CHAPTER IX

DETERMINANTS OF HOUSEHOLD EXPENDITURE

This chapter deals with the analysis of household consumption expenditure as a function of income (total expenditure as proxy), wealth, age of the head of the household, and household size. The first section describes the regression analysis based on per capita total expenditure and per capita expenditure on commodity groups. It includes also regression done with the sample divided into three sub-samples for a few selected commodities. Multiple regression with all the four explanatory variables mentioned above forms the subject-matter of the second section. Therein first the regression tables are presented and described followed by general conclusions.

It is well-known that a wide variety of factors apart from available money income and what is offered in the market determines the composition of the basket which a

consumer selects. In consumption analysis, determinants other than money income usually considered are price and (occasionally) the level of assets held. The focus of attention in micro-economic theory is on the demand relationship between two commodities or between a commodity and price, under the assumption in either case that the consumer's tastes and preferences are given and constant. ' While in the pure theory of consumption preferences are regarded as given, in empirical research it is necessary to study them in more detail in order to specify in what manner they differ between households.'[1]

The most obvious cause of variation in preferences are the determinants of expenditure such as variations in family size and composition, differences in location which reflects external conditions and social habits. Social class may significantly influence the demand function, so too religion and various psychological characteristics of the members of the household such as expected future income etc. 'Thus differences can be accounted for by a variety of family variables of psychological, physiological and of purely economic nature.'[2] However as Prais and Houthakker

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[1] S.J.Prais and H.S.Houthakker, The Analysis of Family Budgets, Cambridge University Press, 1955, p.11.

[2] Dipankar Coondoo, 'A Comparison of Expenditure Patterns of Indian Middle Class and Working Class Families,' Sankhya, Series C, Vol.37, pt.2, June 1975, p.81.

have pointed out, ' it is not possible to isolate all the sources of variation and we must be content with introducing the more conspicuous ones explicitly and assume that the others which are presumably numerous and unimportant individually give rise to an error term conforming to some probability distribution.'[3]

In the preceding chapter on regional, social and occupational factors in consumption we have already discussed the influence of :

Region of Origin of the Head of the Household
Dietary Habit (Vegetarian / Non-Vegetarian)
Educational Qualification of the Housewife
Occupation of the Head of the Household.

These variables have all the common feature that they are non-quantifiable. In the present chapter we concern ourselves with the major determinants of consumption which are directly quantifiable and whose influence can be estimated by means of standard regression technique, namely :

Income (Total Expenditure as proxy)
Wealth of the Household
Family Size
Age of the Head of the Household

[3] Prais and Houthakker, ibid.,p.11.

Three series of regressions have been run to determine :

(1) The relationship between per capita income (Total per capita expenditure as proxy) and per capita expenditures on various goods and services by the sample households.

(2) The relationship between per capita income and per capita expenditures of households classified into three sub-samples on the basis of income.

(3) The relationship between income, wealth, household size and age of the head of the household on the one hand and expenditures of households on the other (entire sample).

The results are discussed sequentially.

Income and Expenditures of Households on Goods and Services

Numerous studies have established the dominant role played by income. This is not surprising because apart from providing the purchasing power which motivates consumer behaviour strongly other socio-psychological factors are associated with income and thus indirectly influence expenditure. Income is a primary indicator of social rank. In the present study therefore, income was expected to be overall a dominant factor, but major concern was to determine how far in respect of individual categories of goods it was able to account for the expenditure, how the income

elasticities shaped for the different items for this affluent group.

Total Expenditure as Proxy for Income

In the present analysis total expenditure has been taken as proxy for income, a procedure which has already been adopted by us as mentioned in our earlier chapter on commodity preferences and income levels. Modern studies have preferred to base their analysis on the latter variable as data about income is generally unreliable and people tend to omit unconsciously or deliberately certain types of income, for instance receipts from investments, while giving information. According to Prais and Houthakker [4] the success of an empirical analysis must depend on the choice of some simple readily obtainable measure which substantially represents the facts. The use of total expenditure as determining variable in the Engel curves can be justified on the assumption that while total expenditure may depend in a complicated way on income expectation and the like, the distribution of expenditure among the various commodities depends only on the level of total expenditure.'[4] In the ILO report it is stated, 'consumption expenditure per consumption unit is perhaps the best index of the actual level of living.

[4] S.J.Prais, H.S.Houthakker, The Analysis of Family Budgets, Cambridge, p.81.

Consumption expenditure represents a much closer approximate to the cost of a given level of living than income.'[5] In our view, if income is grosely underreported, say due to fiscal fear, the understatement is concerned more with the saving component than the consumption component. Hence measured total consumption should be more reliable than measured current income. Given the limitation that permanent income and permanent consumption are not easily measurable, there seems to be sufficient theoretical justification for taking total expenditure as proxy for income, avoiding the controversy of permenent income vs total income.

Aggregate or Per Capita ?

Most consumption studies have based their analysis on per capita expenditure treating income as the sole explanatory variable. Multiple regression does offer an elegant technique of simultaneously studying the effect of several explanatory variables on the explained variable, nevertheless an analysis of data corrected for family size in the form of per capita value has its own intrinsic merit. More than anything else it provides readily comparable figures. Hence before applying multiple regression, simple regression for the entire one hundred and eightyfive observations on per capita basis has been run.

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[5] Methods of Family Living Studies, International Labour Office, Geneva, 1949.

SECTION I

(A) Analysis of Per Capita Consumption Expenditure

Econometric Models :

The models tried were :

$$Y = b_o + b_1 x + u \qquad \text{(linear)}$$

and

$$\log Y = b_o + b_1 \log X + u \qquad \text{(Double logarithmic)}$$

Where Y = Per Capita monthly consumption expenditure on different commodity groups

X = Total per capita monthly expenditure of the household

u = Disturbance term

Both these models specify expenditure on commodities as a function of total expenditure. The choice of the form implies certain basic assumptions regarding the economic relationship between the explanatory and the explained variables. The linear model gives for instance the estimate of the marginal propensity to consume in the regression coefficient b_1. Elementary calculations show that for the linear form the elasticity is less than unity if b_o is positive and greater than unity, if b_o is negative, when b_1 (the marginal propensity to consume) is positive.[6]

[6] L. Phlips, Applied Consumption Analysis, Amsterdam : North Holland, 1974, p. 108. The results given there in the form of exercise are easily proved by taking the first derivative of the functional form taken and making suitable transpositions.

In the double logarithmic model the coefficient b_1 gives straightway an estimate of the elasticity. The marginal propensity to consume is however inversely related to total expenditure. It was therefore necessary to check the suitability of the alternative forms for the various commodities at different levels of income. The twin criteria which were employed were goodness of fit indicated by maximum R^2 value and explanatory power of the regression in the form of number of explanatory variables shown to be significant.

Commodity Groups :

In the regression analysis expenditures on selected commodities were aggregated and taken as observations of the variable. The justification and need for such grouping has already been dealt with in chapter II. The goods considered were :

Total Food

Total Non-Food (excluding insurance)

Cereals and Pulses (rice, wheat, other cereals, pulses)

Fats (ghee, butter, oil)

Sugar

Milk (including milk products) and Eggs

Fruits and Vegetables

Rent (including other rents and maintenance)

Utilities (Gas, fuel, electricity, telephone)

Clothing and Footwear

Intellectual Activities (school fees, newspaper, library, books)

Insurance

Conveyance

Domestic Servants

Relationship Between Expenditure on Commodities and Total Expenditure

Table 9.1 shows the results of the regression for the different commodity groups.

In spite of the high variations exhibited by the sample households for many of the individual commodities and services the regression is fairly satisfactory judged by the R^2 and F-values. All the relations are found significant.

All the marginal propensities to consume (b_1's) are positive according to the table. (As total expenditure moves upward, expenditure on the commodity also goes up). The elasticity - what we may call total expenditure elasticity to differentiate it from income elasticity - is given by $(X / Y)(dY / dX)$ and will be greater than unity if b_0 is negative and less than unity if b_0 is positive, where X represents total expenditure and Y expenditure on selected commodity. In the table the constant term is negative only for rent (including other rents, maintenance), Insurance, Conveyance, Servants and Total Non-Food (excluding

Table :9.1: Estimated Regression Coefficients for Selected Groups of Commodities for 195 Households with Per Capita Aggregate Monthly Expenditure of the Household as the Explanatory Variable

Model I (Linear) : $Y = b_o + b_1 X_1 + u$

Model II (Double log): $\text{Log } Y = b_o + b_1 \text{Log } X_1 + u$

Commodity	Model	b_o	b_1 (t-value)	R^2 (F-value)
1. Cereals and Pulses	I	+20.892	+0.009** (3.803)	.0734 (14.459)
	II	+ 0.935	+0.168** (3.165)	.0520 (10.017)
2. Fats (Ghee, Butter, Oil)	I	+15.362	+0.020** (6.402)	.1832 (40.979)
	II	+ 0.215	+0.431** (7.024)	.2125 (49.334)
3. Sugar	I	+ 4.708	+0.008** (5.114)	.1353 (26.155)
	II	- 0.395	+0.472** (5.662)	.1490 (32.064)
4. Milk (Other milk products) and Eggs	I	+19.104	+0.039** (10.086)	.3576 (101.719)
	II	+ 0.016	+0.575** (10.768)	.3981 (115.951)
5. Fruits and Vegetables	I	+ 3.018	+0.048** (10.600)	.3807 (112.329)
	II	- 0.659	+0.762** (10.998)	.3983 (120.964)
6. Rent (other rents and maintenance)	I	- 8.512	+0.188** (14.419)	.5314 (207.898)
	II	- 1.576	+1.272** (16.168)	.5883 (261.382)

Are negative intercept in model 2 meaningful?

(Continues...)

(Table 9.1 continued)

Commodity	Model	b_o	b_1 (t-value)	R^2 (F-value)
7. Utilities (Gas, fuel, electricity, telephones)	I	+ 2.412	+0.032** (9.367)	.3230 (87.743)
	II	- 1.133	+0.873** (12.628)	.4651 (159.474)
8. Clothing and Footwear	I	12.183	0.039** (6.749)	.1989 (45.543)
	II	- 0.486	0.707** (7.182)	.2200 (51.576)
9. Intellectual Activities (School fees, newspaper, library books.	I	0.238	0.056** (7.870)	.2530 (61.942)
	II	- 0.927	0.846** (7.785)	.2490 (60.614)
10. Insurance	I	- 7.543	0.190** (8.260)	.2714 (68.230)
	II	- 2.033	1.225** (5.07)	.1225 (25.704)
11. Conveyance	I	-37.900	0.136** (15.198)	.5580 (230.988)
	II	- 3.389	1.727** (11.235)	.4083 (126.235)
12. Servants	I	-12.063	0.055** (11.423)	.4160 (130.473)
	II	- 2.536	1.344** (13.877)	.5127 (192.566)
13. Food	I	+60.468	0.306** (19.035)	.6642 (362.330)
	II	+ 0.580	0.606** (17.601)	.6288 (309.795)
14. Non-Food (Excluding Insurance)	I	-52.699	0.695** (51.942)	.9370 (2697.919)
	II	- 0.781	1.198** (48.781)	.9293 (2379.602)

insurance). These goods are thus elastic, and may be described as luxuries, i.e. when total expenditure changes the proportionate change in commodity expenditure is greater. The inelastic goods, i.e. necessities are :

Cereals and Pulses,
Fats,
Sugar,
Milk,
Fruits and Vegetables,
Utilities, Clothing and Footwear,
Intellectual Activities, and
Total Food.

Estimation of Total Expenditure Elasticity

Though b_1 (m.p.c) is constant for each commodity, the elasticity varies from point to point on the regression line, being given by $(X / Y)(dY / dX)$. It is therefore necessary to have a fixed reference point when discussing total expenditure elasticities derived from linear regression. The per capita total expenditure of Rs. 606.50, the average for the one hundred and eightyfive households is suitable for this purpose and has accordingly been used in the calculation of total expenditure elasticities according to the linear model. These may be compared with the constant elasticities given by the double logarithmic model.

Table 9.2 gives the two total expenditure elasticities.

Table :9.2: Total Expenditure Elasticities of Selected Groups of Commodities from Per Capita Expenditure for 185 Households based on Two Engel Models

Commodity	Total Expenditure Elasticity	
	Linear* Model	Double Log Model
Cereals and Pulses	.207	.168
Fats	.441	.431
Sugar	.508	.472
Milk and Milk Products	.553	.579
Fruits and Vegetables	.913	.762
Rent	1.081	1.272
Utilities	.889	.873
Clothing and Footwear	.660	.707
Intellectual Activities	.993	.840
Insurance	1.142	1.225
Conveyance	1.850	1.727
Servants	1.551	1.344

* Elasticity calculated at Rs. 606.50, per capita total expenditure

It may be observed that the elasticities given by the double logarithmic model are generally less than those given by the linear model with the exception of milk, rent, clothing and footwear, and insurance. A choice between the two models and their estimates may be made with R^2 value as criterion, in which case the elasticities given by the linear model may be taken for Cereals and Pulses, Fruits and Vegetables,

Intellectual Activities, Insurance, and Conveyance and the double logarithmic estimates for the rest, i.e. (milk, rent, clothing and footwear and insurance).

Arranging the commodities in ascending order of importance based on total expenditure elasticities, we get :

Cereals and Pulses	0.207
Fats (Ghee, Butter, Oil)	0.441
Sugar	0.508
Milk (Milk, Milk Products) and Eggs	0.575
Clothing and Footwear	0.707
Utilities (Gas, Fuel, Electricity, Telephones)	0.869
Fruits and Vegetables	0.919
Intellectual Activities (School Fees, Newspaper, Library books)..	0.993
Insurance	1.225
Rent (Other rents), Maintenance ..	1.272
Servants	1.551
Conveyance	1.850

For poorer sections of the population generally milk, clothing and footwear, are luxuries. For the affluent group these are clearly seen as necessities indicating their high level of living. The elasticities for fruits and vegetables and intellectual activities, though less than unity are nearly unity so that we may term them as semi-luxuries for this group.

(B) Analysis of Per Capita Consumption at Three Levels of Income Through Simple Regression

It has already been seen through difference-in-means test that household per capita consumption expenditure differed significantly according to level of total expenditure in the case of :

> Oil, vegetables, fruits, electricity, clothing, cosmetics, school fees, entertainment, conveyance, domestic servants, insurance, vacation, rent,

while in the case of other food and non-food items there was no significant difference. For the t-tests the households were classified into three groups on the basis of aggregate monthly expenditure, namely Group I (Rs.650 - 1850), Group II (Rs. 1850 - 3050) and Group III (over Rs. 3050). It has been argued that aggregate expenditure (proxy for income) is an indicator of social rank and that consumption level is influenced both by this factor as well as by the available per capita disposable income. It was therefore decided to keep the three income groups separate and run a series of regression of commodity expenditures with per capita total expenditure as the explanatory variable. This yielded three separate regression lines which could be interpreted as showing the relationship between income and consumption level on different commodities and services, taking both family size and social rank into consideration. It turned out that for oil,

electricity, cosmetics, school fees, entertainment, and insurance the R^2 value was not significant in the case of one or more income groups, leaving only :

vegetables, conveyance, servants, vacation and rent with useful regressions. Table 9.3 (p.201) summarises the results of the regressions. Graphs 9.1 to 9.5 show the regression lines for the three income groups for the abovementioned items.

General Discussion of the Regression Results based on Three Levels of Income

In the case of the thirteen commodities for which the difference-in-means - - test showed significant differences in consumption level depending on the level of income, and for which the regressions have been run for the three sub-samples, it may be pointed out that no aggregation was involved. Rent for instance related only to house rental value and did not include other rents or maintenance. It has already been seen that when individual items are considered there is large dispersion with this affluent group. Hence the relationship between income (total expenditure of household) and expenditure on a commodity might not become evident unless there is suitable grouping. This could perhaps explain why only for five commodities or services out of thirteen the F-values were significant.

The marginal propensities to consume (regression coefficient of the aggregate expenditure) for the three income levels showed irregular patterns. The marginal propensity increased with income level in the case of vegetables and rent, while there was a reverse trend in the case of conveyance.

The total expenditure elasticities calculated at the per capita total expenditure of each of the three income class also displayed mixed trend (Table 9.4 p.202). For vegetables the elasticity was less than unity (indicated by positive constant), while for conveyance and servants the elasticities were greater than unity (positive coefficient, negative constant). For vacation and rent however, income group I in the case of the former and Group II in the case of the latter showed elasticities less than unity, the remaining two income levels for the goods showing elasticities greater than unity. This would mean that for the less affluent group vacation is a 'necessity', while in the case of rent, it is a necessity for the moderately affluent group only. We now describe the results with reference to the individual goods briefly.

Vegetables

The preference analysis showed that vegetables belong Type I goods, the mean of each high group being significantly higher. In terms of absolute values the higher income groups

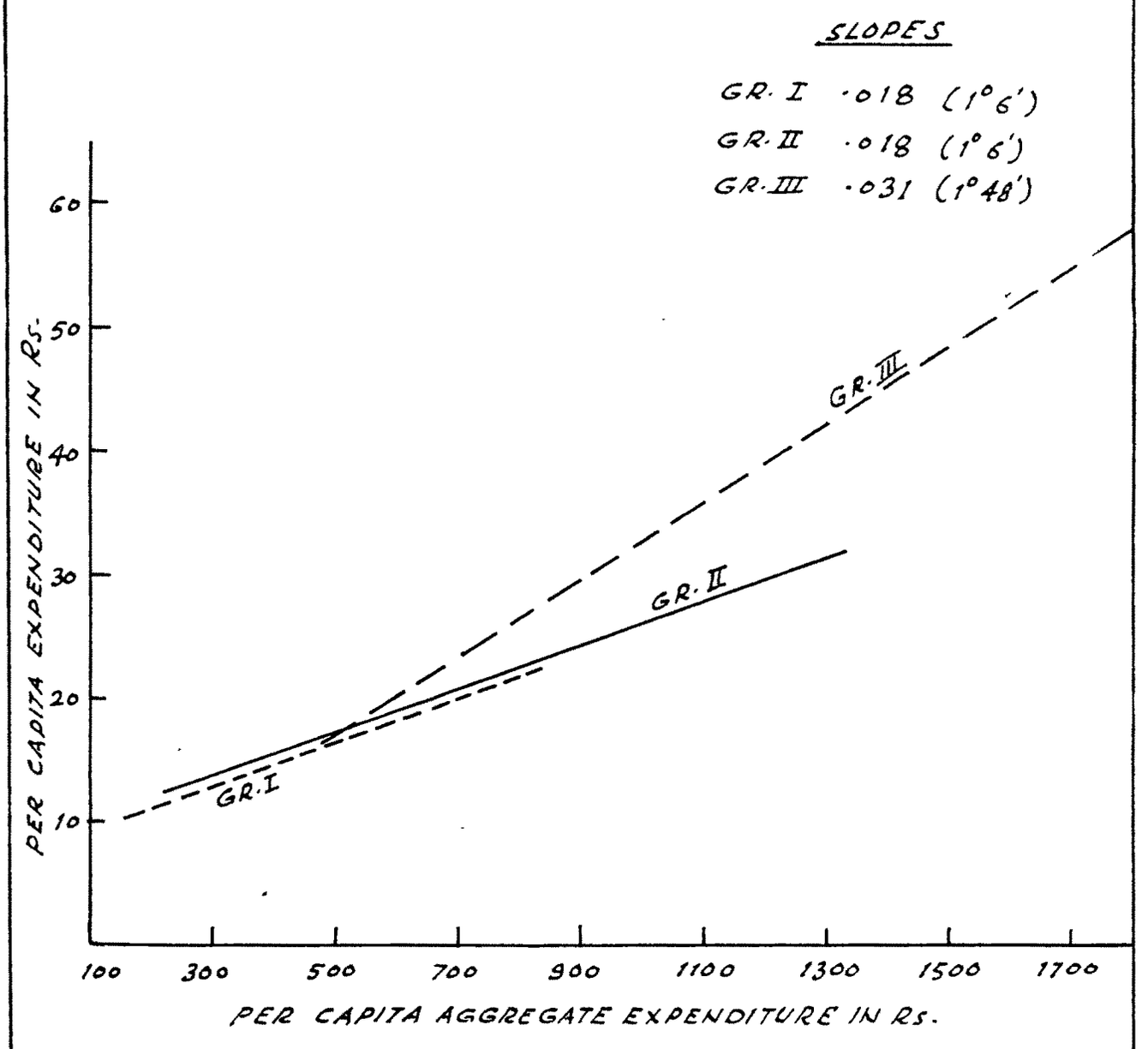
spend significantly more per person. The estimated m.p.c. for income group I and II are 0.018, and 0.031 for group III (Vide Table 9.3 and Graph 9.1). That is to say, for every additional 100 Rs., in income, the low and middle income groups would both spend 1 Re. 80 nP. more on vegetables, while the high income group would spend 3.10 Rs. more.

The total expenditure elasticities calculated at the mean value of per capita total expenditure for each of the three income classes (427.30 Rs., 650.20 Rs., and 919.10 Rs.) were 0.507, 0.594 and 0.906 respectively. For the high income group it was nearly unity. As all the elasticities were less than unity we have to conclude that this item is a necessity for the affluent section. | 0.936?

Having three expenditure classes and correspondingly three regression lines implies that though per capita aggregate expenditure may be same for different households their outlay on a commodity would depend on the income class to which they belong. Thus for Rs. 700 p.c. aggregate expenditure the consumption would be Rs.20.07, Rs.20.61 or Rs. 23.64 depending on whether the household belonged to the less affluent income group, moderately affluent group or the highly affluent group. Further as income moves the consumption level moves upwards along the regression line till the increase in aggregate income of the household shifts

GRAPH: 9·1

PER CAPITA EXPENDITURE ON VEGETABLES FOR THE THREE INCOME GROUPS



the household from one income group to the higher income group. At that point the consumption level also shifts to the corresponding regression line.

Conveyance

This item too figured under Type I according to the preference analysis (consumption significantly higher in rupee value as income increases). The regression showed, however that the marginal propensities to consume decreased from 0.177 to 0.135 and then to 0.128 as households move from income level I to level II and from level II to level III. (Vide Table 9.3, and Graph 9.2).

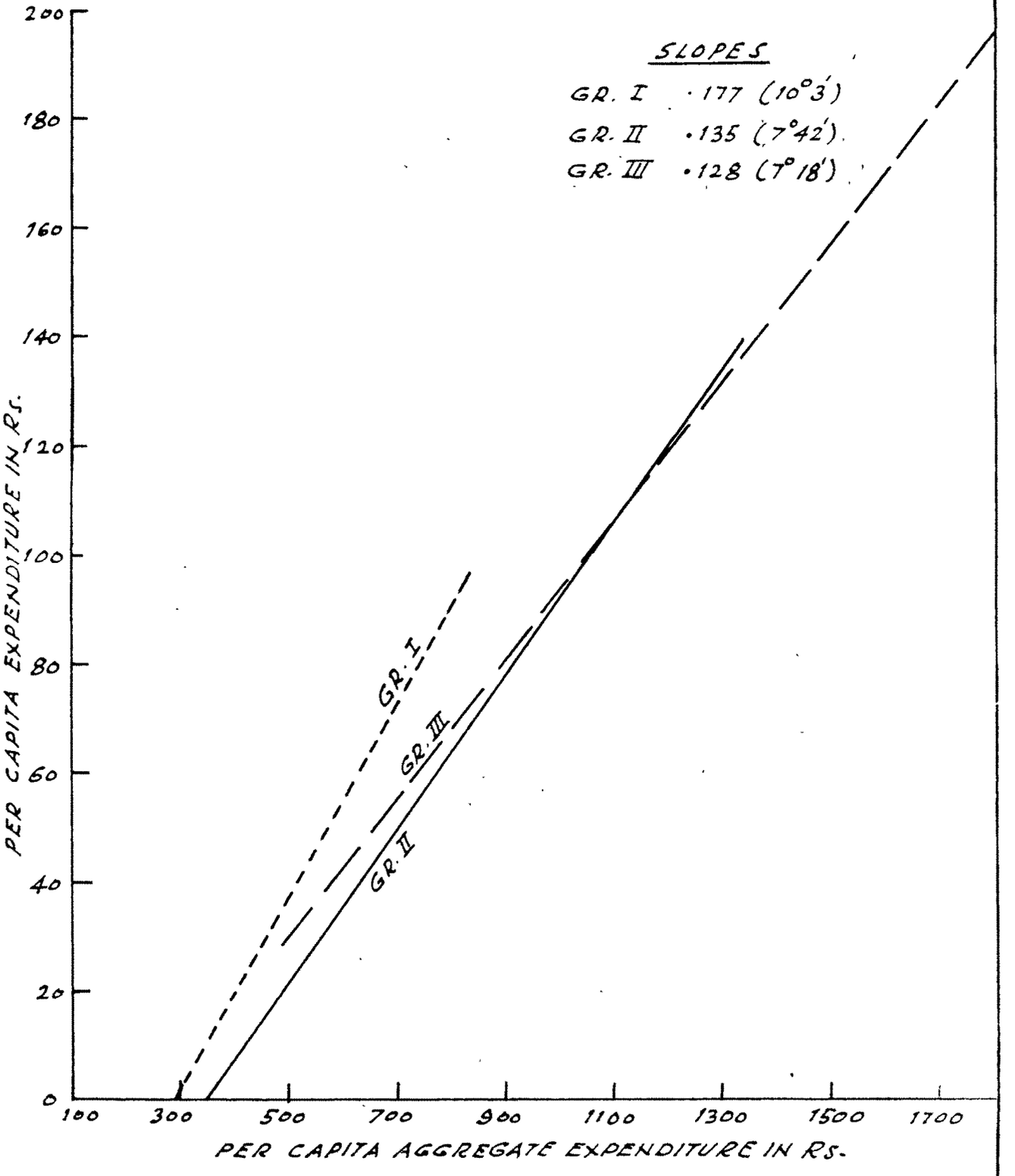
Marginal propensity to consume for group I is higher and suggests that as households become more affluent their outlay on conveyance is lower. This seems to be quite unrealistic ; however when we remember that the regression relates to per capita consumption and recall that family size is negatively related to per capita expenditure on conveyance, the result appears to be quite reasonable.[7] According to Schipper the relationship between family size and expenditure of households on durables ' appears to be negative, indicating that as the size of the family increases, average expenditure on durables decline.[8] As with this

[7] NCAER, All India Consumer Expenditure Survey, Vol.2, Pattern of Income and Expenditure, New Delhi 1967, p.64.

[8] Lewis Schipper, Consumer Discretionary Behavior, North-Holland Publ. Co., Amsterdam, 1964, p.21.

GRAPH: 9·2

PER CAPITA EXPENDITURE ON CONVEYANCE FOR THE THREE INCOME GROUPS



affluent group conveyance can be associated with expenditure on automobiles the interpretation may be carried over also to conveyance. The multiple regression taking both Income and Family Size into consideration gave the following equation :

$$C = -13.332 + 0.120\ T - 25.035\ S, \quad R^2 = .5459$$
$$\qquad\qquad (14.589) \qquad (4.037) \qquad (19.613)$$

Where C = Consumption on Conveyance
T = Total expenditure of the household
S = Family size in equivalent adult units

and figures in brackets represent t-values for regression Coefficient and F-value for overall regression.

The regression coefficient for family size has negative sign showing the negative relationship between expenditure on conveyance and family size.

The total expenditure elasticities calculated for the mean values of the three income groups were 3.330, 1.842 and 1.446 respectively all greater than unity, placing this item as a luxury for all the three income levels. This result is in keeping with the results of the preference analysis.

Servants

Earlier preference analysis with three subsamples had placed domestic servants under the category of

conventional necessities, i.e. Type I, where consumption level increased with the level of income. In the regression with per capita figures however the m.p.c of income group II (moderately affluent) (0.034) registered a slight decrease in comparison to group I (less affluent) (0.028), while group III (highly affluent) had a higher m.p.c. than either of the two income levels (0.067). (Vide Table 9.3 and Graph 9.3). The total expenditure elasticities are consistently greater than unity (1.30, 1.089 and 1.135) thus placing domestic servants as belonging to the category of luxuries.

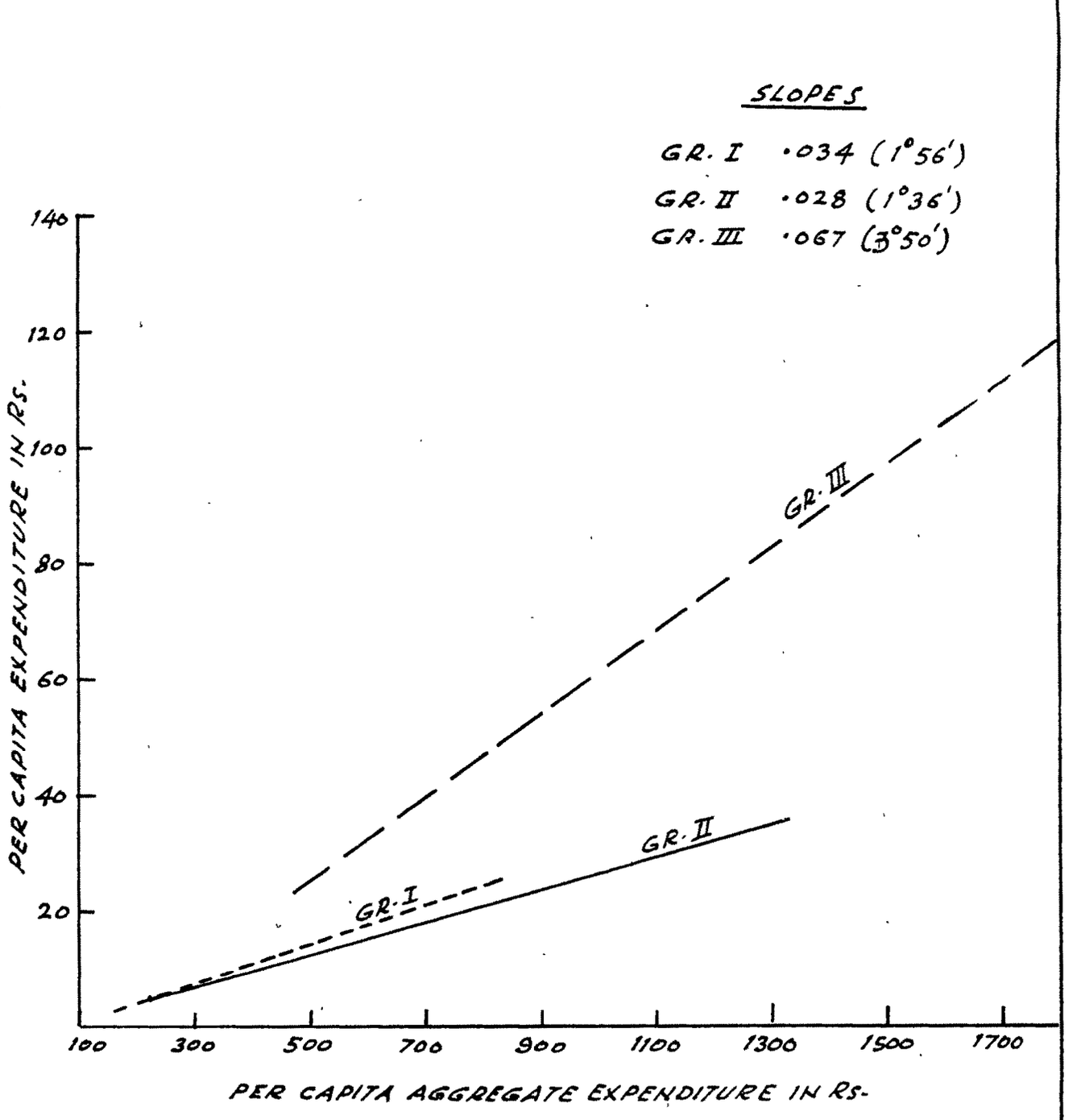
Vacation

The intercept for the income group I was positive while those of the more affluent groups II and III were negative (Vide Table 9.3 and Graph 9.4) showing this item to be a necessity for the less affluent group I in the technical sense of the term and a luxury for the other two. The m.p.c. for the three groups were 0.019, 0.061 and 0.045 respectively. The total expenditure elasticities were 0.952, 1.469 and 1.656. Though vacation was inelastic for the income group I still the value was near unity and the item may be considered a semi-luxury (in respect of elasticity) for group I.

The marginal propensities to consume were however irregular. The middle group had the higher value. The estimated

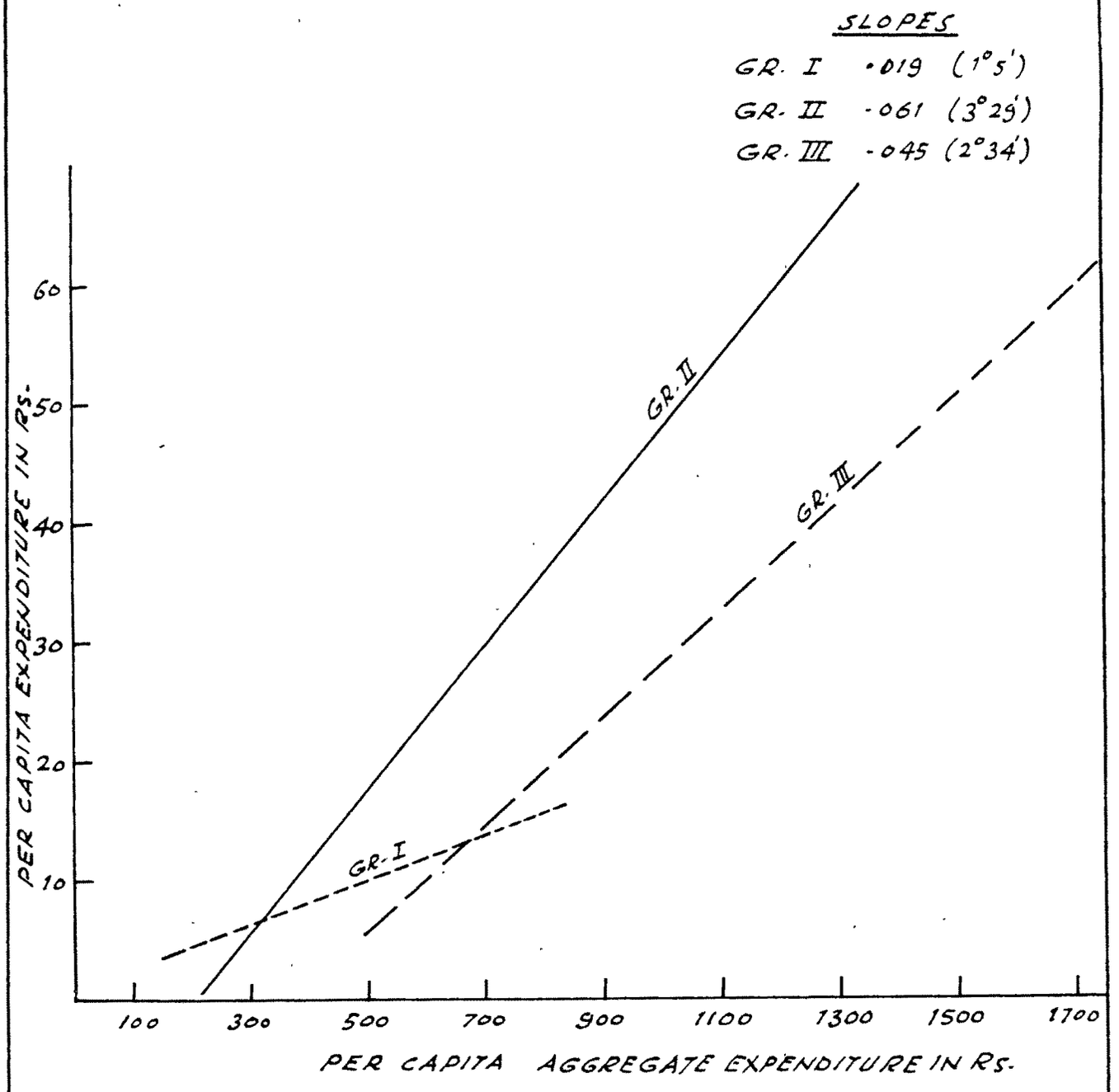
GRAPH: 9-3

PER CAPITA EXPENDITURE ON SERVANTS FOR THE THREE INCOME GROUPS



GRAPH: 9·4

PER CAPITA EXPENDITURE ON VACATION FOR THE THREE INCOME GROUPS



per capita consumption for the means of the three income groups (total per capita expenditure of household Rs. 427.30, Rs. 650.20 and Rs. 919.20 respectively) were Rs. 8.52, Rs. 26.99 and Rs. 24.93 respectively, with the middle group having the highest per capita allocation on this item. This is probably to be explained by the fact that data on conveyance and vacation have been limited to some extent by the fact that expenditure on use of automobiles in affluent households is frequently charged to business account and some bias is unavoidable in separating the imputed expenditure involved in automobile running and maintenance relating to private use and official use. Conveyance is linked up with vacation in this context because many affluent households use their car for vacation trips. While collecting data care was taken to see that there was no underestimation on this account as far as possible.

Rent

The estimated per capita consumption on rent for the mean values of the three income classes were Rs. 63.95, Rs. 113.40 and Rs. 150.50 (low, middle and high) respectively. The M.P.C values were 0.157, 0.165 and 0.172 (Vide Table 9.3). The total expenditure elasticities were 0.045, 0.947 and 1.060 respectively. Analysis with t-tests showed clearly that this item fell under the category of goods to which social prestige value was still attached (Type I). The regression

confirmed this finding. The lines are shown graphically in Figure 9.5 . We may recall that the Engel ratios for this item were nearly constant. The regression lines in the graph are close to each other for a income range indicated that the outlay on rent would not differ much for a household having a certain per capita total expenditure, say Rs. 700 per month whether it belonged to group I, group II or group III. However, as a group the high group spends significantly more than the middle income group and the latter more than the low income group. (t-test result).

The preceding discussion shows clearly that neither of the techniques employed by itself provides conclusive results about the consumption behaviour of households in the face of changing income. The t-tests have yielded interesting and valuable results about the sub-groups as a whole, since the statistics used were only means and variances. Linear regression has yielded additionally, information on the marginal propensities to consume and estimates of total expenditure elasticity which are equally important to assess the nature of changes in the consumption pattern. The combination of the two techniques gives therefore a consolidated picture.

1) Need to test when separate equations for third group or other than pooled equation
2) Not right to extrapolate the line beyond the domain of the sub-group

GRAPH: 9·5

PER CAPITA EXPENDITURE ON RENT FOR THE THREE INCOME GROUPS

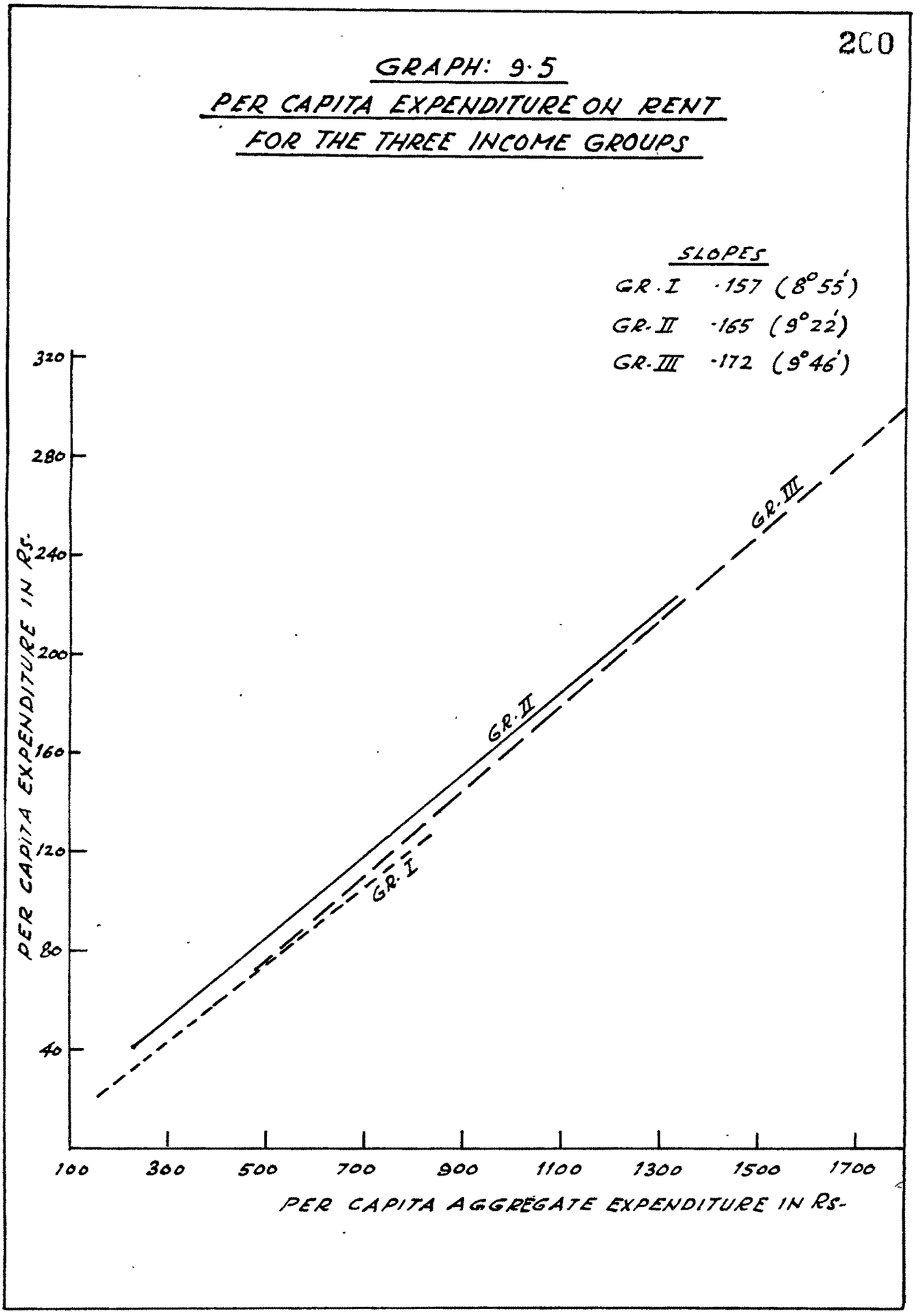


Table :9.3: Results of Regressions of Per Capita Commodity Expenditure on Per Capita Aggregate Expenditure, by Income Groups

Commodity	Income Class	Constant	Regression Coefficient of Aggregate Expenditure (t-value)	R^2 Value	F Value
1.Vegetables	I	7.473	.018 (4.865)	.237	23.952**
	II	8.015	.018 (3.600)	.135	10.720**
	III	1.935	.031 (2.743)	.185	7.496**
2.Conveyance	I	-51.178	.177 (11.346)	.627	129.339**
	II	-40.505	.135 (7.181)	.428	51.510**
	III	-34.417	.128 (4.923)	.424	24.255**
3.Servants	I	- 2.779	.034 (9.985)	.564	99.705**
	II	- 1.432	.028 (5.007)	.266	25.069**
	III	- 7.323	.067 (3.401)	.260	11.576**
4.Vacation	I	.407	.019 (2.923)	.100	8.590**
	II	-12.656	.061 (4.692)	.242	21.949**
	III	-16.468	.045 (4.206)	.349	17.679**
5.Rent	I	- 2.944	.157 (10.979)	.596	113.677**
	II	5.988	.165 (4.865)	.255	23.665**
	III	- 8.837	.172 (4.971)	.428	24.714**

** Indicates significant at both 0.01 and 0.05 level

I Income Group = Rs.650-1850 : No. of Observations, n=79
II Income Group = Rs.1850-3050: " " , n=70
III Income Group = Rs.3050 and above " " , n=36

Table :9.4: Estimates of Total Expenditure Elasticities for Per Capita Expenditure on Selected Commodities at Three Income Levels

Commodity	Total Expenditure Elasticity		
	Group I	Group II	Group III
Vegetables	0.507	0.594	0.936
Conveyance	3.330	1.943	1.446
Servants	1.439	1.085	1.135
Vacation	0.952	1.469	1.656
Rent	1.045	0.947	1.060
Income level taken for Calculating Elasticity	Rs.427.70	650.20	919.10

SECTION II

Influence of Income, Wealth, Age of the Head of the Household and Household Size

In Section I - A the relationship between Income (Total Expenditure of the Household) and Per Capita Expenditure on Commodities and Services for the entire Sample has been discussed. Section I - B was devoted to similar per capita regressions done with the sample partitioned into three sub-samples according to income level of the households (based on total expenditure). In this section we concern ourselves apart from income with other variables such as wealth of the household, age of the head of the household, size (in number

of equivalent adult units).

We have already stressed the importance of income and also justified employing total expenditure in its place as explanatory variable (p. 177). Wealth has been taken as another variable. Although some correlation is expected between total expenditure used as proxy for income and wealth of the household nevertheless we have taken wealth as additional variable since with the affluent group the large variation in expenditure allocations could be due to several factors and it was possible that for one or other dependent variable wealth could prove to be a dominant variable displacing income from that position. There was a priori no reason to ignore wealth.

The age of the head of the household places the household in the stage of family life cycle (beginning - expanding - contracting) and has implication for the economic status of the household. Thus, partly the age of the head of the household influences income. Over and above this it could be expected that families, especially in the contracting stage exhibit a different pattern of consumer behaviour than families in the beginning of the life cycle. The multiple regression permits the testing of the influence of this variable simultaneously along with income.

The inclusion of household size hardly needs any justification. While the selection of the variable did not

require any deep thought two problems had to be considered while deciding the modus operandi for deciding the adult equivalent scale to be used. One was the question of economies or possible diseconomies of scale. The other was what weights to be assigned to the different age and sex categories. Great interest has been shown in recent years in the evolution of suitable scales.[9] As has been pointed out by Barton if scales are to be evolved it would be necessary to study the consumption of each commodity in some depth before one can venture to assign precise scales.[10] The importance of developing an operationally valid equivalent adult unit scale to differentiate in a precise manner between families differing in composition cannot be underestimated when one deals with time series data. In static cross-section studies a simpler technique should prove adequate. Hence a common scale for all items was adopted, with children of fourteen years and below constituting 0.5 adult units. The sex factor was ignored.

Models Fitted

Standard multiple regression technique has been employed to fit the linear and double logarithmic models step-wise as follows :

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[9] J. Blokland, Continuous Consumer Equivalence Scales, The Hague : Martimus Nijhoff., 1976

[10] Barton, A.P., 'A Cross Country Comparison of the Effects of Price, Income and Population Composition on Consumption Pattern,' Economic Journal, Sept.'73, p.834.

Linear :

(1) $Y = b_o + b_1 X_1 + u,$

(2) $Y = b_o + b_1 X_1 + b_2 X_2 + u$

(3) $Y = b_o + b_1 X_1 + b_2 X_2 + b_3 X_3 + u$

(4) $Y = b_o + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + u$

Where Y = Expenditure on a Commodity,

X_1, X_2, X_3, X_4 the explanatory variables, Total Expenditure on the Household, Wealth, Age of the head of the household and household size in equivalent adult units, u the disturbance term.

Double Log :

(1) $\log Y = b_o + b_1 \log X_1 + u$

(2) $\text{Log } Y = b_o + b_1 \text{ Log } X_1 + b_2 \log X_2 + u$

(3) $\text{Log } Y = b_o + b_1 \log X_2 + b_2 \log X_2 + b_3 \log X_3 + u$

(4) $\text{Log } Y = b_o + b_1 \log X_2 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + u$

Where the variables are as above, but occur in logarithmic form.

Though numerous forms have been tried by other researchers with partial success, as already indicated in chapter IV, our choice has been restricted to the two above-mentioned forms from a number of considerations. Firstly an inspection of the

numerical values and the curves for consumption levels at different levels of income (Vide Appendix III Tables I, II and App. IV Graphs 1-6) indicated that a linear fit should prove satisfactory. The double-logarithmic model was included for the sake of comparison and because of the extensive use it has found in consumption analysis. Due weight had also to be given to practical considerations such as availability of the computer time, since each additional model implied not only four additional regressions for all the commodity groups considered, but involved also additional computer work in the form of calculation of inverse matrices, t-values etc.

Goods and Services Considered

Total Food Expenditure, Total Non-Food Expenditure and Insurance (including charges towards G.P.F. etc.) were regressed on Total Expenditure of Household, Age of the Head, Wealth and Household Size.

Among food items, the following groups were selected for regression :

All Cereals and Pulses (Rice, Wheat, Dal etc.)
Fats (Ghee, Butter, Oil)
Sugar
Milk (including other milk products) and Eggs
Fruits and Vegetables

and among Non-Food items :

Rent (including other rents) and maintenance
Utilities (gas, fuel, electricity and telephones)
Conveyance
Domestic Servants

These goods and services were major items of expenditure which accounted for seventyfive per cent of total expenditure of the household. In the following paragraphs we present first the results of the regression for the commodities and services and then follow it up with an overall-summary so that the salient features are clearly focussed in spite of the sheer volume of the numerical results considered.

Total Expenditure on Food

Table 9.5 shows the results for the linear and the double-logarithmic forms. Both the forms gave good fit - the linear form being slightly better than the log-log form. The double-log model did not explain any variable which was not explained by the linear model. We shall accordingly discuss in detail, the linear model only, considering the double log model only for the purpose of comparing the constant elasticity given by it.

Total Expenditure of the household was the first variable to enter the regression, as it had the highest correlation with the dependent variable (.9216). It was highly significant at all steps in the regression. Household size which entered the regression at the second stage also proved

Table :9.5: Regression Table

Linear — Food

Model	b_o	b_1 (T)	b_2 (S)	b_3 (A)	b_4 (W)	R^2 (F-value)
I	+140.272	+0.251** (23.866)				.7569 (569.614)
II	+ 21.769	+0.226** (23.160)	+42.640** (5.135)			.7875 (337.439)
III	+107.476	+0.225** (17.751)	+47.520** (5.375)	-2.374 (1.476)		.7899 (227.142)
IV	+103.469	+0.227** (16.830)	+47.560** (5.378)	-2.311 (1.228)	-0.016 (0.132)	.7900 (169.455)

Double-Log

Model	b_o	b_1 (Log T)	b_2 (Log S)	b_3 (Log W)	b_4 (Log A)	R^2 (F-value)
I	+0.612	+ 0.667** (16.792)				.6064 (281.99)
II	+0.726	0.574** (15.714)	+0.320** (6.936)			.6807 (201.34)
III	+0.781	0.547** (12.030)	+0.315** (6.604)	+0.022 (0.961)		.6902 (134.48)
IV	+0.960	0.541** (11.614)	+0.336** (6.555)	+0.029 (1.266)	-0.112 (1.245)	.6929 (101.55)

** Significant at 0.01 level
* Significant at 0.05 level

T = Total Expenditure of Household
S = Household Size
A = Age of the Head of the Household
W = Wealth of the Household

The Figures in brakcet indicate t-values of the coefficient

to be significant till the last step. Age of the head and wealth of the household which entered the regression in this order proved to be insignificant even at 0.05 level. Considering the second step where both the dominant variables are involved, the estimated expenditure on total food is given by the relation :

$$F = +21.769 + \underset{(23.160)}{0.226\ (T)} + \underset{(5.135)}{42.640\ (S)} \qquad \underset{(337.439)}{R^2 = .7875}$$

where T represents Total Expenditure and S the size of the household. Figures in brackets indicate t-values for regression coefficient and F-value for regression equation. For every additional 100 Rs. total expenditure, 22.60 Rs. would go towards the food bill. An additional adult unit in the family size would cause Rs. 42.64 additional expenditure on food.

The intercept was positive in the linear and double logarithmic models. (necessity, vide p. 179). The variables, Total Expenditure and Size, had positive coefficients in both the models, indicating positive relationship between these variables and expenditure on total food. The regression coefficient for Age of the head of the household was negative in both the linear and double log model (though not significant). There seems to be thus grounds for suspecting that the age of the head of the household has negative relation with total expenditure on food. As wealth entered as the last variable and was not significant no conclusion could be drawn.

Total Expenditure of the Household on All Non-Food Items

In the case of this variable only income was found to the significant determinant, age, wealth and family had no influence at all in the linear model (with higher R^2 value). The relationship between total expenditure on non-food and income is given by the following equation :

$$NF = -220.512 + \underset{(62.209)}{0.701\ T} \qquad R^2 = \underset{(3970.00)}{.9548}$$

(Figures in brackets t-value and F-value respectively)

(The coefficient for income was significant at 0.01 level at all steps of the regression). The negative intercept in both linear and double-log models (with regression coefficient positive) shows that this item was a luxury for the affluent group. (Since Food is a necessity, Non-food has to be luxury). Family size had consistently negative coefficients in both the models. Though it was not significant in the linear form, it was highly significant in the double-logarithmic model. [illegible]. Hence we may conclude that family size is negatively related to total expenditure on non-food items. From the constant elasticity we may say that if there is 1 % increase in family size there will be 0.143 per cent decrease in expenditure on total non-food. Age of the head of the household and wealth contributed very little to the explanation in the variance.

Table :9.6: Regression Table

Linear — Non-Food

Model	b_o	b_1 (T)	b_2 (S)	b_3 (W)	b_4 (A)	R^2 (F-value)
I	-220.512	+0.701** (62.209)				.9548 (3870.00)
II	-174.264	+0.711** (63.810)	-16.641 (1.765)			.9556 (1958.92)
III	-167.292	+0.706** (46.453)	-17.322 (1.838)	+0.065 (0.660)		.9627 (130.20)
IV	-197.869	+0.706** (45.994)	-18.859 (1.871)	+0.056 (0.558)	+0.793 (0.418)	.9696 (97.20)

Double-Log

Model	b_o	b_1 (Log T)	b_2 (Log S)	b_3 (Log A)	b_4 (Log W)	R^2 (F-value)
I	-0.857	+ 1.185** (45.108)				.9176 (2034.73)
II	-0.907	+ 1.226** (47.323)	-0.143** (4.253)			.9249 (1121.43)
III	-0.822	+ 1.227** (46.569)	-0.129** (3.800)	-0.060 (0.964)		.9252 (747.64)
IV	-0.859	+ 1.239** (37.365)	-0.126** (3.454)	-0.050 (0.787)	-0.009 (0.567)	.9254 (556.71)

** Significant at 0.01 level
* Significant at 0.05 level

T = Total Expenditure of Household
S = Household Size
A = Age of the Head of the Household
W = Wealth of the Household

Figures in Brackets indicate t-values of coefficients

Cereals and Pulses

Family size appeared as the dominant variable in the consumption of cereals and pulses, which has been described as poor man's diet (Vide Table 9.7). The regression coefficient of family size is 15.492 (at the second stage in the linear model where wealth the second variable has been found significant at 0.01 level) which means that with an increase of one adult member, the expenditure on cereals and pulses will register an increase of 15.49 Rs. The constant family size elasticity given by the double log model, of 0.880 (significant at 0.01 level) shows that if family size increases by one percent, consumption of cereals and pulses will go up by 0.88 percent. In the case of necessities when family size goes up, expenditure on the item also will go up. The positive values of the family size regression coefficient in both linear and double log models indicate that cereals and pulses are a necessity for this affluent group.

The second significant variable which entered the regression was wealth with a positive regression coefficient in both the models. The inclusion of wealth reduced the coefficient of family size from 17.561 to 15.492. But both the variables were highly significant. Age of the head of the household, the next variable, showed a positive relationship with consumption

Table :9.7: Regression Table

Linear — Cereals and Pulses

Model	b_o	b_1 (S)	b_2 (W)	b_3 (A)	b_4 (T)	R^2 (F-value)
I	+34.597	+17.561** (10.454)				.3741 (109.27)
II	+35.787	+15.492** (8.852)	+0.051** (3.232)			.4053 (62.68)
III	+ 5.436	+14.053** (7.694)	+0.045** (2.859)	+0.841* (2.355)		.4263 (44.68)
IV	- 1.446	+13.134** (6.806)	+0.030 (1.543)	+0.913* (2.566)	+0.004 (1.396)	.4315 (65.70)

Double-Log

Model	b_o	b_1 (Log S)	b_2 (Log W)	b_3 (Log A)	b_4 (Log T)	R^2 (F-value)
I	+1.464	+0.880** (12.561)				.4629 (157.79)
II	+1.351	+0.775** (10.500)	+0.092** (3.307)			.4935 (88.65)
III	+0.935	+0.723** (9.356)	+0.077** (2.741)	+0.290* (2.118)		.5057 (61.73)
IV	+0.670	+0.709** (9.069)	+0.052 (1.498)	+0.899* (2.270)	+0.088 (1.220)	.5097 (46.79)

** Indicates significant at 0.01 level
* Indicates significant at 0.05 level

Figures in brackets indicate t-values of coefficients

S = Household size
W = Wealth
A = Age of the Head of the Household
T = Total Expenditure of the Household

expenditure on this item, but only at 0.05 level. Total expenditure entered the regression at the final step only. Though its influence was not significant still its inclusion in the regression dramatically altered the picture. Wealth of the household ceased to be explanatory variables in the linear model, but in the double log model, too, age continued to be significant at 0.05 level.

The double logarithmic model showed a better fit (R^2 value .5097).

Fats (Ghee, Butter, Oil)

This item also fell under the category of necessity with a positive constant and positive slope in the linear model (Table 9.8). Income was the main determinant, significant at 0.01 level ; while family size was significant at 0.01 level at the second step, with the addition of the variable age its significance was slightly reduced, but it still continued to be significant at 0.05 level. Age and wealth did not have any influence at all. The regression could explain only thirty percent of the variation in the consumption of fats. The double log showed better coefficient of multiple determination. Unlike in the linear model family size continued to be significant at 0.01 level till the end.

Table :9.8: Regression Table

Linear Fats

Model	b_o	b_1 (T)	b_2 (S)	b_3 (A)	b_4 (W)	R^2 (F-value)
I	+55.743	+0.027** (7.989)				.2582 (63.89)
II	+37.499	+0.019** (6.115)	+6.565** (2.802)			.2894 (37.07)
III	+ 9.672	+0.019** (6.158)	+4.980* (2.001)	+0.771 (1.705)		.3006 (25.94)
IV	+10.112	+0.019** (4.928)	+4.975* (1.998)	+0.764 (1.664)	+0.002 (0.071	.3006 (19.35)

Double-Log

Model	b_o	b_1 (Log T)	b_2 (Log S)	b_3 (Log A)	b_4 (Log W)	R^2 (F-value)
I	+0.317	+0.502** (7.411)				.2308 (54.92)
II	+0.473	+0.374** (5.771)	+0.451** (5.348)			.3354 (45.91)
III	+0.113	+0.368** (5.600)	+0.393** (4.641)	+0.254 (1.641)		.3450 (31.79)
IV	+0.291	+0.314** (3.788)	+0.378** (4.144)	+0.208 (1.310)	+0.044 (1.076)	.3492 (24.15)

** Indicates significant at 0.01 level
* Indicates significant at 0.05 level
Figures in brackets indicate t-values of coefficients

T = Total Expenditure of the Household
S = Household size
A = Age of the Head of the Household
W = Wealth

Sugar

Income and family size were the significant variables which influenced the expenditure on this item, which proved to be a necessity for this group with an elasticity of .445 (second step in the double log model) (Table 9.9). Age and wealth did not make any contribution to the explanation of the variation.

Milk, Milk Products, Eggs

In many surveys of poorer sections of the population this commodity group has figured as a luxury. Family size also was found to have a negative effect. But with the current affluent households the group milk, milk products and eggs, turned out to be a necessity both according to the linear model as well as the double log model (Table 9.10).The intercept and slope with respect to total expenditure in the linear model were positive, indicating elasticity less than unity, and the regression coefficient for family size was found to have consistently positive significant values. Age and wealth had absolutely no contribution to make to the explanation.

Fruits and Vegetables

Income alone was the determinant of consumption of fruits and vegetables according to the linear model, which showed this item to be a luxury (Table 9.11). In double logarithmic form not

Table :9.9: Regression Table

Linear — Sugar

Model	b_o	b_1 (T)	b_2 (S)	b_3 (A)	b_4 (W)	R^2 (F-value)
I	+16.651	+0.009** (6.684)				.1962 (44.68)
II	+ 4.609	+0.006** (4.272)	+4.333** (4.092)			.2640 (32.63)
III	- 5.089	+0.006** (4.288)	+3.781** (3.350)	+0.269 (1.308)		.2708 (22.41)
IV	- 6.014	+0.007** (3.798)	+3.790** (3.358)	+0.283 (1.360)	-0.004 (0.330)	.2712 (16.75)

Double-Log

Model	b_o	b_1 (Log T)	b_2 (Log S)	b_3 (Log W)	b_4 (Log A)	R^2 (F-value)
I	- 0.351	+0.552** (5.909)				.1600 (34.85)
II	- 0.220	+0.445** (4.724)	+0.380** (3.112)			.2024 (23.10)
III	- 0.239	+0.454** (3.889)	+0.384** (3.089)	-0.007 (0.129)		.2025 (15.32)
IV	- 0.278	+0.456** (3.775)	+0.380** (2.859)	-0.009 (0.152)	+0.025 (0.105)	.2025 (11.43)

** Indicates significant at 0.01 level
* Indicates significant at 0.05 level

Figures in brackets indicate t-value of coefficients

T = Total Expenditure of the Household
S = Household Size
W = Wealth
A = Age of the Head of the Household

Table :9.10: Regression Table

Linear — Milk, Milk Products, Eggs

Model	b_o	b_1 (T)	b_2 (S)	b_3 (A)	b_4 (W)	R^2 (F-value)
I	+59.268	+0.045** (12.516)				.4612 (156.64)
II	+ 9.564	+0.034** (9.355)	+17.885** (6.527)			.5634 (117.43)
III	+46.784	+0.034** (9.445)	+20.004** (6.889)	-1.031 (1.952)		.5724 (80.76)
IV	+46.492	+0.034** (7.741)	+20.007** (6.888)	-1.026 (1.915)	-0.001 (0.038)	.5724 (60.24)

Double-Log

Model	b_o	b_1 (Log T)	b_2 (Log S)	b_3 (Log A)	b_4 (Log W)	R^2 (F-value)
I	+0.408	+0.533** (9.847)				.3463 (96.97)
II	+0.483	+0.472** (8.623)	+0.216** (3.060)			.3783 (55.38)
III	+0.0833	+0.478** (8.674)	+0.273** (3.845)	-0.250 (1.937)		.3910 (38.73)
IV	+0.877	+0.466** (6.738)	+0.260** (3.535)	-0.260 (1.963)	+0.010 (0.281)	.3913 (28.92)

** Indicates significant at 0.01 level
* Indicates significant at 0.05 level
Figures in brackets indicate t-values of coefficients

T = Total Expenditure of the Household
S = Household Size
W = Wealth
A = Age of the Head of the Household

Table :9.11: Regression Table

Linear — Fruits and Vegetables

Model	b_o	b_1 (T)	b_2 (A)	b_3 (S)	b_4 (W)	R^2 (F-value)
I	-32.858	+0.069** (15.161)				.5568 (229.85)
II	- 2.666	+0.069** (15.101)	-0.722 (1.053)			.5578 (115.54)
III	- 2.549	+0.066** (13.148)	-1.142 (1.563)	+6.276 (1.537)		.5650 (78.39)
IV	- 6.703	+0.068** (10.952)	-1.077 (1.442)	+6.317 (1.560)	-0.017 (0.413)	.5655 (58.57)

Double-Log

Model	b_o	b_1 (Log T)	b_2 (Log S)	b_3 (Log A)	b_4 (Log W)	R^2 (F-value)
I	- 0.898	+0.876** (11.926)				.4373 (142.22)
II	- 0.795	+0.792** (10.662)	+0.297** (3.097)			.4654 (79.24)
III	- 0.379	+0.799** (10.775)	+0.363** (3.779)	-0.293 (1.668)		.4654 (54.27)
IV	- 0.053	+0.701** (10.136)	+0.334** (3.253)	-0.376* (2.103)	+0.081 (1.741)	.4823 (41.92)

** Indicates significant at 0.01 level
* Indicates significant at 0.05 level

Figures in the brackets indicate t-values of coefficients

T = Total Expenditure of the Household
S = Household Size
W = Wealth
A = Age of the Head of the Household

only income, but also family size (positively associated) and age of the head of the household (negatively associated) were significant at 0.01 and 0.05 levels respectively. The constant total expenditure elasticity was 0.876 ; thus according to the double logarithmic model fruits and vegetables are a necessity for the affluent group. Although the double-log model gave a lower R^2 value perhaps it is to be preferred as it includes two more variables with significant coefficients. It has thus, greater explanatory power. If this is accepted then the near-unity of constant elasticity would place this commodity as a semi-luxury.

Rent, Other Rents, Maintenance

This is one commodity group in which total expenditure and wealth of the household figured as significant determinants at 0.01 level through out the regression steps (Table 9.12). In the linear model family size was not significant, but in the double log it entered the regression at the second step as a significant variable and retained its influence till the end. Wealth entered the regression at the third step only and was significant at 0.05 level only. But the addition of Age of the Head of the household improved the status of wealth and made it highly significant. In the double log family size had negative coefficient indicating that rent is a luxury item. The total expenditure elasticity was also greater than

Table 9.12: Regression Table

Linear — Rent, Other Rents, Maintenance

Model	b_o	b_1 (T)	b_2 (W)	b_3 (A)	b_4 (S)	R^2 (F-value)
I	-31.544	+0.187** (14.573)				.5371 (212.37)
II	+ 1.708	+0.146** (9.176)	+ 0.428** (3.961)			.5738 (122.55)
III	-64.112	+0.147** (9.246)	+ 0.408** (3.694)	+1.535 (0.797)		.5753 (81.75)
IV	-64.270	+0.145** (8.572)	+ 0.407** (3.681)	+1.282 (0.627)	+3.846 (0.343)	.5756 (61.04)

Double-Log

Model	b_o	b_1 (Log T)	b_2 (Log S)	b_3 (Log W)	b_4 (Log A)	R^2 (F-value)
I	- 1.360	+1.159** (13.899)				.5135 (193.20)
II	- 1.471	+1.249** (14.776)	- 0.319** (2.925)			.5354 (104.87)
III	- 1.155	+1.096** (10.620)	- 0.392** (3.621)	+0.123* (2.424)		.5500 (73.74)
IV	- 0.748	+1.081** (10.188)	- 0.344** (2.946)	+0.141** (2.703)	-0.255 (1.244)	.5539 (55.86)

** Indicates significant at 0.01 level
* Indicates significant at 0.05 level

Figures in the brackets indicate t-values of coefficients

T = Total Expenditure of the Household
S = Household Size
W = Wealth
A = Age of the Head of the Household

unity. In spite of a slightly less R^2 value the double log may be considered to have better explanatory power.

Utilities (Gas, Fuel, Electricity, Telephone)

In the linear model Income was the sole dominating variable and the item is seen to be a luxury (intercept negative, slope positive) (Table 9.13). In the double log model too only income has been the significant variable. The constant elasticity was nearly equal to unity (0.886), thus placing it as near-luxury.

Clothing and Footwear

The R^2 values with respect to this item were very poor in both the models, being only about .2750 (Table 9.14). While in the linear model wealth has been the topmost significant variable entering the regression at the first step as a significant variable and not relinquishing this position till the end, in the double log model this place has been taken by total expenditure. Wealth entered at the last step only and proved to be completely insignificant.

In the linear model wealth was found to be significant at 0.01 level, total expenditure at 0.05 level; age and family size were not significant. In the double log model total expenditure was significant at 0.01 level, and family size at 0.05 level.

Table :9.13: Regression Table

Linear — Utilities (Electricity, gas Fuel)

Model	b_o	b_1 (T)	b_2 (S)	b_3 (W)	b_4 (A)	R^2 (F-value)
I	- 4.781	+0.035** (10.633)				.3919 (113.06)
II	- 6.815	+0.033** (8.994)	+4.172 (1.507)			.3895 (58.96)
III	- 4.586	+0.031** (6.947)	+3.954 (1.429)	+0.021 (.729)		.3912 (38.77)
IV	+ 6.256	+0.030** (6.748)	+4.518 (1.527)	+0.024 (0.821)	-0.291 (0.527)	.3921 (29.034)

Double-Log

Model	b_o	b_1 (Log T)	b_2 (Log S)	b_3 (Log A)	b_4 (Log W)	R^2 (F-value)
I	- 1.102	+0.886** 12.352)				.4547 (152.57)
II	- 1.069	+0.859** (11.564)	+0.098 (1.015)			.4578 (76.81)
III	- 0.939	+0.863** (11.464	+0.134 (1.391)	-0.162 (0.914)		.4602 (51.44)
IV	- 0.781	+0.845** (8.919)	+0.129 (1.239)	-0.176 (0.970)	+0.015 (0.308)	.4605 (38.41)

** Indicates significant at 0.01 level
* Indicates significant at 0.05 level

Figures in the brackets indicate t-values of coefficients

T = Total Expenditure of the Household
S = Size of the Household
W = Wealth
A = Age of the Household

Table :9.14: Regression Table

Linear — Clothing and Footwear

Model	b_o	b_1 (W)	b_2 (T)	b_3 (S)	b_4 (A)	Overall F-test Value	R^2
I	+106.947	+0.231** (7.073)				50.02	.2166
II	+ 70.875	+0.142** (3.465)	+0.021** (3.380)			32.15	.2610
III	+ 52.836	+0.135** (3.297)	+0.017** (2.684)	+6.292 (1.589)		22.45	.2712
IV	+ 81.045	+0.143** (3.435)	+0.017* (2.596)	+7.757 (1.850)	-0.756 (0.967)	17.07	.2750

Double-Log

Model	b_o	b_1 (Log T)	b_2 (Log S)	b_3 (Log A)	b_4 (Log W)	Overall F-test Value	R^2
I	- 0.372	+0.725** (7.077)				50.09	.2148
II	- 0.300	+0.665** (6.322)	+0.209 (1.538)			26.41	.2250
III	+ 0.197	+0.674** (6.350)	+0.289* (2.113)	-0.350 (1.396)		18.38	.2332
IV	+ 0.128	+0.695** (5.203)	+0.295* (2.007)	-0.332 (1.297)	-0.017 (0.258)	13.70	.2335

** Indicates significant at 0.01 level
* Indicates significant at 0.05 level

Figures in the brackets indicate t-values of coefficients

T = Total Expenditure of the Household
S = Size of the Household
W = Wealth
A = Age of the Household

Intellectual Activities (School Fees, Library Fees, Newspapers, Books and Magazines)

Income was the only dominant variable in the linear model (significant at 0.01 level through out. (Table 9.15) In the double log model also the influence of income was significant at 0.01 level while family size was significant at 0.05 level. The interesting feature of the double log model was the income elasticity given for this item, namely 0.981, which was higher than that of milk or fruits and vegetables. Apparently the affluent group values education and other forms of intellectual activities highly.

Insurance

Income and Family Size were the dominant variables in the linear model in the case of expenditure on insurance (both significant at 0.01 level)(Table 9.16). Family size had however, a negative coefficient indicating that as family size increases the expenditure on insurance would correspondingly decrease, other things being constant. The t-test preference analysis had showed that among the affluent group this item was more popular with Group II income level (moderately affluent). The top asset holders of the group would naturally prefer to have varied outlets for their savings, being 'interest conscious' and prefer alternate avenues for investing their savings more profitably. (Even among the moderately affluent group it may be remembered insurance was popular with the semi-professional group (managerial occupation).

Table :2.15: Regression Table

Linear — Intellectual Activities

Model	b_o	b_1 (T)	b_2 (S)	b_3 (W)	b_4 (A)	Overall F-test Value	R^2
I	+ 0.509	+0.057** (10.159)				103.20	.3606
II	+25.132	+0.062** (9.961)	-8.860 (1.888)			54.10	.3728
III	+23.408	+0.064** (8.453)	-8.691 (1.852)	-0.016 (0.328)		35.92	.3733
IV	+31.555	+0.064** (8.314)	-8.268 (1.646)	-0.014 (0.274)	-0.218 (0.233)	26.62	.3734

Double-Log

Model	b_o	b_1 (Log T)	b_2 (Log S)	b_3 (Log A)	b_4 (Log W)	Overall F-test Value	R^2
I	-1.281	+0.981** (8.653)				74.87	.2903
II	-1.189	+0.906** (7.786)	+0.266 (1.767)			39.43	.3023
III	-0.895	+0.911** (7.683)	+0.313* (2.049)	-0.206 (0.743)		25.41	.3045
IV	-1.041	+0.955** (6.400)	+0.326* (1.986)	-0.169 (0.591)	-0.036 (0.490)	19.78	.3054

** Indicates significant at 0.01 level
* Indicates significant at 0.05 level

Figures in the brackets indicate t-values of coefficients

T = Total Expenditure of the Household
S = Size of the Household
W = Wealth
A = Age of the Household

Table :9.16: Regression Table

Linear — Insurance

Model	b_o	b_1 (T)	b_2 (S)	b_3 (A)	b_4 (W)	R^2 (F-value)
I	+80.237	+0.048** (5.123)				.1255 (26.24)
II	+152.484	+0.063** (6.284)	-25.997** (3.439)			.1788 (19.61)
III	+103.187	+0.063** (6.293)	-28.804** (3.567)	+1.365 (0.930)		.1827 (13.49)
IV	+ 93.257	+0.067** (5.498)	-28.706** (3.556)	+1.522 (1.022)	-0.040 (0.495)	.1833 (10.13)

Double-Log

Model	b_o	b_1 (Log T)	b_2 (Log S)	b_3 (Log W)	b_4 (Log A)	R^2 (F-value)
I	-1.291	+0.923** (2.632)				.0419 (8.03)
II	-1.604	+1.182** (3.519)	-0.092* (2.030)			.0642 (6.75)
III	-2.239	+1.489** (3.576)	-0.755 (1.728)	-0.248 (1.213)		.0717 (4.67)
IV	-2.291	+1.491** (3.482)	-0.761 (1.615)	-0.251 (1.192)	+0.033 (0.039)	.0718 (3.40)

** Indicates significant at 0.01 level
* Indicates significant at 0.05 level

Figures in the brackets indicate t-values of coefficients

T = Total Expenditure of the Household
S = Size of the Household
W = Wealth
A = Age of the Household

The income elasticity in the double log model was nearly equal to unity when income alone was the independent variable (0.928) and even greater than unity on the addition of other variables, family size, age and wealth. Thus, according to the linear model it is a 'necessity' in the technical sense of the term/ and according to double log model a luxury. In both cases the R^2 value was rather low (.1838 and .0718).

Conveyance

According to the t-test preference analysis conveyance belonged to the type of luxuries which had been classified as 'conventional necessities.' The regression confirmed this finding. The income elasticities given by the double-log model at the different steps in the regression were all greater than unity (Table 9.17). Income, Family Size and Wealth were the determining factors, all at 0.01 level. While the regression coefficient for income was positive, those of family size and wealth were negative indicating that they were negatively associated with expenditure on this items. This is in accordance with the results under preference analysis as well as findings by other researchers.

In the double-log model income and wealth were significant at 0.01 level, but family size was significant at 0.05 level only. The coefficient for wealth was negative in this model too.

Table 9.17: Regression Table

Linear — Conveyance

Model	b_0	b_1 (T)	b_2 (S)	b_3 (W)	b_4 (A)	Overall F-test Value	R^2
I	-82.909	+0.105** (13.698)				26.24	.5062
II	-13.332	+0.120** (14.589)	-25.035** (4.037)			19.61	.5469
III	-35.525	+0.139** (14.298)	-22.866** (3.795)	-0.208** (3.287)		13.49	.5724
IV	-42.833	+0.139** (14.133)	-23.245** (3.603)	-0.210** (3.274)	+0.196 (0.163)	10.13	.5724

Double-Log

Model	b_0	b_1 (Log T)	b_2 (Log W)	b_3 (Log S)	b_4 (Log A)	Overall F-test Value	R^2
I	-3.584	+1.649** (8.651)				74.84	.2903
II	-4.630	+2.180** (8.990)	-0.379** (3.356)			45.15	.3317
III	-4.634	+2.232** (9.618)	-0.321** (2.839)	-0.473 (1.853)		31.65	.3443
IV	-6.012	+2.283** (9.470)	-0.379** (3.198)	-0.634* (2.390)	+0.865 (1.853)	24.91	.3563

** Indicates significant at 0.01 level
* Indicates significant at 0.05 level

Figures in the brackets indicate t-values of coefficients

T = Total Expenditure of the Household
S = Size of the Household
W = Wealth
A = Age of the Household

Domestic Servants

In the linear model income was the dominant factor at all stages (significant at 0.01 level) (Table 9.18). Wealth was the second variable to enter the regression, it was not significant at the time of its inclusion, but became significant at 0.05 level when age and family size were introduced. Age was significant at 0.05 level when it entered the regression at the third step, and with a negative sign and then became significant (negatively) at 0.01 level in the fourth step on the inclusion of family size. Thus, family size was the only variable which was not significant with respect to expenditure on this item. The regression coefficient for the age of the head of the household was negative, showing that age of the head has negative relationship with expenditure on servants. It is likely that at the later stages of the family cycle the requirement for domestic servants decreases.

In the double-log model also income was significant at 0.01 level, Age of the head was significant at 0.05 level only, here too negatively. That is, with advancing family life cycle the expenditure on domestic servants decreases. In the double model neither family size nor wealth was significant.

Table :9.18: Regression Table

Linear — Domestic Servants

Model	b_o	b_1 (T)	b_2 (W)	b_3 (A)	b_4 (S)	Overall F-test Value	R^2
I	-108.840	+0.085** (19.098)				364.89	.6715
II	-103.480	+0.078** (13.685)	+0.069 (1.782)			186.28	.6715
III	- 36.955	+0.078** (13.867)	+0.090* (2.309)	-1.552* (2.276)		128.72	.6808
IV	- 37.167	+0.075** (12.678)	+0.089* (2.281)	-1.892** (2.635)	+5.156 (1.305)	94.34	.6939

Double-Log

Model	b_o	b_1 (Log T)	b_2 (Log A)	b_3 (Log W)	b_4 (Log S)	Overall F-test Value	R^2
I	-3.143	+1.464** (14.311)				204.60	.5281
II	-2.490	+1.508** (14.713)	-0.487* (2.116)			106.59	.5395
III	-2.192	+1.421** (10.765)	-0.572* (2.366)	+0.067 (1.020)		71.42	.5421
IV	-2.219	+1.425** (10.679)	-0.555* (2.171)	+0.069 (1.052)	-0.030 (0.202)	55.29	.5421

** Indicates significant at 0.01 level
* Indicates significant at 0.05 level

Figures in the brackets indicate t-values of coefficients

T = Total Expenditure of the Household
S = Size of the Household
W = Wealth
A = Age of the Household

Summary of the Results of the Multiple Regression

We may summarize our results based on the foregoing tables and our discussion so far:

For a majority of the commodity groups the coefficient of multiple determination R^2, for the linear model proved higher than for the double-log model. These were : Total Food expenditure, Total Non-Food, Sugar, Milk, Fruits and Vegetables, Rent, Clothing and Footwear, Intellectual activities, Insurance, Conveyance and Domestic Servants. Only for Cereals and Pulses, Fats and Utilities the double log model proved a better fit, according to the higher R^2 value. Though the F-values were significant for all the regressions, unaccounted variation in consumption varied from 32 to 73 %.

With regard to the double log model we may recall Prais and Houthakker's finding that the double log proved a good form for luxuries, while the semi-log was found suitable for necessities. Our results are at variance with their findings; one reason may be that the British studies related to working class and middle class. The proportion of discretionary income available after allocation for basic needs from the disposable income is far less for the lower income groups and hence there is perhaps not so much

variation in their expenditures as with affluent groups. Regrettably comparative figures for an equivalent class from elsewhere could not be obtained.

An important application of regression lies in estimating elasticity from the functional relationship. In the double logarithmic model the regression coefficient gives directly the elasticity for the concerned variable. For the linear model, where elasticity differs according to the income level, fixed points of reference have to be taken. As was done for simple linear regression with per capita expenditure of the three sub-samples, three points of reference have been chosen, to have an idea how the estimated elasticity changes over income (total expenditure as proxy) :

Rs. 1413.40 (Mean total expenditure of the households in the expenditure class Rs.650 - 1850 p.m.)

Rs. 2385.00 (Mean total expenditure for the entire sample of 185 households) which is quite close to the Rs. 2380.57, the mean expenditure of the moderately affluent class Rs. 1850 - Rs.3050 p.m.)

Rs. 4530.33 (Mean total expenditure of the households in the highly affluent group, Rs. 3050 and over).

In respect of all items except clothing and footwear, the elasticity was calculated by using the estimate of marginal

propensity to consume, i.e. the regression coefficient b_1 in the first step in the regression. In the case of clothing and footwear the coefficient b_2 was taken from the second step in the regression, since total expenditure entered the regression only at the second step as a significant determinant.

Table :9.19: Total Expenditure Elasticities for Two Engel Forms at Three Consumption Levels for Different Commodity Groups

Commodity	Total Expenditure Elasticity			Double-Log (Constant Elasticity
	Less Affluent	Average	Highly Affluent	
Total Food	.719	.810	.890	.667
Total Non-food	1.287	1.152	1.075	1.195
Fats	.406	.536	.687	.502
Sugar	.433	.562	.710	.552
Milk	.518	.644	.755	.533
Fruits and Vegetables	1.580	1.250	1.118	.876
Rent	1.135	1.076	1.038	1.159
Servants	10.638	2.160	1.395	1.464
Utilities	1.107	1.060	1.031	.886
Clothing and Footwear	0.295	0.414	0.573	.725
Intellectual Activities	.993	.996	.998	.981
Insurance	.458	.588	.730	.928
Conveyance	2.268	1.495	1.211	1.649

For all food items (including total food) excluding fruits and vegetables the total expenditure elasticities may

be seen in the table to be less than unity (necessities). Among the non-food items intellectual activities, clothing and footwear, and insurance had elasticity coefficient less than unity. The total expenditure elasticities were greater than unity (luxuries) for rent, servants, and conveyance, as well as for fruits and vegetables. Since elasticities calculated for a linear model show an increasing trend if the elasticity is less than unity (intercept and slope positive) and vice-versa a decreasing trend if it is greater than unity, it is necessary to have some points of reference for comparing elasticities obtained from the linear model and other models. We may accordingly compare the constant elasticity given by the double log model with the elasticities obtained at the mean of total expenditure for the entire sample, i.e. the middle income level (Table 9.19, Col.2). It may be seen that the constant elasticity shows conservative estimates being consistently lower than the estimates obtained from the linear model, except in the case of the luxuries, rent, servants, utilities, conveyance and except insurance (necessity). Prais and Houthakker found in their study that double logarithmic model yielded higher values.[11] We may note this, as striking difference. It might be due to the variations in the population studied.

[11] Prais, S.J. and Houthakker, H.S., Op.Cit.

For the sake of further comparison we give a table of elasticities obtained by other researchers in the field. (Vide Table 9.20)

Table :9.20: Total Expenditure Elasticities from Different Sources for Comparison

Commodity	Working class	Middle Class	Middle Class	Affluent Class
Cereals	-	-	0.22	-
Pulses	-	-	0.07	-
Oils	1.41	0.65	0.25	0.536
Vegetables	-	1.90	0.61	1.250
Milk, Milk Products	2.75	1.19	0.83	0.644
Fruits	-	1.60	1.69	-
Clothing	-	-	1.18	0.838
Education and Reading	-	-	0.91	0.996
Personal Care	-	-	1.64	-
Recreation	-	-	2.24	-
Transport	-	-	1.76	1.495

Cols. 1 and 2 relate to studies by Sinha and Hay[12] (only food expenditure),

Col. 3 to study by Dipankar Coondoo,[13]

Col. 4 relates to present study, Vide Table 9.19, Col.2

[12] Sinha, R.P. and Hay, S.C., 'Analysis of Food Expenditure Patterns of Industrial Workers and Their Family in a Developing Country.' Journal of Developmental Studies, Vol.8, July 1972, No.4.

[13] Dipankar Coondoo, 'A Comparison of Consumer Expenditure Patterns of Indian Middle Class and Working Class Families,' Sankhya, Vol.37, Series 3, pt.2, June 1975.

Although a direct precise comparison is not possible, common features may be noted. Sinha and Ray found in their study of food expenditure patterns of industrial workers from fifty urban centres of India (1958-59) that the elasticity with respect to total expenditure on the whole for food was fifty percent higher for the working class.[14] Oil was found to be a clear luxury for the working class, the expenditure elasticity being double that of the middle class. In the case of milk too the elasticity was twice that of the middle class. On the whole milk, milk products, oils, and fruits were luxuries for this socio-economic group (Table 9.20). Srinivasa Iyengar, Jain and Srinivasan (NSS data 1961-62, urban and rural sectors, U.P. and Madras states) found rural elasticities to be higher than the elasticities for the urban sectors.[15] The difference was attributed to the fact that rural households enjoyed relatively low level of living compared to urban households. Cereals, fuel and light turned out to be necessities. Milk and Milk products were found to be a luxury (elasticity greater than unity).

In another study fruits, prepared meals, housing, clothing, medical care, recreation, transportation, personal

[14] Sinha, R.P. and Ray, S.C., 'Analysis of Food Expenditure Patterns of Industrial Workers and Their Families in a Developing Country.' Journal of Developmental Studies, Vol.8, July 1972, No.4

[15] Sreenivasa Iyengar, L.R. Jain and T. Srinivasan, 'Economies of Scale in Household Consumption - A Case Study' - The Indian Economic Journal, Vol.XV, No. 4 July-Sept. 1967.

effects, proved generally, to be luxury items for both middle class as well as working class.[16] For the working class families milk and milk products and personal care were also luxuries.

In his comparative study of the elasticities for food, clothing, housing and miscellaneous with reference to total expenditure Houthakker[17] found that the elasticities were found to be similar though not equal. The elasticities for food were all less than unity. The total expenditure elasticity for clothing was greater than unity for all countries, except one, a 'moderate luxury'. Housing (including fuel, light, but not furniture) elasticities were mostly less than unity. Miscellaneous expenditure had elasticities well above unity for most of the countries.

Influence of the Explanatory Variables

Income was found to be a dominant variable for all items except in the case of cereals and pulses, entering the regression in both the models at the first step and with regression coefficients being significant at 0.01 level. In the case of clothing in the linear model however wealth proved to be dominant. In the case of cereals and

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[16] Dipankar Coondoo, 'A Comparison of Consumer Expenditure Patterns of Indian Middle Class and Working Class Families,' Sankhya, Vol.37, Series 3, pt.2, June 1975, pp.81-101

[17] Houthakker, H.S., 'An International Comparison of Household Expenditure Patterns,' Econometrica, Vol.25, 1959, pp.532-55.

pulses household size was the dominant factor.

The regression coefficient for household size was significant only in the case of total food, non-food sugar, milk, insurance and conveyance apart from cereals and pulses (all at 0.01 level). The coefficient for this variable in the case of insurance and conveyance though significant had negative sign, indicating that household size has negative influence on the consumption of affluent households for these two items. Commonly durables is an item with which previous studies have shown family size to have negative relationship. The common feature between durables and conveyance, as far as the affluent group is concerned, could be that conveyance for this section implies use of cars (durables) and a vehicle can be used by more than a person at the same time.

Age of the head of the household was significant negatively only in the case of domestic servants at 0.01 level, and in the case of Cereals and Pulses, positively related at 0.5 level. It is likely that after the dominating influence of income (total expenditure) and household size the influence of age is suppressed.

Wealth of the household was significant(at 0.01 level) only in the case of rent, clothing and footwear, conveyance and at 0.05 level in the case of domestic servants. In

the case of clothing and footwear wealth entered as the first variable in the linear model, but in the double-log model total expenditure took precedence. In the case of Rent and Conveyance both Income and Wealth were significant.

Before concluding this chapter we may make a few observations concerning the relative merits of the two types of regression analysis done, one with per capita expenditures and another with expenditures for household, as well as family size and other explanatory variables included in the regression. When commodities are aggregated into suitable groups, e.g. all cereals and pulses, fats (ghee, butter, oil), then we have seen that regression with per capita figures gives significant relationships, from which total expenditure elasticities can be calculated. As many studies are done with per capita this would facilitate comparison. Multiple regression has of course greater explanatory power since additionally it yields estimates from which other elasticities can be calculated, e.g. household size elasticity. A comparison of the elasticities and m.p.c's relating to the regression with per capita figures with those obtained from multiple regression suggests that regression with per capita figures may prove adequate in those cases where income (or total expenditure) is the key factor in influencing consumption.
