5.1 INTRODUCTION:

In the foregoing chapter, the assumption of homogeneity in consumption habits and responses of the people of Orissa is implicitly present. This assumption limits the scope of the conclusions in view of enormous heterogeneity in consumer behaviour over different regions of the state. Therefore, study of consumer expenditure patterns on regional basis is more appropriate than that based on the narrow assumption of homogeneity in consumer behaviour. In the present chapter, an attempt is made to ascertain the extent of regional variations in consumption patterns in Orissa. To this end, two regions have been included under the study viz. Orissa - rural and Orissa - urban. Time-series data on cross-section of households are undoubtedly better than the simple single point cross-section data to explain regional variations in consumption patterns. It is because, time itself assumes a pivotal role in shaping the consumption performances of the people. But the non-availability of comparable time-series data restricts our choice to cross-section data only. NSS data for Orissa collected in its central sample through 38th round covering the period January-December, 1983 have been used to compute the regional estimates.
of elasticities for interpretation and drawing inference. Tables-4.1 and 5.1 narrate the salient features of the data.

5.2 CAUSES OF REGIONAL VARIATIONS IN CONSUMPTION:

Both economic and non-economic factors contribute to regional variations in consumption patterns. Though non-economic factors are as much responsible as the economic factors in shaping the propensity to consume, the former have been kept beyond the precincts of the present analysis. Only few such economic factors responsible for the variations in consumption over regions have been included for a brief elaboration in the following paragraphs.

Inter-regional variations in consumption may be attributed to the variations in the growth of percapita income over regions over time. Disparity in percapita income is basically caused by a disparate growth of income and population of a region. Other things remaining constant, variations in percapita income cause variations in consumer expenditure patterns.

Expenditure elasticities of demand for different commodities are computed on the assumption of a given price vector faced by the population of consumers. This assumption is ridiculous in view of large inter-regional differences in price. It is equally likely that price of a commodity differs within the same region. The intra and inter-spatial price differences lead to difference in consumer expenditure patterns.
Difference in the levels of economic development causes differences in consumption over regions. A rural-urban dichotomy of the state indicates that while the former is lagging behind, the latter is marching ahead in terms of development. Since the pattern of consumption is strongly tied with the levels of economic development, a difference in the latter over regions is to reflect on the difference in the pattern of consumption.

Industrialisation of an economy leaves its indelible mark on the standard of consumption. With the industrialisation of a region of an economy, the pattern of consumption changes. An industrial worker imitates higher consumption standard of his work-mates more rapidly than the agricultural labourers foregoing the consumption of conventional items of household expenditure. Other things remaining constant, an industrial worker has a greater propensity to consume non-food items than the same of a farm labourer. But for the food items, the revealing of preference is just apposite.

5.3 REGIONAL ESTIMATES OF ELASTICITIES:

The principal objective of every cross-section study on consumer behaviour analysis is to arrive at the estimates of MPC and expenditure elasticities for various categories of items. These estimates will help desired policy formulation. These elasticity estimates are called 'regional estimates of elasticity' in so far as they refer to the region as a whole. This procedure again holds the assumption that each region is homogeneous with respect to expenditure effects.
5.3.1 METHODOLOGY:

To compute the regional estimates of elasticities, three Engel function equations viz. (1) linear (2) loglinear and (3) semilog have been included. Linear form has been selected as it is a good approximation to the true relationship between percapita specific expenditure and percapita total expenditure. Loglinear form possesses the quality of defining elasticity at the mean total expenditure better than what other two can do. Semilog Engel function is one of the members of the family of variable elasticity models. Each model has been fitted to data on consumer expenditure for rural-Orissa and urban-Orissa taken separately. The best-fit is to be judged on the basis of highest $R^2$ value. The parameter estimates of each Engel functional form is to be taken to compute expenditure elasticity. In the present chapter, following three methods have been adopted to calculate elasticities for 13 individual and 2 broad categories of commodities both for rural and urban Orissa separately.

Method - I : Under this method, elasticity is computed as a mean of all elasticities with respect to different expenditure brackets. The value of elasticity will differ depending on the equation of Engel functional form.

1. Linear Functional Form:

$$Y_{ijk} = a_{ik} + \beta_{ik} X_{jk} + \epsilon_{ijk}$$  \hspace{1cm} (5.1)

$$i = 1, 2, \ldots I$$
$$j = 1, 2, \ldots J$$
$$k = 1, 2$$
where \( Y_{ijk} \) is the per capita expenditure on the \( i \)th item by the 
\( j \)th expenditure class belonging to the \( k \)th region.

\( X_{jk} \) is the per capita total expenditure by the \( j \)th expenditure 
bracket in the \( k \)th region.

\( \epsilon_{ijk} \) is the stochastic error term.

Engel aggregation conditions are given by

\[
\sum_{i=1}^{I} a_{ik} = 0 \quad \text{and} \quad \sum_{i=1}^{I} \hat{a}_{ik} = 1 \\
\sum_{i=1}^{I} b_{ik} = 1 \quad \text{and} \quad \sum_{i=1}^{I} \hat{b}_{ik} = 1
\]

Expenditure elasticity of demand for \( i \)th item of the \( j \)th category 
of households is given by

\[
\eta_{ijk} = \hat{\beta}_{ik} \frac{X_{jk}}{Y_{ijk}}
\]

Therefore, expenditure elasticity for the \( i \)th item of consumption 
in the \( k \)th region is given by:

\[
\eta_{ik} = \hat{\beta}_{ik} \frac{1}{J} \sum_{j=1}^{J} \frac{X_{jk}}{Y_{ijk}}
\]

2. Loglinear Functional Form:

\[
\ln Y_{ijk} = a_{ik} + \beta_{ik} \ln X_{jk} + \epsilon_{ijk} \tag{5.2}
\]

Engel elasticities are given by

\[
\eta_{ijk} = \hat{\epsilon}_{ik} = \text{a constant for all expenditure classes.}
\]
Therefore,

\[ n_{ik} = \hat{\beta}_{ik} = \text{a constant} \quad k = 1, 2 \]

(3) Semilog Functional Form:

\[ Y_{ijk} = \alpha_{ik} + \beta_{ik} \ln X_{jk} + \epsilon_{ijk} \]  
\( i = 1, 2, \ldots I \)  
\( j = 1, 2, \ldots J \)  
\( k = 1, 2 \)

Engel elasticities are given by:

\[ n_{ijk} = \hat{\beta}_{ik} \frac{1}{Y_{ijk}} \]

For the region as a whole

\[ n_{ik} = \hat{\beta}_{ik} \frac{1}{J} \sum_{j=1}^{J} \frac{1}{Y_{ijk}} \quad k = 1, 2 \]

Method – II: Under this method, Engel elasticities are computed as a weighted average of individual elasticities with respect to different expenditure classes - the weights being equal to square root of the number of households surveyed under each expenditure class. The weights so selected may help minimising the bad consequences of heteroscedasticity, which is a fundamental problem with grouped data, on estimation (Kakwani, 1977). Depending upon the choice of Engel functional form, the values of elasticities will differ

1. Linear Functional Form:

\[ Y_{ijk} = \alpha_{ik} + \beta_{ik} X_{jk} + \epsilon_{ijk} \]  
\( i = 1, 2, \ldots I \)  
\( j = 1, 2, \ldots J \)  
\( k = 1, 2, \ldots K \)
Engel aggregation conditions are given by

\[ \sum_{i=1}^{I} \beta_{ik} = 0 \quad \text{and} \quad \sum_{i=1}^{I} \beta_{ik} = 1 \quad k = 1,2 \]

Engel elasticity for the \( i \)th item in the \( k \)th region is computed from

\[ \eta_{ik} = \frac{1}{\sum_{j=1}^{J} w_{ij}} \sum_{j=1}^{J} w_{ij} \eta_{ijk} \]

where

\[ \eta_{ijk} = \beta_{ik} \frac{X_{jk}}{Y_{ijk}} \]

\[ w_{ij} = \left( N_{j}^{1/2} \right) \quad \text{for} \quad j = 1,2, \ldots J \]

and \( \hat{\beta}_{ik} \) is the weighted least-squares estimates of \( \beta_{ik} \) in (5.4)

(2) Loglinear Functional Form :

\[ \ln Y_{ijk} = \alpha_{ik} + \beta_{ik} \ln X_{jk} + \varepsilon_{ijk} \quad \text{for} \quad i = 1,2, \ldots I \]
\[ j = 1,2, \ldots J \]
\[ k = 1,2 \]

Expenditure elasticities are given by :

\[ \eta_{ik} = \hat{\beta}_{ik} = \text{a constant for all expenditure classes.} \]

(3) Semilog Functional Form :

\[ Y_{ijk} = \alpha_{ik} + \beta_{ik} \ln X_{jk} + \varepsilon_{ijk} \quad \text{for} \quad i = 1,2, \ldots I \]
\[ j = 1,2, \ldots J \]
\[ k = 1,2 \]
Expenditure elasticity for the \( i \)th good in the \( k \)th region is given by:

\[
\eta_{ik}^{*} = \frac{1}{\sum_{j=1}^{J} w_{j}} \frac{J}{\sum_{j=1}^{J} w_{j} \eta_{ijk}^{*}}
\]

where

\[
\eta_{ijk}^{*} = \beta^{*}_{ik} \frac{1}{Y_{ijk}}
\]

\( k = 1,2 \)

Method - III: This method was originally used by Stone et al (1954) and subsequently by Prais and Houthakker (1955). Let us define the following:

- \( Y_{ik} \) is the aggregate expenditure on the \( i \)th good in the \( k \)th region.
- \( Y_{ijk} \) is the total expenditure on the \( i \)th good by the \( j \)th expenditure class in the \( k \)th region.
- \( X_{k} \) is the aggregate expenditure of all consumers in the \( k \)th region.
- and \( X_{jk} \) is the expenditure of the \( j \)th category of consumers in the \( k \)th region.

Therefore,

\[
Y_{ik} = \sum_{j=1}^{J} Y_{ijk}
\]

\[
X_{k} = \sum_{j=1}^{J} X_{jk}
\]

\( (5.7) \)

\( i = 1,2, \ldots I \)

\( k = 1,2, \ldots \)

If \( \tilde{\eta}_{ijk} \) is the expenditure elasticity for the \( i \)th good of the \( j \)th expenditure group in the \( k \)th region, when aggregate expenditure changes, then
\[
\bar{\eta}_{ijk} = \frac{X_k}{Y_{ijk}} \cdot \frac{\partial Y_{ijk}}{\partial X_k} = \frac{X_k}{Y_{ijk}} \left( \frac{\partial Y_{ijk}}{\partial X_{jk}} \cdot \frac{\partial Y_{ijk}}{\partial X_k} \right) \quad (5.8)
\]

Or,
\[
\bar{\eta}_{ijk} = \left( \frac{X_{jk}}{Y_{ijk}} \cdot \frac{\partial Y_{ijk}}{\partial X_{jk}} \right) \left( \frac{X_k}{X_{jk}} \cdot \frac{\partial X_{jk}}{\partial X_k} \right) \quad (5.9)
\]

If aggregate elasticity is a weighted average of group elasticities, then
\[
\bar{\eta}_{ik} = \frac{X_k}{Y_{ik}} \cdot \frac{\partial Y_{ik}}{\partial X_k} = \frac{1}{Y_{ik}} \sum_{j=1}^{I} Y_{ijk} \cdot \bar{\eta}_{ijk}
\]

with \( Y_{ijk} \) as weights

Or,
\[
\bar{\eta}_{ik} = \frac{1}{Y_{ik}} \sum_{j=1}^{I} Y_{ijk} \left( \frac{X_{jk}}{Y_{ijk}} \cdot \frac{\partial Y_{ijk}}{\partial X_{jk}} \right) \left( \frac{X_k}{X_{jk}} \cdot \frac{\partial X_{jk}}{\partial X_k} \right) \quad (5.10)
\]

(On substitution from 5.9)

On the assumption of equi-proportional change in all expenditures within a region
\[
\frac{X_k}{X_{jk}} \cdot \frac{\partial X_{jk}}{\partial X_k} = 1 \quad \text{for all } j, \text{ then } (5.10)
\]

simplifies to
\[
\bar{\eta}_{ik} = \frac{1}{\Sigma_{j=1}^{I} Y_{ijk}} \sum_{j=1}^{I} Y_{ijk} \cdot \frac{X_{jk}}{Y_{ijk}} \frac{\partial Y_{ijk}}{\partial X_{jk}} \quad \text{from } (5.7)
\]

Or
\[
\bar{\eta}_{ik} = \frac{1}{\Sigma_{j=1}^{I} Y_{ijk}} \sum_{j=1}^{I} X_{jk} \frac{\partial Y_{ijk}}{\partial X_{jk}} \quad (5.11)
\]

\( i = 1, 2, \ldots I \)

k = 1, 2

The estimates of expenditure elasticity will differ depending on the choice of the equation of the Engel functional form.
(1) Linear Functional Form:

\[ Y_{ijk} = \alpha_{ik} + \beta_{ik} X_{jk} + \epsilon_{ijk} \]  \hspace{1cm} (5.12)

\( i = 1,2, \ldots I \)

\( j = 1,2, \ldots J \)

\( k = 1,2 \)

The Engel aggregation conditions are the same as those for (5.1).

Expenditure elasticities corresponding to (5.12) are given by:

\[ \tilde{\eta}_{ik} = \frac{1}{\sum_{j=1}^{J} Y_{ijk}} \cdot \hat{\beta}_{ik} \frac{1}{\sum_{j=1}^{J} X_{jk}} \]

\( k = 1,2 \).

(2) Loglinear Functional Form:

\[ \ln Y_{ijk} = \alpha_{ik} + \beta_{ik} \ln X_{jk} + \epsilon_{ijk} \]  \hspace{1cm} (5.13)

\( i = 1,2, \ldots I \)

\( j = 1,2, \ldots J \)

\( k = 1,2 \).

Expenditure elasticities in respect of (5.13) are given by:

\[ \tilde{\eta}_{ik} = \hat{\beta}_{ik} \]

\( k = 1,2 \).

(3) Semilog Functional Form:

\[ Y_{ijk} = \alpha_{ik} + \beta_{ik} \ln X_{jk} + \epsilon_{ijk} \]  \hspace{1cm} (5.14)

\( i = 1,2, \ldots I \)

\( j = 1,2, \ldots J \)

\( k = 1,2 \).

Corresponding Engel elasticities are giving by:

\[ \tilde{\eta}_{ik} = \frac{J}{\sum_{j=1}^{J} Y_{ijk}} \cdot \hat{\beta}_{ik} \]

\( k = 1,2 \).
5.3.2 EMPIRICAL RESULTS:

Tables-5.2 and 5.3 give the elasticity estimates for 15 broad categories of commodities for rural and urban Orissa respectively. Tables-5.4 and 5.5 describe the nature of commodities obtained from the values of elasticity estimates for rural and urban Orissa respectively. Method-I assumes homogeneity in that for each expenditure class weights are equal. Methods-II and III achieve elasticity estimates as the weighted average of individual elasticities. In method-II, square root of the number of households included in each expenditure class are taken as the weights. Method-III incorporates per capita specific expenditure of different expenditure classes as weights. Each method has been applied to three alternative Engel curve specifications viz. linear, loglinear and semilog.

For rural Orissa, methods-I, II and III agree with each other in respect of the nature of commodities irrespective of the choice of Engel curve equation except that method-III with semilog Engel curve proves total food as a necessary while the same functional form under methods-I and II proves total food as luxuries. Cereals are found as necessary while cereal substitutes are inferior items of consumption. All other items are proved as luxuries except that the linear form, irrespective of methods adopted, shows vegetables as necessaries. Expenditure elasticities for milk and milk products in rural Orissa are quite high with method-I with semilog and method-II with linear and semilog specifications. Total food is a necessary, it is proved as luxury if methods-I and II
are taken with semilog Engel functional form. However, the latter conclusion is weak as it is rejected in seven cases out of a total of nine. Methods-I and II agree with each other with linear specification except for milk and other milk products. Though both the methods prove milk and milk products as luxuries, the latter proves it to be highly elastic. The values of elasticity estimates arrived at by applying methods-I and II with loglinear Engel function, do not differ very much from each other. Method-III with linear specification always gives lower values of elasticity estimates of luxury items than those with methods-I and II with linear Engel function. Methods-I and II with semilog specification of the Engel curve invariably yield higher values of elasticity than those found out by applying methods-I and II with linear and loglinear functional forms to budget data. Method-III achieves compatibility between elasticity estimates irrespective of the choice of functional form except for vegetables with linear equation of the Engel curve.

For urban Orissa, for a majority of commodities elasticity estimates do not agree with each other. Cereals are proved to be necessaries by all methods. Cereal substitutes are not inferior items of consumption in urban areas. For necessaries, the values of elasticities are in descending order according as the methods III, I and II with linear specification of the Engel curve. But no such evidence exists for the consumption of luxuries. Pulses, edible oil, sugar and pan, tobacco and intoxicants are found as necessaries with the method-III. Method-III supports this conclusion with respect to the consumption of sugar and pan, tobacco and
intoxicants. Out of nine cases, in seven cases vegetables have been proved as necessaries in urban Orissa. Methods-I and II with semilog functional form yield a very high value of elasticity estimates for milk and milk products, fruits and nuts and clothing. Elasticity estimates obtained from the method-III are not significantly fluctuating among themselves irrespective of the choice of Engel functional forms.

A comparison of rural-urban consumption patterns on the basis of the elasticity estimates shows that cereals are necessaries for both the sectors. Cereal substitutes are inferior items for rural households, while it is not inferior for urban consumers. Pulses, edible oil, sugar and pan, tobacco and intoxicants are proved to be necessaries for urban area while these are luxuries for rural consumers. Vegetables in most of the cases appear to be necessaries both for rural and urban households. For necessaries in the food group, the values of elasticity corresponding to urban area are generally lower than those corresponding to rural area. This is indicative of the fact that inelasticity in consumption of food necessaries is more marked in urban area than in rural area. This is attributable to the fact that an increase in total household expenditure (may be due to an increase in income) of the urban consumers is not principally diverted into the consumption of food necessaries like cereals and vegetables unless exigencies of circumstances compel them to do so.
5.4 INTER-REGIONAL STABILITY OF ENGEL FUNCTIONS:

In this section an attempt is made to study inter-regional stability of an Engel function. For this purpose, the Engel functions viz. linear, loglinear and semilog forms have been estimated for each region separately and also for Orissa as a whole for each of the 15 groups of broad items of consumption. The estimates have been obtained by applying the method of weighted least-squares with weights being equal to square root of the number of sample households surveyed under each expenditure class to data furnished by the NSSO in its 38th round for Orissa. The estimates of intercepts and slopes together with standard error and t-statistic, the estimates of Engel elasticities at the mean total per capita expenditure, the coefficient of determination adjusted for relevant degrees of freedom ($\bar{R}^2$)\(^1\), and the value of Durbin-Watson d-statistic are all computed separately for each region and also for Orissa and furnished in the Tables-5.6 through 5.14. The final selection of the best-fitting Engel function for each sector and for Orissa has been made by adopting the following procedures:

(1) For each form, value of t-statistic corresponding to estimated slope is computed and if this is found to be less than the tabulated value of t-statistic at 5 percent level of significance with 11 degrees

---

\(^1\) Adjusted $R^2$ ($\bar{R}^2$) has been used in place of unadjusted $R^2$ for the reason that "... it is good practice to use $\bar{R}^2$ rather than $R^2$ because $R^2$ tends to give an overly optimistic picture of the fit of the regression, particularly when the number of explanatory variables is not very small compared with the number of observations". Henri Theil, Introduction to Econometrics, Prentice-Hall. Inc., Englewood Cliffs, New Jersey, 1978, p.135.
of freedom (using a single tail), the form is rejected.

(2) Out of the remaining forms, the one with the highest value of $\bar{R}^2$ has been selected. Since the dependent variable appears in different scales over three functional forms, direct comparison of $\bar{R}^2$ becomes absurd. Therefore, the procedure adopted is to find antilog values of $\ln \hat{Y}_{ij}$ from the model (5.5) and then to compute $\bar{R}^2$ between antilog of $\ln \hat{Y}_{ij}$ and $Y_{ij}$. This $\bar{R}^2$ value is comparable with the $\bar{R}^2$ values of the models (5.4) and (5.6).

The results corresponding to the above two criteria have been given in Tables-5.15 through 5.17.

With a view to examining inter-regional stability of Engel functions, following three null-hypotheses have been tested separately for each of the two sectors:

(i) The best-fitting Engel function is invariant over the regions.

(ii) The slope of the best-fitting Engel function is invariant over the regions. This hypothesis is tested if and only if the null-hypothesis (i) is rejected.

and (iii) The intercept of the best-fitting Engel function is invariant over the regions. This hypothesis is tested if and only if the null-hypothesis (i) is rejected but the null-hypothesis (ii) is not rejected.

To conduct the above tests to their final end, a couple of methods are available (Suits, 1957; Chow, 1960; Kendall and Stuart, 1966; Johnston, 1972), but what one selects to use is largely
a matter of convenience. In the present work, the technique of covariance analysis is used and in each case, the Snedecor's F-statistic (Johnston, 1972) has been computed to test the validity of the null-hypotheses under (i) through (iii).

5.4.1 RESULTS OF TESTS OF NULL-HYPOTHESES:

For each of the 15 broad categories of items of expenditure for rural and urban Orissa taken separately the values of F-statistic viz. $F_1$ (F-statistic for overall homogeneity), $F_2$ (F-statistic for homogeneity in slopes) and $F_3$ (F-statistic for homogeneity in intercepts) have been computed wherever relevant by applying the technique of covariance analysis based on Snedecor's F. F-distribution corresponding to 5 percent level of significance with (2,22) degrees of freedom viz. 3.44, it may be seen from the Table-5.18 that $F_1 > 3.44$ for commodities like milk and milk products, edible oil, meat, egg and fish, salt, spices and beverages and pan, tobacco and intoxicants in rural sector and for milk and milk products, edible oil and pan, tobacco and intoxicants in urban sector. In consequence, the null-hypothesis (i) is rejected in case of each and all these groups of commodities. For all these items, except edible oil in the urban sector, the same remarks hold for the null-hypothesis under (ii) as the $F_2$ value exceeds the corresponding critical value at 5 percent level of significance with (1,22) degrees of freedom. Thus, for edible oil in urban region, the null-hypothesis (ii) is not rejected but the null-hypothesis under (iii) is rejected as the $F_3$ value exceeds the corresponding critical value at 5 percent
level of significance with (1,23) degrees of freedom. Therefore, in the present study, lack of inter-regional homogeneity of consumer behaviour may be attributed to the variable slopes of the best-fitting Engel functions.

The above results show that the best-fitting Engel function for each of the goods described in the foregoing paragraph is not invariant over the regions. This in consequence implies that inter-regional homogeneity assumption of consumer behaviour is thin. That is, the assumptions of same scale of preferences for all consumers irrespective of their regional location and the same market price structure facing them are not defended in this study. Thus, it appears that sample data on consumer expenditure from various regions of a state should not be pooled for carrying out Engel function analysis at an aggregative level.

One of the principal objectives of consumer demand analysis is to work out tolerably precise demand projections. For this purpose, computing Engel elasticities at the mean level of expenditure is more important than estimating the Engel function as a whole. Regionwise estimates of Engel elasticities for 15 categories of commodities along with all-Orissa pooled Engel elasticities based on pooled sample data as well as Orissa's weighted Engel elasticities (weights being the share of each region in all-Orissa expenditure incurred on the commodity under enquiry) are all given in Table-5.20. While column (5) of the table shows Engel elasticities computed on the basis of pooled data, column (6) shows elasticity estimates
as a weighted average of rural and urban elasticities. It is found that Engel elasticities are overestimated if the percentage difference between pooled elasticity and regional elasticity is positive for both the sectors. In the reverse case pooled elasticities are underestimated. It is observed that true elasticities are overestimated for commodities like cereals, milk and milk products, and edible oil and the difference is significant in case of milk and milk products. True elasticities are underestimated in case of pulses, clothing, other non-food items and non-food total and the difference between true elasticity and elasticity obtained on the basis of weighted average is significant in the case of clothing. The difference between two sets of elasticities for fruits and nuts, and salt, spices and beverages is seen to be significant. Therefore, the use of all-Orissa elasticities instead of both regions' weighted elasticities may seriously impair demand projections for commodities like milk and milk products, fruits and nuts, salt, spices and beverages and clothing. For rest of the items it may not be so. Hence, the lack of stability in Engel functions over regions poses problems for precise demand projections.

5.5 REGIONAL INTERDEPENDENCE OF CONSUMPTION PATTERNS:

In this section an attempt is made to reveal the extent of regional interdependence of consumer behaviour. The possibility of interdependence emerges from the imitative nature of consumer behaviour. Rural consumption pattern is prone to be affected by the pattern of consumption of urban population of consumers. One
of the causes of such interdependence may be a continuous interaction between the two categories of consumers. The process of interaction has been smoothened by increasing transport facilities, rural-urban migration, an increasing dependence of rural people on urban centres for education, health care and the like. Here an attempt is made to ascertain the extent of interdependence without of course any explanation of the factors responsible for such interdependence as the latter is beyond the scope of the present study.

5.5.1 THE MODEL :

The present model is based on the assumption that urban consumption patterns influence the patterns of consumption of the rural people, but not the reverse. This assumption seems plausible in view of an inherent tendency among consumers to follow their counterparts elsewhere enjoying better standard of living with whom/whose consumption patterns they frequently come across. Therefore, regional utility functions for a specific commodity may be interdependent. In view of this interdependent nature of regional consumption functions, it is postulated that the percapita specific expenditure of a group of consumers belonging to a definite expenditure bracket not only depends on the percapita total expenditure of the group but also on its size relative to the overall percapita total expenditure of the consumers whose consumption patterns they imitate. The multiple regression model so developed on the basis of this empty hypothesis can be estimated directly from the data for further inference.
Let the consumption function for a particular commodity \( i \) for the rural sector be given by the linear model

\[
Y_{ij1} = a_{i1} + \beta_{i11} X_{j1} + \beta_{i12} \frac{X_{2}}{X_{j1}} + \epsilon_{ij1} \tag{5.15}
\]

\[i = 1, 2, \ldots, I\]
\[j = 1, 2, \ldots, J\]

where \( Y_{ij1} \) is the per capita expenditure of the \( j \text{th} \) expenditure class on the \( i \text{th} \) good in region 1 (subscript 1 refers to rural region),

\( X_{j1} \) is the per capita total expenditure of the \( j \text{th} \) expenditure class on all goods in region 1 (rural),

\( X_{2} \) is the per capita total expenditure of all expenditure classes on all goods in region 2 (subscript 2 refers to urban region),

and \( \epsilon_{ij1} \) is the amount of error.

Or,

\[
Y_{ij1} = a_{i1} + \beta_{i11} X_{j1} + \beta_{i12} \frac{1}{X_{j1}} \sum_{j=1}^{J} \frac{n_{2} N_{j2} X_{j2}}{n_{2} N_{j2} X_{j2}} + \epsilon_{ij1}
\]

where \( X_{j2} \) is the per capita total expenditure of the \( j \text{th} \) expenditure class on all goods in region 2,

\( n_{2} \) is the average size of the household in region 2.

and \( N_{j2} \) is the number of households included under the \( j \text{th} \) expenditure class in region 2.

Or,

\[
Y_{ij1} = a_{i1} + \beta_{i11} X_{j1} + \beta_{i12} \frac{1}{X_{j1}} \sum_{j=1}^{J} \frac{N_{j2}}{N_{j2}} X_{j2} + \epsilon_{ij1} \tag{5.16}
\]

\[i = 1, 2, \ldots, I\]
\[j = 1, 2, \ldots, J\]
The Engel curve model given in (5.16) is short of the assumption of 'spherical disturbances' (Johnston, 1984). Since \( Y \) refers to percapita specific expenditure at its mean and \( X \) to household total expenditure in percapita terms, the variance about the Engel curve is likely to increase with the size of \( X \). In view of this non-spherical disturbances, the assumption of constant variance is replaced by the assumption of variable variance of the disturbance error in (5.16) while the assumption of zero covariance among them is retained. The matrix equivalent of the model (5.16) is given by:

\[
Y = X\beta + \varepsilon
\]  

such that

(i) \( E(\varepsilon) = 0 \)

(ii) \( E(\varepsilon \varepsilon') = \begin{bmatrix}
\sigma_1^2 & 0 & 0 & \ldots & 0 \\
0 & \sigma_2^2 & 0 & \ldots & 0 \\
0 & 0 & \sigma_3^2 & \ldots & 0 \\
\vdots & \vdots & \vdots & \ddots & \vdots \\
0 & 0 & 0 & \ldots & \sigma_J^2
\end{bmatrix} \)

and (iii) \( \rho(X) = k < J \)

It is a standard case of heteroscedasticity. Therefore, the application of the generalised least-squares (GLS) method to (5.17) yields

\[
\hat{\beta}^* = (X' \Omega^{-1}X)^{-1} X' \Omega^{-1}Y
\]  

(5.18)
with variance - covariance matrix

\[ V(\hat{\beta}^*) = \sigma^2 (X' \Omega^{-1}X)^{-1} \]  \hspace{1cm} (5.19)

where

\[ \hat{\sigma}^2 = \frac{Y' \Omega^{-1}Y - \hat{\beta}'X' \Omega^{-1}Y}{J - K} \]

and

\[ \Omega = \begin{bmatrix} 1/N_{11}^{\frac{1}{2}} & 0 & \cdots & 0 \\ 0 & 1/N_{21}^{\frac{1}{2}} & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & 1/N_{J1}^{\frac{1}{2}} \end{bmatrix} \]

such that

\[ \Omega^{-1} = \begin{bmatrix} N_{11}^{\frac{1}{2}} & 0 & 0 & \cdots & 0 \\ 0 & N_{21}^{\frac{1}{2}} & 0 & \cdots & 0 \\ 0 & 0 & N_{31}^{\frac{1}{2}} & \cdots & 0 \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & 0 & \cdots & N_{J1}^{\frac{1}{2}} \end{bmatrix} \]

where \( N_{j1} \) is the number of households included under the jth expenditure class in region 1 (rural) for \( j = 1,2,\ldots,J \).

5.5.2 EMPIRICAL FINDINGS:

Model (5.17) is estimated from the NSS data collected in its 38th round for Orissa. Results are given in Table-5.21. The estimates relate to the estimates of the consumption function for rural Orissa under the hypothesis that urban pattern of consumption may influence that of the rural households not the reverse.
It is evident from the Table-5.21 that the consumption of cereals, cereal substitutes, vegetables, fruits and nuts, salt, spices and beverages in the food group and that of pan, tobacco and intoxicants, clothing and other non-food items in the non-food group depends partly on total expenditure of rural households in relation to total expenditure of urban consumers as in each case $|t_{\beta_2}^*| > t_{(0.05,11)} = 1.796$. There is no evidence of such linkage for goods like pulses, milk and milk products, edible oil, meat, egg and fish and sugar as in each case $|t_{\beta_2}^*| < t_{(0.05,11)} = 1.796$. Though consumption patterns are interdependent in case of the former group of commodities, the direction, nature and extent of relative influence is different. The relative expenditure elasticity ($\eta_2^*$) for cereal substitutes, fruits and nuts, salt, spices and beverages, clothing, other non-food items and non-food total are positive but greater than unity. This shows that an increase in expenditure of rural households in relation to an increase in expenditure of the urban people, increases the consumption of these goods by more than the proportion. For pan, tobacco and intoxicants, though $\eta_2^* > 0$ but $0 < \eta_2^* < 1$. This shows that an increase in relative expenditure of the rural people increases the expenditure on this item but by less than the proportion. Therefore, the demonstration effect is stronger and felt more intensely in the consumption of former categories of commodities than that in the case of the latter. For items like cereals, vegetables and total food, there is the evidence of influence of urban consumption patterns as in each case $|t_{\beta_2}^*| > t_{(0.05,11)} = 1.796$. But in all these cases, the elasticity estimates are associated with negative sign with $0 < |\eta_2^*| < 1$. 
Therefore, an increase in expenditure of the rural households in relation to the increase in expenditure of the urban people, reduces the expenditure on these goods by less than the proportion. These three items are necessaries in the food group. This is proved by $0 < \eta_1^* < 1$ in each case (Table-5.21) and also in terms of the best-fitting Engel functions for rural Orissa (Table-5.16). With an increase in overall expenditure due to an increase in standard of living, there would always be the possibility of a change in the ratios allocating total expenditure between food items and non-food items. A substitution of non-food expenditure in place of food expenditure in general and that of necessary-food expenditure in particular is the cause of such changes in the ratios. Thus, rural people coming in contact with urban standard of living are exposed to increasing expenditure on non-food items. All these above inferences are based on the assumption of constant price vector facing both rural and urban households. Therefore, the present study of inter-dependence between rural and urban consumption patterns ignores the price effect. In general, consumption of few items belonging to food group and all items belonging to non-food group by rural households of Orissa are seen to depend on the urban pattern of consumption.

5.6 CONCLUSION:

In the present chapter, a study of inter-regional variations in consumption patterns in Orissa is made. Two regions viz. rural Orissa and urban Orissa are included in the study. For rural Orissa,
the nature of commodities is invariant over the choice of functional forms. For urban Orissa, the conclusion holds for most of the commodities. An attempt to study inter-regional stability of Engel functions by sectors and groups of commodities, revealed that Engel functions are not stable over regions. The instability has been contributed mostly by significant difference between estimates of slope parameters of the best-fitting Engel functions. Therefore, demand projections based only on aggregate elasticity not on regional estimates of elasticity may obscure the results. Moreover, demand projection for important articles ought to take into account the interdependence that exists between urban and rural consumption expenditure. One of the limitations of the study is that it ignores price variations between the regions.
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Items</th>
<th>Rural Percapita Total Expenditure</th>
<th>Urban Percapita Total Expenditure</th>
<th>Rural Percapita Total Food Expenditure</th>
<th>Urban Percapita Total Food Expenditure</th>
<th>Rural Non-Food Expenditure</th>
<th>Urban Non-Food Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cereals</td>
<td>50.63</td>
<td>31.53</td>
<td>68.72</td>
<td>48.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Cereal Substitutes</td>
<td>0.13</td>
<td>0.06</td>
<td>0.18</td>
<td>0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Pulses</td>
<td>2.07</td>
<td>2.86</td>
<td>2.81</td>
<td>4.37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Milk and Milk Products</td>
<td>1.52</td>
<td>4.03</td>
<td>2.06</td>
<td>6.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Edible Oil</td>
<td>2.70</td>
<td>3.90</td>
<td>3.67</td>
<td>5.97</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Meat, Egg and Fish</td>
<td>3.34</td>
<td>4.73</td>
<td>4.54</td>
<td>7.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Vegetables</td>
<td>5.91</td>
<td>6.60</td>
<td>8.03</td>
<td>10.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Fruits and Nuts</td>
<td>0.95</td>
<td>1.10</td>
<td>1.29</td>
<td>1.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Sugar</td>
<td>1.57</td>
<td>1.90</td>
<td>2.13</td>
<td>2.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Salt, Spices and Beverages</td>
<td>4.84</td>
<td>8.60</td>
<td>6.57</td>
<td>13.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Total Food (1-10)</td>
<td>73.66</td>
<td>65.31</td>
<td>100.00</td>
<td>100.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Pan, Tobacco and Intoxicants</td>
<td>2.63</td>
<td>2.50</td>
<td>9.97</td>
<td>7.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Clothing</td>
<td>6.17</td>
<td>7.77</td>
<td>23.42</td>
<td>22.39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Other Non-Food Items</td>
<td>17.54</td>
<td>24.42</td>
<td>66.61</td>
<td>70.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Non-Food Total (12-14)</td>
<td>26.34</td>
<td>34.69</td>
<td>100.00</td>
<td>100.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 5.2

**Regional Estimates of Elasticities - Commoditywise**

(Orissa-Rural)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Items</th>
<th>Elasticity Estimates ($\eta_{ik}$)</th>
<th>Elasticity Estimates ($\eta^*_ik$)</th>
<th>Elasticity Estimates ($\tilde{\eta}_{ik}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Method-I (LN) LL SL</td>
<td>Method-II (LN) LL SL</td>
<td>Method-III (LN) LL SL</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>3 4 5 6 7 8 9 10 11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Cereals</td>
<td>0.365 0.578 0.607</td>
<td>0.379 0.588 0.614</td>
<td>0.411 0.578 0.478</td>
</tr>
<tr>
<td>2.</td>
<td>Cereal Substitutes</td>
<td>-1.133 -0.421 -1.484</td>
<td>-0.222 -0.258 -0.981</td>
<td>-0.590 -0.421 -0.756</td>
</tr>
<tr>
<td>3.</td>
<td>Pulses</td>
<td>2.373 1.688 3.221</td>
<td>2.121 1.754 4.346</td>
<td>1.276 1.688 1.201</td>
</tr>
<tr>
<td>5.</td>
<td>Edible Oil</td>
<td>1.253 1.304 2.786</td>
<td>1.232 1.331 2.257</td>
<td>1.028 1.304 1.008</td>
</tr>
<tr>
<td>6.</td>
<td>Meat, Egg and Fish</td>
<td>1.609 1.424 3.645</td>
<td>1.634 1.484 2.956</td>
<td>1.183 1.424 1.113</td>
</tr>
<tr>
<td>7.</td>
<td>Vegetables</td>
<td>0.917 1.067 3.415</td>
<td>0.957 1.101 1.594</td>
<td>0.895 1.067 1.707</td>
</tr>
<tr>
<td>9.</td>
<td>Sugar</td>
<td>2.520 1.717 7.672</td>
<td>2.124 1.671 4.858</td>
<td>1.241 1.717 1.144</td>
</tr>
<tr>
<td>10.</td>
<td>Salt, Spices and Beverages</td>
<td>2.262 1.370 3.999</td>
<td>2.214 1.391 3.158</td>
<td>1.536 1.370 1.307</td>
</tr>
<tr>
<td>11.</td>
<td>Total Food (1-10)</td>
<td>0.676 0.838 1.142</td>
<td>0.684 0.843 1.048</td>
<td>0.738 0.838 0.739</td>
</tr>
<tr>
<td>12.</td>
<td>Pan, Tobacco and Intoxicants</td>
<td>1.347 1.032 2.091</td>
<td>1.330 1.010 1.750</td>
<td>1.234 1.032 1.072</td>
</tr>
<tr>
<td>14.</td>
<td>Other Non-Food Items</td>
<td>1.958 1.282 3.352</td>
<td>1.975 1.309 2.759</td>
<td>1.455 1.282 1.251</td>
</tr>
<tr>
<td>15.</td>
<td>Non-Food Total (12-14)</td>
<td>2.106 1.350 3.741</td>
<td>2.125 1.390 3.051</td>
<td>1.481 1.350 1.278</td>
</tr>
</tbody>
</table>

**Notes:**
- LN: Linear
- LL: Loglinear
- SL: Semilog
### TABLE - 5.3
REGIONAL ESTIMATES OF ELASTICITIES-COMMODITY WISE
(ORISSA-URBAN)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Items</th>
<th>Elasticity Estimates($\eta_{ik}$) Method-I</th>
<th>Elasticity Estimates($\eta_{ik}^*$) Method-II</th>
<th>Elasticity Estimates($\tilde{\eta}_{ik}$) Method-III</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>LN</td>
<td>LL</td>
<td>SL</td>
</tr>
<tr>
<td>1</td>
<td>Cereals</td>
<td>0.237</td>
<td>0.371</td>
<td>0.372</td>
</tr>
<tr>
<td>2</td>
<td>Cereal Substitutes</td>
<td>2.710</td>
<td>1.264</td>
<td>4.393</td>
</tr>
<tr>
<td>3</td>
<td>Pulses</td>
<td>1.396</td>
<td>2.008</td>
<td>3.080</td>
</tr>
<tr>
<td>5</td>
<td>Edible Oil</td>
<td>1.203</td>
<td>1.856</td>
<td>1.980</td>
</tr>
<tr>
<td>6</td>
<td>Meat, Egg and Fish</td>
<td>1.461</td>
<td>2.607</td>
<td>2.316</td>
</tr>
<tr>
<td>7</td>
<td>Vegetables</td>
<td>0.748</td>
<td>0.959</td>
<td>1.444</td>
</tr>
<tr>
<td>8</td>
<td>Fruits and Nuts</td>
<td>1.770</td>
<td>2.700</td>
<td>5.116</td>
</tr>
<tr>
<td>9</td>
<td>Sugar</td>
<td>0.914</td>
<td>2.150</td>
<td>1.229</td>
</tr>
<tr>
<td>10</td>
<td>Salt, Spices and Beverages</td>
<td>2.346</td>
<td>2.147</td>
<td>2.878</td>
</tr>
<tr>
<td>11</td>
<td>Total Food (1-10)</td>
<td>0.697</td>
<td>0.826</td>
<td>1.170</td>
</tr>
<tr>
<td>12</td>
<td>Pan, Tobacco and Intoxicants</td>
<td>1.026</td>
<td>1.702</td>
<td>1.591</td>
</tr>
<tr>
<td>14</td>
<td>Other Non-Food Items</td>
<td>1.700</td>
<td>1.279</td>
<td>3.278</td>
</tr>
<tr>
<td>15</td>
<td>Non-Food Total (12-14)</td>
<td>2.083</td>
<td>1.423</td>
<td>4.331</td>
</tr>
</tbody>
</table>

LN : Linear  
LL : Loglinear  
SL : Semilog
### TABLE - 5.4
NATURE OF COMMODITIES - REGION WISE
(ORISSA - RURAL)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Items</th>
<th>Method - I</th>
<th>Method - II</th>
<th>Method - III</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>LN</td>
<td>LL</td>
<td>SL</td>
</tr>
<tr>
<td>1</td>
<td>Cereals</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>2</td>
<td>Cereal Substitutes</td>
<td>I</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>3</td>
<td>Pulses</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>4</td>
<td>Milk and Milk Products</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>5</td>
<td>Edible Oil</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>6</td>
<td>Meat, Egg and Fish</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>7</td>
<td>Vegetables</td>
<td>N</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>8</td>
<td>Fruits and Nuts</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>9</td>
<td>Sugar</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>10</td>
<td>Salt, Spices &amp; Beverages</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>11</td>
<td>Total Food (1-10)</td>
<td>N</td>
<td>N</td>
<td>L</td>
</tr>
<tr>
<td>12</td>
<td>Pan, Tobacco and Intoxicants</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>13</td>
<td>Clothing</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>14</td>
<td>Other Non-Food Items</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>15</td>
<td>Non-Food Total (12-14)</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

LN : Linear  
LL : Loglinear  
SL : Semilog  
N : Necessary  
I : Inferior  
L : Luxury
### Table 5.5

**Nature of Commodities - Region Wise**

*(Orissa - Urban)*

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Items</th>
<th>Method - I</th>
<th>Method - II</th>
<th>Method - III</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>LN</td>
<td>LL</td>
<td>SL</td>
</tr>
<tr>
<td>1</td>
<td>Cereals</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>2</td>
<td>Cereal Substitutes</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>3</td>
<td>Pulses</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>4</td>
<td>Milk and Milk Products</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>5</td>
<td>Edible Oil</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>6</td>
<td>Meat, Egg and Fish</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>7</td>
<td>Vegetables</td>
<td>N</td>
<td>N</td>
<td>L</td>
</tr>
<tr>
<td>8</td>
<td>Fruits and Nuts</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>9</td>
<td>Sugar</td>
<td>N</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>10</td>
<td>Salt, Spices and Beverages</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>11</td>
<td>Total Food (1-10)</td>
<td>N</td>
<td>N</td>
<td>L</td>
</tr>
<tr>
<td>12</td>
<td>Pan, tobacco and Intoxicants</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>13</td>
<td>Clothing</td>
<td>L</td>
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<td>L</td>
</tr>
<tr>
<td>14</td>
<td>Other Non-Food Items</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>15</td>
<td>Non-Food Total (12-14)</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
</tbody>
</table>

**Legend:**
- LN: Linear
- LL: Loglinear
- SL: Semilog
- N: Necessary
- L: Luxury
### TABLE - 5.6
PARAMETER ESTIMATES AND RELATED STATISTICS OF THE LINEAR ENGEL CURVE EQUATION BY GROUPS OF COMMODITIES AND SECTORS

ORISSA - RURAL

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Items</th>
<th>$\alpha$</th>
<th>$\beta$</th>
<th>$\eta_i$</th>
<th>$\bar{R}^2$</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cereals</td>
<td>31.710</td>
<td>(5.945)</td>
<td>0.379</td>
<td>0.950</td>
<td>0.431</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[5.334]</td>
<td>[5.111]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Cereal Substitutes</td>
<td>0.146</td>
<td>(0.207)</td>
<td>0.222</td>
<td>0.710</td>
<td>0.193</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[0.705]</td>
<td>[-2.000]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Pulses</td>
<td>-0.922</td>
<td>(0.534)</td>
<td>2.121</td>
<td>0.825</td>
<td>2.627</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[-1.727]</td>
<td>[10.000]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Milk and Milk Products</td>
<td>-1.478</td>
<td>(0.614)</td>
<td>9.034</td>
<td>0.844</td>
<td>1.833</td>
</tr>
<tr>
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Figures within (…) indicate standard errors of estimates.

Figures within […] indicate t-values.

Not significant at 5 percent level.

All other slope estimates are significant.
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Figures with (...) indicate standard errors of estimates.
Figures within [...] indicate t-values.
* Not significant at 5 percent level.
All other slope estimates are significant.
PARAMETER ESTIMATES AND RELATED STATISTICS OF THE LINEAR ENGEL CURVE EQUATION BY GROUPS OF COMMODITIES AND SECTORS

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Figures with (...) indicate standard errors of estimates.
Figures within [...] indicate t-values.

* Not significant at 5 percent level.
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Figures within (...) indicate standard errors of estimates.
Figures within [...] indicate t-values.

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Figures within (...) indicate standard error of estimates.
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Figures within [...] indicate t-values
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Figures within (...) indicate standard errors of estimates.
Figures within [...] indicate t-values.

* Not significant at 5 percent level.
All other slope estimates are significant.
## Table 5.13

Parameter Estimates and Related Statistics of the Semi-log Engel Curve Equation by Groups of Commodities and Sectors

### Orissa - Urban

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Figures within (...) indicate standard errors of estimates, Figures within [...] indicate t-values.

All slope estimates are significant at 5 percent level.
### TABLE - 5.14

PARAMETER ESTIMATES AND RELATED STATISTICS OF THE SEMILOG ENGEL CURVE EQUATION BY GROUPS OF COMMODITIES AND SECTORS

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Figures within (...) indicate standard errors of estimates.
Figures within [...] indicate t-values.

¶ Not significant at 5 percent level.
All other slope estimates are significant.
### TABLE - 5.15

**BEST-FITTING ENGEL FUNCTIONS BY GROUPS OF COMMODITIES AND REGIONS**

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LN : Linear  
LL : Loglinear  
SL : Semilog

BFEF : Best-Fitting Engel Function.
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Figures within (...) indicate standard errors. 
Figures within [... ] indicate t-values.
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Figures within (...) indicate standard errors.
Figures within [...] indicate t-values.
TABLE - 5.18
PARAMETER ESTIMATES AND RELATED STATISTICS OF THE BEST-FITTING ENGEL FUNCTIONS BY GROUPS OF COMMODITIES

ALL - ORISSA

<table>
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<th>Sl. No.</th>
<th>Items</th>
<th>$\hat{\alpha}$</th>
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<th>$\bar{R}^2$</th>
<th>d</th>
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<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
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<td>Edible Oil</td>
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<tr>
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<td>[34.000]</td>
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<td></td>
<td>(0.617)</td>
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<td>0.902</td>
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</tr>
<tr>
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<td>Salt, Spices and</td>
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<td>1.537</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Beverages</td>
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<td>(0.089)</td>
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<td>0.958</td>
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<td>4</td>
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<td>---</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
<td>-----------</td>
</tr>
<tr>
<td>11. Total Food (1-10)</td>
<td></td>
<td></td>
<td>0.580</td>
<td>0.809</td>
<td>(0.159)</td>
<td>(0.034)</td>
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<td>(0.206)</td>
<td>(0.044)</td>
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<td>1.888</td>
<td>(0.441)</td>
<td>(0.095)</td>
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<td>1.381</td>
<td>(0.341)</td>
<td>(0.074)</td>
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<td>15. Non-Food Total (12-14)</td>
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<td></td>
<td>-3.408</td>
<td>1.436</td>
<td>(0.328)</td>
<td>(0.071)</td>
</tr>
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</table>

Figures within (...) indicate standard errors.
Figures within [...] indicate t-values.

2 For cereal substitutes, with all three Engel function equations viz. linear, loglinear and semilog, $|t^*_{β*}| < t_{0.05}$ with 11 degrees of freedom.
**TABLE - 5.19**

INTER-REGIONAL STABILITY OF ENGEL FUNCTIONS BY SECTORS AND GROUPS OF COMMODITIES

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<th>Orissa - Urban</th>
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<td></td>
<td></td>
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<td>F-values under the Hypotheses of Constancy of the Intercepts</td>
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<td></td>
<td></td>
<td>Relationship</td>
<td>Slopes</td>
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<td>--</td>
</tr>
<tr>
<td>3</td>
<td>Pulses</td>
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<td>Milk and Milk Products</td>
<td>28.927*</td>
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<td>5</td>
<td>Edible Oil</td>
<td>7.216*</td>
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<td>Meat, Egg and Fish</td>
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<td>7</td>
<td>Vegetables</td>
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<td>Fruits and Nuts</td>
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<td>9</td>
<td>Sugar</td>
<td>0.745</td>
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<td>Salt, Spices and Beverages</td>
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<td>Total Food (1-10)</td>
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<td>Pan, Tobacco and Intoxicants</td>
<td>4.982*</td>
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<td>13</td>
<td>Clothing</td>
<td>0.110</td>
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<td>14</td>
<td>Other Non-Food Items</td>
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<td>15</td>
<td>Non-Food Total (12-14)</td>
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* Significant at 5 percent level.
### TABLE - 5.20

**ENGEL ELASTICITIES AT MEAN LEVELS OF EXPENDITURE BY GROUPS OF COMMODITIES**

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<th>Sl. No.</th>
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<th>Engel Elasticity for Orissa-rural</th>
<th>Engel Elasticity for Orissa (Pooled)</th>
<th>Elasticity for Orissa as a weighted Average of (3) and (4)</th>
<th>t-values of difference between (5) &amp; (6).</th>
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<td>Pulses</td>
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<td>1.823</td>
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<td>1.558</td>
<td>3.635</td>
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<td>1.619</td>
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<td>0.749</td>
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<td>0.993</td>
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<td>0.497</td>
</tr>
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<td>2.295</td>
<td>1.888</td>
<td>2.843</td>
<td>1.724*</td>
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<td>1.121</td>
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* Significant at 5 percent level.
### TABLE - 5.21

PARAMETER ESTIMATES AND RELATED STATISTICS OF THE INTERDEPENDENT LINEAR CONSUMPTION FUNCTION FOR RURAL ORISSA BY GROUPS OF COMMODITIES

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<th>( \hat{\beta}_2 )</th>
<th>( \eta_1 )</th>
<th>( \eta_2 )</th>
<th>( R^2 )</th>
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cont...
11. Total Food (1-10)  
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12. Pan, Tobacco & Intoxicants  
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13. Clothing  
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14. Other Non-Food Items  
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15. Non-Food Total (12-14)  
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Figures within (...) indicate standard errors of estimates.  
Figures within [ ] indicate t-values.  
\* Not significant at 5 percent level. All other estimates are significant.