.2) and the long-run (-1.0) price elasticity of demand for gasoline in Texas.[4] However, the previous study on gasoline consumption in Texas done by Thompson is done for per capita consumption of gasoline and the elasticities of his studies may not be the same as for total fuel consumption in the state. Therefore, the total state demand for fuel was modeled.

The type of model used was a flow-adjustment model the same as that used by Thompson. This type of model was used because it yields both a short-run and a long-run price elasticity.

Let Q_t^* be the desired level of fuel consumption in time period t associated with P_t and Y_t:

$$Q_t^* = Q(P_t, Y_t) \qquad (1)$$

where P_t = Price of fuel in time period t

Y_t = Income in time period t.

However, due to the time adjustment process, and cost of change, consumption does not immediately adjust to changes in P and Y, but partial adjustment does occur such that

$$Q_t - Q_{t-1} = \lambda(Q_t^* - Q_{t-1}): \quad 0<\lambda<1 \qquad (2)$$

where Q_t = actual consumption in time period t

Q_{t-1} = actual consumption in the time period previous to t

λ = adjustment coefficent

Then specifying the demand function:

$$Q_t^* = \beta_0 + \beta_1 P_t + \beta_2 Y_t \qquad (3)$$

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[4]Russell G. Thompson, "Relationship Between Supply/Demand and Pricing for Alternative Fuels in Texas: A Study in Elasticities," Report for the Governor's Energy Advisory Council of Texas, January, 1975.

TABLE 5

Recent Estimates of the Price Elasticity of Motor Fuel Demand

Author	Type of Data	Elasticity	
J. Ramsey, A. Rasche, B. Allen	Annual U.S. for passenger cars & motorcycles	- .77	--
Charlotte Chamberlain (D.O.T.)	Annual U.S. Passenger car	-0.06	- .07
Data Resources, Inc.	Quarterly U.S. highway motor fuel	- .196	- .446
Louis Philips	Annual, U.S.	- .11	- .68
Charlotte Chamberlain	Annual-International	- .12	-1.21
Hendrick Houthakker	Annual-International	- .465	- .82
John Enns (RAND)	Annual, U.S.	- .10 to - .18	
H.S. Houthakker and Verleger	Annual, U.S.	- .43	- .75
F. Adams, H. Graham, and J.M. Griffin	Cross-sectional, International	--	- .9
NAV (Model)	Annual, U.S. (automobile only)	- .83	- .92
FEA		- .2	- .8
Thompson	Annual, Texas	- .2	-1.43

and substituting it into the time adjustment equation, actual consumption in time period t is:

$$Q_t = \beta_0{}^* + \beta_1{}^*P_t + \beta_2{}^*Y_t + \beta_3{}^*Q_{t-1} \qquad (4)$$

where $\beta_i{}^* = \lambda\beta_i, \quad = 0,1,2\ i$
$\beta_3{}^* = 1-\lambda$

Equation (4) is the function which is actually estimated. $\beta_1{}^*$ is interpreted as the short-run (one year) price coefficient and $(\beta_1{}^* \div \lambda)$ is the long-run price coefficient (β_1). $\beta_2{}^*$ and β_2 are interpreted similarly for income. $\beta_3{}^*$ is the weight which the previous period's consumption has on the present period's consumption.

The estimation of equation (4) was done by the Cochrane-Orcutt Interative Procedure which yields unbiased least squares estimates of the β coefficients. Two forms of the function were estimated using this procedure: a strictly linear model which implies that the effects of price and income are additive and a log-linear form which implies that the effects of price and income are multiplicative.

Both models yield high R^2's (implying that the changes in price, income and previous consumption explain changes in consumption very well) and good t-statistics (meaning the coefficients are significantly different from zero).

The linear model estimated was:

$$FUEL = \beta_0{}^* + \beta_1{}^*PGR + \beta_2{}^*DYPC + \beta_3{}^*LFUEL$$

where FUEL = Number of gallons of fuel consumed in the state x 10^3

PGR = Real price of gas in 1967 cents

DYPC = Real personal disposable income in 1967 dollars

LFUEL = Fuel consumed in previous year x 10^3

Sources for Table 5.

J. Ramsey, R. Rasche, and B. Allen, "An Analysis of the Private and Commercial Demand for Gasoline," (unpublished paper) February 18, 1974.

Charlotte Chamberlain, "Models of Gasoline Demand," (unpublished paper) Fall, 1973.

Data Resources, Inc., A Study of the Quarterly Demand for Gasoline and Impacts of Alternative Gasoline Taxes, (unpublished study prepared for the Council on Environmental Quality), December 5, 1973.

Louis Philips, "A Dynamic Version of the Linear Expenditure Model," Review of Economics and Statistics, Vol. LIV, November, 1972, pp. 450-458.

Hendrik S. Houthakker and Michael Kennedy, "Demand for Energy as a Function of Price," unpublished and undated paper.

B. Burright and J. Enns, Econometric Models of the Demand for Motor Fuel, The RAND Corporation, R-1561- NSF (forthcoming).

H.S. Houthakker and P.K. Verleger, "The Demand for Gasoline: A Mixed Crossectional and Time Series Analysis," Preliminary Paper (May, 1973).

F.G. Adams, H. Graham, and J.M. Griffin, "Demand Elasticities for Gasoline: Another View," Discussion Paper No. 279, Economics Research Unit University of Pennsylvania (June 1974).

Sorrell Wildhorn, Burke Burright, John Enns, and Thomas Kirkwood, NAV Model in How to Save Gasoline: Public Policy Alternatives for the Automobile R-1560-NSF (October, 1974).

Federal Energy Administration, Project Independence, Project Independence Report, U.S. Government Printing Office, Washington, D.C. (November, 1974).

Russell G. Thompson, "Relationship Between Supply/Demand and Pricing for Alternative Fuels in Texas: A Study in Elasticities, " Report for the Governor's Energy Advisory Council of Texas, January, 1975.

The regression results were:

	Coefficients	*t*-statistic
β_0*	1445380	1.33114
β_1*	- 60242.2	1.76527
β_2*	516.268	2.14430
β_3*	.889188	7.79452
	R^2 = .9984	

These results imply that λ = .11 or that the adjustment period is about 9 years, since the observations used were yearly data. β_1 or the long-run coefficient of price would thus be -547656.36 and the long-run coefficient of income would be 4693.35. The short-run elasticity of price, estimated at the sample mean would therefore be -.35 and the long-run price elasticity (for a nine year adjustment period, λ = .11) would be 3.182. This means that if the price of fuel were to increase 10 percent then given income does not change, the total fuel consumed would decrease 3.5 percent in the year of the price change and that over a period of nine years, the initial 10 percent increase in the price of gas would cause fuel consumption to fall 31.8 percent.

The short-run income elasticity based on these results is .22 and the long run income elasticity is 2.01. This is interesting to note since the absolute value of the price elasticity, both in the short-run and long-run is greater than the income elasticity. This implies that if the real price of gasoline increases in the future by 1 percent, real personal disposable income per capita must rise by about 1.6 percent for fuel consumption to remain constant.

The log linear model estimated was

$$\ln FUEL = \beta_0 + \beta_1 \ln PGR + \beta_2 \ln DYPC + \beta_3 \ln LFUEL$$

The regression results were

	Coefficients	-statistics
β_0	3.16778	2.02923
β_1	- .389182	2.34388
β_2	.375698	3.06614
β_3	.695215	5.49910
	R^2 = .9982	

These results imply λ = 0.304785 or an adjustment period of about 3¼ years. Given this the long-run price elasticity β_1 would about -1.28, or about 3¼ times the short-run elasticity β_1*(-0.389182). The income short-run elasticity income is .375698 and given λ = 0.34785, the long-run income elasticity would be therefore about 1.22.

Since there is no a priori information on the precise functional specification of a demand function, neither model can be proclaimed as the better model. But together they yield some very valuable information. The results imply that the short-run price elasticity for fuel demand is between -.35 and -.39 and that the long-run price elasticity is somewhere between -1.28 and -3.18. Also, the results imply that for fuel consumption not to decline in the future, real personal disposable income per capita must grow at a rate of between 1.03 and 1.6 times the rate of increase in real fuel prices.

As far as State Highway Department revenues are concerned, the results imply that revenues from the fuels taxes may very likely decline. The magnitude of the decline is somewhat hard to predict as the future of the energy market appears very uncertain at present. Several events could cause the price of fuel to increase substantially over the next months: decontrol of old oil prices, passage of any one of several congressional bills proposing further taxation of fuel, the expected price boost of OPEC oil in the fall. However, estimates of the magnitude of price increases due to these events vary greatly, making reasonable prediction of future fuel prices virtually impossible. However, most experts do believe that the price of crude oil, and hence fuel prices will increase in the near future. Therefore, it is most likely that revenues from the fuels taxes will show a decline, at least in the short-run, until the rise in real personal disposable income can offset the negative impact of the price increases.

FEDERAL FUNDING

Texas has recieved a substantial sum of revenue from the Federal Government in the past which has come primarily from the Federal Highway Trust Fund. The Federal Highway Trust Fund was established by the Highway Revenue Act of 1956 as a source of Federal funds for highway aid. It appears that funds for the Texas Highway Department will continue as they have in the past for the immediate future. However, the picture may change in 1979 with the completion of the National System of Interstate and Defense Highways. At that time revenues from federal excise taxes that now go to the Federal Highway Trust Fund may go to the general fund, in which case the amount of federal funding available to state highway departments could very well decline, depending upon the inclination of the U.S. Congress at that time.

FUTURE REVENUES

To illustrate the impact of rising fuel prices on future Highway Department revenues, three scenarios were developed. The Base Case Scenario portrays revenues if there is no further price increase in the price of gasoline past the end of the current year. The second scenario reflects revenues assuming a fifteen percent increase in the real price of gas in 1976 and the third scenario indicates the impact of a thirty percent increase in the price of gas coupled with a three percent increase in the price of new automobiles. All three scenarios are based upon Census Bureaus' projection Series I-D for Texas population and all assume a one and one-half annual increase in real personal disposable income.

The Second Case Scenario, which assumes a fifteen percent increase in the price of gas should approximate revenues if several events occur: decontrol of old oil prices, an increase in the price of OPEC oil (which is anticipated to occur in September, 1975) and the continuation of the two dollar tariff on imported oil. The fifteen percent increase in the price of gas in 1976 would mean that the price of gas in current dollars in Texas would be about seventy cents per gallon by the end of 1976, assuming an inflation rate of 10 percent for 1975 and 8 percent for 1976. The Third Case would more closely approximate the situation in which Congress passes legislation specifically aimed at constricting gasoline consumption, such as the imposition of a substantial excise tax on gasoline, coupled with decontrol of old oil prices, the anticipated increase in OPEC oil prices, the continuation of the two dollar tariff on imported oil and a tax on automobile fuel efficiency which is paid by the manufacturer. The current price of gas in 1976, given a thirty percent increase in the real price of gas, would be about eighty cents per gallon (assuming an inflation rate of 10 percent in 1975 and 8 percent in 1976).

Figure 6 indicates how revenues from license fees may change under the three scenarios. The decline in revenue in the Base Case Scenario results from recent price increases and anticipated price increases by the end of 1975 (the end of the year price is assumed to reach approximately 57 cents in current dollars which could result from either decontrol of old oil prices effective by the end of August or by the anticipated increase in OPEC oil prices in September). As one might expect, the Second Case Scenario reflects a greater decline in revenues due to the 15 percent increase in the real price of gas in 1976. The Third Case Scenario reflects the more dramatic decline that might be expected if real gasoline prices were to increase by 30 percent and automobile prices were to increase by 3 percent in 1976.

Figure 7 shows the impact of the different scenarios upon revenues from the two fuels taxes. Tables 6 and 7 show the actual estimates based upon the foregoing analysis.

POSSIBLE POLICY ALTERNATIVES

From the previous analysis, it appears evident that the Highway Department's revenues will decline if real fuel prices increase in the future. To compensate for the effects of rising fuel prices, some possible policy alternatives are (1) to increase the taxes on fuels or (2) increase license fees.

Figure 6

Revenues From License Fees
(in millions)

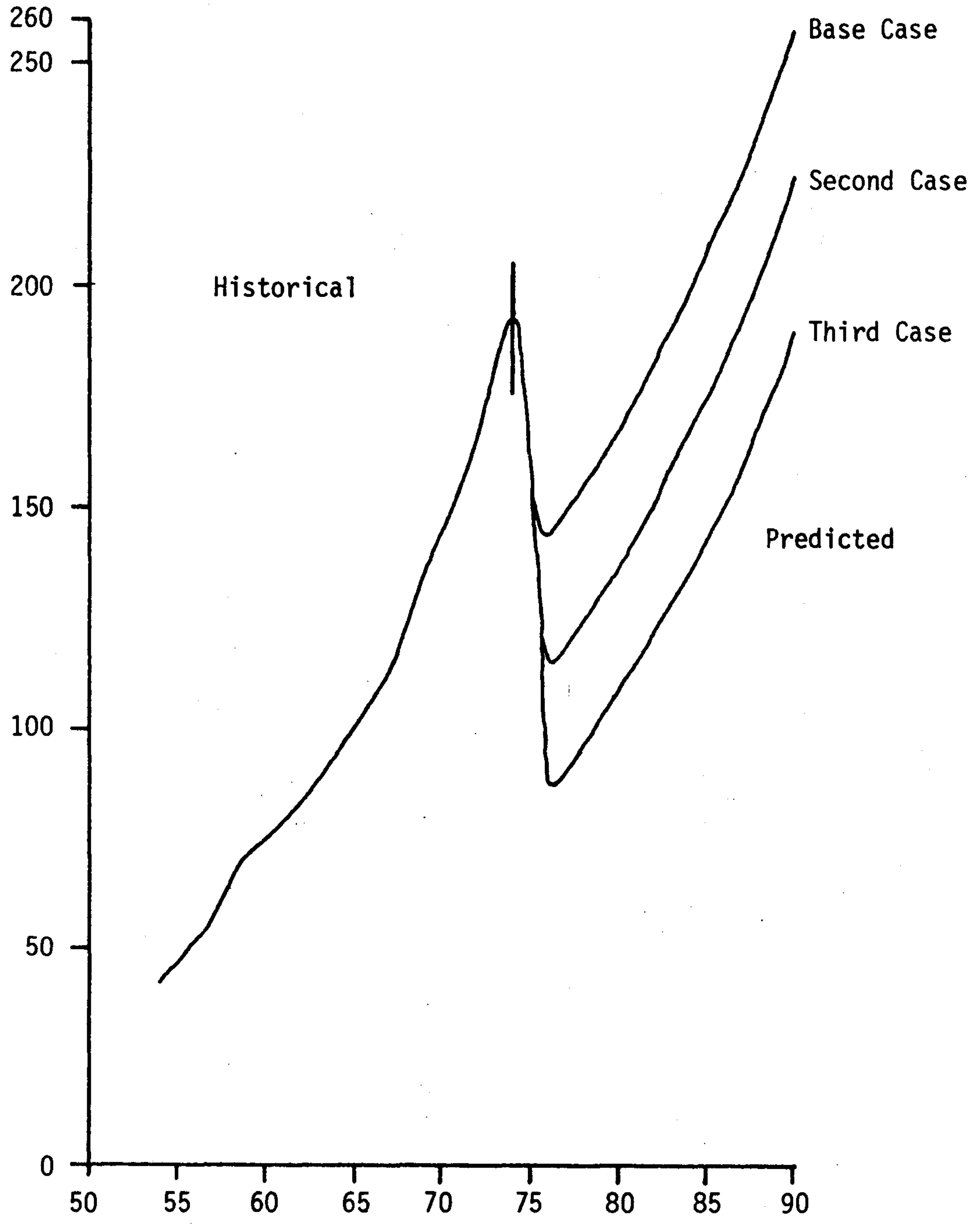

Figure 7

Revenues From Fuels Taxes
(in millions)

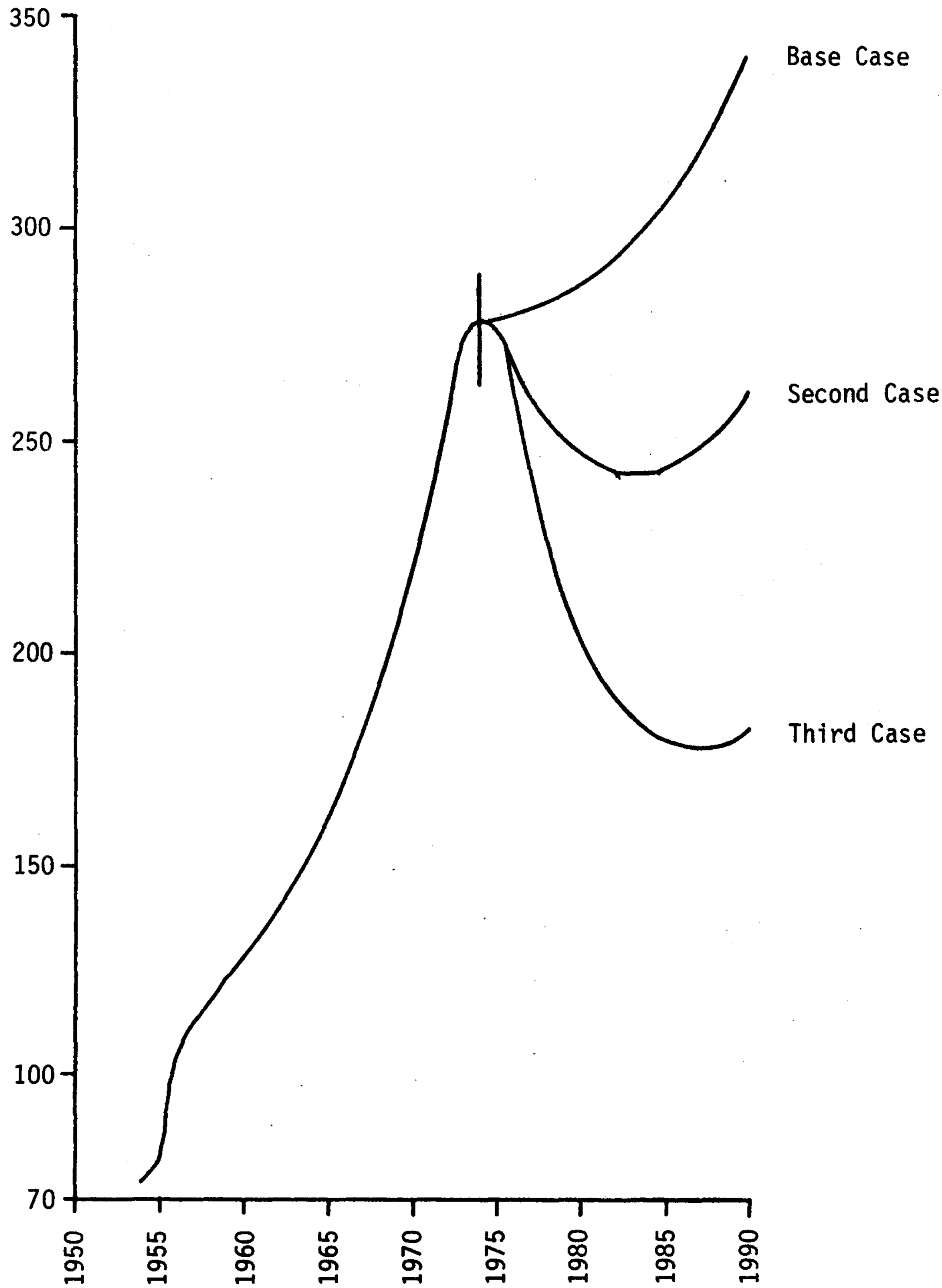

Table 6

Future Net Revenues from License Fees
(in millions)

	Base Case	Second Case	Third Case
1975	$165.7	$165.7	$165.7
1976	143.8	115.7	88.5
1977	149.6	121.5	92.9
1978	155.5	127.2	97.7
1979	161.7	133.1	103.1
1980	168.2	139.3	108.8
1981	175.3	146.0	115.2
1982	182.7	153.1	121.9
1983	190.3	160.4	128.8
1984	198.4	168.0	136.0
1985	206.7	176.0	142.7
1986	215.7	184.6	151.8
1987	225.5	194.1	160.9
1988	235.8	204.0	170.4
1989	246.5	214.4	180.3
1990	257.6	225.3	190.7

Table 7

Future Revenues from Fuels Taxes
(in millions)

	Base Case	Second Case	Third Case
1975	$279.5	$279.5	$279.5
1976	279.9	269.3	258.8
1977	281.0	261.1	241.1
1978	282.8	254.6	226.3
1979	285.3	249.6	213.9
1980	288.3	245.9	203.7
1981	291.8	243.6	195.5
1982	295.7	242.4	188.9
1983	300.1	242.1	184.1
1984	304.8	242.8	180.6
1985	310.0	244.2	178.4
1986	315.5	246.5	177.4
1987	321.3	249.3	177.4
1988	327.4	252.8	178.3
1989	333.7	256.9	180.1
1990	340.3	261.5	182.8

The impact of raising the tax on fuels would be twofold. First, as discussed earlier in the report, a ten percent increase in the real price of gas may be expected to lower fuel consumption and hence revenues from the fuels taxes by between 3.5 and 3.8 percent in the short-run. Thus, if the tax on fuels were increased by enough to make the real price of fuel increase by ten percent, given the present distribution of funds from these taxes, and assuming that income is held constant, the Highway Department's revenues from fuels taxes should increase in the short-run. A ten percent increase in the price of gas would be about 5.5 cents (current dollars), of which about 74 percent (4.07 cents) would accrue to the Highway Department. The average revenue accruing to Highway Department revenues is now about 3.4 cents per gallon. Thus, the revenue per gallon would increase by about 120 percent; however, the number of gallons consumed would fall by about 3.5 to 3.8 percent and the net effect would be that revenues in the short-run would increase about 116 percent. However, if income did not rise over the long-run period, revenues from fuels taxes would decline in the long-run. But it is unlikely that income would not increase to at least partially offset, if not totally offset, the decline.

The second impact of raising the taxes on fuels would be to lower revenues from license fees. As was discussed earlier, an increase in the real price of gas would tend to decrease number of vehicles registered in some classes and would also tend to decrease the average license fees of some classes. Thus, the increase in the fuel taxes would cause a decline in revenues from license fees.

The other alternative to compensate for declining revenues due to rising fuel prices would be to increase license fees. Since the license fee is such a small cost of vehicle ownership and operation, the impact of increasing license fees by ten to twenty percent would most likely have a negligible impact on the number of vehicles registered and hence on the amount of fuel consumed. Thus, revenues from license fees would be increased and revenues from the fuels taxes would not be reduced significantly.