

## **Accounting For Marginal Food Budget Share And The Engel's Law Coefficient In Ghana: The Empirics From The Ghana Living Standards Survey Round Seven**

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### **ABSTRACT**

Using data from the Ghana Living Standards Survey seven, the paper established that the Engel's Law is applicable to the economy of Ghana suggesting that a 10% rise in household expenditure reduces the share of the household budget allocated to food by 0.801 of one percentage point, on average, and that food is a necessity commodity in Ghana. The marginal food budget share is high at a 62 percent rate putting the economy of Ghana in the medium food insecurity category. Strenuous policy effort must be initiated to increase food production and supply in Ghana to make food not a necessity commodity anymore and move the Ghanaian economy away from the medium food insecurity category in the very near future.

**KEYWORDS:** Ghana Living Standards Survey 7, Engel's Law, food, budget share, necessity

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### **I. INTRODUCTION**

The share of total household expenditure spent on food is an indicator of household food security because it is widely documented that the poorer and more vulnerable a household, the larger the share of household income spent on food. This observation is known as the Engel's Law, which demonstrates that as incomes rise, both within a country and across countries, expenditure on food increases while expenditure on other things increases even more, so that the share of total income spent on food declines. Given this observation, the Engel's law coefficient is especially helpful to understand the impact of food price fluctuations on both the quality and quantity of household food consumption. If a change in food prices results in a higher share of total household expenditure being spent on food, then this can result in the household being more resource constrained as a result of the increase in food prices. Consequently, depending on the specific foods, households that are very poor and already consuming the lowest-cost foods will be unable to substitute cheaper foods and will be forced to spend more on basic staples, reduce the quality of their diets, or even reduce the quantity consumed of the least expensive foods, while also reducing non-food expenditures that may be equally needed like on health and education (Lele et al. 2016).

164 years after the seminal paper of (Engel 1857) "*Die Productions und Consumptionsverhaltnisse des Königreichs Sachsen*", translated in English as "The Consumption-Production Relations on the Kingdom of Saxony", social scientists have a tireless attention for its work, especially its applicability and relevance in different socio-economic contexts. According to Engel's law, there is a consumption hierarchy in the economy. The population with a low living standard will spend more money to cover their basic needs comprising food, clothing, housing, etc. However, as the standard of living increases, and income level increases, the expenditure is directed to purchase goods for their comfort, health, transport, recreation and leisure, tourism. He therefore opines in what has become in the social studies literature that as an economy develops, the transition to services consumption is faster but the share of food consumption evolves in an inverse relationship with income and the elasticity coefficient of this type of consumption is less than 1, suggesting that at an increase of 1% of income, the increase of consumption will be lower than 1%.

In his seminal paper, Engel introduced into the discussion the theory of Malthus (1798) according to which the population growth expands faster than the means of production, leading to a social catastrophe. Engel argued that it is possible to avoid such social anarchy when the economic production could balance the economic growing demand, through an adaptation of the goods and services provided to the evolving population demand. Therefore, Engel investigated how the pattern of demand changes as household income changes. He found that an increase in household income lead to a less than proportional increase in food household expenditures. This finding allayed the fear of Malthus that food demand grows at the same geometrical rate as

the population. Due to the changes in the consumption structure when economy grows, per capita income grows, new resources can be directed to the production of non-food goods and services (Chai and Moneta, 2010).

The Engel's Law coefficient is usually calculated with data from Household Consumption and Expenditure Surveys (INDDEX Project 2018), that include the monetary value of household consumption disaggregated into food and non-food items. The share of household expenditure on food is equal to: The monetary value of non-purchased items, including consumption from own production and in kind payments and transfers, which are imputed from available price information. (Smith and Subandoro 2007) have proposed that households spending over 75% of their income on food are considered very vulnerable and consequently food insecure, whereas economies spending 65-75% are considered to have high food insecurity; those spending 50-65% have medium food insecurity; and those that spend less than 50% of their income on food are considered to have lower levels of food insecurity. There are several studies exploring, analyzing and extending the Engel's Law or constructed on its basis. It has also been faced with criticisms and highlights of its limitations (Chai and Moneta, 2010).

Unfortunately, when it comes to social research on analyzing the Engel's Law coefficient using data generated in Ghana, none exist to the best of the author's knowledge. The research gap is bridged by this novel paper estimating the Engel's Law coefficient, household marginal food budget share, and the food expenditure elasticity, using data generated on the economy Ghana. The paper is organized as follows: the description of the Ghana Living standards Survey section is next, followed by the survey design and data section. The description of variables and summary statistics section is next, and the empirical model and methodology of the study is exposed. The penultimate section discusses the main findings, and the last section is dedicated to the conclusions and policy implications.

## **II. BACKGROUND OF THE GHANA LIVING STANDARDS SURVEY**

The Ghana Living Standards Survey (GLSS) is a multipurpose household survey that provides a wealth of data in assessing the living conditions of Ghanaians. The survey provides valuable information on the socio-economic characteristics of households in Ghana. The focus of the GLSS has been on measuring and monitoring living conditions, income and expenditure patterns, which are essential for formulating evidence-based policies in addressing poverty issues. It also provides data to monitor progress towards achieving national policies and international agreements including the United Nations Sustainable Development Goals (SDGs). Among others, the GLSS provides data for measuring Targets 1.1 and 1.2 of the SDGs Goal 1 which seeks to end poverty in all its forms by 2030. The Ghana Living Standards Survey is a customized version of the Living Standards Measurement Study (LSMS), initiated in 1980 by the Policy Research Division of the World Bank. The Bank introduced the project to make available relevant data for policy and decision-makers to measure socio-economic indicators and appreciate their determinants. Through the findings from the survey programmes, could be developed and implemented to address challenges in the various sectors of the economy such as health, education, economic activities and housing conditions, among others. The GLSS has, therefore, been established as a permanent welfare monitoring tool in Ghana. The GLSS was first conducted in 1987. Subsequently, there have been six other rounds of the survey. The second was conducted in 1988. The third, fourth, fifth and sixth rounds were conducted in 1991/92, 1998/1999, 2005/2006, and 2012/2013 respectively. The latest, which is the seventh round of GLSS, was conducted between October, 2016 and October, 2017. The questionnaires used during the sixth round were maintained but new sections on mortality, food security and data protection were introduced. The Ghana Living Standards Survey Seven (GLSS7) provides comprehensive information on the demographic characteristics of households and household population in Ghana, households' income and expenditure (on food and non-food), education, health, tourism, migration and remittances, household agricultural activities and non-farm enterprises. The information gathered from the survey is expected to aid decision-makers in the formulation of economic and social policies to guide developmental efforts, help in the identification of vulnerable groups including those most affected by poverty for targeted intervention, support the construction of models to stimulate the impact of policy options on individual groups, serve as a basis for analyzing the impact of policy decisions on the living conditions of households and assist in welfare monitoring at the national and sub-national levels. (Ghana Statistical Service 2019).

## **III. SURVEY DESIGN AND DATA OF GLSS 7**

The Ghana Living Standards Survey Round Seven (GLSS7) adopted a similar sampling methodology to that of the GLSS6. It was designed to provide indicators which are nationally and regionally representative. The sampling employed a two-stage stratified sampling design. One thousand (1,000) enumeration areas (EAs) were selected to form the Primary Sampling Units (PSUs). The PSUs were allocated into the 10 administrative regions using probability proportional to population size (PPS). The list of EAs from which the samples were drawn was based on the 2010 Population and Housing Census. The EAs were further divided into urban and rural localities of residence. A complete listing of households in the selected PSUs was undertaken to form the

Secondary Sampling Units (SSUs). At the second stage, 15 households from each PSU were systematically selected. The total sample size generated was 15,000 households nationwide, which provide 14,009 respondents (Ghana Statistical Service 2019).

#### IV. VARIABLES DESCRIPTION AND SUMMARY STATISTICS

The description and the summary statistics of the variables are presented in Table 1.

**Table 1: Definition of Variables and Summary Statistics**

Variable	Description	Mean
w	Total annual expenditure on food and non-alcoholic in Ghana Cedis.	5004.189
x	Natural Log of total annual nominal household expenditures in Ghana Cedis, a proxy for household annual nominal income.	8.91505
$\bar{w}$	Sample mean share for food in the household budget.	0.5417

Estimates obtained from STATA 14

#### V. EMPIRICAL MODEL AND METHODOLOGY

The paper seeks:

- (i) to examine if the Engel's Law is applicable in Ghana.
- (ii) to estimate the household marginal food budget shares in Ghana.
- (iii) to estimate the food elasticity expenditure in Ghana.

The methodology to achieve the empirical model is as follows:

Defining the value of food consumption for household  $i$  as  $C_i$  and total household expenditure for household  $i$  as  $x_i$ , the household food budget share can be defined as:

$$w_i = \frac{C_i}{x_i}, \text{ which is the food share in total expenditure.} \quad [1]$$

The Ordinary Least Square (OLS) procedure is used to estimate the following relationship:

$$w_i = \alpha + \beta \ln(x_i) + u_i \quad \text{where } i = 1, \dots, 14,009 \quad [2]$$

The OLS estimate for  $\beta$  is the coefficient that is use to test for the existence of the Engel's Law.

The marginal food budget share, which estimates the effect of a change in household expenditure on food as computed at the means of the data is:

$$\frac{dC_i}{dx_i} \quad [3]$$

Since:

The household food budget share is defined as:  $w_i = \frac{C_i}{x_i}$

$$\text{So: } \frac{dw_i}{dx_i} = \frac{d\left(\frac{C_i}{x_i}\right)}{dx_i} = \frac{\beta}{x_i}$$

$$\Rightarrow \frac{d\left(\frac{C_i}{x_i}\right)}{dx_i} = \frac{x_i \frac{dC_i}{dx_i} - C_i \frac{dx_i}{dx_i}}{x_i^2} = \frac{\beta}{x_i}$$

$$\Rightarrow x_i \frac{dC_i}{dx_i} - C_i = \beta x_i$$

$$\Rightarrow \frac{dC_i}{dx_i} - \frac{C_i}{x_i} = \beta$$

$$\Rightarrow \frac{dC_i}{dx_i} = \beta + \frac{C_i}{x_i}$$

$$\Rightarrow \frac{dC_i}{dx_i} = \beta + w_i \quad \text{since } w_i = \frac{C_i}{x_i}$$

This could be computed at the sample mean of the budget share defined as  $\bar{w}$ . So,

$$\frac{dC_i}{dx_i} = \hat{\beta} + \bar{w} \quad [4]$$

The household expenditure elasticity for food at the means of the sample data can be computed as:

$$\eta = \frac{dC_i}{dx_i} \frac{x_i}{C_i} = [\hat{\beta} + w_i] \frac{x_i}{C_i} = \frac{\hat{\beta}}{w_i} + 1 \quad [5]$$

## VI. RESULTS DISCUSSIONS

The estimated relationship is as follows:

$$w_i = 1.2556 - 0.0801 \ln(x_i) + u_i \quad \text{where } i=1,2,\dots,14009.$$

(0.0150) (0.0017)

The interpretation of the estimated effect for  $\beta$  suggests that a 10% rise in household expenditure reduces the share of the household budget allocated to food by 0.801 of one percentage point, on average.

The null and alternative hypotheses could be expressed as:

$$H_0: \beta = 0 \text{ versus } H_a: \beta < 0$$

A one-tailed (left-sided) test is computed as:

$$T_{14,007} = \frac{-0.0800701 - 0}{0.0016774} = -47.73$$

Using a significance level of 0.05, the relevant critical value is  $-1.645$ . The null hypothesis is decisively rejected and the estimated effect is consistent with the 'Engel's Law'.

The empirical estimate for the derivative of the marginal food budget share is:

$$\frac{dC_i}{dx_i} = -0.0801 + 0.5417 = 0.6218.$$

Interpreted as a one Ghana Cedi increase in household expenditure induces a 0.62 Pesewa increase on food expenditure.

The expenditure elasticity is computed using the OLS estimate for  $\beta$  and the mean budget share for food as:

$$\eta = \frac{\hat{\beta}}{w} + 1 = \frac{-0.0801}{0.5417} + 1 = 0.852$$

The expenditure elasticity suggests that a 10% increase in expenditure raises food demand by 8.5%. The elasticity is numerically less than unity suggesting that food is a necessity or a 'necessary' commodity in Ghana.

## **VII. CONCLUSION AND POLICY IMPLICATIONS**

The Engel's Law is applicable to the economy of Ghana, and the paper established that food is a necessity in Ghana. The marginal food budget share in Ghana is high at a 62 percent (0.62 pesewas) rate putting the economy of Ghana in the medium food insecurity category. Strenuous policy effort must be initiated to move the economy of Ghana from the medium food insecurity category as soon as it is scientifically and practically possible, to make food no more a necessity in Ghana. Using a panel data to examine the impact on Ghanaian household marginal food budget share and the Engel's Law coefficient from the planting for food initiative embarked on by the Government of Ghana in 2018 remains a high agenda for future research.

## **REFERENCES**

- [1]. Chai, A., Moneta, A. (2010). Retrospectives-Engel curves. *Journal of Economic Perspectives*, Vol.24. No.1, pp.225-240.
- [2]. Engel, E. (1857). Die Productions- und Consumtionsverhältnisse des Königreichs Sachsen. *Zeitschrift des Statistischen Bureaus des Königlich-Sächsischen, Ministerium des Innern*, No. 8 u. 9, pp. 1–54. It was reprinted as an appendix to "Die Lebenskosten Belgischer Arbeiter Familien frither und jetzt", *Bulletin de l'institut international de statistique*, tome IX, premiere livraison, Rome 1895.
- [3]. Ghana Statistical Service, (2019). *Ghana Living Standards Survey 7, Main Report*. Accra, Ghana.
- [4]. INDDEx Project (2018), *Data4Diets: Building Blocks for Diet-related Food Security Analysis*. Tufts University, Boston, MA. <https://inddex.nutrition.tufts.edu/data4diets>. Accessed on 1 June, 2020.
- [5]. Lele, U., Masters, W.A., Kinabo, J., J.V. Meenakshi, J.V., Ramaswami, B., Julia Tagwireyi, J., Winnie F.L. Bell, W.F.L. and Sambuddha Goswami, S. (2016). *Measuring Food and Nutrition Security: An Independent Technical Assessment and User's Guide for Existing Indicators*, Technical Working Group on Measuring Food and Nutrition Security. Food Security information Network.
- [6]. Malthus, T. (1798). *An Essay on the Principle of Population*. London: J. Johnson.

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