

ANALYSIS OF ELECTRICITY CONSUMPTION BY INCOME
GROUP FOR DECEMBERS, 1973 AND 1974

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INTRODUCTION

The cost of producing electricity has risen dramatically due to higher fuel cost, increased interest rates and a general inflation in costs in everything from transmission wires to turbines. These increased operating expenses have been passed on to the consumers through higher electric base rates and, in some states, through the introduction of a fuel adjustment clause. Nationwide, electricity bills rose in 1974 by 20 percent with some of the most severe increases in areas using imported oil to produce electricity (Southern California, New England, Florida). With this explosion in prices, public attention has focused upon the methods of charging for electricity.

In particular, attention has focused upon whether a minimum amount of electricity should be provided at special low prices to the poor and aged. Reasoning for this argument is that electricity for many in our modern, urban society has become a necessity providing the sole short-run source for heating, cooking, lighting and preserving food. The dramatic increases in price have deprived the poor of a fundamental provision of life by restricting or depriving them of electricity. If electricity use were restricted for a sizeable portion of the community, the social losses in increased disease, high birthrate and increased pollution from less efficient burning processes for heating and cooking could add a higher cost to other income groups than would be the case in providing the poor with lower rates.

Opponents to a rate structure based upon income reply that utility

rates are not a tool for society to restructure "real" income. "If there is to be a subsidy, let it come from the tax collector and not from the rate designer," says Walter B. Hensley an official of Georgia Power. The price for electricity should be based upon cost and any change in the rate structure should be due to either (1) changes in the cost curves (i.e., increasing marginal cost curve above average cost curve) that would justify an "inverted" price structure or (2) reallocation of cost in the form of peak loads on the system (e.g., running air conditioners in August) and should be charged only the short-run marginal cost for their electricity consumption. If a situation arises such that the price of electricity increases to the point of depriving the poor of its use, and the poor are not entitled to a price reduction due to changes in cost of cost allocation, then it would be society's decision to subsidize this group. This subsidization should be borne by the entire community (taxpayers) and not through discriminatory pricing to other electricity users. A suggested method for this procedure would be the issuance of electricity stamps similar to the Federal Food Stamp Program which would allow the poor to buy electricity at lower rates, the difference between the lower rate and the actual price of the service being paid by the taxpayers.

The question that arises from the above discussion is what effect does income and a dramatic increase in price have upon the consumption of electricity? Is there evidence that the poor are being deprived of a basic need? Has the price of ~~electricity~~ ^{electricity risen} to the point where society or the electric ~~company~~ ^{utility} must step in and provide alternative means of allocating electricity based upon need and income level rather than cost of service?

PARAMETERS OF THE TEST

I proposed to test how the fuel adjustment clause affects the relative financial burden borne by certain income groups of residential consumers. If data could be gathered regarding consumption of electricity by income group before and after the establishment of a dramatic increase in price, some pattern may be established to help clarify the issues presented previously. In March 1974, a fuel adjustment clause was added by the Gainesville/Alachuha County Regional Utilities Board. Previous to March 1974, fuel adjustment costs were reflected in the rates. Given the short length of time to gather data and that no billings were available for 1975^{as} yet, December 1973 and 1974 billing dates were chosen for the test. Using the 1970 census, a one block area per income class was chosen. Attention was given to construction of the different homes in choosing the representative block for each income group with all high income houses being built of brick, middle income houses of cement block, and low income houses with cement block and a few frame homes. Eleven homes were in the high income block of which two were eliminated due to near zero use of water and electricity in December 1973, indicating the houses were used marginally or not at all during the month. Twenty-one houses were in the middle income block and twenty-three houses in the low income block of which three were eliminated due to probable change from single family to multiple family as indicated by the quadrupled water use. The mean incomes of the census tracts in 1970 dollars from which the representative blocks were chosen are as follows: High--\$19,757; Middle--\$11,125; Low--\$6,150. The significance of the 1974 fuel adjustment charge is that it represents 28 percent of the total dollars charged to all sampled homes.

THE TEST*

The data provided electric consumption per KWH, electric charge, fuel adjustment (December 1974 only), water consumption and water charge per home for December 1973, and December 1974. Of the 50 homes sampled, only eight, or 16 percent, showed a decrease in KWH consumption and only one home showed a decrease in their total electric charge. By income groups, two high income homes (22 percent of total high income homes), two middle income homes (10 percent of total middle income homes), and four low income homes (20 percent of total low income homes), decreased their KWH consumption. Total KWH consumption increased among the sample homes by 23.5 percent (9129 KWH) with the total high income group increasing 21 percent (2798 KWH), total middle income group by 23 percent (3805 KWH) and total low income group by 28 percent (2526 KWH). The significance is that, in absolute amounts, the high income group's average home consumed about three times the low income group average home and two times the middle income group average home in both December 1973 and December 1974. The high income average home increased its KWH consumption by 1.7 times that of the middle income and 2.5 times more than the low income average homes.

The charge per KWH (including fuel adjustment in 1974) increased in all groups but with the percentage increase falling heaviest upon the high income with a 68 percent increase versus 44 percent for the middle income group and 33 percent for the lower income group. This percentage shift in price proportional to income group was due to the readjustment of the block structure which removed somewhat the price advantage larger

*See Tables 1 ^{and} ~~through~~ 2.

residential users of electricity had. In spite of this readjustment of the rate structure, the low income group paid more per KWH than either of the other two groups.

As stated, the fuel adjustment charge represented 28 percent of the total electric charge in December 1974, but its effect was widely dispersed among income groups. Among the income groups, the charges represented the following: 24 percent of the total charge and 47 percent of the increased total electric charge in December 1974 for the high income group; 27 percent of the total bill and 67 percent of the increased total electric charge in December 1974 for the middle income group; and, 33 percent of the total charge and 83 percent of the total increased electric charge in December 1974 for the low income group. While for the high and middle income groups the fuel adjustment came to \$0.009/KWH, for the low income group the charge came to \$0.013/KWH.

Assuming that real income hasn't changed since 1970, a comparison between a mean monthly income based upon the 1970 census income figures and the percentage of that income used for electricity may be made. In December 1974, the high income group used 3.9 percent of their monthly income for electricity (versus 1.9 percent in December 1973); the middle income group used 3.5 percent of their monthly income for electricity (versus 2.1 percent in December 1973) and the low income group 4.5 percent of their monthly income for electricity (versus 2.6 percent in December 1973).

CONCLUSION

The most obvious conclusion is that despite a significant price rise between December 1973 and December 1974, consumption in all income groups

rose dramatically. This can be explained by two forces. One is the economic force of increasing incomes which allows an expansion in purchasing power and the use of cost of living escalators which allow consumers' income to keep pace with the increased cost of living. It should be noted that a high percentage of the low income workers ^{are employed} ~~work~~ in service related jobs, and given the Gainesville employment characteristics, a high percentage probably work for a governmental agency which provides them with regular cost of living raises. Increased income cannot solely account for such a dramatic increase in consumption. It should be remembered that in December 1973, the country was faced with an oil embargo which created a psychological depressant on total consumption and in particular, upon fuel and energy. What December 1973 may actually represent is to what degree consumption by income level can actually be depressed. The increase in consumption between 1973 and 1974 may represent the attempt by each income group to increase its consumption back to a "normal" level despite the increase in the cost of electricity. What the price increase does is restrict the poor from attaining a pre-December 1973, "normality" since 83 percent of the poor's increased expenditure involved the added cost of the fuel adjustment. It also appears that the middle income group is attempting to keep electricity cost as a percentage of total income down and has the "excess" electrical needs which can and have been restricted. Assuming that income has remained fixed and relative, the middle income group had the lowest increase of electricity cost as a percentage of income. The relation between income, consumption and increased consumption is unmistakable. The high income group whose mean income is roughly three times that ^{of} ~~the~~ the low income group in both December 1973 and 1974, consumed roughly three times the electricity per house and

increased their consumption three times faster than the low income group. The increase in price produced no relative change in electricity consumption among the three groups.

The following conclusions can be made from the restricted data:

1. A uniform fuel adjustment clause does little to alter relative consumption among income groups.
2. Despite the heavy burden of spending 83 percent of their additional expenditure for fuel adjustment costs, the poor's consumption of electricity has not been depressed relative to other income groups or to the uncertain period of December 1973.
3. Electricity consumption is a function of price, income and behavioral pattern, and fluctuations of income and behavior can alter consumption and counterbalance changes in price.
4. To change relative consumption through changes in price structure would require stable income levels since electricity costs represent a relatively small percentage of total income and any upward shift in income could easily offset any price increase. Indeed, for the high income group an increase in income by two percent can completely compensate for a 107 percent dollar increase in the electricity charge.

FOLLOW-UP STUDY

Due to the limitations in time, geographic area, and demographic

data, the conclusions from this test are restricted in scope and accuracy. An expanded test to include more specific demographic data on income level (replacement of mean income by more accurate data), family size, and consumption patterns in regard to other goods would clarify further how electricity consumption relates to income groups. Lengthening the time period covered by the test would allow insight into how various income groups contribute to peak loads as well as their responses in the short run and long run to price changes. Analysis of this additional data could produce a working model encompassing the various variables found to influence electricity consumption from which predictions could be made concerning changes in electricity consumption given changes in these variables.

RESIDENTIAL ELECTRIC RATE SCHEDULE1973

MINIMUM OR READY TO SERVE CHARGE	\$1.80 PER MONTH
FIRST 30 KILOWATT-HOURS PER MONTH06 PER KWH
NEXT 50 KILOWATT-HOURS PER MONTH05 PER KWH
NEXT 120 KILOWATT-HOURS PER MONTH03 PER KWH
NEXT 200 KILOWATT-HOURS PER MONTH017 PER KWH
NEXT 1100 KILOWATT-HOURS PER MONTH015 PER KWH
OVER 1500 KILOWATT-HOURS PER MONTH013 PER KWH

1974

FIRST 30 KILOWATT-HOURS PER MONTH OR LESS	\$1.80 PER MONTH
NEXT 50 KILOWATT-HOURS PER MONTH05 PER KWH
OVER 80 KILOWATT-HOURS PER MONTH022 PER KWH

MEAN TEMPERATUREDECEMBER 1973

AVERAGE MINIMUM	44.5°
AVERAGE MAXIMUM	69.9°
AVERAGE TEMPERATURE	57.2°

DECEMBER 1974

AVERAGE MINIMUM	46.0°
AVERAGE MAXIMUM	69.3°
AVERAGE TEMPERATURE	57.7°

TABLE 1

<u>CONSUMPTION</u>	<u>INCOME GROUP</u>		
	HIGH MEAN - \$19,757 SAMPLE SIZE: 9	MIDDLE MEAN - \$11,125 SAMPLE SIZE: 21	LOW MEAN - \$6,150 SAMPLE SIZE: 20
DECEMBER 1973 KWH (TOTAL PER GROUP)	12,882	16,749	9,144
DECEMBER 1974 KWH (TOTAL PER GROUP)	15,680	20,554	11,670
Δ KWH (TOTAL GROUP)	+2,798	+3,805	+2,526
% Δ KWH (TOTAL GROUP)	+21%	+23%	+28%
NUMBER OF HOMES WITH INCREASE KWH	7	19	16
% OF HOMES WITH INCREASE KWH	78%	90%	80%
NUMBER OF HOMES WITH DECREASE KWH	2	2	4
% OF HOMES WITH DECREASE KWH	22%	10%	20%
AVERAGE KWH USAGE PER HOME:			
DECEMBER 1973	1,431	798	457
DECEMBER 1974	1,742	978	584
AVERAGE KWH CHANGE PER HOME	+311	+180	+127
AVERAGE KWH CONSUMPTION PER HOME AS A PERCENT- AGE OF THE OTHER GROUPS'	'73 Lo-313% MI-179%	'73 HI-56% Lo-174%	'73 HI-32% MI-57%
AVERAGE CONSUMPTION PER HOME	'74 Lo-298% MI-173%	'74 HI-56% Lo-167%	'74 HI-32% MI-60%
AVERAGE KWH CONSUMPTION PER HOME AS A PERCENT- AGE OF A WEIGHTED AVER- AGE OF TOTAL KWH	'73: 53% '74: 52%	'73: 30% '74: 30%	'73: 17% '74: 19%

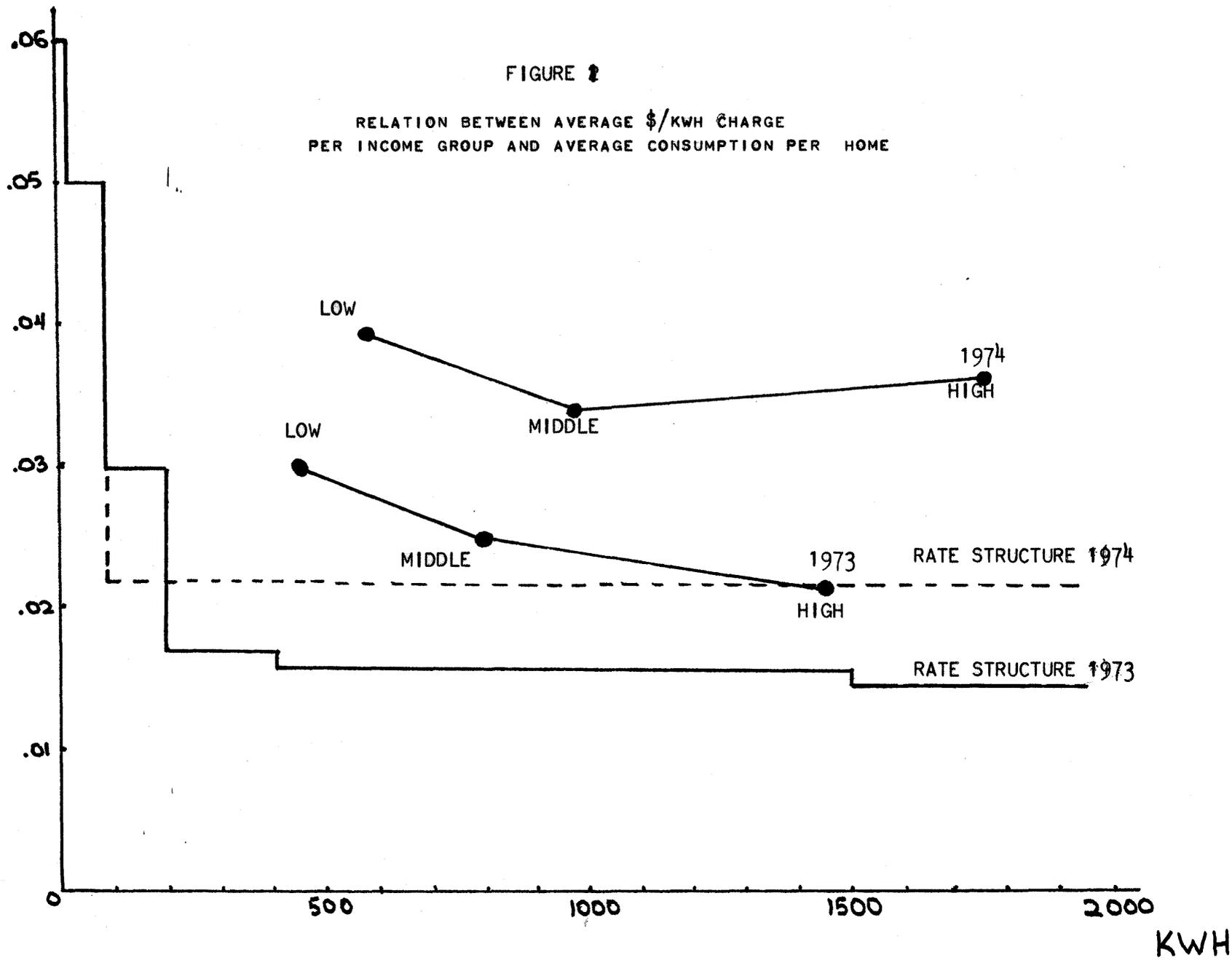
TABLE 2

ELECTRIC CHARGE	INCOME GROUP		
	HIGH	MIDDLE	LOW
DECEMBER 1973 \$ CHARGE	\$278.18	\$415.79	\$273.14
DECEMBER 1974 \$ CHARGE	\$576.77	\$690.22	\$456.99
Δ \$ CHARGE	+\$298.59	+\$274.43	+\$183.85
% Δ \$ CHARGE	+107%	+66%	+67%
NUMBER OF HOMES WITH INCREASED Δ \$ CHARGE	9	20	20
% OF HOMES WITH INCREASED \$ CHARGE	100%	95%	100%
NUMBER OF HOMES WITH DECREASED Δ \$ CHARGE	0	1	0
% OF HOMES WITH DECREASED \$ CHARGE	0%	5%	0%
AVERAGE \$ CHARGE PER HOME:			
DECEMBER 1973	\$30.90	\$19.80	\$13.66
DECEMBER 1974	\$64.09	\$32.87	\$22.85
AVERAGE Δ IN \$ CHARGE PER HOME	+\$33.19	+\$13.07	\$9.19
AVERAGE \$ CHARGE AS A % OF MEAN MONTHLY INCOME:			
DECEMBER 1973	1.9%	2.1%	2.6%
DECEMBER 1974	3.9%	3.5%	4.5%
AVERAGE Δ IN \$ CHARGE AS A % OF MEAN MONTHLY INCOME	2.0%	1.4%	1.9%
FUEL ADJUSTMENT CHARGE DECEMBER 1974	\$141.12	\$183.78	\$151.80
FUEL ADJUSTMENT CHARGE AS A % OF TOTAL \$ CHARGE	24%	27%	33%
FUEL ADJUSTMENT CHARGE AS A % OF Δ IN \$ CHARGE BETWEEN DEC. 1973 AND DEC. 1974	47%	67%	83%
\$ CHARGE PER KWH:			
DECEMBER 1973	\$.022	\$.025	\$.03
DECEMBER 1974	\$.037	\$.034	\$.04
FUEL ADJUSTMENT CHARGE PER KWH	\$.009	\$.009	\$.013
AVERAGE FUEL ADJUSTMENT CHARGE AS A % OF MEAN MONTHLY INCOME	1%	.9%	1.5%
FUEL ADJUSTMENT CHARGE AS A % OF TOTAL DECEMBER \$ CHARGE	-----	28%	-----
FUEL ADJUSTMENT CHARGE AS A % OF Δ IN TOTAL \$ CHARGE BETWEEN DEC. 1973 AND DEC. 1974	-----	63%	-----

\$/KWH

FIGURE 2

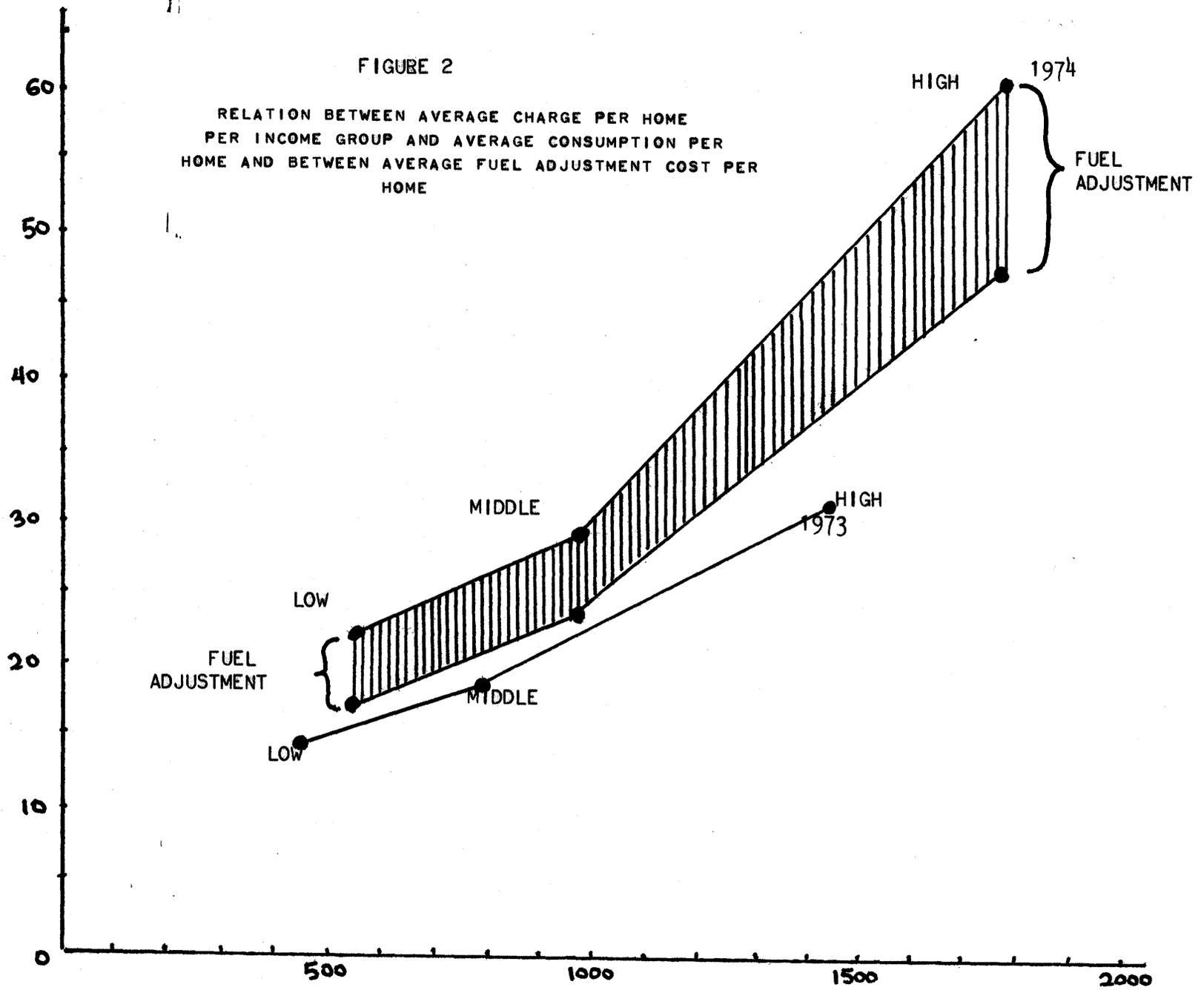
RELATION BETWEEN AVERAGE \$/KWH CHARGE
PER INCOME GROUP AND AVERAGE CONSUMPTION PER HOME



\$

FIGURE 2

RELATION BETWEEN AVERAGE CHARGE PER HOME
PER INCOME GROUP AND AVERAGE CONSUMPTION PER
HOME AND BETWEEN AVERAGE FUEL ADJUSTMENT COST PER
HOME



KWH