ESTIMATING ENGEL CURVE FOR FOOD IN GHANA (1991-2013)

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DECLARATION

This is to certify that this thesis is the result of research undertaken by Nadiatu Issaka, towards the award of a Master of Philosophy (MPhil.) degree in Economics in the Department of Economics, University of Ghana. I hereby declare that with the exception of references made to the works of others, which have been duly acknowledged, this thesis is entirely my own work under the guidance of my supervisors and neither part nor whole of it has been presented for another degree anywhere.

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ABSTRACT

The study examines the nature of food Engel curve using total expenditure as a proxy for income. The Working-leser and the quadratic specifications of Engel's model are employed and modified to include certain demographic characteristics of households. The study uses secondary data from the last four rounds of the Ghana Living Standard Survey.

Results from the study show a significant relationship between budget share of food and total expenditure. The budget share of food also varies across the country. The estimates for the last four rounds of the Ghana Living Standard Survey shows that households living in rural areas have larger budget share of food than those in urban areas. Using income as instrument in correcting the problem of endogeneity, in addition to other instruments, the estimates from the augmented regressions suggest that income is significant in examining the budget share of food with respect to total expenditure.

Using the goodness of fit, the quadratic specification has a better fit for the last four rounds of the Ghana Living Standard Survey data than the Working-leser specification. The Working-Leser model estimates give larger elasticities of food with respect to total expenditure than the quadratic model. The estimates for elasticity of food with respect to total expenditure for all four rounds were less than unity for both the Working-Leser and quadratic models.

DEDICATION

This thesis is dedicated to my family, especially my mum, friends, lecturers and colleagues who encouraged and supported me in varied ways throughout my academic pursuit.

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LIST OF ABBREVIATIONS

Acronym	Meaning
GLSS	Ghana Living Standard Survey
GSS	Ghana Statistical Service
IV	Instrumental Variable
OLS	Ordinary Least Square
FAO	Food and Agriculture Organization
SSA	Sub-Saharan Africa
LAD	Least Absolute Deviations regressions

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CHAPTER ONE

INTRODUCTION

1.1 Background

In developing countries, detailed knowledge of the relationship between expenditure shares and total household expenditure plays a significant role in household welfare analysis. Food and nutritional programs, poverty reduction strategies as well as tax reforms, all require information on how expenditure share respond to changes in household total expenditure for effective formulation and implementation. Knowledge of how expenditure shares respond to changes in household total expenditure, however, is often ascertained through Engel curve analysis. Engel curves as noted in Girma and Kedir (2007) describe the relationship between household expenditure on particular items and household total expenditure. The most studied Engel curve is food Engel curve which describes how food expenditure increases as total expenditure increases. Such studies often show that household food consumption increases less than proportionally with income, and food expenditure as a share of total expenditure decreases as income increases (Girma and Kedir, 2007; Banks et al., 1997; Deaton and Muellbauer, 1980; Engel, 1857). This relationship is known as the Engel's law.

For a developing country such as Ghana, knowledge of food Engel curve is important for a number of reasons. First, food Engel curve is important in welfare analysis. For poorer household food expenditure share is high but it decreases as the household income increases. Therefore, high food expenditure share can be used as indicator of poverty levels while decreases in food share can be associated with rising incomes. Second, since food Engel curve shows the relationship between food share and income, it can be used to predict how food

expenditure will change as income changes. These predictions can be used to simulate the impact of tax policies on consumers as well as the local economy. The food Engel curve reveals important information about aspects of consumer behavior which has relevant policy implications (Deaton and Muelbauer 1980). For instance, food Engel curve may indicate proportionately the burden of tax imposed on food items consumed by the poor. Third, aside from it (food Engel curve) showing how food share responds to changes in income, the food Engel curve also reveals the income elasticity of food and thus, shows if food is a normal good, inferior good or luxury good.

Despite the above benefits, estimating food Engel curves (particularly in developing countries) is often fraught with a number of challenges. One of such is the appropriate functional specification to assume for the relationship between food expenditure share and total income, for instance whether to use a linear or non-linear specification. Earlier studies such as Deaton and Muellbauer (1980) and Leser (1963) used the Working-Leser specification in which expenditure shares are assumed to be linear functions of total income. However, studies such as Girma and Kedir (2007), Banks et al (1997), Hausman et al. (1995) and Gozalo (1997) have shown that food expenditure share can be non-linearly related to total income. Given the benefits of food Engel curves, it is important that the right specification is used in food Engel curves analysis hence the objective of this thesis is to estimate both linear and non-linear food Engel curve for Ghana in order to ascertain the right specification that best fits for Ghana. It uses four rounds of the Ghana Living Standard Survey (GLSS 3, 4, 5 and 6) and compares the relationship across survey periods.

Another challenge with food Engel curves analysis is that household expenditure captured in most expenditure surveys is often associated with measurement error. This is because

expenditure on an item captured in an expenditure survey consists of both cash expenditure and own consumption. While cash expenditure is already monetized, own consumption is often imputed using different set of prices. This imputation in the calculation of expenditures adds an additional layer of error to standard reporting errors made by respondents and interviewers. This type of error has serious consequences in the estimation of food Engel curves particularly when estimation employs share form equations (Lewbel 1996). To correct for this measurement error, the thesis uses the augmented regression approach of Hausman (1978) and Blundell & Robin (1999).

1.2 Statement of problem

As noted earlier, food Engel curve is important tool in understanding household welfare analysis because they provide an insight into the relationship between food consumption and household total expenditure. However, getting the expenditure share of food and total expenditure relationship right is contingent on using the right specification in estimation. Different specifications have been employed in many studies, but the result for the linear and non-linear estimations have not been the same in most cases. Although a number of studies on the food Engel curve have been done for other African countries, studies on Ghana is, however, limited. The few studies on Ghana have assumed either linear relationship or non-linear relationship between expenditure share of food and total expenditure. This approach may lead to bias estimates particularly when the data does not support the assumed specification. As far as this study is concerned no study on Ghana has compared both the linear and non-linear specification to establish which best fit the Ghanaian data.

To fill this gap in the literature the study estimates the two most common functional specifications employed in the literature: the Working-Leser form popularised by Deaton and

Muellbauer (1980) and the quadratic version of this model introduced by Banks et al. (1997). This will afford us the opportunity to compare the two functional specifications and determine the appropriate functional specification for food Engel curve for Ghana. Such information will play a significant role in policy formulation. This study is unique in two ways. First, the study does not only estimate functional specification for food Engel curve, but it also compares food Engel curve across periods to ascertain whether Food Engel curves have been changing over time. As far as we are concern this is the first study in Ghana to have done that. Second, the study explicitly correct the measurement error associated with total expenditure; most studies are silent on it.

1.3 Research Questions

In line with the above problem statement, the thesis seeks to answer three main research questions.

a. Which of the two functional specifications of food Engel curve (that is, the Working-Leser model or the quadratic model) best fit the Ghana Living Standard Survey (GLSS) data?
b. Is this functional specification the same for all survey periods? If not, what explains the differences in specification across survey periods?
c. What has been the nature of food consumption patterns in Ghana between 1990 and 2013?

1.4 Research Objectives

The study seeks to broadly determine the nature of food Engel curve for Ghana from 1990-2013 using the GLSS. Specifically, the objectives of the study are:

a. To determine the functional specification of food Engel curve for Ghana using the Working-Leser and the quadratic functional forms and determining the best functional form for Ghana using the last four rounds of the GLSS.
b. To analyze food consumption patterns in Ghana using the last four rounds of the GLSS.

1.5 Significance of the study

The study seeks to contribute to ongoing discussions on the relevance of Engel curve estimation by focusing on a country-specific study which is the case of Ghana. The determination of the appropriate functional form and the correct nature of the food Engel curve for Ghana will guide the formulation of policies to promote the welfare of the poor and also help in the attainment of the Sustainable Development Goals one and two of no poverty and zero hunger respectively.. It will enable welfare assessments of households which is an important tool for tax policy. Thus, the study will help to improve the design of public policies that aim to shield the poor from the adverse effects of income shocks.

1.6 Data

The study will employ the Ghana Living Standard Survey (GLSS) in its analysis. GLSS is a nationally representative household survey, conducted by the Ghana Statistical Service (GSS), which provides reliable, disaggregated and internationally comparable welfare and living conditions statistics in Ghana. The survey provides detailed information on demographic characteristics of the population, education, health, employment, migration, housing conditions, household incomes, expenditure and agriculture. The variables of focus for this study will be the expenditure on food by households and the total expenditure by these households. The study will employ the last four rounds of the GLSS i.e. GLSS 3, 4, 5 and 6.

1.7 Organization of the study

The study will be in six (6) chapters. Chapter one deals with the introduction of the study, focusing on the background of the study, the statement of the problem, objective of the study and significance of the study. Chapter two reviews both theoretical and empirical literature. Chapter three covers the overview and trends of food consumption and total consumption of households in Ghana. Chapter four presents the methodology used for the study. Chapter five involves the estimation and empirical analysis of the results whilst chapter six summarises, concludes and makes policy recommendations from the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter deals with both the theoretical and empirical literature that pertains to Engel curve estimation. The theoretical framework on which the study is built is examined as well as other empirical findings by authors within the scope of the study. The chapter ends with a summary on the theoretical and empirical literature.

2.2 Theoretical Review

The demand of a commodity by a consumer is expressed as a function of the consumer's income and market prices. This is represented mathematically as:

$Q = q(y, p)$

Where q is the vector of quantities, P is vector of prices and Y is income. It is assumed prices are constant across all commodities and as such

$q_i = q(y)$

Thus, demand becomes a function of the consumer's income alone. The above relationship represents the Engel curve of a consumer. The function is homogenous of degree zero. This function was then extended to include certain demographic variables. That is to say $qi = q(y, z)$, where qi is the quantity consumed of good i, y is income, total expenditure or wealth and z is a vector of demographic characteristics such as household composition and age of the consumer. Engel curves are said to be Marshallian demand functions when the prices of all commodities are held constant.

A number of functional forms of Engel curves have been established by some Economists over the years. This study will look at the functional forms that are widely used. Allen and Bowley (1935) estimated a linear Engel curve of the form $v_i = \alpha_i + \beta_i M + \boldsymbol{\varepsilon}_i$. Where v is the expenditure on the ith commodity, M is total expenditure of the consumer and α and **β** are parameters to be estimated and **ε** is an error term. This model satisfies the additive property of demand theory. The model is easy to compute and also valid at high income levels. Allen and Bowley's specification was criticized for its inability to remain valid at low income levels. The model suggests that the demand for necessities will increase as income increases which may not be the case for some necessities. The model does not always have a good fit for household data.

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Houthakker (1957) also estimated the constant elasticity function which was adjusted for additivity. This model has proven to be valid for all income levels and it maintains a constant difference between elasticities (Leser, 1963). The estimates of income elasticities with this model depend on how the model is specified. Changing the groupings will change the estimated elasticities at any point in time. Observations with zero units cannot be included in this model as it distorts the figures for the estimated variables. Al-Habashneh and Al-Majali (2014) noted that this functional form does not satisfy the additive property of the demand theory.

Prais and Honthakker (1955) also estimated a semi-logarithmic form of the Engel curve. This functional form has been used in most food Engel curve analysis because of its ability to estimate a commodity as luxury at low income levels and then necessity when income rises.

Thomas (1987) stated that the semi-logarithmic form of the Engel curve does not satisfy the additive property of the demand theory.

The Working-Leser functional form was estimated by Working (1943) and Leser (1963). The Working-Leser specifies the share of food as a linear function of the logarithm of total expenditure. The functional form is specified as $w_i = \alpha_i + \beta_i \log X + \boldsymbol{\varepsilon}_i$, where w_i is the budget share of food, X is total expenditure and $\boldsymbol{\varepsilon}$ is an error term. α and $\boldsymbol{\beta}$ are parameters to be estimated. The Working-Leser specification with zero observations does not distort estimated elasticities as is the case in some specifications (Houthakker, 1955). The Working-Leser specification becomes invalid at extreme levels of income or total expenditure. The income elasticity is estimated as $1 + {}^{\beta_i}/_{w_i}$.

The quadratic model, proposed by Bank et al (1997) on the other hand specifies the share of food as a quadratic function of total expenditure. The functional form is specified as $w_i = \alpha_i + \beta_i \log X + \theta_i log X^2 + \boldsymbol{\varepsilon}_i$, where w_i is the budget share of food, X is total expenditure, X^2 is total expenditure squared and $\boldsymbol{\varepsilon}$ is an error term. α, $\boldsymbol{\beta}$ and $\boldsymbol{\theta}$ are parameters to be estimated. This model allows for the study of a commodity as it moves from being a necessity to being a luxury.

The hyperbolic functional form of the Engel curve is also specified as $v_i = a_i + (\frac{\beta_i}{M}) + U_i$. The log-reciprocal form of Engel curve is estimated as $\log v_i = a_i + (\frac{\beta_i}{M}) + U_i$. Both forms have logistic forms although they pass through the origin. This model satisfies the additivity property of the demand model and is suitable for variables with zero observations.

One can tell the nature of the commodity under consideration based on the estimated income elasticity of the good. A good that has income elasticity below zero is an inferior good, while a good that has income elasticity between zero and one is a necessity and that with income elasticity above one is a luxury good. Engel's estimation using the Belgium survey found food to be a necessity. The income group under consideration at any point in time may affect the nature of a good. A commodity that appears as a necessity for the non-poor may appear as luxury for the poor.

2.3 Empirical Review

This section examines various empirical works on functional forms of Engel curves and elasticities. Different authors have employed different functional forms in examining food Engel curves for both developing and developed countries. While some used total expenditure as their independent variables, others used the income of household as their independent variable. In all cases, the food elasticity with respect to income or total expenditure was found to be less than unity irrespective of the functional form of Engel curve employed in the study.

Liviatan (1961) employed the instrumental variable approach in determining the Engel curve, using recorded income as the instrumental variable for Israel using data from the Survey of Family Expenditures for 1956-1957 which covered 6600 wage-earning families. The study found biases in its estimates when other explanatory variables were added to total expenditure. These biases were controlled using number of persons in a household as both an independent variable and an instrumental variable in addition to income, in a linear model and estimated using Ordinary Least Square regression.

Hasan (2016) assessed Engel curves for the main groups of expenditure using the Household Income and Expenditure Survey (HEIS) for 2010 for Bangladesh. The groups of expenditure employed in the study were food, clothing, footwear and cosmetics, transport, education, medical and other expenditure. He found Engel curves with quadratic nature for expenditures on food and some other commodities. The study controlled for endogeneity in total expenditure using income as an instrument. He established from his study that as household incomes in Bangladesh increased expenditure on protein and non-home-made food increased more rapidly which resulted in the quadratic food Engel curve.

Seale et al (2012) analyzed the income elasticity of food consumption in Beijing for nine groups of food. They realized that the Working's model fitted their data well. Their result showed a relatively large range in income elasticity among the categories of food. They found out that all expenditures for the food groups that were not conditional were inelastic in all classes of expenditures of food, except 9 of the 35 food items they employed that became inferior goods when they were estimated at the higher classes of food expenditure.

Al-Habashneh and Al-Majali (2014) estimated the Engel curve for Jordan using six functional forms, which fitted their data well, on nine groups of commodities. They concluded from their study that family size did not affect per-capita consumption. They also found that family size did not affect the expenditure on vice, housing, transportation and Health and the consumption of most commodity groups were not the same in the urban and rural sectors. The demand for food, vice and health were found to be inelastic with respect to total expenditure, thus,

implying they were necessities whiles personal care, transportation, housing and miscellaneous commodity group appeared as luxuries with elastic demand.

Betti (2000) used the Italian Household Budget Survey from 1985 to 1994 in his study to find out the appropriate demand system for Italy employing demand rank tests and non-parametric regression on seven broad groups of consumer goods. He found quadratic demand systems to be the most appropriate for Italy. Kedir and Girma (2007) also estimated a quadratic food Engel using the 1994 Ethiopian Urban Household Budget Survey, employing the instrumental variable estimation approach. They used the log and log square of income, the gender of the head of household and regional dummies as their instrumental variables. The findings of their study rejected the linear Working-Leser model for food and instead established that the food Engel curve for food for Ethiopia was quadratic and had an inverted U shape.

Okunade (1985) studied the relationship between total income and household consumption for Ghana, Kenya, Malawi, Sudan, Tanzania and Uganda using seven classes of expenditure. The study estimated a mean income elasticity of expenditure on food to be approximately 0.57. He found that the inverse semi-log was the best fit for studying the Engel relationship for all countries except for Tanzania, which could be attributed to insufficient data.

Houthakker (1957) looked at the elasticities of food, clothing, housing and miscellaneous with respect to total household expenditure and family size for 30 countries. The study noted that these elasticities were comparable though not the same. He estimated the elasticity of food with respect to total expenditure for all countries to be less than one with Poland having the highest

elasticity of 0.731 and British having the least elasticity of 0.344. Thus, food was found to be a necessity in all the countries under the study. Prais and Houthakker (1955) also employed a number of functional forms in estimating expenditure data on necessities and luxuries for British and concluded that the semi-logarithmic form was most appropriate for necessities while the double logarithmic form was the appropriate for luxury expenditure.

Hymans and Shapiro (1975) conducted a study on the determinants of household expenditure on food on 5000 households in the United States. They estimated an income elasticity of food of 0.5 for the low income households and 0.3 for the high income households. The study found that programs that were meant to support the income of the poor increased the quality of food consumption though it had very little effect on the income elasticity of food consumption.

Yatchew et al (2003) applied the Pendakur semi-parametric specification in a partial linear index model framework to the 1993 South African Living standards Survey. The study found that food share on income rose as the number of people in the family increased for any given level of expenditure. The Engel curve for food was found to be downward sloping.

Abdulai et al (1999) estimated a complete demand system for India using their household survey and found the Working-Lesser model inappropriate for food consumption pattern. The study noted that all food groups had elasticity between zero and one making them necessities.

Aor (2009) employed nine functional forms on 1419 household data from Turkey and the study found food and clothing to be necessities since their income elasticities were less than unity.

Çağlayan and Astar (2012) estimated the income elasticities using Engel curves and data from the 2009 Turkish household budget survey with emphasis on food and clothing expenditures. The study employed the Least Absolute Deviation (LAD), M and the Least Trimmed Squares in addition to Ordinary Least Square (OLS) in finding the regression estimates for the two commodities using nine different functional forms. RESET test was conducted on the models and the log-log model was found to be the most appropriate specification for the food and clothing expenditure. The elasticity of food expenditure was found to be 0.33 using LAD, 0.34 using M and LTS and that of clothing was 0.76 using LAD, 0.73 using M and 0.78 using LTS. Thus, food expenditure and clothing expenditure were both found to be necessities in all the regression models.

Banks et al (1997) used data from the United Kingdom Family Expenditure Survey (FES) for 1970 to 1986 to examine the appropriate functional specification and Engel curve for food, fuel, clothing and alcohol. The linear Working-Lesser model was found to be most appropriate for food whiles the other expenditures were best fitted by the quadratic models. The study also noted that both poor and non-poor households may have the same budget share for food, fuel, clothing and alcohol.

Wan (1996) employed the Working-Lesser Model on a panel data from China in estimating the Engel curve for a number of commodities. The study concluded that vegetables, poultry, beef, pork and lamp had income elasticities which were above unity and as such these goods were

classified as luxury goods while cereals and other foods whose elasticities were estimated to be between zero and one were classified as necessities.

Kebede (2000) assessed a Quadratic Almost Ideal Demand System (QUAIDS) in his study of the apportioning of resources within households in rural Ethiopia. The study suggests that the proportion of household earnings spent on food rises as the earnings of household rises. This observation was explained by the assertion that most households in rural Ethiopia were earning incomes that were just enough to cater for food.

Baudish (2006) estimated the budget share of the United States on footwear and found footwear to be a necessity in the United States. However, he found the budget share on footwear to be increasing after the 1970s which he attributed to the continuous inventiveness of the producers of footwear in the United States. Consumers were willing to buy new designs of footwear as their income increased.

Kaus (2013) examined the income elasticity of twelve groups of expenditure for over fifty countries over a period of fifty years. The study employed a nonparametric regression model in exploring the extent of change in these expenditure groups as income increased. The study found food to be a necessity in all countries. The elasticity of a commodity will often depend on the category of income the household fall within.

Ndanshau (2001) examined the Engel's law on six expenditure commodities in three agricultural dominated districts in northern Tanzania. The study employed a log-linear

regression model in estimating the elasticities. Among the findings of the study were that food, as well as cooking oil, wood fuel, clothes and medical charges, were necessities since their income elasticities were less than one. Utensils on the other hand had income elasticity greater than one, making it a luxury good.

Salathe (1979) looked at the effect of fifteen functional forms of Engel curves on the income elasticities in USA on seven expenditure groups; dairy products(excluding butter), flour and cereals, beef and pork, fruits, vegetables, fats and oils, and total food consumed at home. The double-logarithmic functional form was the best fit for the data though it did not fit too well for flour and cereals good which appeared to be inferior goods. The study noted that the functional form used in the estimation of Engel curves affected the income elasticities estimated.

Hymans and Shapiro (1975) also studied the relationship between changes in income and food consumption in USA using a five-year household data set from the Survey Research Center at the University of Michigan (1974). The study concluded that the logarithmic model was a better fit than the linear model employed in the study. The incomes from food subsidy programs were found to have very little effect of the income elasticity of food consumption.

Ahçıhoca and Ertek (2000) examined the consumption pattern for North Cyprus using data of 300 households they collected by means of a consumer expenditure survey from four cities in April 1997. They employed the Working-Leser form, semi-logarithmic form, double-logarithmic form and the linear form of Engel curve estimations on food expenditure and some other groups of expenditure. The Working-Leser form was found to be the most appropriate for

the data set. The estimations from the study showed that food, rent, water and gas, electricity, transportation and communication, housing services were necessities while personal care, culture, education and entertainment, health, furniture, clothing, restaurant and other were found to be luxuries.

Blundell et al (2007) looked at seven groups of expenditure; food-in, food-out, leisure goods and services, fares, alcohol, fuel and travel, for British using data from the British FES for 1995. The study employed a nonparametric instrumental variable method of a shape-invariant Engel curve system and endogenous total expenditure. The study noted that not taking endogeneity may lead to an inappropriate specification of the nature of Engel curves.

Ryan and Wales (1996) estimated quadratic Engel curves for Canada using two flexible demand systems on seven food groups between 1947 and 1995. Their estimations revealed that the quadratic terms were very significant while the semi flexible forms were only suitable to a certain level. Bhalotra and Attfield (1998) found the Engel curves for food, child goods and adult goods to be nonlinear. The study looked at the food expenditure for households in rural Pakistan using semiparametric estimations for 1987 to 1988. The study found the quadratic logarithmic function to be the appropriate specification for food.

Soregaroli et al (2002) employed the 1995 Family Expenditure survey of the Italian Institute of Statistics (ISTAT) in studying the nature of Engel curve for food, housing, beverages and tobacco, transportation, recreation and other goods and services groups of expenditure in Italy. The study employed a number of functional forms against a general model in estimating the

Engel curve for the various expenditure groups which gave similar elasticities. The study concluded that the quadratic log model and the Quadratic Expenditure models were the most appropriate functional forms for the data because they had identical elasticities at various levels of the expenditure groups.

Dudek (2011) estimated food Engel curve for Poland using the Household Budget Survey (HBS) for 2000, 2005 and 2009. The study employed the Working-Leser specification and the results obtained were in line with the Engel's law. The share of food expenditure was inversely related to the logarithm of total expenditure. Household size was found to affect household consumption patterns.

2.4 Summary

The empirical literature reviewed shows different findings on the specification of Engel curve that is appropriate for any given data. While some studies estimated a linear relationship between food share and total expenditure, others estimated a quadratic relationship between these variables. As identified in the theoretical literature, the elasticity of a commodity at any point in time was influenced largely by the income group the households fall into. This was seen in the different categories of commodities; inferior goods, necessities and luxury goods, estimated for different commodities in various countries. In light of these empirical findings, it is necessary to determine the appropriate functional form for estimating the food Engel curve for Ghana and also to estimate the income elasticity of the total food expenditure in Ghana. This will serve as a guide to policy makers and the government on issues pertaining to food budget share in Ghana.

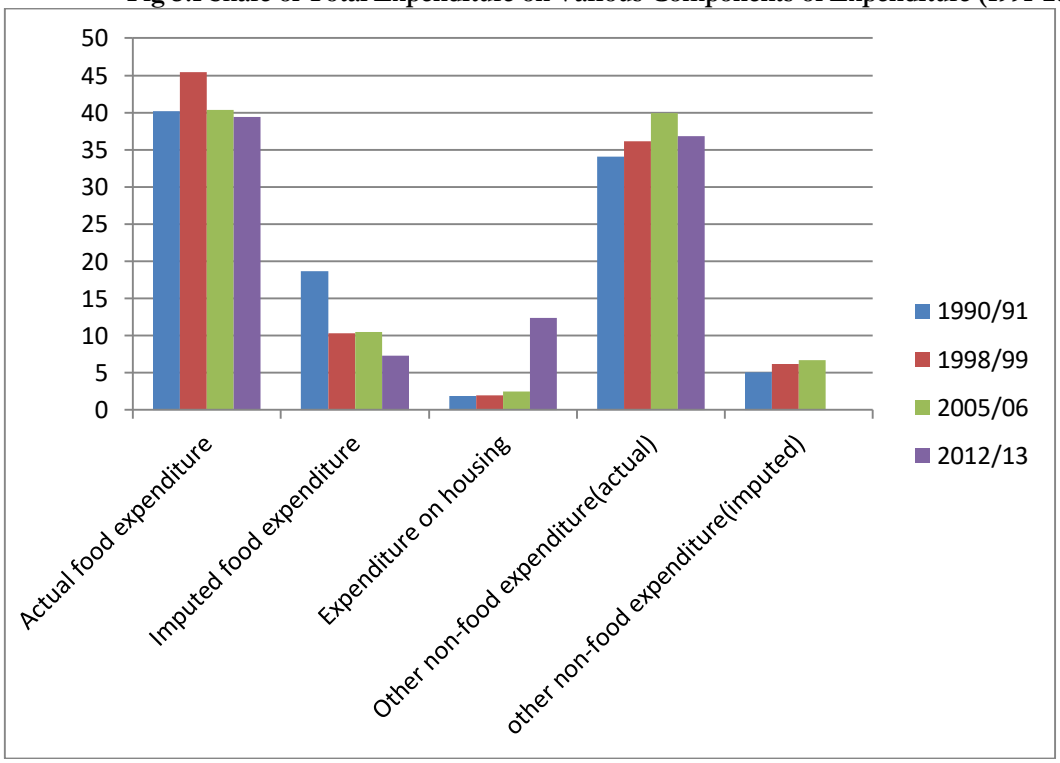
CHAPTER THREE

OVERVIEW OF HOUSEHOLD EXPENDITURE IN GHANA

3.1 Household Total Expenditure

Total expenditure as found in the GLSS dataset encompasses actual and imputed food expenditure, actual and imputed housing expenditure, actual and imputed other expenditure and expenditure on remittances. All these expenditures are quoted in current prices in the various rounds of the GLSS. Figure 3.1 represents the share of total expenditure on each component for 1991/92 to 20/13.

Fig 3.1 Share of Total Expenditure on Various Components of Expenditure (1991-2013)



Source: Author's computation using data from GLSS rounds 3-6

From the diagram above, actual food expenditure had the highest share of total expenditure per data from the last four rounds of the GLSS. It was followed closely by other non-food expenditure. Imputed food expenditure had the third highest share of total expenditures in all years except for 2012/13 where expenditure had the third highest share of total expenditure. Expenditure on housing had the least share in most cases after other non-food expenditure (imputed). Table 3.1 shows the average expenditure at the national level, by locality, by poverty status and by regions in Ghana.

Table 3.1: Average Expenditure by Entire Sample, locality, poverty status and regions

	1991/92(GH¢	1998/99 (GH¢)	2005/06 (GH¢)	2012/13 (GH¢)
National	379.4211	447.9679	533.5187	8517.347
Locality				
Urban	510.7675	559.9034	705.806	10533.92
Rural	309.0426	383.1756	410.5486	6907.68
Poverty status				
Extremely Poor	220.6568	215.1017	218.2794	2938.086
Poor	304.7259	327.2919	324.4922	4768.483
Non-poor	466.2083	538.3681	622.2584	9933.134
Regions				
Western	308.0743	537.9552	553.8268	9066.235
Central	364.406	331.0745	564.5768	8121.297
Greater Accra	487.6214	640.9338	711.943	12732.59
Volta	329.7697	427.736	455.4826	8072.036
Eastern	337.6938	415.5945	545.6574	7897.026
Ashanti	441.2783	503.1175	603.6657	9882.621
Brong Ahafo	376.0655	382.7391	495.0254	8060.521
Northern	372.2481	347.4586	472.8626	6893.747
Upper East	256.7855	245.3952	323.2	6597.869
Upper West	356.7582	199.1899	292.0247	6357.3

Source: Author's computation from GLSS3, GLSS4, GLSS5, GLSS6.
Note: All values are deflated at 1999 prices.

From Table 3.1, it can be observed that household average expenditure has increased tremendously from 1991/92 to 2012/13. The percentage change in average expenditure across total sample, locality, poverty status and regions are all above 90%. The average household spending in Ghana was about GH¢ 379.42, GH¢447.97, GH¢533.52 and GH¢8517.35 in 1991/92, 1998/99, 2005/06 and 2012/13 respectively. The urban areas recorded higher average expenditures than the rural areas for all four rounds of GLSS under consideration. This could be partly explained by the low levels of income that characterize the rural households. The extremely poor and poor recorded lower average expenditure as compared to the non-poor households in 1991/92, 1998/99, 2005/06 and 2012/13. The rural, extremely poor and poor households recorded average expenditures below the sample mean in all four rounds of GLSS employed in the study.

Regionally, Greater Accra region, held the highest average expenditure across the four rounds of GLSS while Upper West region recorded the least average expenditure for 1998/99, 2005/06 and 2012/13. Upper East region recorded the least average expenditure in 1991/92. In 1991/92, with the exception of Greater Accra and Ashanti region, all other regions recorded average expenditures which were less than the national average. In 1998/99, Western region also recorded an average expenditure above the national average in addition to Greater Accra and the Ashanti region. 2005/06 saw much improvement from previous years' average expenditure as four regions, namely Greater Accra, Ashanti region, Central region and Eastern region recorded averages above the nation average expenditure. As at 2012/13, Greater Accra, Western region and Ashanti region were the only regions with average expenditure above that

of the national average. The three northern regions of Ghana, which are Northern, Upper East and Upper West, often had the least average expenditures.

3.2 Food Consumption Trend in Ghana (1991-2013)

The budget share of food expenditure has been observed to be decreasing from 1990 to 2013. This decrease was preceded by an increase in general income levels since 1984 which placed the country at a middle income level in 2011. High income levels generally give rise to increase in expenditures. The fall in budget share of food as a result of the increase in income is thus in accordance with the Engel's law which states that the budget share of food will fall as income increases. This section analyses the trend of food consumption expenditure in Ghana between 1991 and 2013. Table 3.2 gives expenditure share on food at the national level, by locality, regions and ecological zones.

Table 3.2: Expenditure Share on Food by Households in % (1991-2013)

Category	1991/92	1998/99	2005/06	2012/13
National	60	60	57	55
Locality:				
Urban	53	55	50	49
Rural	64	64	62	60
Region:				
Western	61	59	58	51
Central	63	63	58	55
Greater Accra	50	53	48	49
Eastern	62	60	60	56
Ashanti	56	59	51	52
Brong Ahafo	59	66	60	55
Northern	65	65	64	62
Upper East	69	72	64	62
Upper West	77	66	62	60
Ecological Zone:				
Coastal	58	57	53	53
Forest	59	60	55	54
Savannah	66	66	63	60
Sample size	4523	5998	8687	16772

Source: Author's computation from GLSS3, 4, 5, and 6.

The share of total expenditure spent on food was about 60% in 1991/92 and 1998/99 but it decreased to about 57% in 2005/06 and to 55% in 2012/13. Upper East region recorded the highest share of expenditure on food in all the years under study except for 1991/92 while Greater Accra region recorded the least share of total expenditure spent on food. There has been a general decline in the share of total expenditure spent on food for all regions. Ecologically, the savannah belt recorded the highest level of share of total expenditure on food with approximately 66%, 66%, 63% and 60% in 1990/91, 1998/99, 2005/06 and 2012/13 respectively. It was followed by the forest zone which recorded approximately 59%, 60%, 55%

and 54% in 1990/91, 1998/99, 2005/06 and 2012/13 respectively. The coastal zone recorded the least share of total expenditure on food with approximately 58%,57%, 53% and 53% in 1990/91, 1998/99, 2005/06 and 2012/13 respectively.

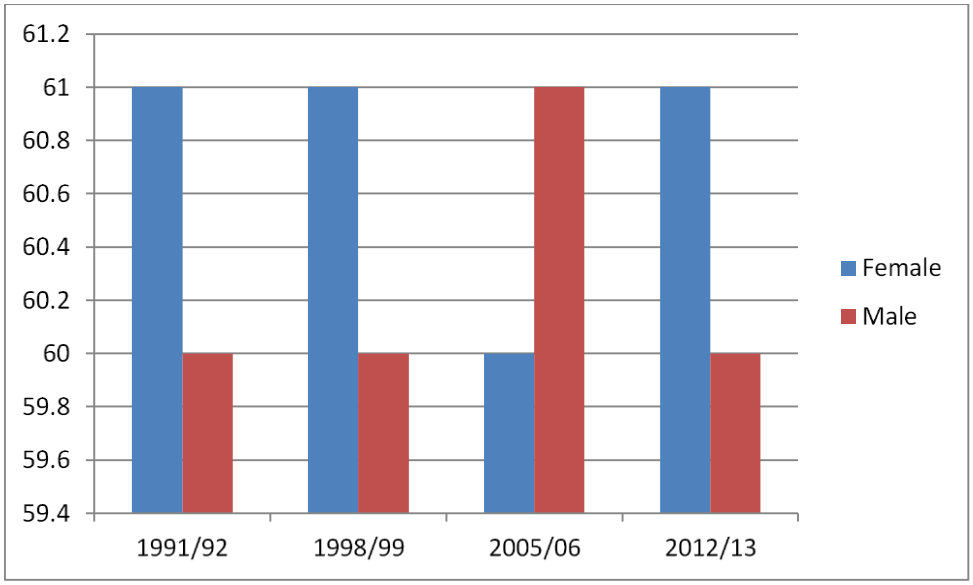
Table 3.3: Expenditure Share of Food by Decile (%)

Decile	1991/92	1998/99	2005/06	2012/13
1	65	63	62	63
2	63	64	61	61
3	64	63	60	59
4	65	63	60	58
5	61	61	60	56
6	61	61	59	56
7	60	61	56	55
8	60	59	56	53
9	60	58	54	50
10	53	57	50	46
Sample size	4,523	5,998	8,687	16,772

Source: Author's computation from 3, 4, 5 and 6.

From the table above, it is observed that the households in the lowest decile spent far more than half of their total expenditure on food. The share of total expenditure on food by the households in the lowest decile was approximately 65%, 63%, 62% and 63% in 1990/91, 1998/99, 2005/06 and 2012/13 respectively. These values drop as you move up to the higher deciles with households in the highest deciles spending approximately 53%,57%,50% and 46% of their total expenditure on food in 1990/91, 1998/99, 2005/06 and 2012/13 respectively.

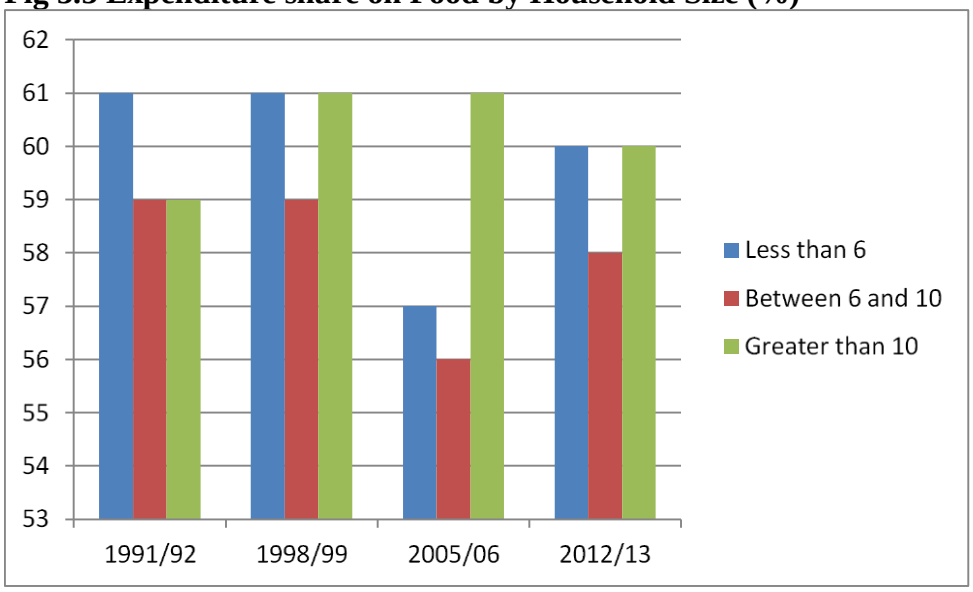
Fig 3.2 Expenditure share on Food by Sex of Household Head (%)



Source: Author's computation from GLSS3, GLSS4, GLSS5, GLSS6.

Households headed by females had about 61% of their total expenditure on food while households headed by males had about 60% of their total expenditure on food in 1991/92. In 1998/99 and 2012/13, female headed households used about 61% again on food while male-headed households spent about 60% of their total expenditure on food. However, in 2005/06 male-headed households spent 1% more on food than female headed households did.

Fig 3.3 Expenditure share on Food by Household Size (%)



Source: Author's computation from GLSS 3,4,5 and 6

In figure 3.4, households with less than six individuals had a larger share of food in expenditure than those with more individuals in 1991/92. In 1998/99, households with less than six and more than ten individuals spent about 61% of their total expenditure on food whiles those with individuals between six and ten had a food share of about 59% in total expenditure. Households with more than ten individuals spent more on food in 2005/06 and 2012/13. It is observed that households with individuals between six and ten spent lesser on food compared to the other households groups.

Fig 3.4 Expenditure Share on Food by Poverty Status (%)

Source: Author's computation from GLSS 3, 4, 5 and 6.

The share of household expenditure on food by the very poor exceeded the poor and non-poor in the last four rounds of the GLSS. In 1991/92, while the non-poor spent about 58%, the poor and very poor spent about 62% and 64% of their total expenditure on food respectively. In 1998/99, the share of total expenditure on food by the non-poor was about 59% while that of the poor and very poor was 63% of their total expenditure. The share of total expenditure on food fell to 56% for non-poor and 61% for both poor and very poor households in 2005/06. The last round of GLSS shows that the non-poor households spent about 53% of their total expenditure on food while the poor and very poor households spent about 60% and 63% of their total expenditure on food.

3.3 Conclusion

The chapter presents variations in total expenditure and food expenditure by demographic characteristics such as sex and age of household head, locality of household, poverty status of household, household size and region of household. There are observable variations within these demographic characteristics with respect to both total expenditure and food expenditure. There are also different assertions with regard to how these demographic characteristics affect household expenditure decision. It is in light of this that the study will employ these variables in empirically analyzing the relationship between budget share of food and total expenditure.

Nationally, the budget share of food fell from about 60% in 1991/92 to about 55% in 2012/13. This period was characterized by increase in average household income (GLSS reports). This confirms the Engel's law which states that the budget share of food falls as income increases. However, this data needs to be empirically tested to confirm this observation or otherwise.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter outlines the methodology and the data source for the study. It is organized as follows; section 4.2 presents the theoretical framework of the study while section 4.3 presents the empirical estimation procedures. Section 4.4 describes the variables and Data source is discussed in section 4.5.

4.2 Theoretical Model

Several studies on food Engel curve have used extensions of the Engel curve theory developed by renowned economists such as Banks et al (1997) and Houthakker (1957). These studies have estimated different functional forms for food Engel curve for different countries. However, the seminal theoretical models which have become the basis for most food Engel curve analysis were first derived by Allen and Bowley (1935), Houthakker, Prais and Honthakker (1955), Banks et al (1997), Working (1943) and Leser (1963). These models have been used to estimate the Engel curve for different items including food. As noted in chapter 1, this study adopts the two most common models in the literature; the Working-Leser model and the Quadratic model.

4.2.1 Working-Leser Model

The model was first developed by Working (1943) using data from the United States. Working asserted that the distribution of family expenditure depended on the desires of the individuals in the family, the standards and customs that existed in the society and the goods and services

that were available for the family to choose from. He noted that laws governing expenditure may not hold everywhere. Also, the budget share of food decreased as total expenditure increased for all households, except in cases of extremely low levels of total expenditure.

Leser (1963) emphasized on the merits of Working's model. He indicated that for a model to be used in family budget studies it should satisfy the adding up property, be linked to a direct or indirect utility function, be valid within a broad range of expenditure, show variations in income elasticity as expenditure changes and should be easy to estimate. Leser (1963) compared Working's model to four other models and found Working's model to be of best fit and easy to estimate which made it plausible for budget studies. The model thus became known as the Working-Leser model. The Working-Leser model which is of the form

$$W_i=\alpha_i+\beta_i \log X+ \boldsymbol{\varepsilon}_i \quad (1)$$

where w is the expenditure share of the ith commodity, X is total expenditure of the consumer, α is a constant and **β** is a parameter to be determined and **ε** is an error term. The Working-Leser model is employed because it is theoretically plausible; it also satisfies the adding up property so that an increase in the budget share of one commodity leads to a reduction in budget share of another commodity and the budget share of all commodities sum up to unity. The Working-Leser model also allows for falling, rising or constant marginal values and slope which makes it suitable for budget share analysis.

4.2.2 Quadratic model

Banks et al (1997) in a study to investigate the welfare cost of indirect tax reform introduced quadratic terms into the linear model using data from the United Kingdom. They were of the view that family budget studies showed more curvature in the Engel curve relationship than

what was presented by the Working-Leser model. The quadratic terms cater for goods that swing from luxuries to necessities and vice versa as income changes. They however indicated that the linear model may be better for food budget share estimations.

The original model has prices but since the focus of this study is on expenditure share, prices are dropped from the model. The model becomes;

$$W_i=\alpha_i+\beta_i log\text{X}+\theta_i log X^2+ \boldsymbol{\varepsilon}_i \quad (2)$$

Where w is the expenditure share of the ith commodity, X is total expenditure of the consumer, α is a constant, $\boldsymbol{\beta}$ and $\boldsymbol{\theta}$ are parameters to be determined and $\boldsymbol{\varepsilon}$ is an error term. This model enables us to observe where there are changes in the nature of a commodity that is if it changes from a normal good to a luxury or vice versa, as total expenditure changes.

4.3 Empirical Model

The empirical versions of the models estimated are slightly different from the original specifications. They were modified to account for two main empirical issues. First, we include some demographic characteristics of households to observe their behaviors with respect to budget share of food. The models are specified as follows:

$$W_i=\alpha_i+\beta_1 \text{logX}+\beta_2 \text{hhsize}+\beta_3 \text{sexhead}+\beta_4 \text{loc}+\beta_5 \text{agehead} +\beta_6 region + \boldsymbol{\varepsilon}_i \quad (3)$$

$$W_i=\alpha_i+\beta_1 log\text{X}+\beta_2 log X^2 + \beta_3 \text{hhsize}+\beta_4 \text{sexhead}+\beta_5 \text{loc}+\beta_6 \text{agehead} +\beta_7 region + \boldsymbol{\varepsilon}_i \quad (4)$$

Where;

W_i = budget share of food expenditure

X= total expenditure by households

hhsize = the number of people in a household

sexhead = Gender of household head

loc = locality of household

agehead = age of household head

Secondly, in demand analysis, total expenditure is endogenous. Some studies have identified correlation between total expenditure and some unobserved characteristics in the error term that affect the budget share of food. For instance, prices affect total expenditure and food expenditure but it is not included as an explanatory variable in the model. This could be absorbed in the error term which causes endogeneity. Also, certain shocks exist that are common to total expenditure and budget share (Blundell and Robin, 1999; Barslund, 2011; Robin and Lecoeq, 2006). An example is income shock; it affects both budget share and total expenditure. Endogeneity in total expenditure could also be caused by measurement errors.

The augmented regression approach proposed by Hausman (1978) and Blundell &Robin (1999) will be used to correct the problem of endogeneity in total expenditure. This is a two stage approach. The endogenous variable (log of total food expenditure) will be regressed on the demographic characteristics of households included in the models and the instruments. This will result to a reduced form equation as:

$$lnX = \alpha + \beta y + \theta z + \varepsilon \qquad (5)$$

where lnX is the log of total food expenditure, y is the vector of instruments, z is a vector of demographic variables and θ are parameters to be estimated and ε is the random error term with the standard properties. The residual from equation 5 will then be predicted and added as an explanatory variable in equations 3 and 4. Equation 3 then becomes:

$$W_i = \alpha_i + \beta_1 \log X + \beta_2 hhsize + \beta_3 sexhead + \beta_4 loc + \beta_5 agehead + \beta_6 region + R\Pi_i + \boldsymbol{\varepsilon}_i \qquad (6)$$

and equation 4 becomes:

W_i=α_i+$\beta_1 log$X+$\beta_2 log X^2$ + $\beta_3$hhsize+$\beta_4$sexhead+$\beta_5$loc+$\beta_6$agehead+$\beta_7 region$ + $R\ \Pi_i$ + $\boldsymbol{\varepsilon}_i$

(7)

where R is the coefficient of the residual Π_i, and every other variable remains the same as in equation 4 and 5. Using the augmented regression approach of Hausman (1978) and Blundell & Robin (1999) allows the testing of the significance of the coefficient of the residual in the second stage of the regression. This test is in effect a test of endogeneity of the endogenous variable. The coefficient of the residual is insignificant if total expenditure is exogenous (Blundell and Robin 1999).

An instrument is deemed to be good, if it satisfies the relevance and exogeneity conditions (Wooldridge, 2002; Blundell & Robin, 1999). The relevance condition demands that, there should be an adequate correlation between the instrument and the endogenous variable while the exogeneity condition demands that the instrument should not be correlated with the error term in the demand model. According to Wooldridge (2002), testing the statistical significance of an instrument means a test for its relevance. However, there is difficulty in meeting the exogeneity condition due to the unobserved disturbance. To take care of this, economic theory is employed to decide if exogeneity can be assumed. A test of over-identifying restrictions is often used as a test of exogeneity when there are more instruments than the endogenous variables.

Using household income as an explanatory variable to estimate the budget share is often not appropriate because, income reported in household surveys are for short periods, do not include property income and contain short-term elements which may be irrelevant to decisions on expenditure. Hence, total expenditure is used in place of household income as the independent variable in estimating budget share.

Although household income is not considered an appropriate regressor, it is often suitable as an instrument for total expenditure Liviation (1961). This is due to the fact that household income is highly correlated with total expenditure but not correlated with the random element in total expenditure hence satisfying the relevance and exogeneity conditions respectively. Several studies have used income as an instrument for total expenditure in budget share estimation (see for example: Bhalotra & Attfield, 1998; Blundel & Robin, 1999; Lecocq &Robin, 2006; Kedir & Girma, 2007; Hassan, 2012).

This study will also follow the above studies by employing income, average cluster income excluding index household's income, welfare and land ownership status of the household as instruments for total expenditure. Employing two or more instruments for total expenditure allows us to test the validity of the instruments using the test for over-identifying restrictions in the models for each period. The expenditure elasticity of food share will be computed for both the Working-Leser and quadratic model estimates at sample means. The elasticities will be estimated as $1+\frac{b}{w}$ for the Working-Leser model as noted in Salathe (1979) and $1+\frac{b+2\theta}{w}$ for the quadratic model.

4.4 Description of variables

The objectives of the study and literature reviewed informed the variables chosen as dependent and independent variables for the study. The expected signs of the independent variables are based on a number of studies conducted within the literature.

Budget share of food

The GLSS records the total amount spent by households on food within the period the survey is conducted. The budget share of food is the proportion of total expenditure allocated to food. The budget share is found by dividing the total food expenditure by total expenditure for a particular time period. Food expenditure includes both food purchased outside and own food consumption. Data on total expenditure and food expenditure is provided in the GLSS. The theoretical and empirical studies within the literature informed the selection of the independent variables to be used in this study.

Total Expenditure

This sums up all the various expenditures by households that were captured in the GLSS. It encompasses actual food expenditure, imputed food expenditure, actual other non-food expenditure, imputed other non-food expenditure and expenditure on remittances. This variable is a continuous variable.

Household size

This is a continuous variable that shows the number of individuals in a household. This variable is of importance because households with larger numbers are expected to consume more food than households with smaller numbers. The expected sign of this variable is thus positive. Al-Habashneh and Al-Majali (2014) indicated that household with large numbers

enjoyed economies of scale which lead to fall in budget share of food as household size increase. Holcomb and Capps (1995) on the other hand found budget share to be increasing with increase in household size. There is the need to investigate the effect of household size on budget share for Ghana.

Sex of household head

Sex of household head serves as a control variable and it is a dummy with zero (0) for household headed by male and one (1) for household headed by female. It is expected that households headed by males should spend the same proportion of their income on food as households headed by females. Conversely, Kassie et al (2012) found from their study that households headed by females spend more on food than households headed by their male counterparts. The expected sign of this variable is uncertain. This variable is included in the study to test its significance or otherwise in food budget share analysis for Ghana.

Location

It is a dummy that tells if the household is found in the urban or rural sector of the country. Households in the urban areas are represented with zero (0) whiles those in rural areas are represented with one (1). It is expected that households living in rural areas will spend most of their income on food compared to those in the urban areas due to the high level of poverty in most rural areas. The inclusion of the variable in our models will thus reveal if there are disparities in budget share of food between the urban and rural areas as indicated by Al-Habashneh and Al-Majali (2014).

Age of household head

This is a continuous variable. The age of the household head was found to affect food expenditure in a study by Wigraiphat et al (2012) in Thai. The sign of this variable is uncertain for Ghana.

Region

The region dummy is included to investigate the how the various region reacts to the budget share of food when total expenditure varies. Western region is used as the reference region in the study.

4.5 Data Sources

The Ghana Living Standards Survey (GLSS) is a nationwide household survey that provides data and information on the general living conditions of households in the country. It focuses on households in Ghana and makes available information on socio-economic make up of households. The first and second rounds of the GLSS are not easily comparable with the last four rounds and hence our inability to include them in this study. The sample size for the Ghana Living Standards Survey round 3 (GLSS 3) is 4,523 households, that of Ghana Living Standards Survey round 4 (GLSS 4) is 5,998, Ghana Living Standards Survey round 5 (GLSS 5) is 8,687 and Ghana Living Standards Survey round 6 (GLSS 6) is 16,772 households. The Ghana Living Standard Survey (GLSS) over the years it has been conducted had looked at demographic characteristics of households, migration and tourism, credit and asset, household level agriculture, housing conditions, household expenditure and income, governance and

security among others. The Ghana Statistical Service (GSS) use the household questionnaire, community questionnaire and the price questionnaire in gathering data in the various surveys. Each round of the GLSS focuses on a specific issue. The third round concentrated on income consumption and expenditure module, the fourth round concentrated on the labour force model, the fifth round on the non-farm household enterprise module and the sixth round on labor force module.

Total expenditure as captured in the GLSS is a summation of expenditure by households on food and non-alcoholic beverages, alcoholic beverages, tobacco and narcotics, clothing and footwear, housing, water, electricity, gas and other fuels, furnishings, household equipment and routine maintenance, health, transport, communications, recreation and culture, education, hotels, cafes and restaurants and miscellaneous goods and services. Data on these expenditures is collected over a period of thirty five days and aggregated to arrive at the total expenditure by households.

CHAPTER FIVE

PRESENTATION AND ANALYSIS OF RESULTS

5.1 Introduction

This chapter presents the results and discussions from the study. It begins with the descriptive statistics for the dependent and independent variables employed in the regressions. This is followed by the presentation and discussion of regression results from the various models.

5.2 Descriptive Statistics

This section will give descriptions on statistics with respect to household size, gender, locality and the age of household head. Variations in food expenditure with respect to household size, gender, locality, the age of household head and region of residence of household are also discussed in this section. Table 5.1 provides summary statistics of some independent variables.

Table 5.1 Summary Statistics of Selected Independent Variables

Variable	Observations	Mean
Total Expenditure		
1991/92	4523	59.29
1998/99	5998	401.01
2005/06	8687	1084.00
2012/13	16772	8427.34
Household size		
1991/92	4523	4.50
1998/99	5998	4.28
2005/06	8687	4.20
2012/13	16772	4.26
Age of Household Head		
1991/92	4523	44.28
1998/99	5998	45.83
2005/06	8687	45.34
2012/13	16772	45.89

Source: Author's computation from GLSS 3, 4, 5 and 6

The mean total expenditure for 1991/92 was GH¢59.28606, that of 1998/99 was GH¢401.0105, with GH¢1084 for 2005/06 and GH¢8427.339 for 2012/13. There has been significant increase in household average expenditure from 1991/92 to 2012/13. This could be explained by the increase in household average income within this period as seen in the GLSS data. Household size has not changed much over the years, with a mean household size around four in all four rounds of GLSS. The mean age for household head increased from about forty two (42) years in 1991/92 to forty five in 1998/99, 2005/06 and 2012/13.

Table 5.2 Proportion of Sample by Gender, Locality and Poverty Status

Variable	1991/92	1998/99	2005/06	2012/13
Gender:				
Male	68	66	72	72
Female	32	34	28	28
Locality:				
Rural	65	63	58	56
Urban	35	37	42	44
Poverty status:				
Very Poor	27	21	16	10
Poor	13	11	8	14
Non-Poor	60	68	76	76

Source: Author's computation from GLSS 3, 4, 5 and 6

About 68% of households were headed by males while 32% were headed by females in 1991/92. The percentage for male-headed household fell slightly to 66% in 1998/99 while the female-headed households increased to about 34%. In 2005/06, about 72% of households were headed by males while 28% were headed by females and 72% of households were headed by males and 28% of households were headed by females in 2012/13. The rural areas made up about 65%, 63%, 58% and 56% as against the urban areas of about 35%, 37%, 42% and 44% in 1991/92, 1998/99, 2005/06 and 2012/13 respectively of the population sample.

The very poor households constituted about 27%, 22%, 16% and 10% of the population sample in 1991/92, 1998/99, 2005/06 and 2012/13 respectively. The poor households also constituted about 13%, 11%, 8% and 14% of the population sample in 1991/92, 1998/99, 2005/06 and 2012/13 respectively. The non-poor households on the other hand constituted about 60%, 68%, 76% and 76% of the population sample in 1991/92, 1998/99, 2005/06 and 2012/13 respectively.

Table 5.3 Budget share of food by households

	1991/92 (%)	1998/99 (%)	2005/06 (%)	2012/13 (%)
National	60.12	60.4	56.95	55.79
Gender				
Male headed HH	59.82	59.9	57.15	55.43
Female headed HH	60.75	61.4	56.41	56.43
Locality				
Rural	63.9	63.63	62.06	60.79
Urban	53.06	54.82	49.78	49.31
Poverty status				
Extremely poor	64.04	63.5	61.35	63.68
Poor	62.19	62.93	60.96	61.23
Non-poor	57.92	59.05	55.59	53.82

Source: Author's computation from GLSS 3, 4, 5 and 6
*HH=Household

Budget share of food by households varied largely by sex of household head, locality of household, age of household head and region in which household was located among others. Table 5.3 presents the budget share of food. The national budget share of food has fallen from 60.12% in 1991/92 to about 55.79% in 2012/13. There was an increase in average income from GH¢37.27 in 1991/92 to GH¢8,183.80 in 2012/13 (GLSS 3 and 6). This is in accordance with Engel's law which states that the proportion of income spent on food decreases as income increases. The budget share of food was 59.82%, 59.9%, 57.15% and 55.43% for male headed households while that of female headed households was 60.75%, 61.4%, 56.41% and 56.43% for 1991/92 , 1998/99, 2005/06 and 2012/2013 respectively.

Also, whereas households in the rural areas had a budget share of food of about 63.9%, those in urban areas had a budget share of food of about 53.06% in 1991/92. In 1998/99, households in rural sector had a budget share of food of about 63.63% while those in urban sector had a budget share of food of about 54.82%. By 2005/06 households in the rural areas had a budget share of food of about 62.06% while those in urban areas had a budget share of food of about 49.78%. In 2012/2013, while urban households had a budget a share of food of about 49.31%, households in rural areas had a budget share of food of about 60.79%. The extremely poor and poor households had a larger share of food than the non-poor in all four rounds of GLSS under consideration. The very poor and poor households have very low income levels that are often just enough or less to meet their basic needs of which food is a major component. Thus, these households spend most of their income on food accounting for the large budget share of food recorded by these households.

Appendix 1, 2, 3 and 4 shows the regional budget share of food for the various years. In 1991/92, Upper west region recorded the highest budget share of food of about 77.4%, and this was followed by 68.6%, 65.0%, 63.4% and 62.3% for Upper east, Northern, Central and Volta regions respectively. Eastern region recorded a budget share of about 62.0% while Western region recorded 61.4%. The other regions recorded below the sample mean of 60.1%. Brong Ahafo recorded 58.8%, Greater Accra region recorded the least budget share of about 49.9% and it was preceded by the Ashanti region with a budget share of about 55.7%. However, in 1998/99, Upper East led the chat with a budget share of about 72.0%, and it was followed by Upper west, Brong Ahafo, Northern and in Central regions with about 66.1%, 65.6%, 64.8% and 63.3% respectively. Eastern region recorded 59.9%, Volta recorded 59.8%, Ashanti

recorded 58.9%, and Western recorded 58.9% too. Greater Accra recorded the least budget share of about 53.5% in food. Five regions had food budget share below the sample mean of about 60.4%.

Northern region recorded the highest budget share on food of 63.9% in 2005/06. Upper East, Upper West, Eastern and Volta regions followed with food budget shares of 63.8%, 62.0%, 60.2% and 60.1% respectively. Brong Ahafo region recorded a budget share of 59.9% while Central, Western and Ashanti regions recorded 58.3%, 57.6% and 50.7% respectively. Greater Accra recorded the least budget share of food of about 47.8%. Greater Accra was the only region to fall below the sample mean of about 56.9%. In 2012/13, Upper East region recorded the highest budget share on food. Seven regions in all recorded a budget share of food greater than the sample mean of about 52.8%. Brong Ahafo, Ashanti and Greater Accra recorded budget share of food below that of the sample mean.

5.3 Presentation and Discussion of Results

Appendices 5, 6, 7 and 8 give histograms showing the distribution of budget share of food. The histograms are symmetric which means the budget share of food are normally distributed and therefore OLS can be used for the estimations.

5.3.1 Correcting for Endogeneity

The Wooldridge (1995) robust test and Basmann's (1960) chi-squared are used to test the null hypothesis that the log of total expenditure is endogenous. The alternative hypothesis is that the log of total expenditure is exogenous. The test rejects the null hypothesis that the log of total expenditure is exogenous in all the four rounds of GLSS.

Reduced form equations are estimated for each year with at least two instruments employed for each year from log of income, log of average cluster income, land ownership and welfare. Log of income and log of average cluster income were valid for 1991/92 while log of income and land ownership were valid for 1998/99 and 2005/06. Log of income and welfare were the valid instruments for 2012/13. Log of total expenditure is the dependent variable in the reduced form equations. The result is presented in Table 5.4 below.

Table 5.4: First Stage Regression

Variable	1991/92	1998/99	2005/06	2012/13
Household size	0.091***	0.094***	0.093***	0.145***
	(0.003)	(0.003)	(0.003)	(0.004)
Locality (base=urban)				
Rural	-0.430***	-0.270***	-0.417***	-0.204***
	(0.019)	(0.017)	(0.014)	(0.013)
Sexhead(base= Male)				
Female	-0.021	-0.044**	-0.014	-0.060***
	(0.017)	(0.015)	(0.014)	(0.010)
Age of household head	-0.001**	-0.004***	-0.003***	-0.001***
	(0.001)	(0.000)	(0.000)	(0.000)
Regions(base=western)				
Central	0.161***	-0.233***	0.020	0.083***
	(0.030)	(0.029)	(0.027)	(0.017)
Greater Accra	0.049	0.096***	-0.067*	0.104***
	(0.032)	(0.029)	(0.027)	(0.018)
Volta	0.025	-0.112***	-0.086***	0.001
	(0.026)	(0.029)	(0.026)	(0.019)
Eastern	0.136***	-0.171***	0.066**	0.001
	(0.031)	(0.028)	(0.025)	(0.016)
Ashanti	0.144***	0.022	0.032	0.031*
	(0.028)	(0.025)	(0.022)	(0.016)
Brong Ahafo	-0.090**	-0.187***	-0.098***	-0.040*
	(0.028)	(0.028)	(0.026)	(0.017)
Northern	-0.009	-0.389***	-0.274***	-0.190***
	(0.036)	(0.036)	(0.028)	(0.018)
Upper East	-0.208***	-0.492***	-0.459***	-0.067***
	(0.048)	(0.041)	(0.031)	(0.020)
Upper West	0.134**	-0.672***	-0.750***	-0.352***
	(0.049)	(0.035)	(0.034)	(0.021)
Instruments				
Log of Income	0.211***	0.223***	0.241***	0.125***
	(0.009)	(0.008)	(0.006)	(0.005)
Land ownership status		-0.119***	-0.060***	
		(0.016)	(0.007)	
Log of Average cluster income	0.066***			
	(0.016)			
Welfare index				0.000***
				(0.000)
Test of Exogeneity (p-value)	0.000	0.041	0.001	0.000
Test of Over identifying restrictions (p-value)	0.947	0.799	0.161	0.936
R-squared	0.479	0.518	0.528	0.641
Partial R-square	0.178	0.218	0.225	0.490
Partial F statistics	384.927	479.055	741.198	1469.73
Partial F (p-value)	0.000	0.000	0.000	0.000
Sample size	4788	5,772	8,358	13,570

Notes:
*Significant at 10%; **Significant at 5%; ***Significant at 1%
Robust standard errors in parenthesis
Instrumented: total household expenditure; Instruments: income and landowner status for GLSS 4 and 5; income and average cluster income for GLSS 3; income and welfare index for GLSS 6

Test of Exogeneity*:** Wooldridge's (1995) robust score test and a robust regression-based test are reported. If the test statistic is significant, the variables being tested must be treated as endogenous. ***Tests of Over-Identifying Restrictions: Basmann's (1960) chi-squared tests are reported, as is Wooldridge's (1995) robust score test. A statistically significant test statistic always indicates that the instruments may not be valid.

In all periods, the instruments used have significant impact on total expenditure. Household income and the average cluster income have positive impact on total expenditure while land ownership status has a significant negative impact on total expenditure as anticipated. The robust partial F statistics (with p-value of 0.000 in all periods) and partial R-square for the instruments are high which indicates that the instruments are relevant and good predictors of total expenditure.

Residuals are predicted from the reduced form model for all four rounds and included in the standard model as explanatory variables for each round. The predicted residuals were significant in all cases indicating the existence of the problem of endogeneity.

To further ascertain the validity of the instruments in predicting total expenditure, the Sargan test for over-identifying restrictions is run on the instruments. The null hypothesis is that the over-identifying restrictions are valid. The results for the over-identifying tests are also presented in Table 5.4 above. We accept the null hypothesis in all four rounds of the GLSS since the p-values are more than 0.05 in all cases. Thus, the instruments in each case are jointly significant in explaining the endogenous variable.

5.3.2 Augmented Regression Estimates

This section presents results from estimating the standard Working-leser and quadratic models with correction for endogeneity. The predicted residuals from the reduced form equations are added as independent variables in the standard equations. Table 5.5 presents augmented regression estimates for the four rounds of GLSS using the Working-Leser model.

Table 5.5 Second stage regression using the Working-Leser Model

Variable	1991/92	1998/99	2005/06	2012/13
Total Expenditure	-0.072***	-0.039***	-0.049***	-0.080***
	(0.009)	(0.007)	(0.006)	(0.005)
Household size	0.002*	-0.002	-0.001	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
Locality (base=urban)				
Rural	0.042***	0.065***	0.076***	0.073***
	(0.007)	(0.004)	(0.005)	(0.004)
Sexhead(base= Male)				
Female	0.020***	0.008*	-0.007	0.013***
	(0.004)	(0.004)	(0.004)	(0.003)
Age of household head	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Regions(base=western)				
Central	0.028**	0.021**	0.006	0.027***
	(0.009)	(0.008)	(0.007)	(0.006)
Greater Accra	-0.064***	-0.013	-0.051***	-0.034***
	(0.009)	(0.007)	(0.006)	(0.006)
Volta	0.004	-0.007	0.006	0.032***
	(0.008)	(0.008)	(0.007)	(0.007)
Eastern	-0.001	-0.005	0.028***	0.029***
	(0.009)	(0.007)	(0.006)	(0.006)
Ashanti	-0.041***	0.005	-0.053***	0.012*
	(0.008)	(0.007)	(0.006)	(0.005)
Brong Ahafo	-0.018*	0.053***	0.019**	0.019**
	(0.009)	(0.007)	(0.007)	(0.006)
Northern	0.041***	0.042***	0.048***	0.066***
	(0.010)	(0.010)	(0.008)	(0.006)
Upper East	0.044**	0.094***	0.014	0.053***
	(0.016)	(0.012)	(0.009)	(0.006)
Upper West	0.145***	0.021	-0.017	-0.014
	(0.010)	(0.011)	(0.010)	(0.007)
Residual	0.034***	0.015*	0.021***	0.035***
	(0.010)	(0.007)	(0.006)	(0.008)
R square	0.271	0.195	0.235	0.206
P>F	0.000	0.000	0.000	0.000
Sample size	4435	5772	8358	13570

Notes:
*Significant at 10%; **Significant at 5%; ***Significant at 1%
Robust standard errors in parenthesis

The independent variables are jointly significant at 1% in all four years using the F-statistics for the Working-Leser model. The independent variables jointly explain about 27.1%, 19.5%, 23.5% and 20.6% of variations in the budget share of food in 1991/90, 1998/99, 2005/06 and 2012/13 respectively. The R-squared is generally low for all years which is often the case with cross sectional data. The coefficients of the residuals are significant in all four years. This confirms that total expenditure is endogenous. Total expenditure has inverse relationship with the budget share of food in all years. This implies that as total expenditure increases, the budget share of food falls and vice versa holding all other variables constant. This is confirmed in studies by Habashneh and Al-Majali (2014) and Dudek (2011) and Holcomb and Capps (1995) and affirms the Engel's law which states that the budget share of food decreases as total expenditure increases.

Household size was only significant at 10% in 1991/92 and 5% in 2012/13. The household size is positively related to the budget share of food. As household size increases, the share of total expenditure used on food also increases and vice versa holding all other variables constant. This is line with studies by Holcomb and Capps (1995) who found budget share of food to increase with increase in household size.

Households in rural areas have higher budget share than households in urban areas in all years. This is consistent with consumption patterns of households in Ghana. Rural households have very low income levels which are often spent on food and other basic needs compared to urban households who are often better to do. This therefore explains the high budget share of food recorded by households in rural areas. This is also confirmed by Habashneh and Al-Majali

(2014) who estimated a lower budget share of food for urban households than rural households for Jordan.

Households with female heads have higher budget share of food than those with male heads in all years except 2005/06 were it was not significant. This means that households with female heads will increase their budget share of food more than households with male heads when total expenditure increases and vice versa holding all other variables constant.

Also, the age of household head has positive relationship with budget share of food for all four years. It is expected that as the age of household increases, the budget share of food increases and vice versa holding all other variables constant.

The regional dummy does not show much consistency over the years. However, with Western region as the base region, it is not surprising to observe that Greater Accra and Ashanti region have lower budget shares on food. These regions have the highest levels of income in the country which could explain their low budget share on food compared to the Western region. And also as expected, the three northern regions have higher budget share of food than the Western region in all the years the coefficients were significant. Brong Ahafo region had a lower budget share than Western region in 1991/92 but recorded higher budget share of food from 1998/99 to 2012/13. Central, Volta and Eastern regions also have higher budget share on food than the Western region in some years.

The quadratic model is also estimated at the second stage using all the independent variables in addition to a quadratic term. The result of the quadratic model is presented in table 5.6 below.

Table 5.6 Second stage regression using the Quadratic Model

Variable	1991/92	1998/99	2005/06	2012/13
Total Expenditure	0.962***	0.784***	0.984***	0.199***
	(0.087)	(0.080)	(0.055)	(0.041)
Total Expenditure squared	-0.035***	-0.027***	-0.034***	-0.016***
	(0.003)	(0.003)	(0.002)	(0.002)
Household size	0.003*	-0.002	-0.001	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)
Locality (base=urban)				
Rural	0.037***	0.060***	0.070***	0.075***
	(0.006)	(0.004)	(0.004)	(0.004)
Sexhead(base= Male)				
Female	0.019***	0.007	-0.009*	0.013***
	(0.004)	(0.004)	(0.003)	(0.003)
Age of household head	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Regions(base=western)				
Central	0.029***	0.018*	0.009	0.027***
	(0.009)	(0.008)	(0.007)	(0.006)
Greater Accra	-0.057***	-0.011	-0.046***	0.035***
	(0.009)	(0.007)	(0.006)	(0.006)
Volta	0.009	-0.009	0.006	0.032***
	(0.008)	(0.008)	(0.007)	(0.007)
Eastern	0.004	-0.007	0.029***	0.029***
	(0.009)	(0.007)	(0.006)	(0.006)
Ashanti	-0.031***	0.002	-0.051***	0.011*
	(0.008)	(0.007)	(0.006)	(0.005)
Brong Ahafo	-0.015	0.048***	0.020**	0.019**
	(0.008)	(0.007)	(0.007)	(0.006)
Northern	0.049***	0.041***	0.054***	0.068***
	(0.010)	(0.010)	(0.008)	(0.006)
Upper East	0.048**	0.085***	0.031***	0.056***
	(0.016)	(0.012)	(0.008)	(0.006)
Upper West	0.155***	0.026*	0.014	-0.004
	(0.009)	(0.011)	(0.010)	(0.007)
Residual	0.038***	0.014*	0.020***	0.020*
	(0.009)	(0.007)	(0.006)	(0.008)
R square	0.298	0.220	0.273	0.213
P>F	0.000	0.000	0.000	0.000
Sample size	4,435	5,772	8,358	13,570

Notes:
*Significant at 10%; **Significant at 5%; ***Significant at 1%
Robust standard errors in parentheses

The quadratic model is estimated for 1991/92, 1998/99, 2005/06 and 2012/13 using the augmented regression approach. Variables are jointly significant at 1% in all rounds of estimations. The fit of the model were 29.8%, 22.0%, 27.3 %and 21.3% for 1991/92, 1998/99, 2005/06 and 2012/13 respectively. The log of total expenditure square, which is the quadratic term, is statistically significant at 1% in 1991/92, 1998/99, 2005/06 and 2012/13. Studies such as Hassan (2016), Betti (2000) and Kedir and Girma (2001) found similar estimates using the quadratic model for Bangladesh, Italy and Ethiopia respectively. The estimates of the quadratic model is also in line with the study by Kebede (2000), which employed a QUAIDS model for Ethiopia and found that the budget share of food increased as total expenditure increased. Kebede (2000) attributed his result to the low income of households in Etiopia.

Female headed household has positive relationship with budget share of food in 1991/92, 1998/99 and 2012/13. This implies that female headed households have higher share of their budget on food than male headed households. However, male headed households have a higher budget share of food than female households in 2005/06. This is in line with household consumption pattern in Ghana.

Age of household head is positively related to budget share of food and also significant in all four rounds of GLSS. Household size is insignificant in 1998/99 and 2005/06. However, it has a positive relationship with budget share of food in 1991/99 and 2012/13. Rural households had larger budget shares of food than urban households in all four rounds of GLSS. This implies that the expenditure share of food increase more for households in rural areas than households in urban areas when total expenditure increases.

The regional dummy does not show much consistency over the years for the quadratic model too. However, with Western region as the base region, it is not surprising to observe that Greater Accra and Ashanti region have lower budget shares on food. These regions have the highest levels of income in the country which could explain their low budget share on food compared to the Western region. And also as expected, the three northern regions have higher budget share of food than the Western region in most in all the years the coefficients were significant. Brong Ahafo region recorded higher budget share of food from 1998/99 to 2012/13. Central, Volta and Eastern regions also have higher budget share on food than the Western region in some years.

Estimates for all four rounds show an inverse relationship between log of total expenditure and budget share of food using the Working-Leser model. The log of total expenditure was significant at 1% in all cases. The square of the log of total expenditure, which was the quadratic term in the quadratic model, was statistically significant in all cases under study. This means we cannot rule out the possibility of a quadratic relationship between food share and total expenditure. In order to compare the two models to determine which best fit the Ghanaian data, the goodness of fit (R-square) value for the models are compared as seen in Hasan (2016), Salathe (1979) and Al-Habashneh and Al-Majali (2014). This method of determining the appropriate model for data compares the goodness of fit and the model with the highest value for the goodness of fit is considered most appropriate.

Applying this method to this study, the quadratic model has higher R-square value than the Working-Leser model in all the four rounds of GLSS. Thus, it can be ascertained that the quadratic model fits the GLSS data better than the Working-Lesser model, making it more appropriate for analysis. The fact that the quadratic term was significant in all estimations reinforces the quadratic model to be preferable.

The estimations from the quadratic model imply that budget share of food at initial levels are low, but increases as total expenditure increases. This could be due to low levels of income in most households in Ghana. Households may have low salaries that are not enough to cater for their feeding needs. So even as income increases, which result in increase in total expenditure, most part of the expenditure still remains on food.

5.4 Elasticity of Budget Share of Food with respect to Total Expenditure

Engel elasticity for food is computed using the estimates from the Working-Leser specification and the quadratic specification for GLSS3, GLSS4, GLSS5 and GLSS6 at sample means. Column 1 and column 2 are elasticity estimates for the Working-Leser model and the quadratic model respectively. The Engel elasticity was below unity for both the Working-Leser and the quadratic specifications for all four rounds of GLSS indicating food share is inelastic to total expenditure. This means that food is a necessity and it conforms to other studies in the literature. However, the Working-Leser specification gave elasticities that were higher than the elasticities from the quadratic specification in most cases.

Though the Engel elasticities estimated are below unity, they are generally higher compared to Engel elasticity estimates by Bhalotra and Attfield (1998), Salathe (1979), Al-Habashneh and

Al-Majali (2014), Dudek (2011) among others. This could be due to the high levels of poverty faced by households in Ghana. Low Income levels cause most households to spend most part of their earnings on food with very little left for other expenditures. Table 5.7 below presents the expenditure elasticity of food for 1991/92, 1998/99, 2005/06 and 2012/13.

Table 5.7 Expenditure Elasticity of Food by Sample Means

Year	Working-Leser Model	Quadratic Model
1991/92	0.750	0.734
1998/99	0.904	0.902
2005/06	0.870	0.849
2012/13	0.793	0.723

Source: Author's computation from GLSS 3, 4, 5 and 6

CHAPTER SIX

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

6.1 Summary

Food is a major necessity of life and a commodity that cannot be neglected in any economy. Abraham Maslow (1943) identified foods as one of the physiological needs which are a required for human survival. Food provision should be a major concern to every economy which seeks to continue to exist for an indefinite period. A number of policies have been put in place to cater for the increasing demand for food in Ghana. Food budget share studies have shown that households tend to spend less of their incomes on food as incomes increase.

The findings of this study suggest that there exists a negative relationship between food budget share and log of total expenditure, though the relationship between food and total expenditure is positive as shown in food budget studies. The quadratic model was found to be a better fit for the GLSS data than the Working-Leser model because it had higher goodness of fit in all four rounds.

Various studies have shown that using different functional forms of Engel curve to estimate income elasticity of food yields different results and elasticities. These differences has led various researchers to conduct study on country-specific cases in order to identify the functional form of Engel curve that best fit data from these various countries. However, such a study cannot be said to be available for Ghana; the functional form that fits best for Ghana has

not been investigated and this motivated the study to look into various functional forms of Engel curve and identify the one that has the best fit for the country.

An overview of expenditure in Ghana revealed that expenditure on food was the highest component of total expenditure from 1991 to 2013 while expenditure on housing was the least component of total expenditure. Female headed households spent more on food than male headed households and the households in rural areas also had larger share of budget on food than the households in the urban areas.

The study employed data from the third, fourth, fifth and sixth rounds of the Ghana Living Standard Survey (GLSS) conducted in 1991/92, 1998/99, 2005/06 and 2012/2013 respectively. The theoretical framework by Engel (1857) and some functional forms developed out of this model by a number of Economist Including Working-Lesser were looked at in the study. The models looked at were the ones that dominated the literature. The models employed suffered from endogeneity and this was corrected using log of income, log of average cluster income, welfare and land ownership as instruments. The relationship between total expenditure and budget share was estimated using the augmented regression approach while controlling for factors such as household size, sex of household head, locality, age of household head, region and poverty status. The study used robust standard errors to control for heteroskedasticity.

The Engel elasticities were estimated for the four rounds of GLSS used in the study for both the Working-Leser and the quadratic models and they were in conformity with economic theory. However, the elasticities had larger values compared to studies for other countries such as Okunade (1985) who found the elasticity of six African countries to be 0.57, which could be attributed to low income levels resulting in food taking a high proportion of total expenditure by households. Literature reviewed indicated that very few studies have been conducted on food Engel curves for countries in the Sub-Saharan region. Most of the studies carried out on food budget share established different functional forms of Engel curve as the best for their data though in all cases food was seen as a necessity.

6.2 Conclusion

Analysis of food expenditure showed variations in locality, regions and poverty status. The rural households spent more of their budget on food than the urban households. The poor and very poor households generally had larger budget share of food than the non-poor households. The study employed household size, sex of household head, locality, age of household head and region of household as control variables. Some of these variables were not statistically significant in some of the models. The estimates using the augmented regression approach and employing the Working-leser and the quadratic specifications of Engel curve showed that changes in total expenditure had significant effect on budget share of food. The study suggested that most households may just have enough for food though food is a necessity for all households in all rounds of the GLSS. Though the fit for both models were generally low which is often the case with cross sectional analysis, the quadratic model had better fit than the Working-Leser model in all four rounds of the GLSS.

The elasticity estimates for both the Working-leser model and the quadratic were less than unity for all four rounds of GLSS used for the study. Thus, confirming the notion that food is a necessity as asserted by Engel (1857), Salathe (1979) and Al-Hasbashneh and Al-Majali (2014) among others. The Working-leser specification had higher Engel elasticity estimates in most cases.

6.3 Policy Recommendations

The following policy implications can be made from the results of this study on food in Ghana.

Considering variations in total expenditure across households, the income effect of food expenditure can be fully taken in modeling demand to predict household responses to tax reforms on food. The elasticity estimate for food share can serve as a guide to designing tax structures for food in Ghana. It will help government to model household responses to negative income shock. Knowing the right functional form for food share will give government and other policy makers a clue on the effect of tax reforms on food on households with low incomes. This can guide the government to implement programs to counter such effects or reconsider the tax reform.

Equivalence scales which are used for welfare comparisons across households can be computed from the findings of this study. Equivalence scales are used to make welfare comparisons across households. It gives a common basis for comparing the welfare of households with different demographic characteristics. Thus, the findings from this study will enable the estimation of equivalence scale for households in Ghana for the purpose of welfare comparisons.

Findings from this study can be used as criteria for poverty line for households in Ghana. Poverty lines show the minimum threshold below which an individual or household can be said to be poor. The expenditures that are deemed relevant are for human survival, of which food is part, are summed up in determining the poverty line.

6.4 Limitations to the Study

The study sought to investigate the functional form of Engel curve that best fits data for Ghana using the last four rounds of the GLSS. Though the study used secondary data from the Ghana Living Standard Survey which is recognized by many as a good dataset, the problem of understatement of income and/or expenditure cannot be overlooked. Most households tend to understate their incomes and/or expenditure when approached by survey conductors for fear of being heavily taxed (Ofori, 2009). Also, since most rural dwellers get food substances from their farms, there could be issues of over or under pricing of these food substances.

The study could not delve into the causes of the insignificance of some control variables, such as household size and age of household head used in the research, as they were not a major concern to this research though it would have been worth the time and resource. Further research is needed to ascertain the reason behind the behavior of these variables for the GLSS data as other studies such as Al-Habashneh, F., & Al-Majali, K. (2014) have shown some of them to be significant in the analysis of food Engel curve.

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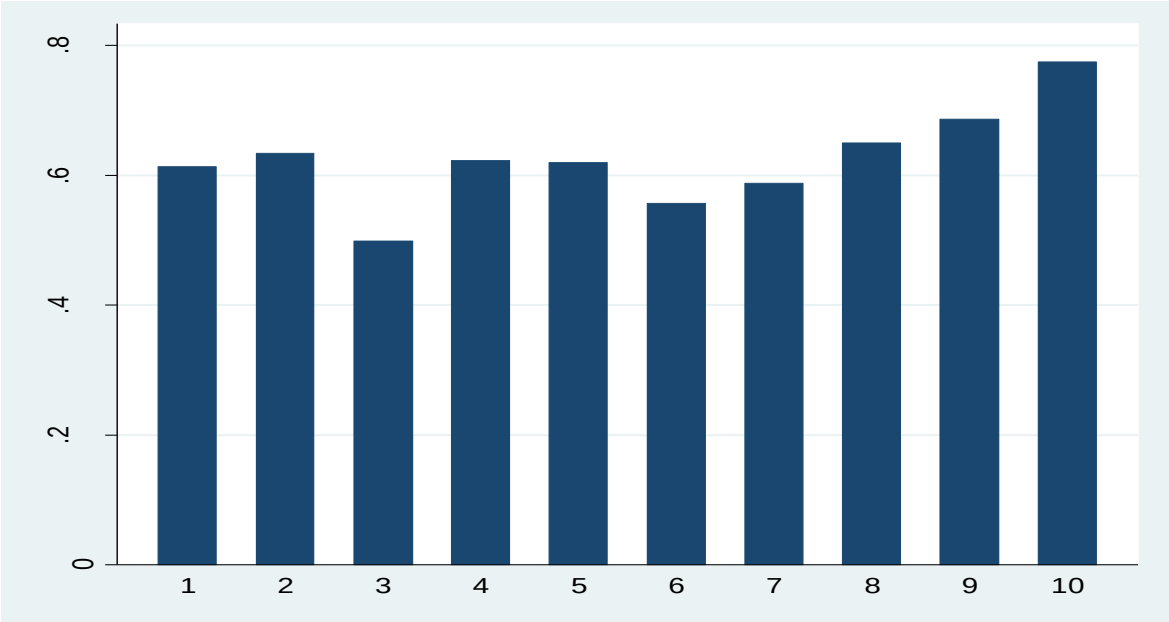
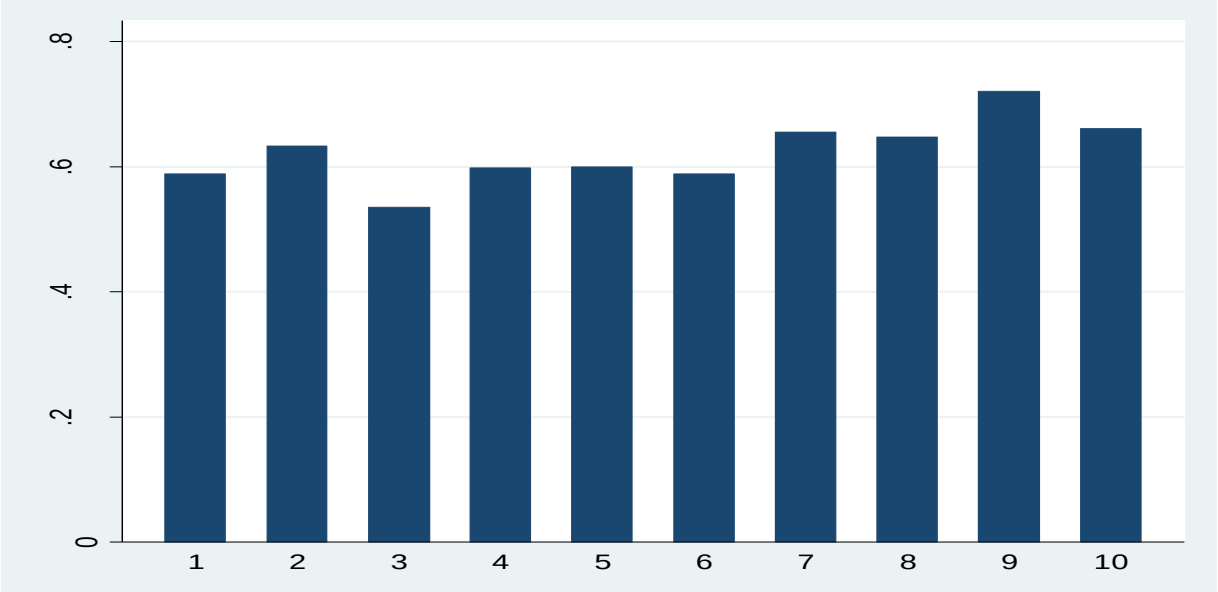
APPENDICES

A1: Mean Budget Share of Food by Regions for 1991/92



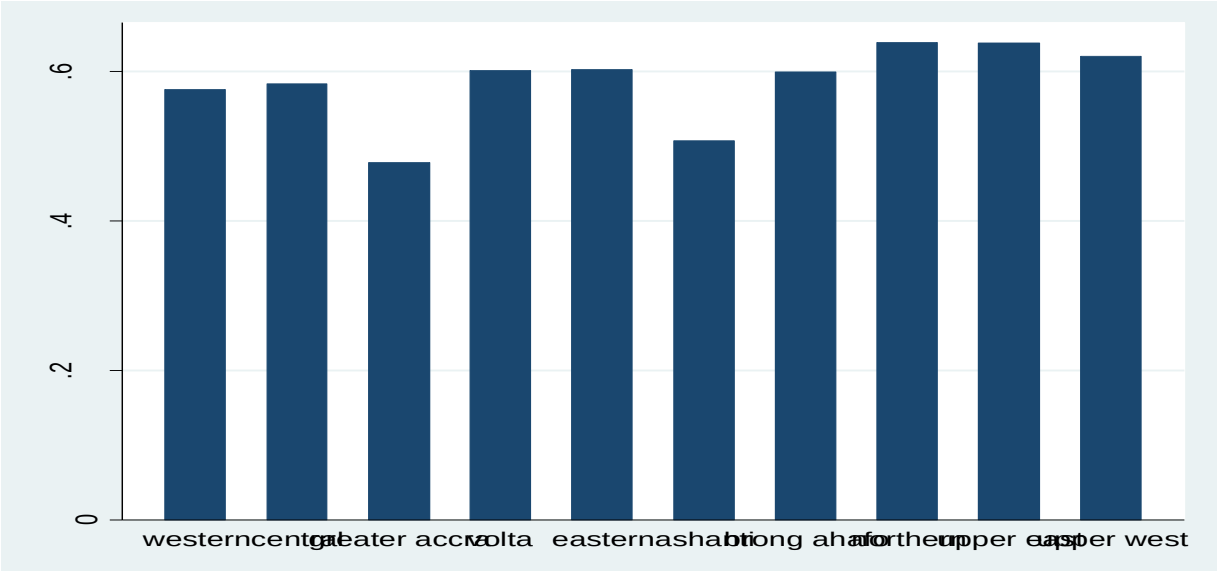
Source: Author's computation from GLSS 3

A2: Mean Budget Share of Food by Regions for 1998/99



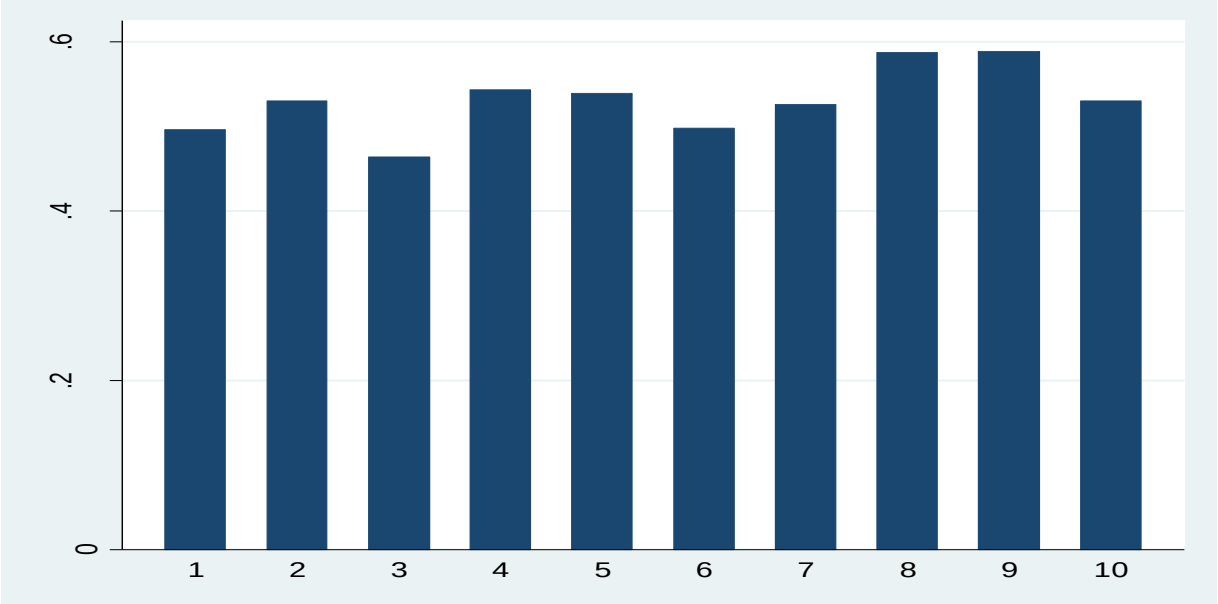
Source: Author's computation from GLSS 4

A3: Mean Budget Share of Food by Regions for 2005/06



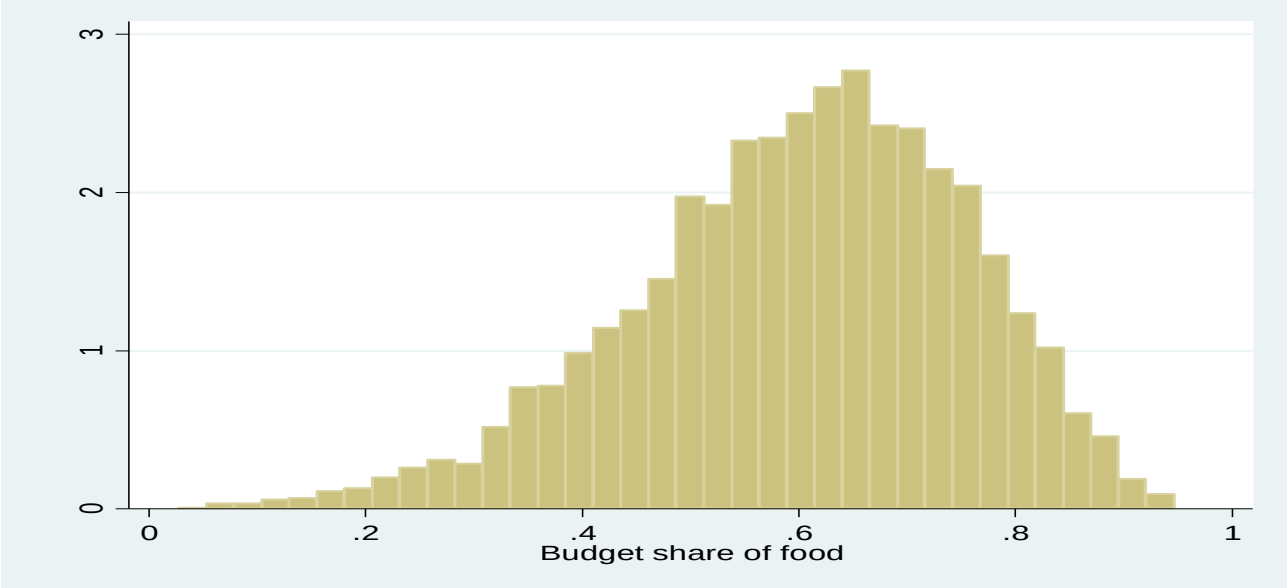
Source: Author's computation from GLSS 5

A4: Mean Budget Share of Food by Regions for 2012/13



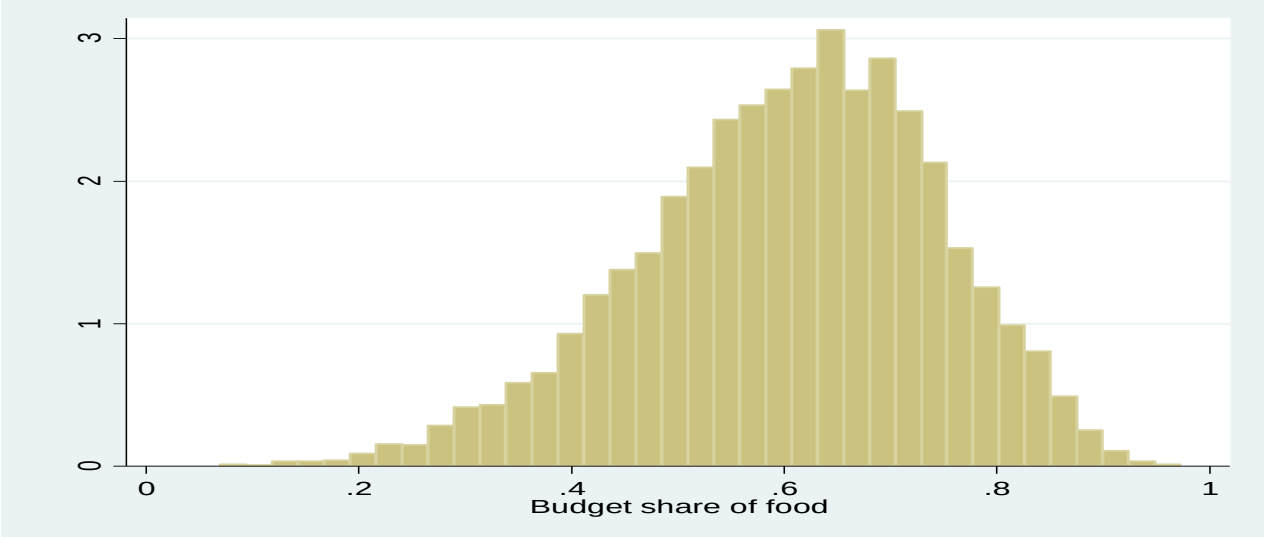
Source: Author's computation from GLSS 6

A5: Histogram for 1991/92



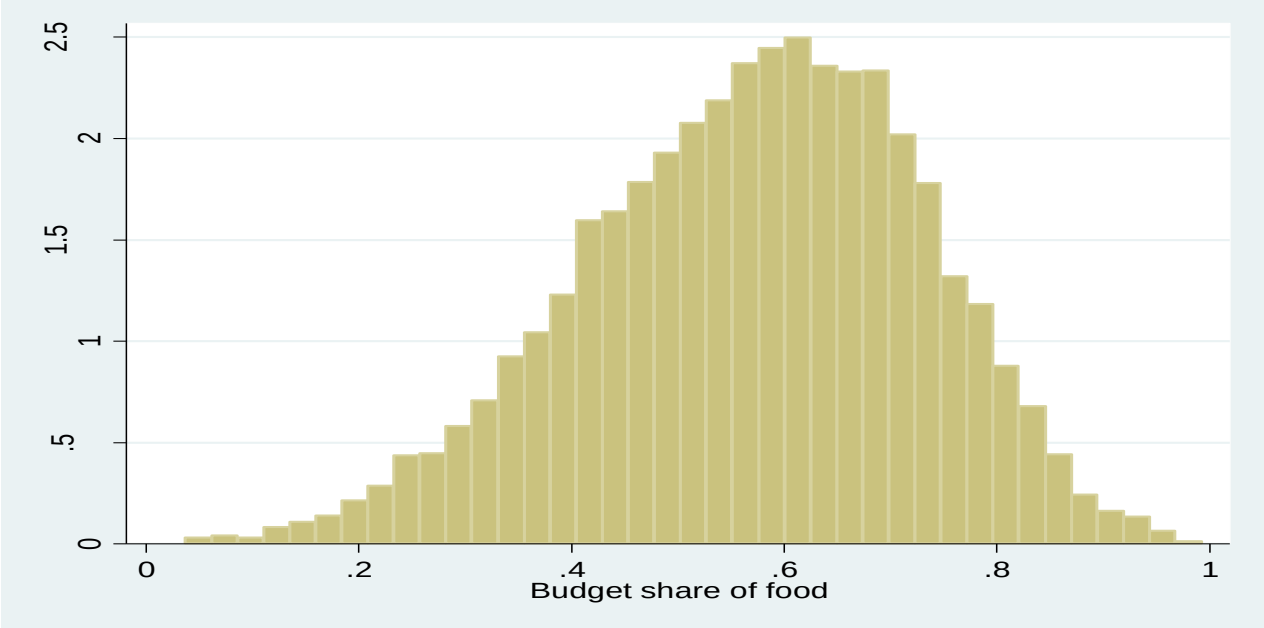
Source: Author's computation from GLSS 3

A6: Histogram for 1998/99



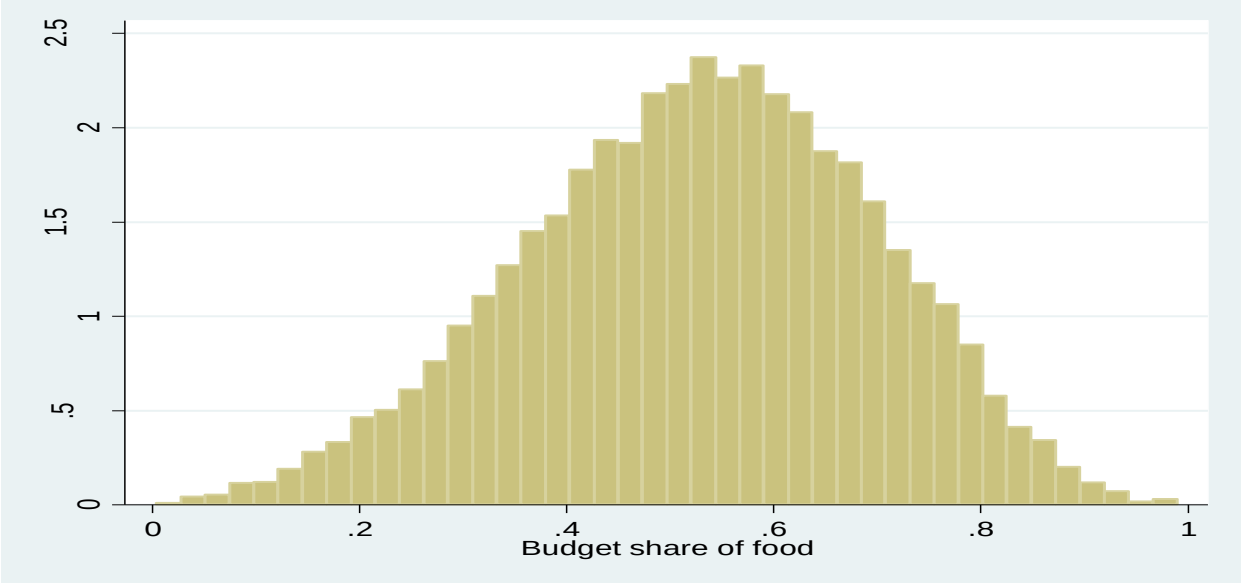
Source: Author's computation from GLSS 4

A7: Histogram for 2005/06



Source: Author's computation from GLSS 5

A8: Histogram for 2012/13



Source: Author's computation from GLSS 6