

The Effect of Market Liberalization on Maize Price Distributions in Nigeria

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Abstract

Market liberalization is a major provision of the structural adjustment programme. This paper examined the nature of maize price fluctuations following the introduction of the reform. Secondary data on average monthly prices of maize covering the period 1983-2000 were sourced from various publications. Data on monthly prices were deflated by consumer price index of food items to construct real price series for maize. The econometric model, Autoregressive Conditional Heteroskedastic in Mean (ARCH-M) was employed to determine the effect of the policy reform on the mean and volatility of maize prices.

The results of the ARCH-M model show that a sharp increase was observed in the first-order autocorrelation between the pre- liberalization and post- liberalization periods for both the mean (0.02 to 0.10) and variance (0.49 to 3.96). This implies that the long term changes in the price of maize due to free marketing are different from periods of administrative pricing. The variation was lowest in the pre- liberalization period relative to the post- liberalization period while the highest variability was experienced in the short term period immediately after the reform. The price of its close substitute, sorghum, and the border parity price affects the price of maize thus allowing for informal cross border trade in the post- liberalization period. The lagged prices of maize and seasonal changes reduce volatility in the price of maize between the pre and post liberalization periods. There are also differences in the volatility of maize price across regions. Regional differences show that volatility increased in Adamawa and Niger and decreased in Akwa Ibom in the post- liberalization period. Prices became more stable in the southern agro- climatic zones in the long run but were high in the northern savannahs. Policy makers can stabilize maize prices by disseminating information on price movements and keeping stock of maize for the dry season. Present efforts to increase productivity through improved access to inputs should be strengthened and effectively monitored to ensure increased output so as to increase maize stock. The conclusion is that the reform has increased the mean prices of maize and its volatility over the years, however, other factors have also contributed to price increase since Nigeria's maize are only traded across close borders and the country is yet to be integrated into the world's maize market.

Keywords: market liberalization, maize, price distributions, arch-m model, Nigeria

1. Introduction

Maize is a staple food crop for most sub-Saharan Africans including Nigeria. Despite the economic importance of maize to the teeming populace in Nigeria, its production has not met the food and industrial needs of the country and this could be attributed to low productivity of maize farms or that farmers have not adopted improved technologies for maize production (Onu et al., 2010). The demand for maize sometimes outstrips supply as a result of the various domestic uses (Akande, 1994). Additionally, other factors like price fluctuations, diseases and pests, poor storage facilities have been associated with low maize production in the country (Ojo, 2000). In a bid to increase food production in Nigeria over the years, several policy reforms have been put in place by successive governments and one of such policy reforms in time past is the Structural Adjustment Programme (SAP) introduced in July 1986. Olomola et al., (1996) pointed out that the Structural Adjustment Programme (SAP) was introduced in Nigeria in 1986 and the principal components include the improvement of public sector management and resource allocation, institutional reforms and market liberalization. Of these components, market liberalization appears to be the core strategy in the implementation of SAP.

Mesike et al. (2008) observed that prior to the inception of SAP in 1986, several policies aimed at providing support for the agricultural sector turned out to be regarded as anti-competitive. The policies were introduced in the past due to market failures in the allocation of resources and the need to achieve sustained growth and equitable development in the country. They included: price control (administered output prices for export commodities), guaranteed minimum price for grains, input subsidy, centralized marketing and export monopoly.

Market liberalization, an important component of structural adjustment programmes has been a dominant feature of economic reforms in developing countries and it is assumed that it will shift internal terms of trade in favour of farmers as the real prices received by farmers will improve with the dismantling of structures the government used to suppress food prices such as subsidies, price ceiling mechanism, territorial pricing and commodity boards (Timmer, 1986).

Trade liberalization is the major instrument geared towards the goal of global economic integration. It has been at the heart of World Trade Organisation (WTO) negotiations and agreements, and entails the removal of import quotas and other quantitative restrictions, abolition or reduction of the level and dispersion of import tariff rates, removal of export taxes, removal of protection for local industries and export subsidies, elimination of non-tariff barriers, and devaluation of the local currency (Olomola et al., 1996).

In Nigeria, attempts have been made by past governments to liberalize the market for food items. This was done through the abolition of import licences and scrapping of commodity boards in 1986 and consequently allowing prices to be determined through the market forces.

A common argument in literature is that, has market liberalization and deregulation of domestic markets in developing countries resulted in increased incentives for agriculture? What effect has this major policy reform had on the price of maize? This paper evaluates the effect of market liberalization policy on maize price distributions across four ecological zones of Nigeria.

2. Materials and Methods

2.1 Sources and Scope of Data.

The data analyzed were obtained from secondary sources. Data collected were the monthly price of maize and sorghum per kilogram, the local currency (Naira) official exchange rate to a US Dollar and the international market price of maize; covering the period 1983-2000. The choice of time period is predicated on data availability and the need to capture the pre-and post liberalization periods. The reference year for the post liberalization period is 1987. The data were obtained from various publications of Federal Office of Statistics (FOS), Federal Ministry of Agriculture and Rural Development (FMA&RD) and the World Bank. The monthly prices were deflated by the consumer price index (CPI); to construct the real price series for maize and sorghum. The border parity price (BP) was estimated as the international market price of maize converted into Naira at the nominal exchange rate and then deflated by the Nigerian CPI. The real exchange rate (ER) was calculated as the nominal bilateral Naira (₦) per US dollar rate deflated by their respective CPI.

2.2 Analytical Procedure

The Augmented Dickey-Fuller (ADF) test and the Autoregressive Conditional Heteroskedastic in Mean (ARCH-M) model were employed in the analysis.

2.3 Test for Stationarity

The first step in carrying out a time series or panel data analysis is to check for the stationarity of the variables (price series in this case). A series is said to be stationary if the means and variances remain constant over time. It is referred as $I(0)$, denoting integrated of order zero. Non stationary stochastic series have varying mean or time varying variance. The price series were initially tested for stationarity in order to avoid the problem of having a spurious regression. A stationary series tends to constantly return to its mean value and fluctuations around this mean value have broad amplitudes, hence, the effects of shocks are only transient. Other attributes of stationary and non-stationary data and their implications in econometric model are discussed by Adams (1992), Gujarati (1995) and Juselius (2006).

A variable that is non-stationary is said to be integrated of order d , written $I(d)$, if it must be differenced d times to be made stationary. Consequently, a variable that has to be differenced once to become stationary is said to be $I(1)$ i.e., integrated of order 1. The augmented Dickey Fuller (ADF) was adopted to test for stationarity. This involves running a regression of the form:

$$\Delta P_{it} = \alpha + \beta \Delta P_{it-1} + \gamma P_{it-1} + \sum_{i=2}^m Y_i \Delta P_{it} + \mu_t \quad (1)$$

Where:

P_{it} = Price of maize in region i in month t ;

m = number of lagged differences;

μ_{it} = error term.

The null hypothesis that $\gamma = 0$ implies existence of a unit root in P_{it} or that the time series is non-stationary. The critical values which have been tabulated by Dickey and Fuller (1979), Engle and Yoo (1987) and Mackinnon (1990) are always negative and are called ADF statistics rather than t-statistics. If the value of the ADF statistics is less than (i.e. more negative than) the critical values, it is concluded that P_{it} is stationary i.e. $P_{it} \sim I(0)$.

When a series is found to be non-stationary, it is first-differenced (i.e. the series $\Delta P_{it} = P_{it} - P_{it-1}$ is obtained and the ADF test is repeated on the first-differenced series). If the null hypothesis of the ADF test can be rejected for the first-differenced series, it is concluded that $P_{it} \sim I(1)$. The price series for all the markets included in this study were investigated for their order of integration using the Augmented Dickey-Fuller test.

2.4 Autoregressive Conditional Heteroskedastic in Mean (Arch-M) Model

It is accepted that price uncertainty tends to influence retail prices and marketing margins of food commodities (Holt, 1993; Brorsen et al., 1985). The econometric model Autoregressive Conditional Heteroskedastic in Mean (ARCH-M) was employed to measure the effect of temporal variation in the conditional means and variances of the dependent variable (price per kilogram of maize) and at the same time permitting for evaluation, the simultaneous estimation of time-varying price risk on conditional mean price estimates. Gujarati (1995) observed ARCH-M methods are used to evaluate the determinant of prices reflected in the conditional mean and various regressors as well as factors that explain price risk as reflected in series conditional variance and the interactions between the mean and variances of food prices, that is, the price risk premium, prevailing in food market. Hence, the ARCH-M was adopted to evaluate the effect of liberalization on the price of maize and whether there were significant changes in the price of maize after the policy reform. With the assumption that errors are conditionally normally distributed, ARCH-M is estimated by maximum likelihood using iterative algorithms. Following Barrett (1997), the ARCH-M model empirical model can be written for the mean and variance estimations respectively as:

$$P_{it} = \beta_0 + \beta_1 P_{it-1} + \beta_2 BP_t + \beta_3 POS_{it} + \beta_4 ER_t + \beta_5 S + \sum_{i=1}^3 \varphi R_i + \beta_6 TREND + \delta h_{it}^{1/2} + \mu_{it} \quad (2)$$

Where $\mu_{it} | \psi_{t-1} \sim iid N(0, h_{it})$

$$h_{it} = \alpha_0 + \alpha_1 U_{it-1}^2 + P_{it-1} + \beta_2 BP_t + \beta_3 POS_t + \gamma_3 ER_t + \gamma_5 S + \sum_{i=1}^3 \varphi_i R_i + \gamma_2 TREND \quad (3)$$

Where

P_{it} = Price of maize in Naira in region i in month t ;

P_{it-1} = Price of Maize in Naira in region i the previous month;

BP_t = Border Parity Price in month t ;

POS_t = Price of Sorghum in region i in month t ;

ER_t = Real exchange rate in month t ;

S = Seasonal Dummy 1 for rainy season; 0 for dry season;

R_i = Region specific dummy;

Trend = Time trend;

U = Error term.

The δ estimate reflects a risk premium with respect to the conditional standard deviation.

3. Results

3.1 Price Fluctuation in Pre-Liberalization Period (1983-1987)

Table 1 shows the pattern of maize prices for the four agro-climatic zones in the pre-liberalization period 1983-1987. The four agro-climatic zones include the Guinea Savannah (Adamawa), the Mangrove Swamp zone (Akwa Ibom), the Derived Savannah (Niger), and the Rain Forest (Osun).

Table 1. Regional prices of maize ₦/kg in the pre-liberalization period (1983-1987)

Regions	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
Adamawa	1.0748	0.50	1.76	0.4718	0.4390
Akwa-Ibom	1.1550	0.59	2.10	0.4746	0.4109
Niger	0.9712	0.58	1.48	0.3289	0.3387
Osun	0.530	0.22	1.30	0.3632	0.6853

Source: Computed from FOS Annual Price Data (Various Issues).

The result shows that the Akwa-Ibom region had the highest mean price of maize followed closely by Adamawa. Although Osun had the least mean price, it had the highest variation. The mean price in Niger is relatively lower than Akwa- Ibom and Adamawa and also had the least variability.

3.2 Price Fluctuation in the Post-Liberalization Period in the Short Term (1988-1992)

Table 2 gives the summary statistics of maize prices for the agro-climatic zones for the immediate post liberalization period between 1988-1992. As shown in the table, the mean prices increased in all the zones relative to the pre reform period. The disparities between the minimum and maximum prices for each year were wide in all the regions. Price variability was over 50percent in all the regions except Niger where it was a little lower. It indicates that maize prices increased immediately after the reform with high variability.

Table 2. Regional prices of maize ₦/kg in the post-liberalization m period (1988-1992)

Regions	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
Adamawa	2.4192	1.26	6.25	1.3061	0.5399
Akwa-ibom	4.1627	1.47	11.27	2.9695	0.7134
Niger	2.1460	1.11	5.90	1.0457	0.4873
Osun	2.4333	1.41	5.57	1.2655	0.5201

Source: Computed from FOS Annual Price Data (Various Issues).

3.3 Price Fluctuation in the Post-Liberalization Period in the Long Term (1993-2000)

Table 3 reveals the movement of maize prices for the four agro-climatic zones in the post liberalization period between 1993 and 2000. The table shows sharp increase in food prices in all the regions. The variability in food prices reduced in Osun and Akwa-Ibom but increased in Niger and Adamawa. Although Niger had about 60 percent maize price variability, it had a lower mean price relative to Adamawa and Akwa Ibom.

Table 3. Regional prices of maize ₦/kg in the post-liberalization period (1993-2000)

Regions	Mean	Minimum	Maximum	Standard deviation	Coefficient of variation
Adamawa	19.3356	3.40	38.81	11.7051	0.6054
Akwa-Ibom	21.0701	8.12	46.54	9.7859	0.4644
Niger	15.0007	3.12	39.78	9.0374	0.6025
Osun	14.2306	4.85	28.07	6.5021	0.4569

Source: Computed from FOS Annual Price Data (Various Issues).

3.4 Stationarity Test for Maize Price Series

The result in Table 4 shows the stationarity test for the maize prices using ADF statistics. The results indicate that all the variables were not stationary at levels. The values of the ADF statistics were smaller in absolute term than the critical value. This showed that the null hypothesis of non-stationary could be accepted at the 5 per cent level of significance. This implies that the mean is time dependent; it has infinite variance, tendency to stray from mean

value and integrated of order one or more. When differenced once, however, the null hypothesis of non-stationary was rejected in favour of the alternative as the values of the ADF statistics were greater in absolute term than the critical value of (-2.89) at 5 per cent level of significance. The findings here corroborate earlier findings that food commodity price series are mostly integrated of order one i.e. I (1) (Alexander & Wyeth, 1994; Ogundare, 1999; Franco, 1999; Chirwa, 2001; Oladapo, 2003).

Table 4. Result of Augmented Dickey-Fuller Unit Root Tests for Maize Prices

Variables	ADF stats
L(price of maize)	-3.0516
L(Price of Sorghum)	-3.2446
L(Lagged Price of Maize)	-3.0964
L(Border parity price)	-4.5995
L(Exchange rate)	-2.9889

3.5 Results of Arch-M Model

The results of ARCH-M model for the pre and post liberalization periods are presented in Tables 5 and 6 below.

In the mean equation, in the pre liberalization period, only three variables were significant. They are the lagged price of maize, the price of sorghum and the exchange rate. In the post liberalization period, four variables were significant and they include the lagged price of maize, the price of sorghum, border parity price and the seasonal dummy. They all have positive relationship with the price of maize except the seasonal dummy.

In the variance equation, lagged price of maize, price of sorghum, time trend, border parity price and the regional and seasonal dummies affect the volatility of maize prices. Except for seasonal dummy that was not significant and the exchange rate that was significant at 10percent, other variables were significant at not more than 5percent in the post-liberalization period as in the pre-liberalization period estimation. The effect of lagged price of maize and the seasonal dummy decreased volatility in maize prices from the pre-liberalization to the post-liberalization period. Volatility in maize prices increased with changes in the price of sorghum, border parity price and time trend between the two periods. Regional differences show that volatility increased in Adamawa and Niger relative to Osun.

Table 5. Table showing ARCH-M result for the pre liberalization period

Variables	Coefficient	Standard error	Variance	Standard error
L(lag price of maize)	0.0193*	0.0117	-0.4966**	0.2422
L(Price of sorghum)	0.1919***	0.0576	-4.8765***	1.6171
L(Exchange rate)	0.3584***	0.0691	-2.0257*	1.3863
Time trend	-0.0001	0.0002	-0.0885***	-0.0885
L(Border parity price)	-0.2141	0.2698	-28.2568***	5.7760
Seasonal dummy	-0.0006	0.0055	0.0911	0.2180
Regions				
Adamawa	-0.0047	0.0080	0.7847	0.7084
Akwa-Ibom	-0.0085	0.0078	1.7267**	0.7625
Niger	-0.0052	0.0002	1.3128**	0.5826
Constant	0.0038	0.0089	52.4694***	12.2466
ARCHM				
α_1	2.6880	3.8232	0.0557	0.0636

N= 240, Wald chi2 (10) = 714.82, Log likelihood = 436.6814 Prob > chi2 = 0.0000.

Table 6. Table showing ARCH-M result for the post liberalization period

Variables	Coefficient	Standard error	Variance	Standard error
L(lag price of maize)	0.1046***	0.0332	-3.9622***	0.3606
L(Price of sorghum)	0.1756***	0.0263	-1.3963***	1.4333
L(Exchange rate)	0.0570	0.4589	0.5811	0.6274
Time trend	-0.0001	0.0001	0.4715***	0.0068
L(Border parity price)	0.1434*	0.0814	3.3712***	1.2158
Seasonal dummy	-0.0168***	0.0055	-0.5035***	0.1136
Regions				
Adamawa	-0.0049	0.0064	1.1413***	0.1327
Akwa- Ibom	-0.0059	0.0059	0.9189***	0.1642
Niger	0.0017	0.0085	1.9982***	0.1691
Constant	0.0146*	0.0078	-17.7502***	2.5150
ARCHM				
α_1	2.2212***	0.6969	0.3595***	0.0655

N= 600, Wald chi2 (10) = 37.93, Log likelihood = 785.0758 Prob > chi2 = 0.0000.

4. Discussion

As seen in Tables 1 to 3, prices were lowest in the pre liberalization period with modest increases in the period immediately after the reform. This shows that the impact of the reform increased over time. Generally, in all the four regions, prices received a significant jump in the long term. This could be attributed to pronouncement of government policy in devaluation of currency and scrapping of marketing boards that administer prices. Maize is not a major tradable commodity in Nigeria and therefore the impact of the reform is not direct. The impact is transmitted through increase in price of inputs used in maize production such as fertilizers and agrochemicals. These inputs are mostly imported and supplemented with local production. However, the National Fertilizer Company that became moribund made the acquisition of fertilizer difficult for most farmers. The increase in the cost of these inputs as a result of high exchange rate of Naira to the Dollar increased the cost of producing maize significantly thereby discouraging its use. In addition, the incessant upward review of petroleum pump prices between the mid-nineties and year 2000 increased the cost of transportation of both inputs and output of maize resulting in higher maize prices.

Although, there was general increase in food prices, the degree of variation was high in both the pre and post liberalization periods; though they differed in the different regions. The variation was lowest in the pre liberalization period relative to the post liberalization period while the highest variability was experienced in the short term period immediately after the reform. The immediate impact of the reform had wide variation in different regions. A very high coefficient of variation of 71 per cent was recorded in Akwa-Ibom but declined to 46percent in the long term. Osun recorded the highest variability in the pre reform but had the least (45 percent) in the long term which means; it had more stable prices in the long run. In other regions, the coefficient of variation was as high as 60percent. It shows that while prices became more stable in the southern agro- climatic zones in the long run, they were high in the northern savannahs.

The lagged price of maize is significant in both the pre and post liberalization periods in determining the price of maize. There was a sharp jump in the first order autocorrelation from 0.02 in the pre liberalization period to 0.10 in the post liberalization period. This implies that the long term changes in the price of maize due to free marketing are different from periods of administrative pricing. The price of its close substitute, sorghum is also significant at the 1 percent level. The effect of the price of sorghum decreased marginally between the two periods. It shows that irrespective of policy regime, the lagged price of maize and its substitute will increase the current price of maize. The real exchange rate was significant in the pre liberalization period but was not in the post liberalization period. A plausible reason may be that farmers, due to overvalued currency which made imported farm inputs cheap use more of these inputs in the pre liberalization period; but reduced the use of imported inputs after the reform. Therefore, the effect of deregulation of the exchange rate was not significant in the post liberalization period. The

border parity price was not significant in the pre- liberalization period but significant at 10 percent and positive in the post liberalization period. This implies that maize will be traded if the border price is favourable as it could be part of unrecorded cross border trade. The price of maize decreases in the rainy season which agrees with a priori expectation. Due to the influx of maize output during this season, prices fall relative to the dry season.

The effect of border parity price was highly significant in increasing the volatility of maize prices followed by the price of sorghum. This implies that it is possible that much of unrecorded informal cross border trade affects the volatility in the price of maize. This increased with the policy reform. The lagged price of maize and seasonal changes reduce volatility in the price of maize between the pre and post liberalization periods.

5. Conclusion

The empirical evidence reveals spatial and temporal differences in maize price before and after the policy reform. The mean prices and variability were generally lower in the pre- liberalization period. The results show significant increase in the mean prices after the reform which increased variability. There were significant regional differences and in the long run, the variability in the south was lower than in the north. The result revealed that exchange rate is not significant in dictating maize prices in the post liberalization period. It is believed that the high cost of imported inputs discouraged its use by farmers thus reducing the impact of the deregulation of the local currency. However, the border parity price affects the price of maize thus allowing for informal cross border trade. The lagged price of maize and the seasonal dummy reduces volatility in the price of maize between the two periods. Policy makers can stabilize maize prices by disseminating information on price movements and keeping stock of maize for the dry season. Present efforts to provide inputs at subsidized rates and effectively distribute them to farmers should be strengthened and effectively monitored to ensure access and increase output so as to increase maize stock and even seasonal supplies.

References

- Adams, C. S. (1992). Recent Developments in Econometric Methods: An Application to the Demand for Money in Kenya. *AERC Special Paper, 15, September*.
- Akande, S. O. (1994). Comparative Cost and Return in Maize Production in Nigeria. *Nigeria Institute for Social and Economic Research (NISER) individual Research Project Report*. Ibadan: NISER.
- Alexander, C., & Wyeth, J. (1994). Co-integration and Market Integration: An Application to the Indonesian Rice Market. *Journal of Development Studies, 30(4)*, 303-328. <http://dx.doi.org/10.1080/00220389408422317>
- Barret, C. B. (1997). Liberalization and Food Price Distributions. ARCH-M evidence from Madagascar. *Food Policy, 22(2)*, 155-173. [http://dx.doi.org/10.1016/S0306-9192\(96\)00033-4](http://dx.doi.org/10.1016/S0306-9192(96)00033-4)
- Chirwa, E. W. (2001). Liberalization of Food Marketing and Market Integration in Malawi. *Report of AERC Sponsored Research*.
- Dickey, D. A., & Fuller, W. A. (1979). Distribution of Estimators for Autoregressive Time Series with Unit Root. *Journal of American Statistical Association, 74(366)*, 427-431.
- Engle, R. F., & Yoo, B. (1987). Forecasting and Testing in Co-integrated Systems, *Journal of Econometrics, 35(2)*, 143-159. [http://dx.doi.org/10.1016/0304-4076\(87\)90085-6](http://dx.doi.org/10.1016/0304-4076(87)90085-6)
- Federal Office of Statistics (FOS). *Bulletin on Commodity Prices*. Various Issues.
- Franco, R. (1999). Testing the Quality-Price Relations in Parmigiano and Padano Cheese Markets. *Journal of International Food and Agribusiness Marketing, 10(3)*, 19-43. http://dx.doi.org/10.1300/J047v10n03_02
- Gujarati, D. N. (1995). *Basic Econometrics* (3rd edn). New York, Mc Graw Hill.
- Juselius, K. (2006). *The Co-integrated VAR Model: Methodology and Applications*. Oxford University Press.
- Mackinnon, J. (1990). *Critical Values for Co-integration Tests*. San Diego University of California (San Diego), Department of Economics Discussion Paper 90-4.
- Mesike, C. S., Giroh, D. Y., & Owie, O. E. D. (2008). Analyzing the Effect of Trade Liberalization Policy on Nigerian Rubber Industry. *Journal of Agriculture & Social Sciences, 4(3)*, 132-134.
- Ogundare, G. O. (1999). *The Determinants of the Traditional Export Crops in Nigeria Using Co-integration Approach*. Unpublished M.Sc Thesis, University of Ibadan.
- Ojo, S. O. (2000). Factor Productivity in Maize Production in Ondo state, Nigeria. *Applied Tropical Agriculture, 15(1)*, 57-63.

- Oladapo, O. O. (2003). *Market Integration for Pineapples in Nigeria*. An Unpublished Ph.D Thesis, University of Agriculture, Abeokuta, Nigeria.
- Olomola, A., Nwosu, A. C., & Okunmadewa, F. (1996). *Maize Liberalization and its Effects on Nigerian Agriculture*. NISER/SSCN National Research Network on Liberalization Policies in Nigeria. Working Paper No 16.
- Onu, E. G., Ogara, I. M., Yahaya, H., & Nannim, N. (2010). Economic Analysis of Maize Production in Mangu Local Government Area of Plateau State, *Nigeria. PAT Journal*, 6(1), 1-11.
- Timmer, C. B (1986). The Plundering of Agriculture in Developing Countries. *Journal of Development Studies*, 8(4), 58-60.