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# INCOME AND ECONOMIES OF SCALE EFFECT ON HOUSEHOLD FOOD DEMAND PATTERN IN PAKISTAN USING PSLM DATA

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## ABSTRACT

*The study evaluates the household food demand patters for various income groups in Pakistan namely: The Lower Income Group(≤ 5000), Lower-middle Income Group(5001-10000), Middle Income Group(10001-15000), Upper-middle Income Group (15001-20000) and Upper Income Group (20001+), respectively. The study uses Pakistan Social and Living Standard Measurement Survey (PSLM) 2007-08, data conducted by the Federal Bureau of Statistics (FBS), Government of Pakistan, Islamabad. The food expenditures are the sum of expenditures by each household on the following commodity groups: cereals, pulses, fruits, vegetables, dairy products, chicken, meat, fish, condiments, sugar, edible oils, drinks and miscellaneous food products. The household size and income elasticities are estimated to explain the food consumption trends in Pakistan. The results of the study indicate that all the income and household size elasticities are positive and significant at one percent level of significance. Results of the study indicate that food income elasticity is the highest (0.896) for the Lower-Middle Income Group and the same is the lowest (0.706) for Upper Income Group. Similarly, household size elasticity is the highest (0.171) for the Upper Income Group and the same is the lowest (0.057) for Lower Income Group.*

**Key Words:** Households, Income Groups, PSLM, Income Elasticities, Size Elasticities.

## INTRODUCTION

Household demand is a combination of two important components household and demand. The household is defined as the person or a group of persons living in the same dwelling (Sheffrin, 2003). This is basically the fundamental residential unit in which economic production; consumption, inheritance, child rearing, and shelter are organized and carried out by all members. According to household surveys, household consists of persons who share kitchen. A household may be either a solitary being or a multi-person household.

On the other hand the demand refers to the ability and willingness of individuals to buy a particular quantity of a good or a service at a specific price during a given time period (Chaudhary, 2005). This is basically the consumption of various types of goods and services by the members of a family in the society which is helpful for them to provide physical and psychological well-being and satisfaction. Consumption of various goods and services is the reflection of household expenditure pattern which are largely influenced by household composition, needs, taste and financial means. Everybody directs his highest interest to the continuous satisfaction of those wants that stem directly from his human nature, to the expansion of these wants and also to the attainment of the necessary ways to satisfy the higher expanded wants. Economists use the concept of utility to define the level of satisfaction or welfare that comes from a specific allocation of income among different products.

The progress and development of any economy is related with the consumption in a way that it measures the welfare of the people who are making expenditure on the purchase of various consumption heads. Then again, it is helpful in the extension of business activities because the entire investment set up is dependent upon the consumption pattern in the country. Due to the importance of consumption in the economic theory, a number of researcher have carried out research on household deeds in Pakistan and in other countries ranging from its simplest form to very complicated by using different types of data and variety of econometrics techniques.

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Engel's law (1857) states that as income increases the consumer's spending upon food is decreased. It also implies that the income elasticity of food demand lies between zero and one. It means that increase in expenditures on food item by the consumers is less than the increase in income of the consumers (Timmer et al., 1983). A number of studies are accomplished both for developed and developing countries that confirm the Engel's law regarding the household's behavior evaluation. The validity of the Engel's law regarding the consumption patterns of the household have been tested by research studies. Western households in the United States consume less food energy, protein, iron, thiamin and niacin but more calcium and vitamin A as compare to Southern households and household consumption of vitamin A, vitamin C, and calcium is largely affected by income (Nayga, 1994).

Functional description of Engel's Law is known as Engel curve which describes that how household expenditure on a particular good or a service varies with change in total income or expenditure. Budget share Engel curves depict how the share of household expenditures on a specific good or service changes with variation in income (Chai & Moneta, 2010a). Engel curve of a commodity reflects its income elasticity and indicates whether a particular good is an inferior, normal or a luxury good (Chai & Moneta, 2010b). No established theory subsists that could explain the pragmatic shape of Engel curves and their associated income elasticity values. Ernst Engel himself argues that households have a hierarchy of wants that determines the shape of Engel curves. As household income rises, some incentives become more prominent as far as household expenditures are concerned that dominates consumption patterns such as starvation, ultimately become satisfied at higher income levels (Witt, 2001).

The specific objectives of the present study are numerous. First is to determine the household food demand pattern among different income groups. Second is to measure the economies of scale effect in household consumption by including the household size as an explanatory variable in Engel curve equation. Third is to estimate Engel elasticities and finally to suggest some policies.

The remaining part of paper is organized as follows: The review of literature is presented in section 2. The description of data is given in section 3. Section 4 describes methodology. Results and discussion are presented in section 5. Concluding remarks are given in section 6.

## LITERATURE REVIEW

The review of literature is helpful to obtain the base and in depth evaluation of proficient knowledge and understanding of previous research studies related to household consumption trends that have been conducted so far both nationally as well as at internationally. This section reviews the theoretical as well as empirical literature on the analysis of household demand system.

Nayga (1994) investigates the impact of household socioeconomic and demographic characteristics upon the consumption of 10 food nutrients in the United States. Ordinary Least Square (OLS) regression is employed to make the consumption analysis of vitamin A while the demand pattern for remaining nutrients is evaluated by employing Weighted Least Square (WLS) technique. The impact of socio-demographic factors on the household demand pattern is statistically significant. It is further observed that Western households consume less food energy, protein, iron, thiamin and niacin but more calcium and vitamin A as compared to Southern households. Household consumption of vitamin A, vitamin C, and calcium is largely affected by income and income elasticities are relatively small for poor as compared to rich households.

Holcomb et al. (1995) study the household expenditure pattern of total food consumption at home (FAH) and food away from home (FAFH) in the United States. The Engel's law is verified by employing four estimation techniques namely: the Working-Leser Model, Semi-Logarithmic Model, Double-Logarithmic Model and Quadratic Expenditure Model. The parameter estimates of weekly income for total food, food at home and food away from home are negative and statistically significant in Working-Leser form while are positive and statistically significant in semi logarithmic, double logarithmic and quadratic functional practices, respectively. In all expenditure categories, the income elasticities are less than one for each empirical form that confirms the accuracy of Engel's law. The consumption of food away from home is largely affected by income than the consumption of food at home. All the household size elasticities are positive and are comparatively higher for FAH rather than FAFH.

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Byrne and Capps (1996) conduct the consumption analysis for food away from home for the United States households. The impact of various socioeconomic and demographic variables is also determined and marginal effects and elasticities are estimated by adopting the inverse Mill's ratio and Probit model techniques. It is found that income is positively related with the household food consumption away from the home. The trend of food consumption away from home is most common in the Midwest and South as compared to the Northeast. Households belonging to White group are more likely to consume food away from home as compared to the Black households. Most of the expenditure elasticities are positive and less than unity.

Salvanes and Devoretz (1997) determine the household demand pattern for fish and meat products in Canada. The impact of household demographic characteristics is also determined and the separability test of meat and fish commodities are conducted, using three demand models namely Model-1, Model-2 and Model-3. Four commodity groups are included in Model-I. Model-2 and Model-3 have six commodity groups and eight commodity groups, respectively. These demand models are estimated by using the Linear Approximation of An Almost Ideal Demand System (LA/AIDS). All the own price elasticities are found to be negative while the cross price elasticities are positive. Similarly, all the expenditure and cross price effects are significant at one percent level of significance.

Farooq et al. (1999) discuss the farm household's response in terms of their consumption of six food items to changes in prices of food, income and the age composition of the household in Punjab Pakistan. Linear Expenditure System, An Almost Ideal Demand System (AIDS) and Complete Demand System are used for the estimation purpose. It is observed that paddy and wheat are gross complements; pulses and meat are gross substitutes, dairy products and meat are luxuries and all own price elasticities are negative and significant.

Ozer (2003) estimates the household demand pattern of six major food groups in Turkey. The Linear Expenditure System (LES) is used to estimate the price and expenditure elasticities. The demand pattern is found to be expenditure elastic for meat, fish, poultry, tobacco, liquors and beverages while expenditure inelastic for the remaining food groups and all the expenditure elasticities are found to be positive. The uncompensated cross-price elasticities show that bread and cereals are gross complement while the compensated cross-price elasticities show that all the food groups are net substitutes. The income-compensated own-price elasticities are lower in absolute terms as compared to uncompensated price elasticities. Cross price elasticities are low as compared to own price elasticities indicating that consumers are more sensitive to changes in own-prices of food items.

Babar and Shahnawaz (2010a) explain the changes in consumer's preference for meat group and their per capita consumption by using the Linear Approximation of An Almost Ideal Demand System (LA/AIDS) in Pakistan. All the own price, cross price and expenditure elasticities are significant and reasonable in magnitude. The uncompensated own price elasticities are negative for beef, chicken and fish and are positive for mutton. The expenditure elasticities of meat components are positive and less than unity and are comparatively higher for fish as compared to other meat items. It is also observed that beef & mutton; beef & chicken and beef & fish are substitutes while the mutton & fish and chicken & fish are complements due to the own and cross price substitution effects between them, respectively.

Manzoor et al. (2011) analyze the impact of inflation on the household consumption pattern of 11 food and nonfood items in Pakistan. It is concluded that household expenditures on food items increase with the increase in price level and the same lowers their access to basic social facilities and luxuries. The overall household consumption behavior is significantly affected by the current inflation situation.

## DATA

The data for this study is drawn from the Pakistan Social and Living Standards Measurement (PSLM) Survey 2007-08, conducted by the Federal Bureau of Statistics (FBS), Government of Pakistan, Islamabad. It is based upon two-stage stratified sampling design. This survey, based on a national sample, covers the universe consisting of all urban and rural areas of the four provinces of Pakistan apart from forces restricted areas. This study uses a sample of 15495 households out of total 15512 households covered by the PSLM 2007-08 due to unreported and missing values for 17 households.

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The expenditures in the form of only paid consumption are used for computation because the goal of study is to compare consumption patterns within various earning sets. The food consumption groups are as: cereals, pulses, fruits, vegetables, dairy products, chicken, meat, fish, condiments, sugar, edible oils, drinks and miscellaneous food products. Frequency of food items data in PSLM 2007-08 is of two types i.e. fortnightly and monthly. The 14 days data is first converted into monthly information and then both of these groups are joined to make the household total food consumption during the month. Thus the dependent variable is the natural log of the monthly expenditures on food items.

The total household expenditures are used as a proxy for income as an explanatory variable because of the fact that income data generally suffers from measurement errors and may also include a transitory component of income (Burney & Khan, 1991). The use of total expenditures instead of income is a common practice in Engel curves estimation because the expenditures mostly reflect the permanent income of the households. Household total expenditures and household size are computed in the form of natural log and then are used as an explanatory variable in this regression analysis. Household size indicates the numbers of persons living in the single house. This variable is computed in the natural log form of total family size of the household. Having certain advantages, the family size is used as a separate independent variable. The same is valuable to directly determine the economies of scale effect, avoids the loss of information problem and gives more efficient results regarding the household members (Malik & Sarwar, 1993).

**Table 1: Households Distribution among Different Income Groups**

| Income Groups (Monthly Income) | Number of Households | Percentage of Households |
|---|---|---|
| ≤ 5000 (Lower IG) | 3577 | 23.08 |
| 5001-10000 (Lower-Middle IG) | 6095 | 39.34 |
| 10001-15000 (Middle IG) | 2683 | 17.32 |
| 15001-20000 (Upper-Middle IG) | 1217 | 7.85 |
| 20001+ (Upper IG) | 1923 | 12.41 |
| Total | 15495 | 100 |

IG = Income group
Source: Author's Calculations using PSLM 2007-08 data.

In order to determine the food demand pattern and to make the consumption comparison; households are divided into five income groups. Table 1 shows the household distribution with respect to different income groups at the national level, measured in Pakistani Rupee. Income groups include: The Lower Income Group (≤ 5000), Lower-middle Income Group(5001-10000), Middle Income Group(10001-15000), Upper-middle Income Group (15001-20000) and Upper Income Group (20001+), respectively.

## METHODOLOGY

For computing income elasticities, the method of Ordinary Least Squares (OLS) is used on the basis of both common practice as well as convenience. The cross section data is based on the assumption that all the households face the same prices for every commodity so it is difficult to capture the impact of price variation on consumption pattern. The price effects can be determined by using the unit values, calculated as the expenditures of consumption items divided by the quantities of items used as a proxy for prices (Tokoyama et al., 2002). The economic theory of consumer behavior is based upon the assumption that consumer attempts to maximize the utility of goods and services subject to the given budget constraint. Consumption of various commodities are usually taken in terms of expenditure rather than quantities in the Engel's curve approximation because the expenditure takes much care of

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the quantity and the quality of the goods consumed to confiscate the problem of aggregation of heterogeneous items (Burney & Khan, 1991). It is further assumed for cross sectional data that all the households face identical prices for all commodities. So the Engel curve equation can be written as:

$$E_i = \alpha_i + \beta_i Y + \mu_i \qquad (1)$$

Where $E_i$ is quantity demanded or expenditure on ith consumption head by ith household, $Y$ is total income of the household, $\alpha$ and β are the unknown parameters to be estimated and $\mu_i$ is stochastic error term.

The choice of an appropriate functional form in estimating the Engel's curve has been a matter of great interest. There are so many functional forms that are used to estimate the Engel curves but yet no single form found its general acceptance (Islam and Siwar, 2005). Thus by incorporating total expenditure and household size as explanatory variables in Engel curve equation and taking the natural log the functional form gives as follows:

$$\ln F_i = \alpha_i + \beta_i \ln E_i + \gamma_i \ln HS_i + \mu_i \qquad (2)$$

Where

$F_i$ is food expenditure by ith household, $E_i$ is total expenditure by ith household, $HS_i$ is household size and $\mu_i$ is the stochastic error term.

## RESULTS AND DISCUSSION

The computed food expenditure elasticities at national level are given in Table 2.

**Table 2: Food Income Elasticities by Different Income Groups**

| Income Groups | Total Expenditures Ln (TE) |
|---|---|
| Overall | 0.778* |
| Lower IG | 0.876* |
| Lower-Middle IG | 0.896* |
| Middle IG | 0.840* |
| Upper-Middle IG | 0.814* |
| Upper IG | 0.706* |

IG = Income Group.
Dependent variable: Natural log of monthly food consumption expenditures (LnF).
* Imply that the coefficients are significant at 1% Level.

All the expenditure elasticities are less than one and significant at one percent level of significance implying that all food items include in the analysis are necessities in the whole computation. Table 2 shows that food income elasticity is the highest (0.896) for the Lower-Middle income group and the same is the lowest (0.706) for Upper income group. Overall analysis shows that the food consumption initially increases with increase in income but gradually declines for higher income groups.

The expenditure elasticities show a little cyclical trend of elasticities in different income groups. The reasoning for this pattern may be explained in terms of quantitative as well as qualitative changes in terms of consumption basket. For a given quality of a commodity, the immediate concern of a household is to consume the commodity up to a certain minimum desired level. If the household are not consuming the said commodity in the desired minimum amount then the expenditure on that commodity increase with the increased level of income. Once the desired quantity is achieved the expenditure on that commodity decline with increase in income. As income continue to increase the

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household switch to a better quality of products thus expenditures starts increasing again. This pattern is repeated as income continues to increase.

The household size is used also as an explanatory variable in order to investigate the economies of scale effect in the food demand pattern for various income groups. The computed household size elasticities at national level are given in Table 3. Table 3 shows that household size elasticity is the highest (0.171) for the upper income group and the same is the lowest (0.057) for lower income group. Economies of scale effect may occur because the public goods within the household can be shared and the same serve their function without needing to be replicated in relation to the number of individuals within the household. Larger households may receive quantity discounts because they buy larger quantities. The size elasticities are also significant at one percent level and depict the specific effect in the food demand patterns analysis.

**Table 3: Household Size Elasticities of Food by Different Income Groups**

| Income Groups | Household size Ln (HS) |
|---|---|
| Overall | 0.127* |
| Lower IG | 0.057* |
| Lower-Middle IG | 0.075* |
| Middle IG | 0.144* |
| Upper-Middle IG | 0.147* |
| Upper IG | 0.171* |

IG = Income Group.
Dependent variable: Natural log of monthly food consumption expenditures (LnF).
* Imply that the coefficients are significant at 1% Level.

## CONCLUDING REMARKS

The study evaluates the double logarithmic analysis to determine the household food demand pattern in Pakistan. The data for this purpose is drawn from Pakistan Social and Living Standards Measurement Survey (2007-08). The households are divided into five income groups. All the coefficients of income and household size elasticities are positive and significant at one percent level of significance. The legitimacy of Engel's law is verified because the proportion of food consumption is lower as compared to income. The household size analysis confirms the existence of economies of scale for food consumption among numerous income classifications. The planning for future increase in food supply is mostly dependent upon accurate prediction of future demand. As the estimates presented in this study are based on recent household level data, so they are much beneficial to predict the true consumption pattern accurately. In particular, income specific estimates are helpful to provide a better understanding of changes in food consumption pattern by enabling policy makers to focus on households in different income groups.

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