Welfare Effects of Policy-induced Rising Food Prices on Farm Households in Nigeria

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Introduction

- Sharp increases in food prices has been an endemic problem in Nigeria over the past three decades.

  - While international food prices were generally on a decline between mid 1970s and 2007 (von Braun, 2008; Pinstrup-Andersen, 2013), composite food price index in Nigeria (1985 = 100), rose from 9.0 in 1970 to 308.0 in 1990 and stood at 7323.1 at the end of 2006 (CBN, 2006). There was about 337% increase in Food CPI in the decade just before the 2007-08 global food crises (CBN, 2011).

  - The average annual food inflation rate in Nigeria in the decade before the global food crisis (11.0%) was not substantially different from the average figure in 2007-08 (13.0%).

  - However, annual food inflation rates actually shoot up from 3% in 2006 to 8% in 2007 and 18% in 2008, but this upsurge were nothing compared to the 28.9% recorded in 2001.

  - Average annual food inflation rates remains as high as 13.4% between January 2009 and March 2013,

Impacts of Food Crisis in Nigeria

- The endemic rising food prices in Nigeria have devastating influence on the people:

  - It leads to rising incidence of poverty, which rose from 46.3% in 1985 to 65.6% in 1996 (FOS, 1996). As much as 64.4% of Nigerians lived on less than US$1.25/day in 2008 (UNDP, 2011).

  - It contributes to deterioration in calorie and protein intake, as well as increased consumption of unhealthy food among low income earners (Olomola, 2013).

  - The widespread poverty and despondency also induce youth restiveness and conflicts, including the "*boko haram*" insurgence in some states in Northern Nigeria.

Causes of International Food Price Crisis 07/08

- Evidences in literature suggests 2007/08 food crisis arose due to rising demand and inadequate supply that are caused principally by three factors (von Braun, 2008; Heady and Fan, 2008) :
  - rising income levels in some emerging economies especially in Asia;
  - surging appetite for biofuels in Europe and the United States
  - droughts that constricted supply in major exporting countries

  Other causative/aggravating factors include
  - slow down in agricultural productivity,
  - hoarding through export restrictions by some major exporting countries
  - rising oil prices that raise production and marketing costs
  - In Africa, neglect of agriculture is the root cause (Ngogi, 2008)
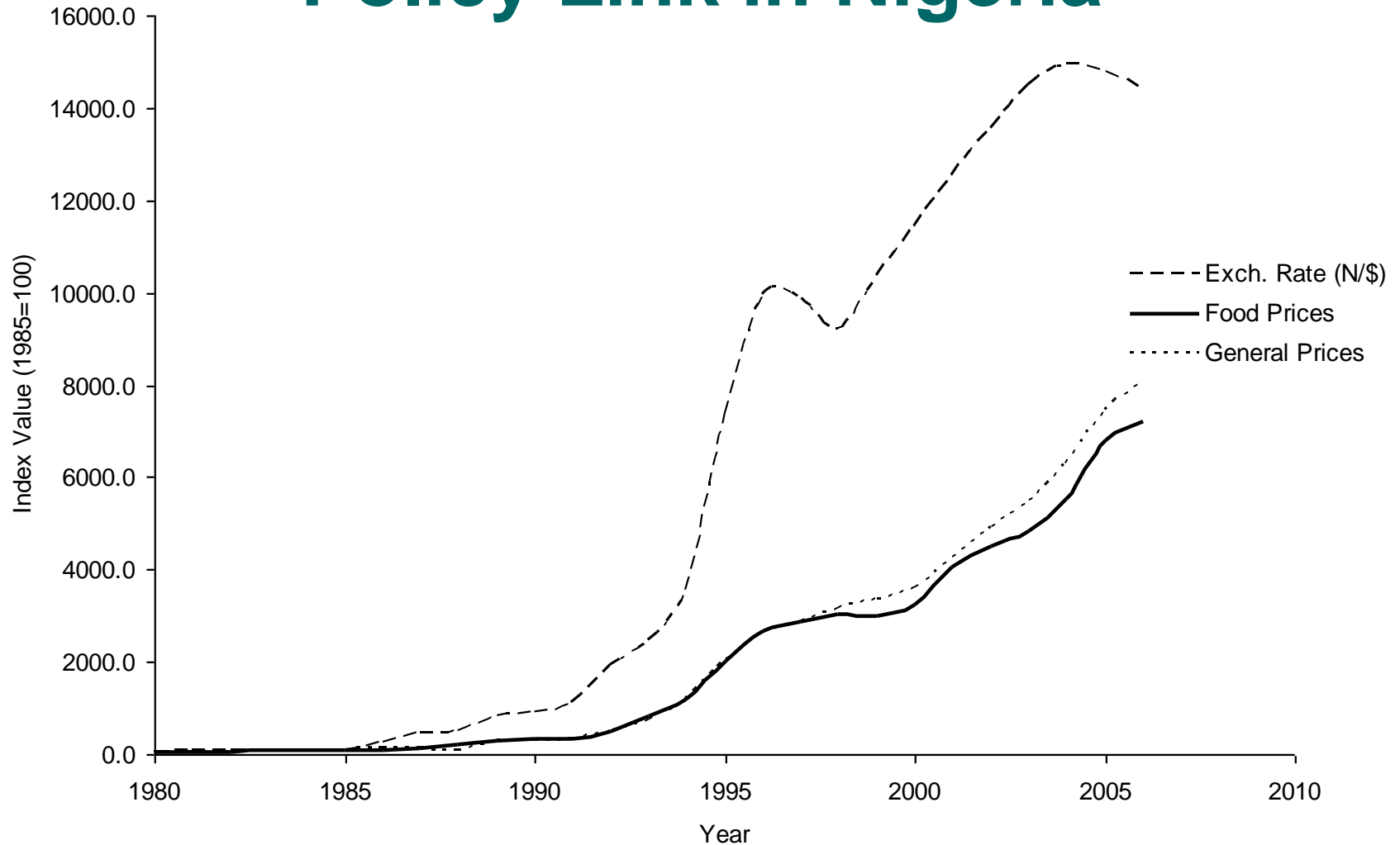
Policy Link in Nigeria

Fig. 1: Trends in index of food prices, general prices and the exchange rate in Nigeria, 1980 - 2006

Objectives of the Study

- This study seek to assess the welfare effects of rising food prices in Nigeria, and the determinants.

- The specific objectives are to:

  - determine the influence of changes in key policy variables including exchange rates, interest rates, money supply, extent of agricultural trade liberalisation, etc – as well as changes in international food prices on domestic food prices across the six geopolitical regions of Nigeria.

  - analyse the welfare effects (including the direct and substitution effects) of food price changes and its determinants on farm households in Nigeria

Analytical Framework

- This study shall employ estimates from time series modelling of agricultural commodity price changes and demand elasticities from a system of household demand equations in assessing the welfare impacts of policy induced price changes on farm households.

- The time series model proposed in the study attempts to distinguish "expectations" from "information" in the price generation process. It assumes changes in current agricultural commodity prices are dependent on past changes in prices, current and immediate-past information and expectations.

- This shall be analysed within the framework of Vector Error Correction (VEC) modelling with tests of stationarity, cointegration, model stability, and Granger causality test as well as analysis of Impulse Response Function (IRF)

Framework for Assessing Policy Induced Price Changes

- Given time series of prices of a domestic food (p_t) and a vector of endogenous explanatory variables (y_t), policy induced price changes shall be assessed within the framework of VEC model following Johansen (1995), Arize *et al.* (2000) and Onanuga and Shittu (2010) as follows:

$$\Delta p_t = \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-1} + B x_t + e_t \qquad (1)$$

- Where

  - X is vector of deterministic variables, constant (C) and/or trend;

  - y is vector of I(1) endogenous variables hypothesised to include the effective exchange rate, interest rate, international price of the commodity, and lagged domestic price of the commodity, among others.

  - B, Γ and Π are matrices of coefficients to be estimated, while

  - e is vector of stochastic residuals.

Framework for Welfare Analysis

● Welfare effects of policy-induced price changes shall be assessed in two step:

– First, given some hypothetical change(s) in a policy variable, the corresponding vector of estimated price changes (Δp) shall be computed based on the estimated VEC model in equation (1).

– Second, the corresponding policy induced welfare changes shall be measured using compensating variation (CV) defined as the extra net income that would need to be transferred to (or withdrawn from) the referenced household so as to enable the household retain the welfare (or utility) level before the policy-induced price changes

Framework for Welfare Analysis *Contd.*

- Considering that price changes affect production and consumption decisions of farm households, the welfare effects will be assessed by examining price change effects on the household net expenditure, defined following Robles and Torero (2010) as:

$$B(\mathbf{p}, \mathbf{w}, U) = e(\mathbf{p}, \mathbf{w}, U) - \pi(\mathbf{p}, \mathbf{w}) \qquad (2)$$

- where

  - $B(\mathbf{p}, \mathbf{w}, U)$, $e(\mathbf{p}, \mathbf{w}, U)$ and $\pi(\mathbf{p}, \mathbf{w})$ are respectively the net expenditure, expenditure and profit function; while $\mathbf{p}$ is the vector of good prices, $\mathbf{w}$ is the vector of prices of factors of production, and U is the household welfare (or utility) level

Framework for Welfare Analysis *Contd.*

- The change in the household net expenditure as a result of a policy induced price change shall be computed, following Robles and Torero (2010) as:

$$dB(p,w,U) = \left[(s_h) - (s_y)\right]\left(\frac{dp}{p}\right)e + \frac{1}{2}\left(\frac{dp}{p}\right)'(s_h)(E_{hp})\left(\frac{dp}{p}\right)e \quad (3)$$

- where

  - *dB{p,* w, *U)* is the CV (amount of extra income the household needs to achieve the original level of welfare, *U,* given the change in prices, *dp)*;
  - *(dp/p)* is a vector of percent changes in prices;
  - s_h is a vector of the share of household expenditure on commodity h;
  - s_y, is a vector of production shares (value of production of each commodity item divided by total household expenditure); and
  - E_{hp} is the matrix of demand elasticities (own price elasticities along the diagonal and cross-price elasticities as the off the diagonal elements).
  - The first RHS term is the direct (or first round) effect of a price change, while the second RHS term is the the substitution effect .

Estimation of Demand Elasticities

- Demand elasticities shall be computed from parameters of the following QUAIDS to be estimated:

$$s_{hit} = \alpha_i + \sum_{k=1}^{m} \rho_{ij} x_j + \sum_{j-1}^{n} \gamma_{ij} \ln p_{jt} + \beta_i \ln\left[\frac{e_{ht}}{a(p)}\right] + \frac{\lambda_i}{b(p)}\left\{\ln\left[\frac{e_{ht}}{a(p)}\right]\right\}^2 \quad (4)$$

- where

  - *n* is the number of commodity groups that are indexed by i;

  - p_{it} is the expenditure weighted average price of goods in commodity group i in period t;

  - *m* is the number of control variables represented by x;

  - e is the total expenditure by household h in period t, and where:

$$\ln a(p) = \alpha_0 + \sum_{i=1}^{n} \alpha_i \ln p_i + \frac{1}{2}\sum_{i=1}^{n}\sum_{j=1}^{n} \gamma_{ij} \ln p_i \ln p_j \qquad \& \qquad b(p) = \prod_{i=1}^{n} p_i^{\beta}$$

Estimation of Demand Elasticities *contd.*

- The demand system in equation (4) shall be estimated using the non-linear seemingly unrelated regression method, with the following restrictions implied by economic theory imposed:

$$\sum_{i=1}^{n} \alpha_i = 1 \qquad \sum_{i=1}^{n} \beta_i = 0 \qquad \sum_{i=1}^{n} \lambda_i = 0 \qquad \sum_{i=1}^{n} \gamma_{ij} = 0 \qquad \sum_{j=1}^{n} \gamma_{ji} = 0 \qquad \gamma_{ij} = \gamma_{ji}$$

- Uncompensated demand elasticities shall be computed using parameters of equation (4) as follows:

$$E_{hp}{}^{u} = \frac{\partial s_{hi}}{\partial \ln p_i} \frac{1}{s_{hi}} - \delta_{ij} \qquad \text{with} \quad \delta_{ij} = 1 \text{ if i=j, 0 otherwise} \quad (5)$$

- Using Slutsky equation, the compensated demand elasticities shall be computed as follows:

$$E_{hp} = E_{hp}{}^{u} + E_e s_{hj} \qquad (6) \qquad\qquad E_{ei} = \frac{\partial s_{hi}}{\partial \ln e} \frac{1}{s_{hi}} + 1 \qquad (7)$$

– where E_{hp} is the income elasticity of demand for commodity i,

Study Data & Sources

- Study data shall include monthly time series of rural agricultural commodity prices (2003 – 2012) that are routinely collected by the Agricultural Development Projects (ADPs) of various States of the Federation.

- Monthly time series of exchange rates, interest rate and other policy variables shall be extracted from various publications of the Central Bank of Nigeria (CBN) and National Bureau of Statistics (NBS).

- Monthly time series of international agricultural commodity prices shall be obtained from International Financial Statistics of the International Monetary Fund (IMF).

- Household consumption data shall be extracted from the recently released General Household Survey (GHS) – Panel data collected by NBS with the support of the World Bank and funding from Bill and Melinda Gate Foundation

Project Activities, Time Line & Personnel

Activities	Time (months)						Deliverables: *(Due at end of timeline)*
	1	**2**	**3**	**4**	**5**	**6**	
Literature review & project development	■	■					-
Data collection, cleaning & analysis		■	■				Complete dataset
Report writing & vetting			■	■			Draft Report
Report revision & final report presentation					■	■	Final Report

Name	Status	Qualification/Specialization	Expected Task
A.M. Shittu	Principal investigator	Ph.D and Associate Professor Agricultural Economics	Data analysis and report writing
O. A. Obayelu	Team member	Ph.D Agricultural Economics	Literature review and report writing
K.K Salimonu	Team member	Ph.D Agricultural Economics	Data mining and report writing

Thanks for listening

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