International Journal of Food and Agricultural Economics
ISSN 2147-8988
Vol. 1 No. 1 pp. 27-39

FOOD PRICE INFLATION AND CONSUMER WELFARE IN GHANA

Yaw Bonsu Osei-Asare
Department of Agricultural Economics and Agribusiness, University of Ghana
Legon-Accra, Ghana
Mark Eghan
Department of Agricultural Economics and Agribusiness, University of Ghana,
Legon-Accra, Ghana.Email: nanaeghan@gmail.com

Abstract

The paper analyses the effects of food price inflation on Ghanaian households using GLSS-5 household data. Expenditure endogeneity and truncated expenditures were controlled in the estimation process using the "Augmented Regression Approach" and Heckman's two-stage procedure, respectively. Symmetry and homogeneity conditions were rejected in the unconstrained LA/AIDS model. The study reveals that cereals and bread; fish; vegetables; and roots and tubers will continue to constitute important share of Ghanaian food expenditure as they collectively constitute 67% of future food expenditure. Food price inflation between 2005 and 2011 has eroded real household food purchasing power by 47.18%.

Key words*: Compensating variation, Food price, Inflation, Welfare, Elasticities*

1. Introduction

The Food and Agriculture Organisation Food Price Index (FFPI) reached an average of 237 index points in February 2011; the highest within the last two decades (Food and Agriculture Organization (FAO), 2011). The first of this price hikes occurred in the year 2008 when food prices increased by 75% (World Food Programme (WFP), 2008). This was followed by a small reduction in the price levels until it started rising up again. The increase in the price levels lead to social and political instability in a number of developing countries and prices are expected to continue above the pre-2004 trend level for the near future (Organisation for Economic Co-operation and Development (OECD) - FAO, 2008).

In Ghana, the 2007/2008 fiscal year observed a high rate of food price increases following the global food crises. For instance the prices of cereals increased by 20% to 30% between 2007 and 2008 (Wodon*et al.*, 2008)**,** food component of the consumer price index also rose from 193.9 to 246.7 indicating a 27% food inflation within the same period (Ghana Statistical Service (GSS), 2009). The food crises put extra burden on consumers by reducing their real income as 44% and 60% of household expenditure are spent on food in urban and rural Ghana respectively (GSS, 2008).

Prices of goods and services have great impact on the livelihoods of consumers; food prices have greater impact on non-food producing households and on inflation trend in Ghana as it is composed of almost 44.91% by weight of the Consumer price in index (GSS, 2011). Ghana is a lower-middle-income country, hence as income increases the demand for goods and services especially food commoditiesare expected to rise. The

pattern of consumption will also be affected, as consumers are likely to consume more protein than cereals/carbohydrates. In developing countries such as Ghana, greater shares of income of peopleare spent on food (Banerjee &Duflo, 2007).

Several policy interventions have been implemented to protect consumers from rising food prices in Ghana(Ministry of Finance and Economic Planning (MoFEP), 2009).For instance during the year 2008, import duties on rice, yellow corn, wheat and cooking were suspended, all in an attempt to cushion Ghanaian consumers from the severe impacts of further price increases.

The cost of higher food and fuel prices to consumers in developing countries has been estimated to be about US$680 billion on aggregate in 2008 (Ministry of Finance and Economic Planning (MoFEP), 2009). Rising food prices have great impacts on poverty levels and food security since access to food is largely dependent on the price of the various food commodities. Given that food is the basic need of individuals, it is the priority on the expenditures of people, especially people within low and middle-income groups. Food price increases reduce the real income of households thereby reducing their purchasing power and shifting available income on foods.

It is important to quantify the extent to which changes in food prices affect welfare of Ghanaian households. In Ghana, there is the general recognition of the effects of food price changes on household welfare and yet relatively little is known about the quantitative effects of rising food prices on household welfare. The object of this study is to quantitatively assess the welfare implications of rising food prices in Ghana from 2005 to 2011.

This study makes contribution to the existing literature in two ways; first, the study models a complete demand system, instead of a partial demand modelling approach often adopted, for all food groups in Ghana.Secondly, expenditure endogeneity and selectivity bias resulting from zero consumption, which are often ignored in several assessments, areexplicitly controlled for in the estimation process in this study. The rest of the paper is structured as follows; Section 2 outlines the model specification. In section 3, thedescription of the data is presented. Sections 4 and 5 provide results and discussions whiles section 6 presents the conclusions.

2. Model Specification and Estimation

2.1. Almost Ideal Demand System (AIDS)

The AIDS model has been widely applied in empirical demand studies since its conception in 1980. Buse (1994) for instance states that closer examination of 207 accessible citations revealed that 68 out of 89 empirical applications used the Linear Approximate version of the AIDS model and that 23 out of 25 papers used the LA/AIDS estimation for estimating demand functions.Following Deaton and Muellbauer (1980).The AIDS model is specified as:

$$w_i = a_i + \sum_j^n \gamma_{ij} \log p_j + \beta_i \log\left(\frac{x}{\mathrm{p}}\right) + u_i \qquad (1)$$

Where w_i is the budget share devoted to commodity i in the commodity groups, $p_j$is the nominal price of commodity j,x is total expenditure of the household on food commodities, $\alpha, \gamma \; and \; \beta$are all parameters to be estimated with u as the error term of the model. P is a translog price index defined by:

$$\log \mathrm{P} = a_0 + \sum a_i \log p_i + \frac{1}{2}\sum\sum \gamma_{ij}^{*} \log p_i \log p_j \quad (2)$$

The use of the price index in (2) raises estimation difficulties caused by the non-linearity of parameters. Originally, Deaton and Muellbauer (1980) suggested the use of Stone's price index defined by:

$$\log P = \sum_{i=1}^{n} w_i \log p_i \quad (3)$$

but the use of stone's price index causes a problem of simultaneity in the model because, the budget share (w_i) serves as both dependent and independent variable in the model (Eales&Unnevehr, 1988; and Moschini, 1995). Following Moschini (1995), a Laspeyres price index is used to substitute for the Stone's Price index in (3). According to (Moschini, 1995) the Laspeyres price index is specified as:

$$\log(P^L) = \sum_{i=1}^{n} \overline{w}_i \log(P_i) \quad (4)$$

Where$\overline{w}_i$ is the geometric mean budget share of the i^{th}commodity.
Substituting equation (3) into the AIDS model (1) gives the Linearised Almost Ideal Demand System (LAIDS) as:

$$w_i = a_i^{*} + \sum_j^n \gamma_{ij} \log p_j + \beta_i\left[\ln(x) - \sum_{j=1}^{n} \overline{w}_j \ln p_j\right] + u_i^{*} \quad (5)$$

where$a_i^{*} = a_i - \beta_i\left(a_i - \sum_{j=1}^{n} \overline{w}_j \ln \overline{p_j}\right)$ and $\overline{p_j}$ is the mean price of the jthcommodity, all other variables retain their previous interpretation.For AIDS model to be consistent with demand theory, the following restrictions are imposed on the AIDS model:

Adding Up,

$$\sum_{i=1}^{n} a_i = 1 \sum_{i=1}^{n} \gamma_{ij} = 0 \sum_{i=1}^{n} \beta_i = 0 \quad (6)$$

Homogeneity,

$$\sum_j \gamma_{ij} = 0 \quad (7)$$

Symmetry,

$$\gamma_{ij} = \gamma_{ji} \quad (8)$$

The Heckman's two-stage procedure is used to estimate the demand model to overcome the problem of selection bias when zero-consumption of commodities is present in the data set. Expenditure endogeneityis controlled using the Augmented Regression Approach proposed by Blundell and Robin (1999).

To avoid singular matrix during estimation due to the use of budget share equations, the demand equation of "other food" is dropped from the system of demand equations. The parameters of the omitted budget share equation are retrieved by using the property of adding-up.

The demand model for all the ten food aggregates are estimated simultaneously by using the Zellner's Seemingly Unrelated Regressions (SUR) procedure with STATA version 11.

Following Ackah and Appleton (2007), the elasticities are computed at sample means as follows:

(i) Expenditure Elasticity

$$\eta_i = \frac{\partial \log q_i}{\partial \log x} = 1 + \left(\frac{1}{w_i}\right)\left(\frac{\partial w_i}{\partial \log x}\right) = 1 + \left(\frac{\beta_i}{w_i}\right) \quad (9)$$

(ii) Marshallian (Uncompensated) Elasticity

$$e_{ij} = \frac{\partial \log q_i}{\partial \log p_j} = -\delta_{ij} + \left(\frac{1}{w_i}\right)\left(\frac{\partial w_i}{\partial \log p_j}\right) = -\delta_{ij} + \left(\frac{\gamma_{ij}}{\overline{w}_i}\right) - \left(\frac{\beta_i}{\overline{w}_i}\right)\overline{w}_j \quad (10)$$

(iii) Hicksian (Compensated) price elasticity as estimated from the Slutsky equation:

$$\varepsilon_{ij}^{*} = e_{ij} + \eta_i w_j \quad (11)$$

(iv) Marginal Expenditure shares (Abdulai*et al*.,1999):

$$m_i = \eta_i w_i \quad (12)$$

whereδ_{ij} is the Kronecker delta defined by:

$$\delta_{ij} = \begin{cases} 1 & \text{for } i = j \\ 0 & \text{0therwise} \end{cases}$$

2.2. Welfare Model

To estimate the magnitude of partial welfare effects, usually, it is useful to obtain a money metric utility of welfare change. The money metric utility is derived by estimating an expenditure function defined as the minimum expenditure required to maintain a specific utility level at a given set of prices (Deaton &Muellbauer, 1980). For a household to remain at the same level of utility after a change in price, the household would have to be compensated for the price change. Thus, the amount of money required to restore a household to her initial level of utility is known as compensating variation. The compensating variation measures the monetary value of welfare effects resulting from a price change.

The consumer initially faces a vector of price $p^o = (p_1^0, \ldots, p_n^0)$ with expenditure level x^0 and maximized utility $u^*(p^0, x^0) = u^0$. Now, with new vector of prices p^1 and same expenditure, the maximized utility becomes $u^*(p^1, x^0) = u^1$. Following Deaton and Muellbauer (1980), the compensating variation can implicitly be defined through the indirect utility function V as:

$$V(x^0 + CV, p^1) = V(x^0, p^0) \quad (13)$$

Where x is household expenditure and p is a vector of prices, the superscript 0 and 1 refers to before and after price change respectively.

In terms of expenditure function, the compensating variation can explicitly be expressed as:

$$CV = e(p^1, u^0) - e(p^0, u^0) \quad (14)$$

Following Friedman and Levinsohn (2002), the second-order Taylor expansion of the minimum expenditure function can be specified as:

$$\Delta \ln c_1 \approx \sum_{i=1} w_i \Delta \ln P_i + \frac{1}{2} \sum_{i=1} \sum_{j=1} w_i \varepsilon_{ij}^* \Delta \ln P_i \Delta \ln P_j \quad (15)$$

where$\Delta \ln c_1$ refers to change in welfare, $w_i$is budget share of commodity i,ε_{ij}^* is the compensated price elasticity of commodity *i* with respect to the change in price of commodity *j*and $\Delta \ln P_i$ is the proportionate change in the price of commodity i computed as:

$$\Delta \ln P_i = \ln P_t - \ln P_{t-1} \quad (16)$$

The nominal prices are deflated using food consumer price index to express all current prices in the constant 2005 prices.The compensating variation would be positive if there is a loss in welfare resulting from the price increase. However, if there is an improvement in welfare following a price change, the compensating variation would be negative.

2. Data

The Ghana Living Standard Survey Round Five (GLSS5) developed and implemented by the Ghana Statistical Service is the main expenditure data set used for this study. The GLSS is a multi-purpose survey of households in Ghana that collects information on different dimensions of living conditions of Ghanaians. The GLSS has enough information to estimate total food consumption of each household in the form of expenditure on the commodities consumed. The GLSS5 sampled 8,687 households, interviewed between September 2005 and September 2006, however, only 8,625 households were used after data management process.

The price data was collected separately from the Ghana Statistical Service since the GLSS5 did not capture commodity prices at the local markets. Hence, the regional average retail prices of fifty-eight food commodities were used to substitute for community prices.These individual prices were later weighted by the respective geometric mean of that food commodity to compute the aggregate commodity prices using the Laspeyres price index. The individual food commodities were aggregated as Bread & Cereals, Tubers & Roots, Fish, Meat, Oils & Fats, Nuts & Pulse, Dairy, Vegetables, Fruits, Cooked meal and "Others". The "others" are used to represent all other food commodities that do not fall under any of these aggregates but data was collected on. The prices for these commodities during the years 2005 to 2011 were used for the analysis.

3. Testing of Theoretical Restriction

Theoretical restrictions of homogeneity and symmetry were tested in the unrestricted Seemingly Unrelated Regressions (SUR) AIDS model. The result of the test for symmetry and homogeneity is reported in Table 1. The null hypotheses that prices are homogenous of degree zero and that the cross price derivatives are identical were tested. The results of the test of the two hypotheses, as presented in Table1, indicate that both symmetry and homogeneity null hypotheses had to be rejected. This implies that both

homogeneity and symmetry conditions did not hold in the model and therefore must be imposed during the estimation process. Earlier studies in demand analysis such as Barten (1969), Christensen *et al*. (1975) and Deaton and Muellbauer (1980) as well as recent studies such as Liao and Chern (2007), Taljaard*et al*. (2004) and Abdulai*et al*. (1999) rejected homogeneity hypotheses.

Table 1. Wald test for homogeneity and symmetry restrictions in the AIDS model

Restriction	**Wald test statistic**	**Degrees of freedom**	***p*-value**
Homogeneity	32.93	10	0.0003
Symmetry	673.20	45	0.0000

Source*:* Author's calculations from GLSS5

4. Results

5.1. Expenditure Elasticities

The calculated expenditure elasticities and the marginal budget shares are presented in Table 2. The first, second and third columns under the expenditure elasticity presents the expenditure elasticity for Ghana, urban and rural areas respectively. All expenditure elasticities are positive with the exception of expenditure elasticity for fruits that is a negative value. The positive expenditure elasticities imply that the food commodities under consideration are normal goods. This means that expenditures on food items rise with increase in income. This is consistent with consumer demand theory. Commodities with expenditure elasticities greater than one are theoretically classified as luxuries whiles expenditure elasticities less than one are classified as necessities.

Fruits appear to be an inferior food item[1] in rural Ghana since the expenditure elasticity of demand for fruit in rural Ghana is -0.33. This means that if rural income increases by 1%, expenditures on fruits are likely to reduce by 0.33%. The possible reason that can be attributed to inferiority of fruits in rural Ghana is that, in rural areas, fruits are consumed without necessarily purchasing them; fruits are abundant in rural Ghana.[i]

From Table 2, cereals and bread, meats, pulse and nuts, tubers and roots, and "others" are classified as luxuries because the expenditure elasticities on these food commodities are greater than 1. The theoretical classification as luxury may not necessarily make the commodity a luxurious commodity. For instance, considering the fact that cereals and roots and tubers are staples in Ghana, then classifying them as luxuries may be misleading. However, the finding reveals that Ghanaian households cut down on their expenditures on cereals and roots and tubers as a means of coping strategy against food price increases. The expenditure elasticities of roots and tubers and meat are consistent with the results from the GLSS 4 (Ackah& Appleton, 2007) where expenditure elasticities for roots and tubers, fish and meat were 1.439, 0.699 and 1.742 respectively.

The marginal budget shares measures the future allocation of any increases in income. The first, second and third columns under the marginal budget share in Table 2 presents the marginal budget share for Ghana, urban and rural areas respectively.From Table2, if Ghanaian household income should increase, on the average the Ghanaian consumer is expected to spend out of the increased income 24.52% on cereals and bread, 17.19% on fish, 13.56% on vegetables, 11.76% on roots and tubers, 8.82% on meat, 7.37% on other food commodities, 6.09% on cooked food, 3.64% on pulse and nuts, 3.31% on oils and fats, 2.43% on dairy and 1.3% on fruits.

Table 2: Expenditure elasticities and marginal expenditure shares

	Expenditure elasticity			Marginal expenditure shares		
	Ghana	**Urban**	**Rural**	**Ghana**	**Urban**	**Rural**
Cereals and Bread	1.2384	1.3578	1.1865	0.2452	0.2379	0.2541
Meat	1.1771	1.3361	0.9665	0.0882	0.1196	0.0624
Fish	0.7866	0.8948	0.7995	0.1719	0.1443	0.2073
Dairy	0.791	0.5554	1.2131	0.0243	0.0276	0.0209
Oils and Fats	0.8386	1.0087	0.8432	0.0331	0.0263	0.0413
Fruits	0.7565	0.5004	-0.3308	0.013	0.0156	-0.0024
Vegetables	0.9239	1.0398	0.9187	0.1356	0.1341	0.1465
Pulse and Nuts	1.2777	0.907	1.394	0.0364	0.0186	0.0476
Roots and Tubers	1.2955	1.3261	1.1732	0.1176	0.1471	0.0897
Cooked food	0.5158	0.3485	0.626	0.0609	0.0633	0.0458
Others	1.9974	2.6131	1.9177	0.0737	0.0656	0.0868

Source: Author's calculations from GLSS5

The marginal budget shares for rural and urban areas and in Ghana as a whole do vary slightly in figures but in terms of rankings using their relative magnitudes, the variations are marginal. In all three instances, cereals and bread get the largest share of the marginal budget between the range of 23.79% to 25.41% whiles fruits get the lowest share of the marginal budget share.

5.2. Price Elasticities

The uncompensated own price and cross price elasticity matrix is presented in Table3. As expected, all own price elasticities are negative, this is consistent with consumer demand theory. Negative own price elasticity means that an increase in the price of the food group results in a decrease in demand for that food group. These are shown in bold figures along the major diagonal in Table3. Cereals and bread, meat, fish and fruits are relatively own price elastic whiles the rest of the food commodities are own price inelastic. Meat is highly elastic with own price elasticity of -1.4 suggesting that when the price of meat increases by 1%, demand for meat will reduce by 1.4% and vice versa. The own price elasticity of oils and fats, fruits and vegetables are close to unity.

International Journal of Food and Agricultural Economics
ISSN 2147-8988
Vol. 1 No. 1 pp. 27-39

Table 3: Uncompensated (Marshallian) price elasticity matrix

Commodity Group	with respect to the price of										
	Cereal	Meat	Fish	Dairy	oil	fruits	vegetables	pulse	roots	cooked	others
Cereals and Bread	**-1.2911**	0.0542	0.1771	-0.0412	-0.0097	-0.0534	-0.0344	-0.0552	0.0862	-0.1432	0.0725
Meat	0.1552	**-1.4027**	0.1927	0.0171	-0.137	0.0644	-0.0718	-0.0444	-0.1169	-0.0301	0.1964
Fish	0.2498	0.0953	**-1.2445**	-0.0307	0.0426	-0.0127	0.1573	0.0186	-0.0347	0.0689	-0.0965
Dairy	-0.1771	0.0707	-0.2196	**-0.4265**	0.2943	0.1833	-0.2844	-0.1574	0.1031	0.1787	-0.3561
Oils and Fats	0.0307	-0.2348	0.2246	0.2274	**-0.9235**	-0.0353	0.1891	0.2596	-0.0789	-0.3953	-0.1024
Fruits	-0.5177	0.3116	-0.1539	0.3273	-0.0775	**-1.0919**	0.0279	-0.0856	0.1751	0.2659	0.0623
Vegetables	0.0158	-0.0177	0.2042	-0.0636	0.0475	0.0004	**-0.9677**	0.0311	-0.0003	-0.1145	-0.0592
Pulse and Nuts	-0.3914	-0.1243	0.035	-0.1845	0.3422	-0.0607	0.1081	**-0.3481**	-0.2981	-0.2885	-0.0673
Roots and Tubers	0.1766	-0.1054	-0.1948	0.0194	-0.0523	0.024	0.055	-0.0941	**-0.8847**	-0.0601	-0.069
Cooked food	-0.0969	0.0305	0.1867	0.0549	-0.1193	0.043	-0.0824	-0.0479	0.0246	**-0.6408**	0.1318
Others	0.2387	0.3376	-0.8364	-0.3334	-0.1553	0.0077	-0.3929	-0.0725	-0.2334	0.2469	**-0.8045**

Source: Author's calculations from GLSS5

Table 4: Compensated (Hicksian) price elasticity matrix

	with respect to the price of										
Commodity Group	Cereal	Meat	Fish	Dairy	Oil	Fruits	vegetables	Pulse	roots	cooked	others
Cereals and Bread	**-1.046**	0.147	0.4477	-0.0032	0.0392	-0.0321	01473	-0.0199	0.1986	0.0031	0.1182
Meat	0.3882	**-1.3145**	0.4499	0.0533	-0.0905	0.0847	0.101	-0.0109	-0.0101	0.109	0.2398
Fish	0.4055	0.1543	**-1.0726**	-0.0066	0.0737	0.0009	0.2727	0.041	0.0367	0.1619	-0.0675
Dairy	-0.0205	0.13	-0.0467	**-0.4022**	0.3255	0.1969	-0.1683	-0.1349	0.1749	0.2722	-0.3269
Oils and Fats	0.1968	-0.1719	0.4079	0.2532	**-0.8904**	-0.0208	0.3122	0.2835	-0.0027	-0.2963	-0.0714
Fruits	-0.368	0.3683	0.0115	0.3506	-0.0476	**-1.0789**	0.1389	-0.064	0.2438	0.3553	0.0902
Vegetables	0.1987	0.0516	0.4061	-0.0352	0.084	0.0163	**-0.8321**	0.0574	0.0836	-0.0054	-0.0251
Pulse and Nuts	-0.1385	-0.0286	0.3143	-0.1453	0.3926	-0.0387	0.2957	**-0.3117**	-0.1821	-0.1375	-0.0202
Roots and Tubers	0.433	-0.0083	0.0884	0.0591	-0.0012	0.0463	0.1351	-0.0572	**-0.7671**	0.093	-0.0212
Cooked food	0.0052	0.0691	0.2995	0.0707	-0.099	0.0519	-0.0067	-0.0332	0.0714	**-0.5798**	0.1508
Others	0.6341	0.4873	-0.3998	-0.272	-0.0764	0.0422	-0.0998	-0.0156	-0.0521	0.4829	**-0.7308**

Source: Author's calculations from GLSS5

The results indicate that food commodities are responsive to own price changes. An average own price elasticity of -0.91 indicates that generally food commodities are responsive to own prices. All cross price elasticities are inelastic as they are all less than 1. This indicates that there is weak response of one commodity group to changes in the price of other food groups. This result is expected because there is less substitutability between food groups; substitutability happens within food groups.

Positive cross price elasticity implies that the commodities are substitutes while negative cross price elasticities indicate that the commodities are compliments. The cross price elasticities are generally low in absolute values suggesting that the degree of responsiveness of demand for one food group to the price of another food group is low. Fruits measure relatively higher degree of substitution between dairy and meats (elasticity of 0.33 and 0.31 respectively).Fish and tubers measures low positive cross price elasticities with meat and cereals respectively.

The compensated price elasticities are presented in Table 4**,** the compensated own price elasticity measures the strength of the pure substitution effects in affecting consumption of the food groups under consideration. Again, as expected, all compensated own price elasticities are negative. The negative compensated price elasticities imply that the necessary condition of concavity of the cost function used to derive the AIDS model is fulfilled (Osei-Asare, 2004).

The compensated price elasticity assumes that the consumer has been compensated with income to keep the household utility constant. The compensated price elasticities of demand are generally smaller in absolute values than the uncompensated price elasticities. The dynamics of the compensated price elasticities are similar to the uncompensated elasticities; the only difference is that the absence of income effect in the compensated price elasticities makes it smaller in absolute values. With income compensation, still demand for cereals and bread, meat, fish, and fruits are owns price elastic. A change in the price of any of them will result in more than proportionate change in quantity demanded of that food commodity group.

5.3. Compensating Variation

The welfare implications of food price increases are presented in Table 5 and Table6. The estimated compensated price elasticities are used to compute the compensating variation to measure the welfare impact of food price changes observed between 2005 and 2011. The compensating variation measures the amount required to compensate households for price changes between 2005 and 2011. It must be noted that the compensated variation is relative to only total household food expenditure.

Both the first and second order approximations of the compensating variation are presented in Table5. The estimates in the second order approximations are smaller than that of the first order approximations because the second order involves substitution effects; this is consistent with a priori expectation. The compensating variation is disaggregated by locality and poverty status.

The results suggest that all households in Ghana suffered adversely from food price increases between 2005 and 2011. On the average Ghanaian households need to be compensated with approximately 47.18% of their 2005 total household expenditure on food in order to accommodate the adverse impact of food price changes they faced between 2005 and 2011. Comparing rural and urban localities, rural households suffered more than urban households as the rural households need a compensation of approximately 48.32% compare to urban household of about 46.05% compensation. Within the urban localities, it is the poor households that suffer relatively more, requiring

a compensation of about 46.97% of their 2005 food expenditure, this finding is consistent with studies of Ackah and Appleton (2007). Similarly, in rural localities, it is the poor households that suffer more adversely from food price increases. Rural poor households need to be compensated to a tune of about 48.43% of their 2005 food expenditure. Over all poor households in rural localities are likely to suffer most adversely followed by non-poor households in local localities.

Table 5: Compensating Variation Estimates (2005-2011)

Household Category	First-order Effects (%)	Full Effects (%)
Ghana	49.90	47.18
Urban	48.83	46.05
Urban Non-poor	48.82	46.06
Urban Poor	49.01	46.97
Rural	50.66	48.32
Rural Non-poor	50.31	48.36
Rural Poor	51.30	48.43

Source: Author's calculations from GLSS5

Table 6: Compensating variation (Year on Year)

	Compensating Variation		
Year	Ghana	Urban	Rural
2005	-	-	-
2006	-0.0215	-0.0157	-0.0259
2007	0.017	0.0242	0.0119
2008	0.0599	0.0546	0.0645
2009	0.3539	0.3315	0.3679
2010	0.0442	0.0502	0.0400
2011	0.0072	0.0106	0.0049

Source: Author's calculations from GLSS5

The changes in the national average food price and the compensated elasticities were used to assess the welfare impact of the price changes. The year on year compensation variations for Ghana, Rural and Urban Ghana are presented in Table 6. On the average, the welfare of Ghanaians improved by closely 2% between 2005 and 2006. In 2007, average welfare of Ghanaians reduced by approximately 1.7% of 2006 food expenditure, this trend of worsening welfare continued in 2008 by 6% over 2007 food expenditure. The worsening welfare further deteriorated by 35% in 2009 following high changes in foodprices in Ghana. After 2009 up to 2011, the average declines in welfare were 4% (2010) and 0.7% (2011). The national trend in welfare changes between 2005 and 2011 were similar for rural and urban households in Ghana. The remarkable difference between rural and urban welfare changes were that in 2008 and 2009, where the welfare losses in rural households were greater than that of the urban households. Considering the change in welfare from 2008 to 2009, rural households had a severe decrease in welfare levels of about 36.7% of 2008 food budget indicating 1.4% and 3.64% more than the average welfare loss of Ghanaian household and urban households respectively.

5. Conclusion and Policy Implications

The study sought to assess the effects of rising food prices on Ghanaian households by estimating a complete demand system for food and further used the compensating variation to estimate the welfare losses.The studymakes contribution to literature in two ways by controlling effects of zero consumption and expenditure endogeneity in the L/AIDS model to derive consistent estimates.

The marginal expenditure shares shows that cereals and bread, fish, vegetables and roots and tubers will continue to constitute important expenditure sharesin the Ghanaian food basket as they collectively constitute 66% of future food expenditure.The expenditure elasticity of demand for all the food groups were positive and all own price elasticities (compensated and uncompensated) were also negative. Both conditions imply that food is a normal commodity and negative compensated own price elasticity also signifies that the condition of concavity used to derive the cost function is also satisfied.

Own price elasticities of food demand ranged from -0.35 to -1.4 with9 of the elasticities being more than 0.6 in absolute terms. Also, expenditure elasticities of demand ranged from 0.52 to 1.99. These figures show that food demand in Ghana respond to changes in food prices as well as changes in food expenditures. With price elasticity being more elastic than expenditure elasticity for some food groups (cereals and bread; meat; fish; oils and fat; fruits; vegetables; and cooked meal) and expenditure elasticity being more elastic than price elasticity for other food groups (dairy; pulse and nuts; roots and tubers; and "others"), an income and price policy mix will be effective in stimulating food demand in Ghana.

The compensating variation of Ghanaian households between 2005 and 2011 was 47.18%. This indicates that food price increase between 2005 and 2011 has eroded real household food purchasing power by 47.18%. The distributional burden of the effects of rising food prices between 2005 and 2011 fell on rural poor consumers since they had the highest compensating variation. The year on year compensating variation analysis shows further that, real food price increases in 2009 had the most adverse impact on consumer welfare. Furthermore, the resulting compensating variation shows that there is adverse impact of food price increase on Ghanaian households.

Acknowledgements: The authors would like to thank the Ghana Statistical Service for providing the data for this study. The authors are also grateful to Professor WayoSeini of Department of Agricultural Economics and Agribusiness, University of Ghana and anonymous Journal reviewers for the useful comments on earlier manuscript.

References

Abdulai, A., Jain, D. K. & Sharma, A. K. (1999).Household Food Demand Analysis in India. Journal of Agricultural Economics, 50(2): 316-327.

Ackah, C. & Appleton, S. (2007). Food Price Changes and Consumer Welfare in Ghana in the 1990s. School of Economics, University of Nottingham: CREDIT Research Paper 07/03.

Banerjee A. V. & Duflo E., (2007).The Economic Lives of the Poor.Journal of Economic Perspectives, 21(1): 141–167.

Barten, A. P. (1969). Maximum Likelihood Estimation of a CornpleteSystem of Demand Equations,European Economic Review 1:7-73.

Blundell, R. & Robin, J. M. (1999). Estimation in Large and Disaggregated Demand Systems: An Estimator for Conditionally Linear Systems. Journal of Applied Econometrics: 14: 209 – 232.

Buse, A. (1994). Evaluating the linearized Almost Ideal Demand System.American Journal of Agricultural Economics, 74: 781 – 793.

Christensen, L., Jorgenson, D. W., & Lau, L. J. (1975). Transcendental logarithmic utility functions. American Economics Review, 65: 367-383.

Deaton, A. & Muellbauer, J. (1980).Economics and Consumer Behavior, Cambridge University Press, New York.

Eales, J. S. & Unnevehr, L. .J. (1988). Demand for beef and chicken products: Seperability and structural change. American Journal of Agricultural Economics, 70(3): 521 - 532.

FAO, Food Price Index (2011). retrieve from: www.fao.org/worldfoodsituation/wfshome/foodpricesindex/en/ on 6th June 2011.

Friedman, J. & Levinsohn, J. (2002). The distributional impacts of Indonesia's financial crisis on household: A "Rapid Response" methodology. The World Bank Economic Review, 16: 397-423.

Ghana Statistical Service, (2008). Ghana Living Standards Survey Report of The Fifth Round (GLSS 5). Accra.

Ghana Statistical Service, (2009). Consumer Price Index (CPI) newsletter. Accra.

Ghana Statistical Service, (2011). Consumer Price Index (CPI) newsletter, April 2011. Accra.

Liao, H. &Chern W. S. (2007). A Dynamic Analysis of Food Demand Patterns in Urban China.2007 Annual Meeting, Portland, Oregon TN, American Agricultural Economics Association.

Ministry of Finance and Economic Planning (2009). Budget Statement Economic Policy of the Government of Ghana for the 2009 Financial year. Accra.

Moschini, G. (1995).Units of Measurement and the Stone Index in Demand System Estimation.American Journal of Agricultural Economics.17: 63-68.

OECD-FAO. (2008). OECD-FAO Agricultural Outlook 2008-2017. Paris and Rome.

Osei-Asare, Y. B. (2004). Household Water Security and Water Demand in the Volta Basin of Ghana, European University Studies: Series 5, Economics and Management. Vol. 3152.

Taljaard, P.R., Alemu, Z. G. & Van Schalkwyk, H. D. (2004). The Demand for Meat in South Africa: An Almost Ideal Estimation. Agrekon, 43(4): 430 – 443.

Wodon, Q., Tsimpo, C. & Coulombe, H. (2008). Assessing the Potential Impact On Poverty of Rising Cereal Prices.The World Bank.Human Development Network.Working Paper 4740.

World Food Programme (2008). Recent Food Price Developments in Most Vulnerable Countries, Issue No. 2, Rome.

[i]Fruits may not be inferior goods but culturally Ghanaians do not eat fruits as part of their diet even in urban areas.