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TESTING MARKET INTEGRATION OF STAPLE FOOD STUFFS IN BORNO STATE, NIGERIA

BY

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ABSTRACT

The main objective of this study is to test market integration of staple foodstuffs in Borno State. The data used came from a database of International Institute of Tropical Agriculture (IITA) Ibadan. The data were on the monthly prices of some selected foodstuffs in Borno State and covered a period of nine years (1992-2000). A total of 108 observations were used. A simpler version of bivariate autoregressive model was employed in the analysis. The study reveals that contemporaneous and instantaneous price effects have more significant effect (at 1% and 5%) in explaining price relationship over space than lagged price effects. The instantaneous price transmission was less than unity in all cases with values ranging from 0.017 to 0.912. Also, lagged price in the independent market lead to decline in price in the dependent market. Out of 11 pairs of Index of Market Connection (IMC) values obtained, pepper shows a very high degree of marketing efficiency and dependence between the market pairs with values of 1.361 for R?U and 1.07 for U?R while dry okra shows a very low degree of marketing efficiency and dependence between the market pairs with IMC values of 0.875 (R?U) and 0.060 (U?R). Moreso, there is a high degree of market efficiency in the marketing of these staple foodstuffs because of the existence of short-run market integration. We recommend that the provision of the necessary infrastructure like storage, processing, transportation facilities, communication system, access roads will prevent the inefficient allocation and distribution of goods and resources in Borno State, Nigeria.

INTRODUCTION

The issue of market integration lies at the heart of many contemporary debates concerning market liberalization, price policy and parastatals reform in developing countries food market. Market integration involves a study of inter and intra-market price dependencies of homogeneous and heterogeneous goods. It also gives an indication of commodity price inter-relatedness (Dahlgran and Blank, 1992). Integration of agricultural commodity markets is also a pre-condition for the effectiveness of market reform programmes. Without its presence, price signals will not be transmitted from food deficit to food surplus areas, agricultural producers will fail to specialize according to comparative advantage and gains from trade will not be realized (Baulch, 1997).

The ensuring misallocation of productive resources undermines static agricultural efficiency, short-term food price stability and long term growth. The social and

political ramification of lack of market integration can be profound (Baulch, 1997).

A market system in which there is synchronous movement of prices in different markets overtime is said to be integrated (Barret, 1996). Similarly, markets are not integrated when the prices do not covary or move apart from each other. Markets that are not integrated may convey inaccurate price information that might distort producer marketing decisions and contribute to inefficient product movements (Goodwin and Schroeder, 1991).

Market integration is important for maintenance of regional and household food security and can help alert government, international and non-governmental organizations to famine situations (Weyth, 1992). Knowledge of the degree of commodity market integration can be used to help rationalize the extensive depot systems maintained by many parastatals. And also, it can help the market intermediaries to identify the substitutional possibilities between markets and commodities. Price transmission or information spread is a prerequisite for achieving the efficient allocation of resources across space and time (Jayaraji, 1992).

The broad objective of this paper is to analyse market integration of staple foodstuffs in Borno state, Nigeria. Specific objectives are to: (1) examine price consonance between rural and urban markets for the staple foodstuffs. (2) examine the level of price dependency between rural and urban markets for the staple foodstuffs. (3) examine the type of integration. The hypotheses tested were derived from objective 1 and 2. They are stated as follows; there is no price association between rural and urban markets and the prices of staple foodstuffs in both markets are independent and inefficient in the state.

METHODOLOGY

The data used in the analysis were derived from secondary sources. Data collected by the Agricultural Development Project in Borno State and obtained from the International Institute of Tropical Agriculture (ITTA) data base were used. The data were on the prices of staple foodstuffs in Borno State. The average monthly prices of staple foodstuffs in urban and rural markets in Borno State were recorded over a period of nine years, from January 1992 to January 2000. Staple foodstuff of interest in this study are maize, cowpea, millet, groundnut, sorghum, fresh and dried tomatoes, pepper, fresh and dried okra and onion. A simpler version of bivariate auto-regressive model developed by Mendoza and Rosegrant in 1995 was used to analyze the data. The model is presented in a multiple autoregressive form (Mendoza and Rose grant, 1995) as follows:

$$\Delta P_{it} = a_0 + a_{it}\Delta P_{it-1} + b_{jt}\Delta P_{jt} + c_{jt}\Delta P_{jt-1} + e_t \quad \text{---------- (1)}$$

$$\Delta P_{jt} = A_0 + A_{jt}\Delta P_{jt-1} + B_{it}\Delta P_{it} + C_{it}\Delta P_{it-1} + e_t \quad \text{---------- (2)}$$

Where,

i = rural markets,

j = urban markets,

P_{it} and P_{jt} are contemporaneous (short term) price changes in markets i and j respectively, ij

b_{jt} P_{jt} and B_{it} P_{it} are the instantaneous changes in P_{jt} as P_{it} and P_{it} as P_{jt} changes respectively,

P_{it-1} and P_{jt-1} are lagged price changes in markets i and j included to capture delay responses in the different markets as prices change. The most appropriate lag

Length for each series was obtained by markets i and j included to capture delay responses in the different markets as prices change. The most appropriate lag length for each series was obtained by experimental regression with different lag lengths and selecting the one with the lowest standard error.

a_0 and A_0 = constants,

a_{it} ,and A_{jt} = coefficients of lagged own price effect,

b_{jt} and B_{it} = coefficients of instantaneous price effect,

c_{jt} and C_{it} = coefficients of lagged price effect of contemporaneous market

e_t = error term.

The study also seeks to know the type of integration, i.e. whether integration is high or low. This is investigated through the use of Timmer's index of market connection (IMC) (Timmer, 1984), obtained as follows:

IMC_i = Absolute value of (a_{it}/c_{jt})

IMC_j = Absolute value of (A_{jt}/C_{it})

a_{it} and c_{jt} are the coefficients of P_{it-1} and P_{jt-1} respectively,

A_{jt} and C_{it} are the coefficients of P_{jt-1} and P_{it-1} respectively. The IMC lies between zero and infinity. The closer it is to zero, the greater the degree of short-run integration. Unity is used to indicate the threshold high or low short-run market integration. IMC>1 implies high short-run market integration and IMC<1 implies low short-run market integration. IMC= implies segmentation or segregation.

RESULTS AND DISCUSSION

Table 1 shows the result of the regression analysis. This result depicts the nature of contemporaneous and lagged relationships in the rural and urban prices of foodstuffs from the year 1992 to 2000. As shown above, each foodstuff has two directional relationships i.e. rural - urban and urban - rural relationships.

The effects on the dependents markets of their own lagged prices were examined and the results show that coefficient b_{jt} which is a measure of instantaneous price transmission was less than unity in all cases with values ranging from 0.017 - 0.912. This implies that response to a change in price can take place within a time span of a day to a month. Negative b_{jt} implies that an increase in the current price of any of these foodstuffs in the dependent market is associated with a fall in the contemporaneous price in the independent market. The result also shows that instantaneous price effect plays a greater role than lagged price in determining market integration in the study area. Thus, lagged own price causes a contemporaneous own price changes to decline. This can be explained by the fact that an increase in foodstuff supply within a period of one month causes excess supply to accumulate and this leads to the fall of the price in the next period. This is typical of the cobweb characteristic of agricultural commodity prices. The R^2, which indicates the degree of price association between pairs of market, is moderately high. However, R^2 has relatively high values in sorghum, groundnut, cowpea, fresh tomatoes dried, tomatoes, okra, onions, dried okra and millet, while those of pepper and maize are relatively low. This implies that price changes in one market are explained by changes in another market. It can then be accepted that current changes in the price of staple foodstuffs prices in each market could be explained by changes in their own lagged prices as well as contemporaneous and lagged price variations in other markets. Then, we reject our null hypothesis that there is no price association between rural and urban markets

Table 1: Pattern of Contemporaneous and Lagged Price Relationship of Staple Food Crops in Borno State Nigeria (1992-2002)

a_i	a_{ii}	b_{jt}	c_{jt}	R^2	IMC	Classification	Type of integration
0.07027	-0.18346*	0.01562	-0.00086	0.0334	2.14	Two way Integration	High S/R market Integration
-0.05400	-0.50061***	0.3408	0.65585	0.2593	0.763	"	Low S/R Market integration
0.11091	-0.82509***	0.79394***	0.89378***	0.7598	0.923	"	Low S/R Market integration
-0.10271	-0.75178***	0.83449***	0.72569***	0.6661	1.036	"	High S/R market Integration
0.09573	-0.46912***	0.94142***	0.71031***	0.6193	0.660	"	Low S/R Market integration
-0.06968	-0.38669***	0.58547***	0.25624***	0.5521	1.509	"	High S/R market Integration
0.33269	-0.29202	0.98548***	0.09997	0.8297	2.921	"	High S/R market Integration
-0.28618	0.14970	0.83856***	0.31918*	0.8283	0.469	"	Low S/R Market integration
0.34579	-0.58549***	0.88584***	0.14852	0.7290	3.94	"	High S/R market integration
-0.27954	-0.27748**	0.77693***	0.62380***	0.7025	0.445	"	Low S/R Market integration

Food crops	Market price $p_i \leftarrow p_j$	a_0	a_{it}	b_{jt}	c_{jt}	R^2	IMC	Classification	Type of integration
Pepper	R ←U	0.22500	-0.48121***	0.80450***	0.35350***	0.4987	1.361	"	High S/R market integration
	U←R	-0.14252	-0.26826***	0.51161***	0.25053***	0.4236	1.071		High S/R market integration
Fresh tomatoes	R←U	0.13480	-0.58872***	0.84527***	0.38517**	0.8412	1.528		High S/R market integration
	U←R	-0.13509	-0.28255*	0.97835***	0.46695**	0.8303	0.605		low S/R market integration
Dry tomatoes	R←U	0.13887	-0.46584***	0.84321***	0.40216***	0.6378	1.158	"	High S/R market integration
	U←R	-0.12906	-0.30693***	0.70878***	0.32500***	0.5994	0.944		low S/R market integration
Fresh okra	R←U	0.17444	0.40288*	0.90316***	-0.53151**	0.8958	0.758	"	low S/R market integration
	U←R	-0.17108	0.58034***	0.96580***	-0.50188**	0.8864	1.156		High S/R market integration
Dry okra	R←U	0.21641	-0.16234	0.87477***	-0.18561	0.5741	0.875	"	low S/R market integration
Onion	U←R	-0.14833	-0.01499	0.61462***	0.24862***	0.5622	0.060		low S/R market integration
	R←U	0.24189	0.19739	0.84021***	-0.57467***	0.8115	0.343		low S/R market integration
	U←R	-0.22380	0.71459***	0.91186***	-0.41522*	0.7776	1.721		High S/R market integration

*** = Highly significant at 1%
** = Significant at 5%
* = Significant at 10%
IMC = Timmer's index of market connection coefficient.
Lag length = One (i.e. one month for all series)
R^2 indicates the degree of price association between markets.
Two ways integration implies two directional relationships i.e. rural to urban and urban to rural
R = Rural and U = Urban.

Table 1 also shows the estimates of Timmer's index of market connection (IMC), in rural urban markets.It was found that maize, groundnut, cowpea, pepper, tomatoes and dry tomatoes have an IMC $_{R-U}$ values of 2.14, 2.92, 3.94, 1.36, 1.53, and 1.16 respectively denoting high short run market integration. While sorghum, millet fresh okra, dry okra and onion have an IMC $_{R-U}$ value of 0.92, 0.66, 0.76, 0.88 and 0.34 respectively denoting low short-run market integration. Maize, groundnut, cowpea, fresh tomatoes, dry okra and dry tomatoes also have an IMC_{U-R} values of 0.76, 0.47, 0.45, 0.61, 0.06 and 0.94 respectively indicating low short-run market integration while sorghum, millet, pepper, okra and onion have an IMC $_{U-R}$ values of 1.04, 1.51. 1.07 and 1.72 respectively denoting high short -run market integration. The existence of short-run market integration which is either low or high in the market pairs implies that there is a high degree of market efficiency in the marketing of these staple food crops in Borno State. Moreover, the degree of market integration is measured by how close the IMC values are to zero. The closer the value is to zero, the higher is the degree of market integration and by extension, the higher the marketing efficiency and vice versa.

CONCLUSION AND RECOMMENDATION

The central focus of this study was to assess the market integration of staple foodstuffs in Borno State, Nigeria. The general conclusion from this study is that contemporaneous price effects are more significant in explaining price relationship over space than lagged price effect and moreover, high lagged prices in the independent markets have the effect of lowering prices in the dependent market. R^2 which indicates the degree of price association between pairs of market is moderately high for all the foodstuffs except maize and pepper. Also, there is a high degree of market efficiency in the marketing of these staple foodstuffs in Borno State because of the existence of short-run market integration which is either low or high.

According to Dittoh (1994) well-integrated markets are fundamental for both agricultural and industrial development, and at such, a system of facilities for optimum allocation of goods and resources is needed. However, the ability of a marketing system to effectively and efficiently perform its development functions depends on the case with which price changes and responses are transmitted spatially and temporally. This, in turn, depends on the availability of the necessary infrastructure like storage, processing, transportation facilities, communication system, access roads and the type of competition in the markets. The importance of good access roads for the maintenance and sustenance of market integration and, hence, marketing efficiency cannot be over-stressed. Therefore, the maintenance of the access roads leading to the various markets in Borno State is of vital economic importance. The provision of new roads is also of high priority. The provision of these facilities will prevent the inefficient allocation and/or distribution of goods and resources.

REFERENCES

Baulch, B (1997): "Testing food market integration revisited", *Journal of Development Studies* 33 (4): 512-534

Barret, C.B. (1996): Market analysis methods: Are our enriched toolkits well-suited to enlivened markets. *American Journal of Agricultural Economics* 78(3) 825-829.

Dahlgran, R.A and Blank, S.C (1992): "Evaluating the integration of contigeous discontinuous market"*American Journal of Agricultural Economics* 74 (2):469-479.

Dittoh, S. (1994): "Market integration: The case of dry season vegetables in Nigeria." In: Steven A. Breth (ed) *Issues in African Rural Development,* Winrock International Ltd. 2:89-101

Goodwin, S.K. and Schroeder, T.C. (1991): Cointegration test and spatial price linkages in regional cattle market, *American Journal of Agricultural Economics* 73, 452-464.

Jayaraj, D. (1992): "Spatial pricing efficiency in groundnut market in Tami Nadu". *Indian Journal of Agricultural Economics* 47(1): 79-89.

Mendoza, M.S and Rosegrant, M. (1995): Pricing contact of spatially differentiated markets. In: Scot, G.J. (ed) *Price, Product and People: Analysis of agricultural markets in Developing Countries*, Lynne Rienner Publishers, Inc. U.S.A

Timmer, C.P. (1984): A model of rice marketing margins in Indonesia. Food Research Institutes studies, 13 (2); 45-167.

Weyth, J. (1992): The measurement of market integration an application to food security policies. Brighton: Institute of Development of Studies Discussion paper, 314.