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Effects of food price spikes on household welfare in Nigeria

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Adebayo M. Shittu, Dare Akerele and Mekbib Haile

Effects of Food Price Spikes on Household Welfare in Nigeria

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Abstract

The dramatic global food price upsurges of 2007/2008 and the resurgence of 2010/2011 have kept the welfare effects of food price shocks at the epicentre of policy discussions worldwide. Studies have found heterogeneous impacts, but empirically little is known in Nigeria. The key objectives of this study are to examine the welfare, i.e. food quantity consumption, dietary diversity, and economic welfare effects of food price spikes among households in Nigeria. Using the 2012/2013 and 2015/2016 Household Survey Panel Data, the linear individual (fixed) effects models were estimated while controlling for participation in safety net interventions and other factors to achieve the stated objectives. Findings suggest that higher spike in the price of cereals consistently has negative effect on food quantity (including calories) consumed, dietary diversity, and economic welfare of households, spikes of price of other staples, animal proteins, fats and oils, fruits and vegetables exert heterogeneous influence. Female headed households advance calorie consumption and dietary variety. Findings suggest that food distribution may be more effective in improving welfare of households than direct cash transfers. Efforts to mitigate extreme spikes in the prices of staples (especially cereals) are relevant for improved food security, nutrition and overall household welfare. However, if policy actions are complemented with food distribution and sensitively guided welfare related gender interventions, more improvements for livelihoods can be achieved.

Keywords: Price Shocks, Food Security, Economic Welfare, Safety Nets, Nigeria

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1. Introduction

Apart from the general tendency of upward price movement, episodes of price spikes have resulted in extraordinary and problematic changes in commodity prices, leaving adverse impacts on substantial number of households in many developing countries. A price spike refers to a change in price levels over a shorter period of time, normally between two successive observations (von Brown and Tadesse, 2012; Kornher and Kalkuhl, 2013). Positive price changes are usually viewed as high prices, and the highest positive values are tagged price spikes. The negative impacts of food price spikes in developing countries are evident in the erosion of purchasing power of consumers, reduction in caloric intake, consumption of less varied foods, deepening food insecurity, poverty and malnutrition (FAO, 2011; von Braun and Tadesse, 2012), among others.

Empirical studies have shown that the welfare implications of high food prices are not straightforward (Ivanic and Martin, 2008; Arndt *et al.*, 2008; Swinnen and Squicciarini, 2012; Shittu *et al.*, 2015; Arndt *et al.*, 2016). Food price shocks may lead to welfare gains or loss especially in rural communities (Swinnen and Squicciarini, 2012). The magnitude of the impacts depends on the rapidity and magnitude at which labor and commodity markets within and outside agriculture adjust in response to price shocks (FAO, 2011; Jacoby, 2013). In their studies on the welfare effects of policy-induced rising food prices among farm households in Nigeria, Shittu *et al.* (2015) noted that on the average, agricultural households benefited from rising prices of foods but between 44% and 56% of the households still suffered welfare losses. Even though there are fortunes in food price rise, the declining socioeconomic and welfare conditions of most households in Nigeria cannot be divorced from food price upsurges. Available statistics on food prices suggests that on average, food prices have been rising. For example, the average annual consumer food price index which was 71.9 in 2007, rose to 83.4 in 2008, and 109.9 in 2010 (Central Bank of Nigeria (CBN, 2012). It rose substantially to an average of 134.9 in 2012 and up to 186.2 in December, 2016 (CBN, 2016).

Based on some selected food commodities, the food price watch data released in June 2017 by the National Bureau of Statistics show that on year-to-year basis (covering May

2016 to May 2017), the average price per 1kg of imported rice increased by 29.6%, the average price of one piece of Agric eggs (medium size) increased by 34.6% and the average price per 1kg of tomato rose by 13.0%. The average price of 1kg of yam tuber increased by 52.7%, the average price per 1kg of garri increased by 65.8% while that of beans rose by 42.7%. The average price of 1kg of beef increased by 29.9%, the average price per 1kg of fish increased by 60.2% while that of local rice rose by 37.4%.

The burden of food price upsurges are borne more by the poor and vulnerable households who spend up to 80% (Obayelu, 2010) or more of their earnings on foodstuffs. When households are faced with massive negative price or income shocks, reduction in food budget is often the most immediate response (Ayinde *et al.*, 2012; Capuno *et al.*, 2013). This manifests in compromised dietary intakes in terms of quantity and quality which ultimately engender higher vulnerability to food insecurity, malnutrition, poverty and related issues. Available statistics on malnutrition in Nigeria show that incidences of stunting and wasting among under-5 children in the country are approximately 32% and 9%, respectively (NPC/ICF, 2014), with the state of hunger in the county still being rated as "serious" from international standpoint (Von Grebmer *et al.*, 2015). A number of studies have put the incidence of household food insecurity in the country between 49% and 78% assessed on the basis on food calorie intake (Omotesho *et al.*, 2007; Nnakwe and Onyemaobi, 2013; Obayelu 2012). It has also been found that a large proportion of households in the country consume less varied and low-quality foods (Ajani, 2010; Sedodo *et al.*, 2014; Agada and Igbokwe, 2015; Akerele, 2015). A number of studies have found income poverty in Nigeria between 60% and 75% (Dada 2011; Kale 2012) with estimates based on self-evaluation (regardless of its subjectivity) revealing higher incidence of poverty.

Governments of different countries usually devise measures to prevent and mitigate the adverse effects of food price upsurges. These could be in the form of targeted policies and implemented programs such as ensuring stable prices through tax reduction (import tariffs and sales taxes), subsidies on essential items, export restrictions and imposition of ban, and efforts to boost domestic food production (Anríquez *et al.*, 2013). Social protection and safety nets such as food distribution, direct cash transfers and the use of vouchers or

food stamps are also common strategies for cushioning excruciating effects of price shocks on the wellbeing of the poor and vulnerable population. The Federal Government of Nigeria (FGN) has recently introduced some safety net interventions including cash transfers (Holmes *et al.*, 2012; World Bank, 2016; Adesina, 2017) to cushion the effects of escalated food price upsurges and fiscal crunch among vulnerable groups (including children), and to systematically mitigate of the challenges of malnutrition, poverty and inequality in the country.

However, little is empirical knowledge about the potential impacts of food price spikes on food consumption (real value of food, calories, and dietary diversity) and economic welfare of households in Nigeria. Such information is crucial for the development of policies and programmes targeting at the improvement of well-being of households in the country. The highlighted concerns provide the motivation for this study. The study therefore seeks to address the following specific questions: How do food commodity price spikes affect the welfare of households in Nigeria? Can participation in targeted safety nets substantially enhance food consumption and economic welfare of the households? Findings from this study can provide useful information for redesigning existing policy actions and programmes or for the introduction of new ones for improved living conditions in Nigeria.

2. Review of Literature: Some Stylized Facts

Substantial number of empirical studies have documented the impacts of food price changes (upsurges) at the macro and micro (household) levels both in developed and developing countries (Ivanic and Martin, 2008; Arndt *et al.*, 2008; Wodon and Zaman, 2008; World Bank, 2012; Swinnen and Squicciarini, 2012; Shittu *et al.*, 2015; Matz *et al.*, 2015; Arndt *et al.*, 2016). Some of the reasons adduced to the sudden price upsurges of major crops such as cereals and oilseeds include increased global demand for food relative to changes in food supply, low and abating level of stocks (Minot, 2014; Tadesse *et al.*, 2014), imposed export restriction, severe weather shocks (Headey and Fan, 2008; Kornher and Kalkuhl, 2013), income growth, increased prices of major inputs, and exchange rate and low interest raise which induce greater demand for commodities (Gilbert and Morgan, 2010; Yeboah *et al.*, 2012).

At the macro level, changes in global food prices influence food export and import, exchange rate movements, foreign exchange reserves, patterns of food consumption and trade and marketing policies. Severe price hike create inflationary pressures, impacting negatively on the wellbeing of poor consumers especially in developing, and food importing countries that spent higher share of their limited income on food. The persistent rise in global food prices has been referred to as a key crisis that needs serious attention (Trostle, 2008; von Braun, 2008; Robles and Torero, 2010; FAO, 2011).

There is evidence at the household level that most poor households reduce their food budget after settling essential bills when faced with massive negative price or income shocks such as sudden costs, (Ayinde *et al.*, 2012). This leads to a reduction in the quantity and quality of food consumed, among others. Robles and Torero (2010) investigate the effect of the 2007-2008 “food crisis” on four Latin American countries: Guatemala, Honduras, Nicaragua and Peru. They found that price upsurges resulted in higher incidence of poverty in the studied population. Francisco *et al.*, (2011) conducted a study using spatially disaggregated monthly data on consumer prices and two household surveys to estimate the welfare and distributional consequences of food price increases in Brazil. The effects on expenditure were large, negative and significantly regressive across households with heightened incidence and depth of poverty.

Shittu *et al.* (2015) found that on the average, farm households in Nigeria experienced welfare gains from rising prices of foods but mentioned that between 44% and 56% of the households suffered welfare loss. Akerele (2013) found that approximately 3.99 million people in Nigeria could have been pushed into hunger and calorific under-nutrition due to food price upsurge. Obayelu (2010) noted that food price increases have affected virtually all agricultural products in Nigeria without equivalent increase in disposable income of families and population groups (especially the vulnerable groups). As noted earlier, advanced food price spike can have a non-trivial negative impact on food security as these can compromise people's ability to access adequate food in quality and diversity. It imposes more hardships (including economic costs of obtaining foods) on poor households (Matz *et al.*, 2015).

Vulnerable households may be forced to sell-off their productive assets or forego other essentials which can result in a long-lasting food insecurity/poverty trap that may be harder to escape (Gustafson, 2013). Nonetheless, to an agricultural household, higher food prices can raise farm incomes, which is expected to enhance purchasing power and household food security (all else equal) (Gustafson, 2013). Likewise, food insecurity and hunger (a reverse situation) can occur in such household if there is a sharp drop in the price of food produced, resulting in substantial reduction of purchasing power (Burchi and De Muro, 2016).

3. Food Price Shocks and Consumption Responses: Conceptual Link

The conceptual perspective to this study derives from Kalkuhl *et al.* (2013) in their work on the link between food price upsurges and its short-term impacts on food and nutrition security. The literature has identified two major pathways through which price shocks could influence household consumption and their food based coping strategies. In the short term, this could be through (i) real income effects and (ii) substitution effects. As mentioned earlier, the effects could be mixed depending on whether the household is a net-buyer or net seller of foods. For a household that is a net consumer of foods such as staples, a sharp rise in staple prices would reduce the real income of the household, all else equal. The shrink in real income may translate to a reduction in the real value of food purchased or consumed and ultimately to a reduction in the total calorie intake of the household. This relates to the income effects of price change.

In response to the price rise, a household may also bias spending away from the more expensive staple to a less expensive substitute. This relates to the price/substitution effects. Depending on the caloric contents of substituted staples, escalated price spikes and the accompanying reduction in the real income may even lead to higher consumption of staples and calories. This is especially true if energy dense staple alternatives become cheaper, and/or comprised income makes consumption of non-staple foods or non-food items unaffordable for the households. Whereas the substitution effects may prevent a reduction in calorie intake, it might reduce consumption of high-quality foods which possibly could have nourished households with essential micronutrients required for normal body functioning, growth and development. This highlights the need to examine the linkage between food price shocks on food consumption variety among households.

Food price spikes can also directly influence expenditure on non-food items such as health, kerosene, vitamin supplements, insecticides, mobile phone recharge cards, matches and fuel/transportation expenses, among others. This may result in a decline of the overall welfare of the households. The magnitude of the impacts of food price shocks and the associated real income reduction can be moderated by the socioeconomic characteristics of households and whether households are part of safety nets or not.

4. Methodology

4.1 Data and Sources of Data

The data for this study were from two main sources. First source is the household level panel data for 2012/2013 and 2015/2016 post-planting and post-harvest agricultural seasons. The data were collected by the World Bank/National Bureau of Statistics (NBS), Nigeria. The panel survey was targeted to cover a total of 5,000 households selected from rural and urban areas of the 36 states of the country. The data covered different aspects of household livelihoods[1]. Parts of the data that are relevant to this study are data on socioeconomic characteristics of the household and household head such as household size, age, sex, marital status, education of household head, location (rural-urban), season (post-planting or post-harvest seasons), whether or not a household engages in agriculture as main source of income, quantity of different foods consumed by the households, quantity of food purchased, value of each food purchased, and expenditure on specific non-food items, and safety nets (including cash transfers and free food distribution).

While data on food consumption and purchases (expenditures) were collected over a recall of period of 7 days, expenditure data on some non-food items either were reported on weekly and monthly basis (frequent non-food purchases), or over a period of 6 months or 1 year (non-frequent non-food purchases). All data on food consumption/purchases were discounted on weekly basis for uniformity. The value of each of the food consumed by a household was extrapolated from the corresponding value of the food purchased[2].

The second set of data are retail price of some specific foods collected by the NBS across the 36 states of the country, and in months and years corresponding to the household panel survey. The food items are imported rice, local rice, maize, sorghum, millet, beef (meat), fish, egg, yam, *garri*, beans, and palm oil. These specific food items are very critical to household food security in the country as they constitute important components of household diets. Others include consumer (Laspeyres) price indexes which were already computed by the National Bureau of Statistics (NBS) for food as well as non-food items at

[1]More details about the dataset and information therein can be accessed via http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/EXTLSMS/0,contentMDK:23512353~pagePK:64168445~piPK:64168309~theSitePK:3358997,00.html

[2] Extrapolation for the value of each food item consumed involved multiplying the value of food purchased by the quantity of food consumed and then dividing the product (outcome) by the quantity of food purchased.

the national level, on monthly basis, and over the years matching the household survey. In order to construct a measure of dietary diversity, food items were grouped into twelve (12): cereals, root and tubers, milk and dairy, egg, fish/sea foods, meat, pulses, fruits, vegetables, sweeteners, fat and oil and miscellaneous group (Swindale and Bilinsky, 2005). Non-food items were also grouped into two categories, frequently purchased non-food items and non-frequently purchased non-food items[3]. Descriptive details of items that belong to each food group or non-food groups and the corresponding the value of each group of items consumed are presented in the appendix (Tables 1).

4.2 Variables and Measurement

4.2.1 Tornqvist-Theil Index of Food Consumption

As mentioned earlier, one of the objectives of this study is to assess the effects of food price shocks on real value of food consumed and economic welfare of the households. In this case, expenditure weighted food price index, and all items price index are required to divide the value of food consumed and the total household expenditure respectively. Consequently, Tornqvist-Theil price index (which is an expenditure weighted price index) was computed for food as well as all items (food and non-food items). Doing this could better adjust for the possible varying effects that changes in prices might have on household food consumption over time and across locations.

The Tornqvist-Theil index is a superlative index that utilizes expenditure and price data from the two domains, i.e. base location/time period and new location/time period. As mentioned earlier, food items were classified into twelve groups and non-food items are classified into 2 groups. This makes a total of fourteen groups for all items (food and non-food items). For the computation of the index, the average price of imported rice, local rice, maize, sorghum and millet was used as cereal price, the average price of yam and garri was used for roots and tubers, prices of egg, beef, fish, palm oil and beans were used as for the eggs, meat, fish/seafoods, fat and oil and pulses groups respectively. For the

[3] Frequently purchased non-food items are non-food items that households may purchase many times at short intervals usually within 7 days to 1 month. Non-frequently purchased non-food items are the non-food items that are less frequently purchased, and may in some cases be up to 6 months to 1 year interval for purchases to be made. It is believed generally that non-food items are less subject to price upsurges, such that their spikes are considered of less importance (but their rising prices) to food security and welfare.

price of each of the remaining 5 food groups (milk/dairy, fruits, vegetables, sweeteners and other foods/miscellaneous group), the NBS food price index was used as proxy. For the two non-food groups (frequently purchased non-food items and non-frequently purchased non-food items), the NBS non-food price index was used respectively as proxy price. It follows therefore that all the twelve food groups and the two non-food groups have their associated (average) prices. As mentioned earlier, Tornqvist-Theil price index was computed for food, and for all items respectively. Following the International Labour Organization (2004), the formula for the Consumer price index (Tornqvist-Theil Index) used for this study can be stated as:

$$A_{it} = exp\left(\sum_{j=1}^{h} \frac{1}{2}\left(\overline{S_j} + S_{ijt}\right) Ln\left(\frac{P_{ijt}}{\bar{P}_j}\right)\right) \qquad 1$$

where A_{it} is the estimated Tornqvist-Theil price index associated with household i in time t. $\bar{P}_j$ is the mean price of estimated item group j. $\bar{P}_j$ is computed from all households in the the four (4) time periods, and is defined as ($\bar{P}_j = \frac{\sum_{rt=1}^{R_t} P_{ijt}}{\sum_{t=1}^{4} R_t}$). R_t is the total number of households in time t, and P_{ijt} is the price of item group j faced by household i in time t. $\overline{S_j}$ is the mean expenditure share of item group *j* computed from all households in the four time periods, and is defined as ($\bar{S}_j = \frac{\sum_{it=1}^{R_t} S_{ijt}}{\sum_{t=1}^{4} R_t}$). S_{ijt} is the expenditure share of item group *j* in the total value of all items consumed by household i in time t. It should be noted here that composition of "items" and "item group" do vary depending on whether Tornqvist-Theil price index is computed strictly for food or for all items (including food and non-foods). J=1, 2, 3,…,h. If price index is computed for strictly for food, item groups would relate to the 12 food groups, and total value of "items" is the total value of food consumed. However, if price index is computed for food all items (food and non-food items as an aggregate), item groups would extend to include the 2 non-food groups, to make a total of 14 commodity groups. In this case the total value of items for a household is the total expenditure on all food and non-food items. Consequently, h=12 if price index is strictly for food and h=14 if price index is for all items. For this study, $\overline{S_j}$ and $\bar{P}_j$ are ascribed to the "base/reference period/location" while S_{ijt} and P_{ijt} are assigned to the "new location/period" respectively.

4.2.2 Dependent Variables

There are four key dependent variables in this study. These include the quantity of food calories consumed, real value of food consumed, dietary diversity, economic welfare of the household (proxy by real total expenditure).

Calorie Intake Estimation

As mentioned earlier, data on the quantities of food consumed were standardized per kilogramme using the conversion factors of local units to the standard unit provided in the LSMS survey manual. The calorie content of each food was obtained by multiplying food quantity by its calorie conversion factor (per kg). The per capita calorie consumption of household j in time t is estimated given the specified formula:

$$\mathrm{V_{it}} = \frac{\sum_{k=1}^{m} B_{kit} A_k}{7 Z_{it}} \qquad 2$$

where $\mathrm{V_{it}}$ is the per capita daily quantity (amount) of calorie consumed by household i at season t. $\mathrm{B_{kit}}$ is weight in kilogramme of food item k consumed by household i at season t, and A_k is the standardized nutrient content per kilogramme of food commodity k. $\mathrm{Z_{it}}$ is the number of people in household i at season t. Households with per capita daily calorie consumption below 500 and above 12000 kilocalories were removed as outliers in line with recent findings (Smith and Subandoro, 2007; Ecker and Qaim, 2011; Harttgen and Klasen, 2012; Rischke, 2015). Having removed the outliers in the 2012/2013 of the panel survey, there are a total of 3,885 households in the post-planting period in 2012) and 4,133 households in the post-harvest season in 2013. With respect to the 2015/2016 agricultural season, a total of 4,072 households were in the post-planting period in 2015 and 4,176 households in the post-harvest period in 2016 of wave 2. The percentage of missing households across the four seasons is less than 7%. It is assumed that households were randomly missing.

Estimating Real Value of Food Consumed and Food Purchased

The weekly per capita real value of food consumed by household i in time t is computed as:

$$H_{it} = \left(\frac{\sum_{j=1}^{Q} F_{ijt}}{Z_{it} * A_{it}} \right) \quad 3$$

where F_{ijt} is the value of food group j consumed by household i at time t. Q=12, the total number of food groups consumed. A_{it} is the consumer food price (Tornqvist-Theil price) index associated with household i at time t (computed based on equation 1).

Measuring Food Consumption Diversity

We conjectured that assessing household dietary diversity using food consumption may be closer to reality than food purchases. Hence, the value of food consumption is used in dietary diversity assessment. As mentioned, food items were classified into 12 food groups namely cereals, root and tubers, milk and dairy, egg, fish, meat, pulses, fruits, vegetables, sweeteners, fat and oil and miscellaneous. Based on the food groups, a two-dimensional food diversity index, i.e. the Berry index, was constructed to capture dietary diversity. The Berry Index is expressed as:

$$B_{it} = 1 - \sum_{g=1}^{F} S^{2}_{git}$$

4 where B_{it} is the Berry index for household i in season t, S_{git} is the food consumption share of food group *g* in the total value of food consumed by household i in time t and F is the total number of food groups (Thiele and Weiss, 2003; Liu *et al.*, 2014).

Measuring Economic Welfare (per capita real expenditure) of the Households

In order to estimate the economic welfare of the household, the total expenditure on food and non-food items were first computed. The Weekly Real per capita total expenditure of household j at time t (used as a proxy for economic welfare of household) is specified as:

$$W_{it} = \left(\frac{\sum_{g=1}^{G} D_{git}}{Z_{it} * Y_{it}} \right) \quad 5$$

where D_{gjt} is the weekly per capita value of commodity/item group g, i.e. all food and non-food commodity group, consumed by household i at time t. G=14, is the total number of item groups and A_{it} is the overall items consumer (Tornqvist-Theil) price index associated with household i at time t (computed based on equation 1).

4.2.3 Measurement of Key Control Variable

Food Price Spikes

We constructed expenditure weighted price spikes for the 12 food groups based on the earlier constructed (assigned) corresponding average (proxy) prices. First, a measure of price spike was constructed (for each food group) using the log return of the food group prices, across specific states, months and years that correspond to the household panel survey. The log return of the price of each food group was estimated for each of the months in each of the years covering 2011:12 – 2016:12. Following Tadesse *et al.* (2014), the price spike is formularized as:

$$R_{mt} = \ln\left(\frac{P_{mt}}{P_{mt-1}}\right) = \ln(P_{mt}) - \ln(P_{mt-1}) \quad 6$$

where P_{mt} is the average/proxy price for a food group in month m of year t in a given state of the country. P_{mt-1} is the average/proxy price of the food group in the preceding month in the same state and year. Thereafter, each estimated spike (R_{mt}) was weighted by the share of each food group in the total value of food consumed by each household as follows:

$$D_{ijt} = S_{ijt}.R_{mt} \quad 7$$

where D_{ijt} is the expenditure weighed spike which better reflect the variation in price spikes across households over time. Data on food price spikes are merged (mapped) with the household panel data by state, year, and month of data collection.

Definition of Other Explanatory Variables

Apart from the key control variables, other relevant explanatory variables[4] were operationalized as follows. Natural log of non-food price (computed from the non-food price); surplus season dummy (1 if data were collected from household in the harvest/post-harvest season, 0 if data were collected during lean/post-planting season); agricultural household dummy (1 if household is classified as agricultural household, 0 otherwise); Urban dummy (1 if household is located in urban area, zero, otherwise); sex of household head dummy (1 if household head is a male, 0 otherwise); marital status of

[4] Classification of households as agricultural or non-agricultural, or whether household is located in urban or rural area is already contained in the data. Likewise, the periods (seasons) of data collection.

household head (1 if household head is married, 0 otherwise); age of household head (years); household headed by master/PhD degree holder (1 if household head has Master/PhD degree, 0 otherwise); household headed by First Degree holder (1 if highest formal educational attainment of household head is HND/First degree, 0 otherwise); household headed (1 if highest formal educational attainment of household head is ND/NCE holder, 0 otherwise); household headed by secondary school certificate holder (1 if highest formal educational attainment of household head is secondary school, 0 otherwise); household headed by primary (1 if highest formal educational attainment of household head is primary school, 0 otherwise); household receiving direct cash transfers from government (1 if household benefited from cash transfer scheme, 0 otherwise); household receiving free food distribution (1 if household benefited from food distribution programme, 0 otherwise); income status of the household.

There are three dummy variables for the income status, reflecting relatively low, middle and high income status[5]. For the middle income status dummy, household is assigned 1 if the household classified as belonging to middle income, otherwise zero. Likewise for the high income status group, household is assigned if the household is classified as having relatively high income, otherwise zero. For the dummy variables on education, the "no formal education household head group" was dropped, while for the income status dummies, the relatively "low income household group" was dropped from analysis. More descriptive information on some household demographic characteristics and spikes of food price used for analysis are presented in the appendix, Tables 2 and 3 respectively.

4.3 Empirical Framework

The empirical framework for examining the relationship between food price shocks and some measures of household welfare such as real per capita food consumption, calorie consumption, dietary diversity and weekly real per capita total expenditure as well as the food based-coping strategies adopted by the households derived from the basic framework on the link between price changes Δp (spikes) and food and nutrition security

[5] To classify households as relatively low, middle or higher income group, households were ranked based on the real household per capita consumption-expenditure. Households falling into the lowest tercile (first 33.33%) were classified as low income households, those falling into the next tercile (next 33.33%) were classified as middle income group while household belonging to the last tercile (last 33.33%) were regarded as the relatively high income group.

by Kalkuhl *et al.* (2013). Although their specification was based on nutrition outcome such as anthropometric measures, we conjecture that nutrition outcomes are more closely related to the inputs of food/nutrient consumption and non-food purchases such as health, education and other basic expenses. Hence, the empirical framework can be used to assess the possible impacts of price reduction in real income on food and nutrient consumption. The potential impacts of price shocks on the identified measures of household wellbeing:

$$W_{jt}=f(\Delta p_t, I_t, F, A, \boldsymbol{X}_t) \quad 8$$

where W_j is a measure of some dimensions of household welfare (i.e. real value of food consumed, food calorie consumed, dietary diversity. Δp is a measure of food price spikes, and I is a measure of income, i.e. the economic status of the household. F denotes the agricultural seasons including post-harvest/food surplus period or post planting/hungry period in which data were collected. A is an indicator of targeted assistance cash transfers/food distribution scheme. X represents household socioeconomic characteristics and location (rural-urban) factors. The likely impacts of price shocks on household's economic welfare measure (proxy by Weekly Real per capita total expenditure) can also be specified as:

$$E_t=f(\Delta p_t, F, A, \boldsymbol{X}_t) \quad 9$$

Where E is the real total per capita expenditure of household.

4.4 Analytical Framework

The data for this study were analysed within the panel data (individual effects) econometrics framework. Controlling for other variables, the fixed effects model was specified for the effect of food price spikes on each of the four identified measures of household wellbeing. The general specification of the fixed effects model for the impacts of food price spikes on food calorie consumption, real value of food consumed and dietary diversity is given as:

$$W_{ijt} = \sum \omega_{dj} S_{idjt} + \phi I_{ijt} + \sum \beta_{kj} X_{ikjt} + \sum \gamma_{aj} A_{iajt} + \alpha_{ij} + e_{ijt} \quad 10$$

where W_{ijt} captures the jth specific dimensions/indicators of wellbeing (real per capita value of food consumed, per capita quantity of calorie consumed, dietary diversity) of household *i* at time *t* respectively. S, I and X denote vectors of spikes in the prices of foods, and income status and socio-demographic characteristics of households. A captures whether or not a household is classified as farm household, rural-urban location, whether or not a household receives cash transfer or food distribution and seasonal dummies reflecting post-harvest or post-planting seasons. α_{ij} represents fixed effects, while e_{ijt} is the error term. The fixed-effects model presumes that α_{ij} is correlated with explanatory variables and uncorrelated with e_{ijt}; thereby allowing for some form of endogeneity.

The fixed effects model for the assessments of impacts of food price spikes on economic welfare of the households, i.e. real total expenditure per capita as proxy, is specified as

$$E_{it} = \sum \omega_d S_{idt} + \sum \beta_k X_{ikt} + \sum \gamma_a A_{iat} + \alpha_i + e_{it} \qquad 11$$

E_{it} is the real per capita expenditure of household i at time t.

The Driscoll and Kraay (1998) standard error which is robust to general forms of cross-sectional (spatial) and temporal error dependence was applied during model estimation to account for the possible heteroskedasticity, and self-correlated errors across periods (time) and between the panels[6].

[6] Data were analysed with STATA 15.0 Software. The data were first *tsset* before applying the *xtscc* command which generated the Driscoll and Kraay (1998) standard errors for the coefficients of the estimated fixed-effects (within) regression. The STATA codes (with the *xtscc* command) used for the analysis was downloaded from the internet as authored by Daniel Hoechle, University of Basel (daniel.hoechle@unibas.ch). The codes can be used for analysis involving both balanced and unbalanced panels.

5. Results and Discussion

5.1 Descriptive results of Some Dimensions of Household Welfare across Seasons

Presented in Table 1 are the descriptive information on the measures of household welfare considered in this study. The real value of food and the amount of calories consumed are used as measures of the quantity dimension of food security (access to food). Dietary diversity is used as a proxy of the quality of diets while real total expenditure is used as a proxy for economic welfare of the households. With respect to calorie consumption, the observed pattern across seasons over the years covered by the study is that the average per capita daily calorie consumption is consistently higher during the post-planting seasons than in the post-harvest seasons. Similar pattern was also observed regarding the real value of food consumed, except for the post-harvest period of wave 2 (year 2013) in which the real value of food consumed was higher than the post-planting season of the same wave (year 2012). Notwithstanding, the metric of dietary diversity for the post-harvest season (year 2013) is slightly higher (0.65) than that (0.62) of post-planting (2012) season.

The somewhat (marginally) high dietary diversity recorded during the post-harvest period (of year 2013), might be associated with relatively higher real value of food consumed during the same season. This is because the quantity of food calories consumed during the period (season) is lower than the quantity consumed in the other periods. All else equal, these statistics suggests that an average household have access to more fairly diverse food sources that could supply high-quality calories and/or some other key nutrients during post harvest periods than in post planting perods. Akerele *et al.* (2017) documented the direct correlation between consumption of more varied foods and likelihood of adequate intakes of food calories and nutrients in Nigeria.

Tabelle 1: Summary Statistics of Some Dimensions of Household Welfare across Seasons

Measures of welfare	Mean	Standard deviation	Min	Max
Year 2012 (Post-Planting Season)				
Daily Per capita calorie consumed	3076.16	2321.09	504.28	11904.61
Dietary Diversity	0.63	0.16	0.00	0.88
Weekly Real per capita Value of Food consumed	975.76	913.04	50.24	18578.09
Weekly Real per capita total expenditure	2378.32	44336.18	55.71	2625199.00
Total number of households in 2012 =3885				
Year 2013 (Post-Harvest Seasons)				
Daily Per capita calorie consumed	2936.99	2253.50	501.04	11916.05
Dietary Diversity	0.65	0.16	0.00	0.88
Weekly Real per capita Value of Food consumed	1130.13	1087.57	34.63	19172.20
Weekly Real per capita total expenditure	1801.13	6852.19	39.47	316501.30
Total number of households in 2013 = 4133				
Year 2015 (Post-Planting Season)				
Daily Per capita calorie consumed	3422.89	2436.06	504.47	11985.29
Dietary Diversity	0.62	0.17	0.00	0.89
Weekly Real per capita Value of Food consumed	1081.63	988.46	58.87	14084.55
Weekly Real per capita total expenditure	1593.53	2217.01	70.28	74304.56
Total number of households in 2015 =4072				
Year 2016 (Post-Harvest Season)				
Daily Per capita calorie consumed	3251.96	2334.45	505.49	11998.53
Dietary Diversity	0.62	0.17	0.00	0.87
Weekly Real per capita Value of Food consumed	981.56	893.28	70.98	12948.05
Weekly Real per capita total expenditure	1335.74	1493.42	74.74	29432.86
Total number of households in 2016 =4176				

Note: The total number of observations (households) with zero (0) dietary diversity (households that consume from only one food group) is **2** in 2012, **5** in 2013, **1** in 2015 and **2** in 2016.The percentage of households with zero (0) values for dietary diversity are negligible.

Even though seasonal comparisons indicates that the average per capita daily calorie consumption is lowest in the post-harvest season of 2013 (2936.99 kilocalories), this amount is higher than the average per capita daily calorie intake (2428 kilocalories) reported by Babatunde *et al.* (2010). This is an evidence of improvement in calorie supply/consumption in Nigeria in recent times compared to the past years. Likewise, the estimated calorie consumption (2936.99 kilocalories) per capita daily calorie consumed is

still higher than the average recommended daily per capita calorie for developing countries (FAO, 1990). This would mean that on the average household may still be adequate in terms of calorie consumption, while at the same time, enjoying marginally higher level of dietary diversity during the period (2013) compared to other seasons (periods). With respect to the economic welfare of the households, the results indicate a progressively declining values of real total expenditure from one season to the other, with the least value recorded in the latest period, 2016. This is a reflection of worsened economic wellbeing of an average Nigeria over the years as also noted by Kale (2012). It thus calls for serious attention from welfare policy standpoint.

5.2 Effects of Food price spikes on Real Value of Food and Calorie Consumed

In Table 2 results of the influence of food price spike and other control variables on the real value of household and per capita calorie are presented. Higher spikes in the price of cereals, fats and oils, vegetables, fish and sweeteners, among others, have significant reduction effects on household food consumption, whereas greater spikes in the price of roots and tubers, pulses, fruits, eggs and milk/diary can substantially increase food consumption. Although higher spikes in the price of some foods may enhance the real value of food consumed, this may not necessarily reflect in improved diets as extreme food price shocks may constrain poor people (households) to shift to less-varied diets, which could have a harmful effect on their nutritional status in the short and long run (IFPR, 2008; NISER, 2009; De Janvry and Sadoulet, 2009; Olomola, 2013; Weber, 2015).

Findings suggest that higher spike in the price of meat is unlikely to substantially influence the real value of food consumed[7]. The results suggest that increase in general price of non-food items may have positive effects on the real value of food consumed. For households who are not into sales of non-food items, higher non-food prices is expected to diminish the purchasing power of the household. However, consumption of food may increase, particularly if household can no longer afford consumption of some non-food commodities due reduced income as noted by Kalkuhl *et al.* (2013).

[7] Effects of price shocks on food consumption may be diluted especially if households adjust to shocks by falling back to deplete the stock of food they already had in store instead of making purchases in the market.

Tabelle 2: Effects of Food price shocks on Food and Calorie Consumption

	Real value of food consumed		Food Calorie Consumed	
Variable	**Spike**	**t-value**	**Spike**	**t-value**
Surplus season	***0.02	2.62	***-0.05	-11.63
Middle income household	***0.40	62.16	***0.57	46.34
High income household	***0.69	115.53	***1.24	148.20
Natural log of non-food price	***1.26	49.07	***1.02	51.43
Agricultural household	4.0e-3	0.48	-0.01	-2.00
Spike in price of cereals	***-0.21	-3.35	***-0.52	-4.49
Spike in price of roots and tubers	***0.31	2.76	***-0.33	-3.19
Spike in price of beans/pulses	***0.46	2.93	***0.87	5.23
Spike in price of fats and oils	***-0.96	-3.48	0.46	1.40
Spike in price of fruits	***10.11	3.06	***-14.32	-7.42
Spike in price of price of vegetables	***-180.63	-60.24	***-25.18	-10.92
Spike in price of price of egg	***4.64	4.34	1.61	1.07
Spike in price of price of meat	1.8e-4	1.9e-3	0.01	0.17
Spike in price of price of fish	*-0.09	-1.80	***0.17	3.28
Spike in price of price of milk/dairy	***36.73	8.16	**-5.38	-2.12
Spike in price of sweeteners	***-22.37	-2.62	*-14.80	-1.83
Spike in price of price of other food items	***-26.15	-4.81	5.31	0.90
Urban dummy	0.02	0.94	***-0.11	-6.91
Male dummy	***0.17	54.25	***-0.15	-35.64
Marital status of household head-married dummy	***-0.04	-21.50	***0.06	7.06
Age of household head	*3.6e-4	1.71	***0.00	3.23
Household headed by master/PHD holder	***0.07	11.07	-0.01	-0.31
Household headed by First Degree holder	***0.09	7.11	**0.03	2.39
Household headed by OND holder	0.01	0.45	***0.05	4.98
Household headed by secondary school certificate holder	***0.04	7.12	***0.03	4.02
Household headed by primary school holder	***0.06	13.45	4.1e-4	0.49
Household receiving direct cash transfers from government	**-0.32	-4.77	**-0.23	-2.25
Household receiving free food distribution	**0.08	2.40	***0.11	11.50
Constant	1.63	13.28	***2.19	21.25
F-Value	***89.63		***1.94	
Prob>F	0.000		0.002	

The real per capita value of Food consumed in an average agricultural household is unlikely to be substantially higher than in a non-agricultural households However, households classified in middle and relatively high income group had higher real per capital

consumption than households in low income groups. This implies that substantial growth in the real per capita income of the household from agriculture and related sources or from non-farm sources is a critical factor for boosting the real per capita food consumption of a household.

The coefficient of surplus/post-harvest season is statistically significant and positively related to the real value of household per capita food consumption. This implies that the real value of household per capita food consumption increases more in the harvest/post-harvest seasons than in the lean/post-planting season. The coefficient associated with the male headed household (dummy) has statistically significant and positive effects on real value of household per capita food consumption. This implies that the male headed households have a substantially higher real per capita food consumption compared to their female headed household counterparts.

The coefficient of marital status of household head (married dummy) is statistically significant but has a negative impact on the real value of household per capita food consumption. This means that an average household headed by a married person has a lower value of per capita food consumption compared to other household groups. This is possible if such household has larger members, and, who do not contribute substantially to raising household income. The coefficients of educational dummies are positive, and statistically significant, pointing to the potential role that formal education gains could play in improving food consumption. A household that received cash transfers is unlikely to have higher real value of per capita food consumption compared to an average household that does not receive.

One possible reason for this could be that the recipient households bias consumption towards non-food items. Even when beneficiary households have very low income, they may invest the money in some income generating activities with the intention to boost future income and food consumption(Holmes *et al.*, 2012). This could also happen if high income households are wrongly targeted. In some cases, and depending on the identity of the member of the household that received the transfers, the money may not be spent on food or invested in any income generating activities (Holmes *et al.*, 2012; FEWSNET, 2017). It might also be that the real per capita income of an average recipient household is very

low such that the real worth of the cash assistance (in terms of the foods it can buy) is lower than the food spending of an average non-beneficiary household. There is evidence that the real value of government cash assistance can be compromised where prices of food items are high (Holmes *et al.*, 2012). Findings also indicate that an average household that participated in food distribution scheme had higher real per capita consumption. This is very important for the design of food related social safety net in the country.

Turning to the results of the relationship between per capita daily calorie intake and food price spikes and other related factors. Higher spikes in the price of cereals, roots and tubers, fruits, vegetables, milk/dairy, and sweeteners would reduce per capita calorie consumption while higher spikes in the price of pulses and fish may enhance it. Households who spend a higher percentage of their income on staples such as cereals, roots could suffer greater (nutrition) welfare loss from higher price (IFPRI, 2008) of the food items. An average household classified as having middle and relatively high real income consumes more calories than a household classified as belonging to the low income group. The implication is that income improvement is crucial for raising food calories and satisfaction of hunger needs among households. Higher non-food price is also positively related to calorie consumption. This means that rising price of non-food items can result in a considerable increase in daily calorie intake per capita of a household. As noted by Weber (2015) and Aksoy and Isik-Dikmelik (2008) consumption of staples as the major sources of calories can even increase when non-staple foods such as fish, beef or non-food items become too expensive and unaffordable for households due to compromised purchasing power.

Although food substitution patterns (arising from relative cheapness (or expensiveness) of food items may forestall (prevent) a decline in calorie intake, it might cut back consumption of more diverse and high-quality foods. This is consistent with the outcome of NSER (2009), SWAC (2011) and Olomola (2013). The coefficient associated with male headed household (dummy) is statistically significant and negative, implying that female headed households have higher per capita daily calorie intake than the male headed households. When women have control of financial resources they tend to spend more on items such as foods (Wiggins *et al.* 2010; Kamar and Quisumbing, 2013) that benefit all household members.

Results suggest that urban households had lower per capita calorie consumption than rural household. This may be indicative of a shift in the locus of caloric inadequacy from rural to urban setting in the country. The coefficient of marital status of the household head is statistically significant with positive impact on household per capita daily calorie intake. This points out that households whose heads are married have higher per capita daily calorie consumption than the other household groups. Findings suggest that households receiving direct cash transfers are unlikely to substantially raise calorie consumption compared to households that did not receive cash transfers. This raises some fundamental questions with regard to the effectiveness of the current government cash transfers in enhancing food consumption and nutrition in the country. This is important especially that participation in food transfers is positively related to higher calorie consumption. The results indicate that access to formal education above primary school level is important for improved consumption of food calories in the country.

With respect to the signs of the estimated food price spike coefficients, the results suggest that spikes in the price of food commodities such as milk/dairy, fruits, and roots and tubers have opposite effects on food calories and the value of food consumed. While for example, higher spikes of roots and tubers, and milk/dairy had negative influence on the amount of calories consumed, they exerted positive influence on the value of food consumed. Likewise, spike in the price of fish reduces the value of food consumed, while it raises calorie consumption. This suggests that higher spikes in the prices of these commodities may not necessary be an effective indicator of onset of household food insecurity especially in terms of access to food quantity and quality.

The coefficients (absolute values) associated with spikes in the price of cereals, roots and tubers, and beans/pulses are generally lower (less than unity) than that of non-staples such as fruits, vegetables milk/dairy, and eggs, among others. This suggests that households are more sensitive to changes in the price of these food items than the major staples. Hence, changes in the prices of these nutrient-dense foods (fruits, vegetables, milk/dairy and eggs) hold enormous implication for diet quality in the country. Spikes in the price of cereals had negative effects on calories and real value of food consumed. The coefficient of cereal spikes with respect to the value of food consumed is also smaller than with respect to

calories. This could mean that households has higher propensity to reduce calories (especially from more expensive calorie-rich food sources) than they would possibly do with other (cheaper) food sources.

It is worthy of note that although price spikes may lead to reduction in food calories (Friedman et al, 2011), richer households are more likely to reduce calories than poorer ones (D'Souza and Jolliffe, 2013). Nevertheless, extremely poor households (whose lives are characterised by inadequate calorie intakes) may be unable to substantially cut-back food quantity (calories), and would rather adjust the compositions of their diets to sustain their calorie intake (energy) levels. Ruel *et al.* (2010) show that households reduce both the quantity (and quality) of food consumed in response to price shocks.

5.3 Effects of Food Price Spikes on Dietary Diversity and Economic Welfare

The results of the factors influencing food consumption variety, and economic welfare of households are presented in Table 2. Higher spikes in the price of pulses, fats and oils, meat, fruits, and vegetables may enhance food consumption diversity, higher price in the price of roots and tubers, and eggs will shrink it. As expected, households consumed more diverse foods during the surplus/post-harvest season than in the surplus seasons (NISER, 2009). Supply and availability of food in the market are linked to seasonality and this can in turn influence food consumption patterns. High income households have access to more varied diets than low income households (Olomola, 2013). At very low level of income, households spend a substantial amount of their income on necessities including staple foods. However, they tend to allocate more of their income to more diverse foods, and other goods and services as their incomes increase. Households that are engaged in agricultural production consumed more variety of foods than non-agricultural households.

Tabelle 3: Effects of Food price spikes on Dietary Diversity and Economic Welfare

Variable	Dietary Diversity		Economic welfare	
	Spike	t-value	Spike	t-value
Surplus season	*4.8e-3	1.90	***0.04	3.69
Middle income household	***0.03	10.98	-	-
High income household	***0.02	8.24	-	-
Natural log of non-food price	***-0.14	-25.58	***-0.12	-3.96
Agricultural household	***0.01	3.23	3.5e-3	1.24
Spike in price of cereals	***-0.12	-3.64	***-0.85	-7.26
Spike in price of roots and tubers	***-0.17	-18.36	***0.34	12.58
Spike in price of beans/pulses	***0.30	2.39	***0.45	2.59
Spike in price of fats and oils	0.18	2.04	***-1.61	-9.99
Spike in price of fruits	***30.09	7.06	-0.09	-0.01
Spike in price of price of vegetables	***24.56	5.89	***-187.27	-61.32
Spike in price of price of egg	***-2.77	-3.94	-0.77	-0.94
Spike in price of price of meat	*0.04	1.90	-0.12	-0.92
Spike in price of price of fish	-4.3e-3	-0.4	0.03	1.41
Spike in price of price of milk/dairy	***49.11	7.09	**35.82	2.22
Spike in price of sweeteners	1.52	0.83	****-38.74	-2.96
Spike in price of price of other food items	***8.26	5.48	***-18.53	-4.25
Urban dummy	***0.02	3.72	***0.19	2.78
Male dummy	-3.3e-3	-4.37	***-0.39	-81.75
Marital status of household head-married dummy	1.1e-3	0.59	***0.17	10.9
Age of household head	6.5e-5	-0.84	2.9e-4	2.96
Household headed by master/PHD holder	*-0.02	-1.76	-0.10	-5.51
Household headed by First Degree holder	***-0.01	-3.44	4.9e-3	-0.26
Household headed by OND holder	***-0.03	-1.67	***0.06	5.37
Household headed by secondary school certificate holder	***-0.02	-5.58	***-0.07	-6.13
Household headed by primary school holder	***-0.02	-4.12	***-0.06	-4.48
Household receiving direct cash transfers from government	***-0.18	-6.9	***-0.78	-8.09
Household receiving free food distribution	*0.01	1.72	**0.20	2.2
Constant	***1.29	48.94	***7.85	53.36
F-Vaue	***280.24		***20.96	
Prob>F	0.000		0.000	

Food consumption also appears to be higher among urban households than rural households. Farm households are expected to have direct access to what they cultivate and this could enhance dietary diversification (Weber, 2015) while non-agricultural households can only purchase what is available in the market (FEWSNET, 2017). Increase

in the price of non-food commodity depresses dietary diversity. That increase in non-food price reduces food consumption diversity may suggest a movement towards consumption of monotonous staple (calorie rich) foods.

Greater spikes in the price of roots and tubers, cereals, and egg had a negative and significant relationship with household dietary diversity. However, the price spike of meat and beans/pulses established a positive and significant relationship with household dietary diversity. On the basis of the estimated coefficients, the results suggest that food consumption diversity is more sensitive to changes in the price of eggs than cereals and root and tubers. This is expected because cereals and roots and tubers are generally calorie-rich foods which are needed to meet hunger needs of the people. Hunger satisfaction (through food calories) is arguably a fundamental (food) needs of human, and an average household would first seek to gratify this before fulfilling other food nutrient needs such proteins and vitamins.

In a similar fashion (as calories and the value of food consumed), the coefficient of cereal price spike also has negative effects on dietary diversity. However, the absolute value of the coefficient (of cereal price spike) is smaller than that of calories and food consumption. This implies that households are still generally less willing to trade-off food diversity (quality) for quantity (calories) in the face of extreme spikes of cereal price. D'Souza and Jolliffe (2013), noted that richer households do normally consume more varied diet (of relatively more expensive foods); thus providing the opportunity to bias consumption towards cheaper (alternative) foods as prices increase (D'Souza and Jolliffe, 2013). It thus become imperative to give more serious attention to the concerns relating to dietary diversity, particularly given the nexus between food insecurity and food price shocks.

Findings show that female headed households consume more varied foods than the male headed households. The negative and statistically significant coefficients of educational dummies imply that having access to formal education is unlikely to promote food consumption diversity. This is contrary to expectation as greater access to formal education is expected to reflect in better appreciation of the roles of more varied foods in enhancing diet quality. The foregoing suggest that other factors beyond access to formal education might need to be considered to raise diversity of household diets. Households

receiving direct cash transfers have a lower dietary diversity than non-beneficiary households. This may be possible if the amount received by the household is too small to meet food needs, and particularly in areas experiencing very high food price spikes. Beneficiary households may also consumed less divers foods if there are delays in the payment of the cash transfer (FEWSNET, 2017). Households may also temporarily go hungry or reduce food consumption in order to invest in anticipation of future welfare gains or spend it on non-food or "non-profitable" items.

Considering the effects of food price spikes on real per capita total expenditure (on food and non-food items. The results suggest that the overall economic welfare of agricultural households is unlikely to increase considerably compared to non-agricultural households. This, however, may change if farm households are able to store, process and sell their products at better price. However, lack of storage capacity forces most farm households to sell at low prices thereby limiting their ability to maximize net-farm income.

Increase in the price of non-food items would substantially diminish households' economic welfare. In the face of extreme price spikes, consumers bear the brunt of the shock (Ligon, 2008; EC, 2008; Wood *et al.*, 2009; Dorward, 2012; Gilbert and Morgan, 2010). Households may adjust by cutting down consumption of luxury foods and non-food goods to accommodate some basic foods for sustenance. Thus the overall household welfare diminishes. Extreme spikes in the price of cereals, fats and oil, vegetables, sweeteners, among others, could substantially diminish households' economic welfare while higher spikes in the price of roots and tubers, pulses and milk/dairy may enhance it.

The coefficients (absolute values) of spikes in the price of foods with negative effects on household welfare are consistently larger than that of food diversity, as well as calories and real value of food consumed. This suggests the adverse effects of higher spikes in the price of these food commodities may be more for the overall economic welfare of the households than the food consumption dimension of household wellbeing. This might be that household's trade-off consumption of some non-food items in order to accommodate the food consumption needs of member. This consumption behaviour is expected in the event of higher food price spikes, since food is generally considered to rank higher in the hierarchy of human needs than non-foods. It is noteworthy however, that a progressive

and persistent compromise in the consumption of certain non-food items such as health and education have long-term implications for the household welfare in terms of poverty and food insecurity, and the country (as a whole) in terms of productivity and economic growth, among others.

Households in urban area also appear to have higher economic welfare status than their rural household counterparts. Female headed households seem to do fairly better in term of their welfare compared to male headed households. This appears contrary to the conventional thinking that male headed household are better off in many developing countries, Nigeria inclusive. It might be that male headed household have larger members than female headed households[8]. Households headed by a married person seem to have higher welfare status than households whose heads are unmarried, divorced or widowed. The results revealed negative and statistically significant coefficients of the secondary school, primary school education, and higher degree (Masters/PhD) dummies. This implies that advances in formal education attainment may not necessarily improve economic welfare of the households in Nigeria. This is again contrary to the expectation that higher educational gains enhance household welfare. However, the economic situation in Nigeria has forced some holders of a higher educational degree such as Masters or PhD degree to settle for low-paying jobs in order to survive the biting economic situations in the country (Akinbode, 2013). Similarly, households receiving direct cash transfers appear to have lower economic welfare status than non-recipient households, while those receiving free food distributions seem to have higher welfare. It might be that the income of recipient house is very low compare to an average non-recipient household.

[8] The mean household size for female headed household is 5.03 (approximately 5 persons while that of male headed household is 7.17 (approximately 7 persons).

6. Conclusion

In the past few years, the issue of food price spikes have attracted attention at the global stage among governments, non-governmental organisations, policy makers and other interest groups due to unfavourable impacts on the livelihoods of the people. Many studies found heterogeneous impacts of food price shocks on food security, nutrition and economic welfare of households across regions of world, including Africa. However, little is known in Nigeria. Governments and non-governmental agencies do intervene to cushion the effects of food price shocks through safety nets. However food consumption and welfare impacts of safety nets have been rarely assessed in Nigeria. Using the 2012/2013 and 2015/2016 Household Survey Panel Data, the study examined the potential impacts of food price spikes on the quantity of food (calories), real value of food consumed, dietary diversity and economic welfare of households in Nigeria having controlled for household's participation in safety nets and other factors.

On the average, household food consumption variety is fairly high. The observed patterns of food calorie consumption over the years indicate higher consumption during post-planting season than in the post-harvest periods. Findings also suggest a progressive decline in economic wellbeing of households over the years. Econometrics results indicate that household with high economic (income) status can substantially raise calorie consumption, the real value of food consumed and dietary diversity. Agricultural households have greater access to more varied diets than non-agricultural households. Spikes in the price of cereals generally hold negative consequences for food quantity consumption (in terms of calorie and real value of food consumed), dietary diversity and economic wellbeing of households. However, spikes in the price of other groups of food items have heterogeneous effects. Increases in the price of non-food items could advance the real value of food and calories consumed, while it would depress dietary diversity and overall economic wellbeing of households. Hence, changes in food quantity may be an ineffectual measure for assessing the onset of household food insecurity in the face of extreme price shocks.

Beyond, increased consumption of food calories, greater access to higher education seems unlikely to enhance food consumption diversity and economic welfare of household

beyond the current level. Hence, except for the reduction of hunger and undernourishment, promoting greater access to formal education (under the prevailing circumstance) may be an ineffectual pathway to raising household dietary diversity and economic welfare. Increase in the age of household head is positively related to higher access to food calorie consumption.

Households receiving food transfers appeared to have greater access to food calories, diverse diets and better economic wellbeing than other non-recipient households. The findings suggest that food distribution may be a more suitable strategy for enhancing food security than direct cash transfers.

Efforts to curtail extreme spikes in the price of cereals can substantially enhance food security and overall economic welfare of the households. Strategies for growth in household income is critical for improved access to foods in terms of quantity and diversity and overall economic wellbeing of households. If policy actions are complemented with food distribution and sensitively guided welfare related gender interventions, more improvements for livelihoods can be achieved. Effectiveness of complementary efforts can be enhanced through proper appraisal of local context and by investing in sectors where the poor benefits the most, and by proper identification of socially deserving people in order to better allocate resources for poverty alleviation, food insecurity and/or malnutrition reduction programmes.

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APPENDICES

Table A1: Group Composition and Descriptive Statistics Weekly Consumption Rates

Food group	List of food items in the food group	Mean value	Share
Cereals	sorghum, millet, local rice, imported rice, maize flour, yam flour, cassava flour, wheat flour, maize unshelled (on-cob), maize shelled (on-cob), maize shelled (off-cob), other grains flour, bread, cake, buns/"puff-puff", biscuits, meat pie,	1347.2	24.7
Roots and Tubers	cassava roots, yam roots, garri white, garri yellow, cocoyam, plantains, sweet potatoes, potatoes, other roots tuber,	925.45	16.9
Pulses	soya beans, brown beans, white beans, ground nuts unshelled, ground nuts shelled, other nuts seeds, cashew nut,	393.51	7.20
Fat and Oil	palm oil, butter, ground nut oil, other oils fats, shea-butter, coconut oil, animal fat	412.22	7.54
Fruits	bananas, orange, mangoes, avocado pear, pineapples, canned fruits, other fruits, pawpaw, watermelon, apples, guava,	158.64	2.90
Vegetables	tomatoes, tomatoes canned, onions, garden eggs, okra fresh, okra dried, fresh pepper, dry pepper, vegetable leaves (spinach), other vegetables,	392.80	7.19
Eggs	agric eggs, local eggs, other eggs,	39.62	0.73
Meat	chicken, duck, other domestic poultry, beef, mutton, pork, goat, bush meat, canned beef, other meat,	596.0	10.9
Fish	fish fresh, fish frozen, fish smoked, fish dried, snails, seafood, canned fish, other fish,	631.90	11.6
Milk/dairy (Beverages)	fresh milk, milk powder, baby milk, milk tinned, cheese *(wara*), other milk products, coffee, chocolate drinks, tea, malt drinks, soft drinks, fruit juice, other non-alcoholic drinks, beer, palm wine, pito, gin, other alcoholic drinks	116.04	2.1
Sweeteners	sugar, jams, honey, other sweets	94.42	1.7
Miscellaneous group	condiments, salt, (unground ogbonno), (ground ogbonno), ground pepper, melon shelled, melon unshelled, melon ground, bottled water, sachet water condiments, salt, kola nut, coconut	355.83	6.5
Total	All foods	5463.63	100.0
Non-Food	**List of non-food items in the non-food group**		
Frequently Purchased Non-food items.	Cigarettes/tobacco, matches, newspaper/magazines, public transport, kerosene, palm kernel oil, cooking gas, cooking fuel, electricity bill, candle, firewood charcoal, petrol, diesel, light bulbs, water, soap/detergent, toilet paper, razor blades, vitamin supplement, insecticides, disinfectants, postal, recharge cards, landline charges, internet services, recreational, vehicle repair, bicycle repair, wages staff, mortgage, dwelling repairs, household repairs, house rent, lubricants	3583.92	80.9
Non-Frequently Purchased Non-food items.	infant clothing, baby diapers, boys tailored dress, boys readymade dress, girls tailored dress, girls readymade dress, men tailored dress, men readymade dress, women tailored dress, women readymade dress, *ankara* materials, other clothing, boy shoes, men shoes, girl shoes, lady shoes, tailoring charges, laundry, glassware plates, cooking utensils, cleaning utensils, torch flashlight, umbrella /raincoat, paraffin lamp, stationery (not school), books (not school), house decorations, night lodging, donation to church, health expenditures, hand loomed *asooke*, repairs footwear, electric kettle , coal pot and other non-electric, repairs of appliances, bedsheets pillow, curtain and other linen, carpet floor, cover handset, personal computer, carpets /rugs, linen/ towels, mat sleeping, mosquito net, mattress, sports equipment, film processing, building items, council rates, health insurance, auto insurance, home insurance, life insurance, legal fees, dowry costs, marriage ceremony, funeral costs, cost Wood pole *(bamboo*) cost, grass for thatching	844.88	19.1
Total	All non-food items	4430.80	100.0

Table A2: Demographic Characteristics of Households across Years/Seasons

Variables	Mean	Std. dev	Min	Max
Year 2012 (Post-Planting Season)				
Male dummy	0.85	0.36	0.00	1.00
Marital status of household head (married dummy)	0.66	0.47	0.00	1.00
Age of household head	51.72	14.37	18.00	112.00
Household headed by master/PHD holder	0.01	0.12	0.00	1.00
Household headed by First Degree holder	0.04	0.19	0.00	1.00
Household headed by OND holder	0.04	0.19	0.00	1.00
Household headed by secondary school holder	0.19	0.40	0.00	1.00
Household headed by primary school holder	0.24	0.43	0.00	1.00
Household receiving direct cash transfers	0.00	0.00	0.00	0.00
Household receiving free food distribution	0.00	0.00	0.00	0.00
Year 2013 (Post-Harvest Season)				
Male dummy	0.85	0.35	0.00	1.00
Marital status of household head (married dummy)	0.62	0.49	0.00	1.00
Age of household head	51.77	14.78	18.00	110.00
Household headed by master/PHD holder	0.00	0.00	0.00	0.00
Household headed by First Degree holder	0.00	0.00	0.00	0.00
Household headed by OND holder	0.00	0.00	0.00	0.00
Household headed by secondary school	0.00	0.02	0.00	1.00
Household headed by primary school holder	0.00	0.02	0.00	1.00
Household receiving direct cash transfers	0.00	0.03	0.00	1.00
Household receiving free food distribution	0.01	0.12	0.00	1.00
Year 2015 (Post-Planting Season)				
Male dummy	0.81	0.39	0.00	1.00
Marital status of household head (married dummy)	0.58	0.49	0.00	1.00
Age of household head	52.92	14.49	15.00	103.00
Household headed by master/PHD holder	0.00	0.00	0.00	0.00
Household headed by First Degree holder	0.00	0.00	0.00	0.00
Household headed by OND holder	0.00	0.00	0.00	0.00
Household headed by secondary school	0.00	0.00	0.00	0.00
Household headed by primary school holder	0.00	0.00	0.00	0.00
Household receiving direct cash transfers	0.00	0.00	0.00	0.00
Household receiving free food distribution	0.00	0.00	0.00	0.00
Year 2016 (Post-Harvest Season)				
Male dummy	0.80	0.40	0.00	1.00
Marital status of household head (married dummy)	0.57	0.50	0.00	1.00
Age of household head	52.84	14.37	18.00	103.00
Household headed by master/PHD holder	0.02	0.13	0.00	1.00
Household headed by First Degree holder	0.04	0.19	0.00	1.00
Household headed by OND holder	0.04	0.20	0.00	1.00
Household headed by secondary school	0.21	0.41	0.00	1.00
Household headed by primary school holder	0.24	0.43	0.00	1.00
Household receiving direct cash transfers	0.00	0.02	0.00	1.00
Household receiving free food distribution	0.00	0.07	0.00	1.00

Table A3: Summary Statistics of the Spikes in the Price of Specific Foods across Years

Variable	Mean	Std. dev	Min	Max	Mean	Std. dev	Min	Max
	Year 2012 (Post-Planting Season)				Year 2013 (Post-Harvest Season)			
Spike in price of cereals	0.002	0.013	-0.085	0.118	0.004	0.045	-0.314	0.315
Spike in price of roots and tubers	0.002	0.019	-0.089	0.119	0.005	0.047	-0.312	0.355
Spike in price of beans/pulses	3.7e-4	0.010	-0.101	0.077	0.003	0.019	-0.150	0.218
Spike in price of fats and oils	0.001	0.007	-0.039	0.134	-3.0e-5	0.013	-0.085	0.113
Spike in price of fruits	2.1e-4	4.7e-4	0.000	0.006	1.5e-4	3.4e-4	0.000	0.005
Spike in price of price of vegetables	0.001	0.001	0.000	0.010	0.001	4.6e-4	0.000	0.007
Spike in price of price of egg	1.9e-5	0.001	-0.015	0.011	0.000	0.002	-0.029	0.025
Spike in price of price of meat	0.002	0.011	-0.057	0.093	-0.004	0.048	-0.368	0.375
Spike in price of price of fish	0.003	0.016	-0.117	0.141	-1.2e-4	0.018	-0.118	0.170
Spike in price of price of milk/dairy	1.8e-4	4.2e-4	0.000	0.005	8.8e-4	3.3e-4	0.000	0.006
Spike in price of sweeteners	2.3e-4	4.7e-4	0.000	0.009	1.5e-4	2.7e-4	0.000	0.004
Spike in price of price of other food items	0.001	0.001	0.000	0.009	0.001	0.001	0.000	0.007
	Year 2015 (Post-Planting Season)				Year 2016 (Post-Harvest Season)			
Spike in price of cereals	0.012	0.030	-0.165	0.188	0.021	0.027	-0.103	0.265
Spike in price of roots and tubers	-0.005	0.030	-0.203	0.274	0.011	0.038	-0.290	0.412
Spike in price of beans/pulses	0.004	0.022	-0.155	0.253	0.002	0.014	-0.078	0.105
Spike in price of fats and oils	0.004	0.015	-0.086	0.142	0.005	0.016	-0.115	0.144
Spike in price of fruits	2.2e-4	4.0e-4	0.000	0.007	4.9e-4	0.001	0.000	0.010
Spike in price of price of vegetables	0.001	3.9e-4	0.000	0.004	0.001	0.001	0.000	0.006
Spike in price of price of egg	-4.3e-5	0.001	-0.040	0.011	1.5e-4	0.001	-0.014	0.022
Spike in price of price of meat	0.011	0.055	-0.418	0.585	0.001	0.033	-0.346	0.260
Spike in price of price of fish	0.008	0.032	-0.385	0.309	-0.005	0.082	-0.885	1.504
Spike in price of price of milk/dairy	1.2e-4	3.5e-4	0.000	0.007	2.1e-4	4.9e-4	0.000	0.007
Spike in price of sweeteners	1.0e-4	2.1e-4	0.000	0.004	1.8e-4	3.6e-4	0.000	0.005
Spike in price of price of other food items	4.6e-4	4.9e-4	0.000	0.008	0.001	0.001	0.000	0.010