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Food Price Inflation and Consumers' Welfare in Ondo State, Nigeria

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Abstract
This study analyzed the effects of food price inflation on households in Ondo State. The study made use of 82 rural households in Ondo state using a Random Sampling Technique. Primary data was employed to generate information for the food groups. Demand for food groups in this study was estimated using Quadratic Almost Ideal Demand System (QUAIDS) technique while the welfare effect was estimated with both the QUAIDS and the Compensated Variation model. The result of the QUAIDS model showed that apart from Plantain, all other estimated expenditure elasticities were all positive and statistically significant at the percent level, indicating that all the food items are normal goods. It was further observed that Rice (0.07), Beans (0.10), Garri(0.03) and Plantain(-0.21) are necessities since their coefficients were less than 1. In addition, the Compensated Variation model indicated that households in Ondo State needed to be compensated around 24.9 percent of their total household expenditure on food in order to accommodate the adverse impact of food price inflation. The conclusion, however, is that all households in Ondo State suffered welfare losses from hike in the food prices between January and October 2016. Consequently, the study recommended that government should try, as much as possible, to subsidize the price of foodstuffs so that it can be accessible to households in Ondo State in order to improve their welfare.
Keywords: Inflation, Households, Welfare, Compensated, Food

SECTION ONE

1. Introduction:

Food is a basic necessity of life. Its importance, at the household level, is not in doubt because it is a basic means of sustenance. In view of the importance of food in man's life, it is rated as the most basic of all human needs. Man needs food for life's sustenance, prevention of sickness and in providing energy for the normal psychological activities of the body including the normal state of mind (Olorunfemi, 2013). Hence, food becomes a subject of an utmost importance in any economy.

According to Ahmad (2013) significant food price spikes coupled with a large increase in food price increases, may have severe effects on low income household. Price inflation lowers the purchasing power of a given nominal income and therefore affects expenditure decisions .Since nominal wage rate tends to adjust to price increases only after a time lag, and even then often only partially, price inflation leads to declining real wages, which lowers consumption and reduce economic growth. In addition, price inflation hollows out the real value of savings which may lead to investment, thus further compromising economic growth. For instance, high costs of food may curtail household spending for other essential goods and services, such as health care (Hung and Hung, 2009). In addition, rising food prices create serious difficulties, especially for the vulnerable and low-income households that spend a substantial proportion of their income on food.

According to Osei-Asare and Eghan (2013), rising food prices can also 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. In Nigeria, and particularly, in Ondo State, food prices continue to soar up daily while household real incomes have been reduced as a result of the high inflation rate in the country. For instance, between March 2015 and June 2016, the price of Rice increased by 30 percent; milk powder by 23 percent; wheat by 10 percent and Beans by 25 percent. In July 2016, further increases were observed. Composite Food Index rose by 17.1 percent in October 2016 (NBS, 2016). The rise in the index was caused by increase in prices of bread and cereal, fish, and meat. On a monthly basis, the food sub-index increase by 0.86 percent in October from 0.81 percent recorded in September 2016. The average annual rate of change of the food sub-index for the twelve-month period ending in October 2016 over the previous twelve-month average was 13.82 percent, 0.58 percent points from the average annual rate of change recorded in September (NBS, 2016).

Consequently, the Ondo State Government launched its Food Palliative Programme on July 10, 2016. This

program was aimed at cushioning the consumer from the severe impacts of further price increases. However, the hardship caused by the incessant rise in the price of food items seems unabated. This situation is particularly worrisome as several questions have been raised on the issue: what factors responsible for increases in food price in Ondo State? What has been the expenditure pattern of the people of Ondo State? How has household's demography affects household demand in Ondo State? What is the welfare impact of price changes of food on the people? To this end, there exists robust literature on food demand, majority of which focused on the demand for individual food items. Such studies include the study on the demand for Rice by Odusina (2008) using AIDS model. In addition, Abiodun, Okoruwa and Ajayi (2009) investigated the impact of socio-economic variables on households' food demand while Olorunfemi (2013) examined the expenditure pattern of food demand in Ondo State. However, little is known about how households in Ondo State respond to food price changes and the welfare effects of such a situation. The study deviates from the previous studies as it looked at the welfare effect of food price inflation on consumers in Ondo State using Quadratic Almost Ideal Demand System (QUAIDS) model.

Against this background, the objective of this study is to investigate the welfare effects of rising food prices on the people of Ondo State. Specifically, the study will attempt to look at the impact of price and income elasticity of the consumer on their food demand. The study will also investigate the effects of Age and Household size on food demand in Ondo State. Following this introduction, the rest of the paper is organized as follows: Section 2 focuses on literature review while section 3 outlines materials and methods. Section 4 presents the results and discussion while Section 5 is devoted to the summary and policy implications.

SECTION TWO
LITERATURE REVIEW
2.1 Conceptual Issues.

An in-depth analysis of household demand is a sine qua non for the evaluation of household consumption behavior in response to price shocks and changes in income of households. Household simply means a social unit who lives together and do things in common. According to Jerome and Perreault (1991), household can be defined to include persons who occupy a housing unit together with common housekeeping, sharing at least one meal a day, and occupying a common living.

It must however be noted that households' expenditure patterns vary from one household to the other. According to Schnepf (2012), allocation of expenditure can depend on the household's demographic characteristics like household size, income group, age, gender and prices. Household demand patterns are affected by increasing prices in two ways. Firstly, through the percentage of the household's expenditure dedicated to consumption, and secondly through the consumer basket mix of goods usually purchased. Households that dedicate a higher percentage of their total income on food experience higher food inflation since an increase in the price of a consumer basket will mean more money spent on consumption compared to those households whose proportion of money spent on food is small (Capehart & Richardson, 2008; McGranahan, 2008)

The first- round welfare effects of food price inflation can be analyzed by categorizing a household's net marketing position. Households can be categorized into three groups depending on their marketing position for a particular food staple. Households whose value of production exceeds the value of their consumption are classified as net sellers; households whose value of their consumption exceeds the value of their production are classified as net buyers; and households who are self sufficient in that food commodity (in the sense that their value of comsumption equals the value of production) are classified as autarkic.

2.2 Theoretical Literature

This research draws upon the standard micro-economic theory of consumer behaviour under adjusting market prices propounded by Milton Friedman. In consumer theory, individuals make choices to purchase goods and services that will maximise their utility given the varying prices and limited income. Each household has a preference system upon which a set of commodities that maximise their welfare are selected. The consumer behaviour theory also postulates that an increase in the price of a commodity leads to both a substitution and income effect. With a normal good, the substitution effect arises from the reduction of the food item purchased and subsequently consumed. In return, consumption of a competitive item is increased. The income effect on the other hand occurs because a rise in the price of a commodity would lead to a decline in real income and subsequently the welfare of an individual or in this case, a household.

The intellectual history of the utility idea had its roots in utilitarian theory, according to which, for example, some goods might be more valuable to me thanto you, in the sense of giving me more additional utility. For example, suppose giving me some good increases your utility by one by increases my utility by two given some representation. If one multiplies all of your utilities by four, one gets an equally valid representation of your preferences, but now the extra utility you get, which is four, exceeds my extra utility of two. This example

illustrates the general principle that utilities derived from observed choices cannot be used for Interpersonal comparisons, that is, they cannot definitively resolve questions about the relative value of various goods to you and to me.

Several variants of utility theory have been developed that might, in principle, be used for interpersonal comparisons. One famous variant is based on hypothetical choices in which individuals are asked to consider the possibility that they might have become either the starving person or the sated person. Behind the philosophically motivated veil of ignorance, they are asked to choose the rule they would apply to allocate any extra food that might become available. A criticism of this entire approach is that it is based on hypothetical choices, rather than real ones. Hypothetical choices, critics argue, do not have the same standing as real choices and are not a reliable way to predict real choices.

Another variant develops a different conception of utility theory, based on the idea that people do not notice small differences and express indifference between choices that are close. If that accurately describes human behavior, then one might determine a unit for measuring utility by determining empirically the just noticeable difference. There are several restrictions placed on a utility function.

The first restrictions are monotonicity and local non-satiation, which are used extensively in consumer theory. Roughly put, these imply that consumers will prefer to spend all of their wealth or income on something, because more is always at least as good as less and consumers are never satiated. This conclusion about consumer spending will be a useful intermediate step for making inferences from consumer's observed choices. The next restriction is that consumer preferences are convex. Convexity is fundamental in the standard model of competitive economies, because when consumer preferences are convex, market clearing prices exist. When preferences are not convex, market-clearing prices may not exist, in which case one cannot sustain the common hypothesis that a competitive market-clearing outcome approximates actual market outcomes.

2.3 Empirical Literature

Bereket (2003), studied intra-household distribution of expenditure in rural Ethiopia using the Quadratic Almost Ideal Demand System (QUAIDS).The empirical results show that Ethiopians rural respond to price, income and demographic changes in a more complicated manner than usually assumed, demographic groups absorbing most of the impact differ for different types of changes. In the same vein, Ackah and Appleton (2005) examined the welfare effects of trade and agricultural policy reforms for Ghanaian households during year 1991-92 and 1998-99. The welfare effects of price changes are calculated for cereal, tubers, fish, meat, alcohol and all other food in terms of compensating variations. It was found that all household groups suffered and welfare losses arising from the food price increases during the 1990s.

In another study, Wood, Nelson and Nogueira(2009) focused on quantifying the welfare losses for Mexican households due to the world food price increases from 2006 to 2009. The authors measured the welfare effects of tortilla price increase, differentiating by household status (poor and non-poor) and by region (border, north, central and south). It was found that non-poor households lose 9 percent of their food budget, on average, and poor households lose about 18 percent of their food budget, on average. These results provide evidence that poor Mexican households are the ones who experience significant welfare losses from significant food price increase. Alem (2011) investigated how urban households in Ethiopia coped with the food price shock between 2004 and 2008. Regression results indicate that households with low asset levels, and casual workers, were particularly adversely affected by high food prices.

In addition, Blow, Lenchene and Levell (2011) used QUAIDS to model the United State consumer expenditure data for non- durable goods. The study found that estimated elasticities are dependent on conditioning and thus on the assumptions made on behavior. In a related study, Abramovsky (2012) estimated a demand system for Mexico using QUAIDS to analyse the optimal rate structure of indirect tax in Mexico. It was found that the current Value Added Tax rate structure is not optimal for Mexico given the pattern substitutability and complementarity between consumption and work.

Adetunji and Rauf (2012) investigated household demand for meat in the Southwest, Nigeria using Descriptive Statistics and Almost Ideal Demand System (AIDS) Model. Data were collected from two hundred and forty households in the study area through well structured questionnaire. Their findings showed that beef (43.7%) was mostly preferred in the study area, income levels of respondents and taste influenced the type of meat preferred. In Egypt, Dawoud and Seham (2013), analyzed the changes in food expenditure patterns over time with special emphasis on the differences between urban and rural sectors using Weighted Least Squares (WLS). It was discovered that food consumption expenditure patterns have changed over the five consecutive survey periods as a result of economic changes.

Furthermore, Taljaard (2003) used the Linear Approximate of Almost Ideal Demand System (LA/AIDS) model to estimate the demand for meat in South Africa. The Hausman exogeneity test showed that, the expensive term in the South African meat demand model, is exogenous. In a related development, Katsuura(2012) studied time-series properties and demand system of household expenditure on culture in Japan.

Data were collected from the Family Income and Expenditure Survey. The result of elasticity shows that, there exists a strong relationship between expenditures for cultural (e.g admission fees for movies and plays, cultural establishments, amusement parks etc and other activities.

Ogunniyi, Oladejo and Akinniyi (2012), investigated Households Demand Analysis for Processed Fruits in Abeokuta Metropolis of Ogun State, Nigeria. Using Almost Ideal Demand System (AIDS), data were collected randomly from one hundred and twenty (120) respondents with the use of structured interview schedule. Their findings revealed that there exists an inverse relationship between household expenditure and the budget share of processed fruit. Robert (2009) examined an analysis of yam consumption patterns in Ghanaian urban communities. Quarterly household panel data collected from four urban centers were analyzed by employing the Almost Ideal Demand system (AIDS) and Quadratic Almost Ideal Demand System (QUAIDS). It was discovered that the shares of food budget that households allocated to yam generally increased during the peak harvest season and dropped during lean season across all urban centers in Ghana.

Mohammad, Javad and Samane (2012), investigated price and income sensitivity of demand for consumer goods in rural households over the period 1971 to 2008 using the linear almost ideal demand system (LAIDS) and the iterative seemingly unrelated regressions (ISUR). The result of the study showed that price elasticity for clothing, food, health, furniture and housing groups is less than unity.

Minot and Dewina (2013) found out that higher maize and rice prices have a relatively modest (negative) short-term impact on national poverty but have significant effects on specific groups of households, including urban households and, surprisingly, a large share of rural households that were net food buyers. In the same vein, Musyoka and Bauer (2012) found that the welfare effect of international food price changes is dependent on how efficiently and effectively domestic markets transmit the prices. They reported that with uniform price transmission (consumer to farm gate), the negative impact of international food price increases could be reduced by about 83% for rural and 16% for urban households, with the welfare and food insecurity impacts found to be more severe for urban poor households. Similarly, Cornia and Deotti (2008) reported that increased millet prices, coupled with the failures of domestic and regional market as well as the failure of policies relating to food security, health financing, and international aid, contributed to the sharp rise in the number of severely malnourished children admitted to feeding centres in Niger Republic, creating near famine conditions in 2005.

SECTION THREE
Research Methods
3.1 Theoretical Framework:

In this study, the theory of Consumer behavior is employed as the theoretical framework. The theory was propounded by Milton Friedman (1952).Under this theory, the cardinalist postulated that utility can be measured in monetary terms. Given the consumer's income and the market prices of various commodities, he plans his income so as to attain his highest possible satisfaction or utility. Accoding to the cardinalist, the total utility of a 'basket of goods' depends on the quantity of the individual commodities. If there are n commodities in the bundle with quantities q_1, q_2,….q_n, the total utility is given as:

$$U = f(q_1, q_2 \ldots\ldots q_n) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where U is the utility and (q_1,q_2,….q_n) are the various quantities of goods(foods) that maximizes utility. A utility maximizing consumer will choose q_1 and q_2 so as to maximized $U = f(q_1, q_2 \ldots\ldots q_n)$ subject to budget constraint.

The Cardinalist - based approach to consumer behaviour provides a useful framework for analyzing data on consumer welfare because it deals with attaining certain utility level.

3.2 Model Specifications:
3.2.1 QUAIDS Model

Demand systems are typically specified with expenditure shares as the dependent variables. This study adapts a model similar to that of Ahmad, Akbari and Mohammad (2013) but with little modifications. According to them, the empirical specification of the QUAID budget share equation is given as:

$$w_i = \alpha_i + \sum_{j=1}^{k} \gamma ij \ln Pj + \beta_i \ln\left[\frac{m}{P(p)}\right] + \frac{\lambda i}{b(P)}\left[\frac{m}{P(p)}\right] + \mho_t \ldots\ldots.(2)$$

Where:

Wi = household's expenditure share of ith food group
α_i = Constant parameter
β_i = Estimated expenditure coefficient
λi = Expenditure Squared coefficient
γij = Estimated coefficient of prices
m = Household total expenditure on all food in the demand system (#/week)
$\mho_t$ = Error term.

Considering the fact that unequal distribution in the Age and Household size of consumers in Ondo State can determine their expenditure pattern, it is important to capture that variable by incorporating them into our model. Hence, equation (2) can be modified as follows:

$$\boldsymbol{lnw_i = \alpha_i + \sum_{j=1}^{k} \gamma ij\ lnPj + \beta_i \ln\left[\frac{m}{P(p)}\right] + \frac{\lambda i}{b(P)}\left[\frac{m}{P(p)}\right] + \sum_{s=1}^{l} \delta_i z_i + \mu_t} \quad \text{.....(3)}$$

Where:

w_i	=	Household's expenditure share of ith food type, for i=1, 2, 3, and 4
w_1	=	Budget share of Rice
w_2	=	Budget share of Beans
w_3	=	Budget share of Garri
w_4	=	Budget share of Plantain
P_i	=	Price of food *i*th (#/ kg), for *i*=1, 2, 3 and 4
P_1	=	Price of a bag of Rice (#/kg)
P_2	=	Price of a bag of Beans (#/kg)
P_3	=	Price of a bag of Garri (#/kg)
p4	=	Price of a bunch of Plantain (#/kg)
m	=	Household's total expenditure on all food in the demand system (N/month)
z_i	=	Socioeconomic variables for *i* = 1 and 2
z_1	=	Household's size (Head count),
z_2	=	Age
μ_t	=	Error term
P	=	Vector of prices
b(p)	=	Cobb Douglas price Aggregator
a(p)	=	Transcendental logarithm prices aggregator function
$\frac{m}{P(p)}$.	=	Total income equivalent to total expenditure in real terms.

However, for equation (2) to hold, the adding up condition must be satisfied and hence we imposed the following restrictions:

$\sum_{i=1}^{k} \alpha_i = 1$; $\sum_{i=1}^{k} \beta_i = 0$; $\sum_{i=1}^{k} \lambda_i = 0$ and $\sum_{i=1}^{k} \gamma_{ij} = \sum_{i=1}^{k} \gamma_{ji}$

Specifically, $\sum_{i=1}^{k} \alpha_i = 1$ is called the adding up condition. This implies that the budget share allocated to each food items must be equal to unity. Put differently, this restriction implies that total expenditure on all food items must be equal to the sum of individual expenditures on the selected food items.

The second condition $\sum_{i=1}^{k} \beta_i = 0$ (for income) and $\sum_{i=1}^{k} \lambda_i = 0$ (for price) are called the homogeneity conditions. Homogeneity condition ensures that the demand functions are homogeneous of degree zero in income and prices. This implies that the Marshallian demand function used in this study for each household is homogeneous of degree 0 in price and income. If income and price rises in the same proportion, demand for the selected food items (Gari, Plantain, Rice and Beans) will not be affected. This is necessary in other to obtain reliable elasticity estimates for the model. In other words, in formulating our model, there were no cases of money illusion problem.

Finally, $\sum_{i=1}^{k} \gamma_{ij} = 0$ is called the slutsky symmetry condition. Generally speaking, the symmetry of a Slutsky matrix means that the substitution effect of an increase in the price of commodity j on the demand for commodity i is identical to the substitution effect of an increase in the price of good i on the demand for good j. For instance, the substitution effect of an increase in the price of commodity Rice on the demand for Beans is identical to the substitution effect of an increase in the price of good Beans on the demand for good Rice. The compensated price responses γ_{ij} tell us how demand changes as we change prices, compensating the agent to keep him on the same indifference curve. Since γ_{ji} is the cross-partial derivative of the expenditure function, and the order of differentiation doesn't matter, it must be equal to γ_{ij}. The symmetry of the Slutsky matrix is necessary for integrability of the demand system to well-defined preferences.

3.2.2 Compensated Variation Model

The Compensated Variation (CV) is used to measure the welfare effect of food price changes on households. Using a set of reference prices, we can compute how well or worse off households were, moving from their initial utility level to the new (recession-period) utility level in response to the changes in food prices. Suppose *c (u, p)* denotes the expenditure function which defines the Minimum expenditure required to achieve a specific utility level, *u,* at a given price vector *p* facing the household. Assume further that prices change from P_0 to P_1 as a result of the economic recession in the country. The money measure of the resultant welfare effect is the difference between the minimum expenditure required to achieve the original utility level, at the new prices, and the initial total expenditure. Put differently, Compensated Variation is the amount of money the households would need to be given at the new set of (higher) prices in order to attain the initial level of utility. Hence, in terms of the expenditure (cost) function:

CV = c(P_1, U_0) – c(P_0,U_o) ……(4)
Where:
CV = Compensated Variations
P_0 = Vector of prices before Price Change (January)
P_1 = Vector of Prices after Price change (October)
U_0 = Initial Utility level

However, according to Friedman and Levinhson (2002), the CV can be approximated using the first order Taylor expansion of the minimum expenditure function as:

$\ln C^h = \sum_{i=1}^{n} w_{ih} \Delta ln\, p_{ih}$ ……(5)

Where *i* subscripts refers to the food type in the demand system and h refers the household. *W* is the budget share devoted to good i in households' *h* budget. The costs of attaining pre-inflation utility levels will increase less rapidly than indicated by (5), as the household has ability to switch away from commodities whose relative prices have disproportionately increased. Thus this measure of compensating variation provides only a maximum bound of the impact of the inflation, ignoring the behavioral responses, the substitution effects towards goods whose prices are relatively lower. Hence, we employed the second order Taylor series expansion approximation that utilizes own and cross price elasticities to capture household's behavioral responses. This is expressed as:

$\ln C^h = \sum_{i=1}^{n} w_{ih} \Delta ln\, p_{ih} + \frac{1}{2} \sum_{i=0}^{n} \sum_{j=0}^{n} w_i^j\, \varepsilon_{ij}\, \Delta ln\, p_{ih}\, \Delta ln\, p_{jh}$ .. ....(6)

where ε_{ij} is Hicks compensated price elasticity of commodity group *i* with respect to price change of group *j*. For clarity, the second part of equation 6 is multiplied by half because we are dealing with the second order Taylors expansion. Equation (6) indicates that the welfare effect depends on the size of price changes as well as the importance of a particular commodity in the household consumption basket. The two compensating variation specifications given in (5) and (6) are used to identify the consumption effects of price changes to households in Ondo State between January and October, 2016.

3.3 Source and Types of Data:

The study relied entirely on primary data. A total of 90 questionnaires were distributed (30 for each of the three Senatorial Districts in the State). The Senatorial districts are the North Senatorial Districts; the Central Senatorial Districts and the South Senatorial districts. Two local governments were selected from each of the six local governments that made up of a senatorial district. In the North, Owo and Ose Local government were chosen while Ondo and Akure South Local government were chosen from the Central Senatorial District while Okitipupa and Irele local Government were chosen to represent the Southern Senatorial district. From this, a total of 72 questionnaires were completely filled and returned by different respondents from the study population. These respondents were either household heads or those who had good idea of the household food purchases and consumption patterns. The selected households were assumed to be net buyers of the food items. The structured questions employed in this study are shown in the appendix

SECTION FOUR

4.0 Result and Discussion:

Table 1 reports the average price increase for each of the aggregated foods using the expenditure shares to weight the price increases of each constituent's individual food. The price of Rice increased by an average of 29 percent while that of beans, Garri and Plantain increased by 41 percent, 22 percent and 49 percent respectively between January and October, 2016. This is shown in the table below:

Table 1: Household Food Budget Shares and Proportionate Price changes (%)

Food Type	Mean Budget Share (January)	Mean Budget Share (October)	Mean Price Increase
Rice	0.4618	0.4479	0.29
Beans	0.2319	0.2161	0.41
Garri	0.1913	0.196	0.22
Plantain	0.1150	0.14	0.49

Source: Researcher's Computation from the Survey (2016).

Table 2 shows the result of the estimated parameters of the Quadratic Almost Ideal Demand System with demographic variables (Household size and Income). The parameters (alpha, beta gamma and lambda) are contained in the first column. The second, third, fourth and fifth column represents the coefficient, standard error, Z statistic and the probability values respectively. The four selected food items (Rice, Beans, Garri and Plantain) are listed in order _1, _2, _3 and _4 respectively. For clarity, equation 3 that represents the budget share equation is used to generate the parameter estimates of the QUAIDS are stated as follows:

$w_i = \alpha_i + \sum_{j=1}^{k} \gamma ij \ln Pj + \beta_i \ln\left[\frac{m}{P(p)}\right] + \frac{\lambda i}{b(P)}\left[\frac{m}{P(p)}\right] + \sum_{s=1}^{l} \delta_i z_i + \mu_i$

Table 2: Estimated Parameters of QUAIDS with Demographic Variables:

	Coefficient	Std. Error	Z	P>|z|
Alpha				
alpha_1	1.0110	0.0818	12.3	0.000
alpha_2	1.2516	0.1285	9.74	0.000
alpha_3	0.5917	0.1255	4.72	0.000
alpha_4	-1.8544	0.0457	-40.58	0.000
Beta				
beta_1	0.0758	0.0088	8.55	0.000
beta_2	0.1037	0.0133	7.74	0.000
beta_3	0.0370	0.0133	2.77	0.006
beta_4	-0.2166	0.0055	-38.99	0.000
Gamma				
gamma_1_1	0.3007	0.0158	18.92	0.000
gamma_2_1	-0.0133	0.0136	-0.98	0.329
gamma_3_1	-0.0452	0.0116	-3.90	0.000
gamma_4_1	-0.2422	0.0238	-10.17	0.000
gamma_2_2	0.2911	0.0319	9.12	0.000
gamma_3_2	0.0058	0.0123	0.47	0.636
gamma_4_2	-0.2836	0.0348	-8.13	0.000
gamma_3_3	0.1603	0.0129	12.39	0.000
gamma_4_3 gamma_4_4	-0.1209	0.0333	-3.63	0.000
	0.6467	0.0278	23.24	0.000
Lambda				
lambda_1	0.0018	0.0002	6.28	0.000
lambda_2	0.0026	0.0003	6.88	0.000
lambda_3	0.0010	0.0004	2.61	0.000
lambda_4	-0.005	0.0002	-27.39	0.000
Eta eta_hsize_1				
eta_hsize_2	8.52e-06	0.0001	0.05	0.962
eta_hsize_3	0.0001	0.0001	1.04	0.299
eta_hsize_4	-0.0003	0.0002	-1.22	0.221
eta_lncm_1	0.0001	0.0001	1.21	0.226
eta_lncm_2	-0.0000	0.0001	-0.15	0.878
eta_lncm_3	-0.0002	0.0001	-1.49	0.135
eta_lncm_4	0.0001	0.0002	0.83	0.409
	0.0005	0.0000	0.73	0.464
Rho				
rho_hsize	11.5	.	.	.
rho_lncm	20.6	.	.	.

Source: Author's Regression Output (2017).

From the QUAIDS result, the constant parameters (alphas) represent the average value of budget shares of food items when income, household size and price effects are equal to zero. The result showed that in the absence of income, household size and price effect, the budget share of Rice, Beans and Garri increase by 101 percent, 125 percent and 59 percent respectively. However, the budget shares of plantain reduced by 185 percent.

The expenditure terms (beta) are statistically significant in all the four expenditure share equations. It was discovered that apart from plantain, every other expenditure elasticities are positive. In this study, Rice, Beans and Garri are regarded as necessities as their coefficients are less than one. This result is consistent with that of Zhou et al (2014) who posited that most primary food products are necessities and price inelastic for urban households in China. The result further indicated that a one percent increase in income will lead to about 7 percent, 10 percent, 3 percent increase in the expenditure share of Rice, Beans and Garri respectively. However, a one percent increase in the income of the household is expected to reduce the expenditure / budget share of plantain by 21 percent. The reason for this is that plantain is an inferior good for households in Ondo State.

In addition, the gamma- parameters captured the responsiveness of demand to variations in relative prices, including both the own price of good i and the prices of other goods j. Most of the price effects are significantly different from zero at the 5 percent significant level. This suggests that there is much quantity response to movement in relative prices. For instance, a change in the price of rice leads to a systemic change in the

expenditure share of rice, Beans , Garri and plantain by 30 percent, 1 percent, 4 percent and 24 percent respectively.

Also, the quadratic expenditure terms (lambda) are similar to the linear expenditure term with minor difference. The lambdas regulate the effects of the second order coefficient on budget shares (thus allowing for nonlinear Engel curves) whereas the beta parameters only regards expenditure and budget shares as a linear relation. All the lambda parameters estimates are statistically significant at the 5 percent level. This confirms the relevance of the quadratic term extension of the linear Almost Ideal Demand System.

The coefficient of household size and income (eta) are both positively related to the expenditure share for individual food items indicating that as income and household size increases, the expenditure share of foods increases. However, these demographic variables are not statistically significant in explaining the budget share of disaggregated food items except that of rice.

4.1 Price Elasticities

The uncompensated own price and cross elasticity matrix are presented in Table 3. In line with consumer demand, theory, all own price elasticities are negative. Negative own price elasticity means that an increase in the price of a commodity results in a decrease in demand for that particular commodity. For instance, when the price of rice increases by 1 percent, demand for rice will reduce by 0.5 percent. These are shown in bold figures along the major diagonal in Table 3. The four food group considered in this study are own price inelastic. All cross price elasticities are inelastic as they are all less than one. This indicates that there is a weak response of one food group to changes in the price of other food groups.

Table 3: Uncompensated (Mashallian) Price Elasticity Matrix

Food	Rice	Beans	Garri	Plaintain
Rice	-0.5006	-0.2252	-0.1730	-0.1191
Beans	-0.4496	-0.2630	-0.1710	-0.1371
Garri	-0.4047	-0.2001	-0.2481	-0.1377
Plantain	-0.4256	-0.2487	-0.2118	-0.0160

Source: Author's calculation from the QUAIDS model (2017)

The compensated price elasticity measures the strength of the pure substitution effects in affecting consumption of the food types under consideration. The compensated price elasticity assumes that the consumer has been compensated with income to keep the household utility constant. From the result in table 3 above, the coefficients of all own price elasticity are negative. This showed that all the four food items were net substitutes.

The economic interpretations of the compensated elasticities are similar to that of uncompensated elasticities except that there is the absence of income effects in the latter which makes it smaller in absolute values. The fact that the signs of several (six out of sixteen) compensated elasticities are different from the signs of the uncompensated elasticities suggests that income effects are important in consumer demand decisions. The compensated price elasticities are presented in Table 4 below:

Table 4: Compensated (Hicksian) Price Elasticity Matrix

Food	Rice	Beans	Garri	Plantain
Rice	-0.0305	0.0108	0.0218	-0.0020
Beans	0.0217	-0.2634	0.0242	-0.0198
Garri	0.0528	-0.0296	-0.0585	-0.2380
Plantain	-0.0089	-0.0395	-0.0391	0.0877

Source: Author's Calculation from the QUAIDS model (2016)

4.2 Compensated Variations:

The compensated variation estimated for this study measures the amount required to compensate household for price change between January and October 2016. To estimate this, the household budget share, estimated proportionate price change and the estimated consumers' responses were used to assess the welfare effects of food price changes in the study period. Table 5 presents the household welfare effects. The Second column represents the first order (static) effects computed using equation 5. It is the summation of the product of the mean budget share of each food items for all households and the mean of their respective price increases. The third and fourth column measures the dynamic effects which jointly consider the first order and consumers' responses in consumption as a share of household food expenditure and total household expenditure in January 2016.

Table 5: Compensated Variation Table

	First Order effect as a proportion of January household food expenditure	Second Order effect as a proportion of January households food expenditure	Second order effect as a proportion of January Total Household expenditure
All Household	32.7%	27.4 %	24.9 %

Source: Author's Regression Output (2016)

The result from Table 5 suggests that the selected household in Ondo State suffered adversely from the food price increases between January and October 2016. The result also suggests that household in Ondo State need to be compensated around 24.9 percent of their total household expenditure on food in January in order to accommodate the adverse impact of food price changes they faced between January and October 2016.

SECTION FIVE

5. Conclusion and Policy Implications:

The paper analyzed the welfare effect of rising food prices for households in Ondo State based on Quadratic Almost Ideal Demand System (QUAIDS), followed by estimation of the Compensating Variation (CV). The QUAIDS model was estimated for the four major foods that virtually everybody consumes in Ondo State. Specifically, we measured the income losses arising from the increases in the price of Rice, Beans, Garri and Plantain. Our result shown that all own price elasticities are negative which suggests that an increase in the price of any of the commodity results in a decrease in demand for that particular commodity. It was also discovered that the four food group considered in the study are own price inelastic which implies that there is a weak response of one food group to changes in the price of other food groups. The compensated variation estimated for the study revealed that household in Ondo State need to be compensated around 24.9 percent of their total household expenditure on food in January.

The main thrust of this paper is that food prices have been on the increase over the past few months and households in Ondo State suffered adversely from food price increases in the period under study. The conclusion however is that food price inflation has eroded the real household food purchasing power between January and October 2016.

To this end, government should try as much as possible to subsidize the price of foodstuffs so that it can be accessible to the people. Also, expanding the conditional cash transfer payments and other social security schemes to the poor and vulnerable households during periods of food price shocks would direct aid toward the people most harmed by the price spikes. Specifically, the food Palliative programme of the Ondo State Government must be sustained by the incoming administration.

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