Spatial Price Analysis of Paddy Rice in Ebonyi North Zone of Ebonyi State, Nigeria

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Abstract: *The study analysed the spatial price of paddy rice in Ebonyi North Zone of Ebonyi State. Data were collected using structured questionnaires administered on 120 paddy rice marketers purposively selected from the 8 markets locations in four Local Government Areas in the zone. Data collected were analyzed using descriptive and inferential statistical tools such as mean, percentage, frequency, simple regression and factor analysis. The result of the analysis shows that there exists spatiality in the prices of paddy rice in the zone. And that market locations, cost of transportation, availability of storage facilities, density of paddy buyers, market information, market organisation, and individual price fixing are the major factors influencing spatial price of paddy rice. The result equally shows that with the coefficient of multiple determination (R^2) of 0.768; about 77% in the total variations in the quantity of paddy rice sold was influenced by spatial price in the area. Despite the spatiality of prices in the markets the coefficients of elasticity in each of the market locations were elastic; thus depicting that that in every ₦1 increase in the price of paddy rice will result into a unit increase in the quantity of paddy rice marketed. Consequent upon the general profitability of paddy rice marketing in the area, the individual Local Government Area market analysis shows that marketing of paddy rice is most profitable in Ohaukwu LGA. Based on the findings, the study recommended the provision of marketing infrastructures such as good roads to enhance easy delivery of paddy to the point of demand. Again, government marketing agency should provide and enforce the use of a standard unit of measure to enhance uniformity in the price of paddy in the area.*
Key words: Paddy rice, spatial price, marketers, market location.

I.   Introduction

Variation of agricultural commodity prices between locations is a natural market phenomenon. Price variation is necessary for the existence of a market, as it creates the incentives that attract market players to engage in trade. Spatial price analysis is an important area of discuss in the structure of markets (Ravallion, 1986). Thus, it is not the spatial differences in of prices *per se* that should be of concern to the policy makers, but rather excessive variability and, in some cases, *no or little* variability of staple food prices across space. The need for spatial analysis arises because agricultural commodities are bulky, their production is seasonal, and production and consumption points are spatially dispersed. As a result, the transportation of a commodity from one market to another is costly and requires special efforts (Sexton *et al*, 1991). Spatial price analysis involves the study of spatial markets in which the concept of pricing efficiency is distinguished from the concept of market integration. Market locations across space often lack integration due to inadequate provision of public goods (such as infrastructure), inefficient flow of information, imperfect competition, and incomplete or missing institutions for risk management like credit and insurance—all of which qualify as sources of market failures. The pricing efficiency is the price-based notion of equilibrium, whereas the market integration is the flow-based indicator of tradability (Barrett, 2001). The efficiency is associated with a condition in which the marginal benefits from trade are zero. If trade in a location exists between two markets and trade volume is unregulated, the process of arbitrage is expected to lead to a spatial equilibrium, such that the price spread between the markets is equal to the transfer costs. However, when the trade volume reaches some ceiling value, the price spread between the markets is bounded below by the cost of arbitrage between these markets (Barrette, 2001). In the case of domestic markets, especially in developing countries like Nigeria, the volume of trade is unrestricted. In such situations, we expect the price spread between the markets to be bounded from above by the cost of arbitrage between the markets. If an equilibrium condition holds, it is said that the spatially separated markets are integrated (Goodwin and Schroeder, 1990), or the law of one price (LOP) prevails between the two markets (Zanias, 1999; Sexton *et al.,* 1991), or the markets are spatially price efficient (Tomek and Robinson, 1990). Otherwise, the markets may have some constraints on efficient arbitrage such as trade barriers and information asymmetry (Ravallion, 1986; Barrett, 2002), or imperfect competition in one or more markets (Faminow and Benson, 1990). Hence, the study of spatial market relationships provides the extent to which markets are related to efficiency in pricing. If trade relates the two markets of interest, the shock in prices in the central market (surplus market) is expected to transmit to the local market (deficit market) as quickly as possible.

In many developing countries like Nigeria, sub-regional and regional markets are poorly integrated due to infrastructural limitations and tariff and non-tariff barriers to trade. Trade barriers include restriction of movement of staple foods coming from neighbouring countries and cumbersome customs procedures (Anderson, 2009). According to Ojo (1998), the plausible underlying factors of the price spatiality in Nigeria can be categorized into global, regional and national factors. Explicitly, he deduced that global factors include rising cost of premium motor spirit, dwindling supplies of grains (due to their conversion to fuel) and climate effects; regional factors would be rising incomes, urbanization and attendant changes in consumer preferences, conflicts such as the *Boko-haram* of the northern region and prevalence of small and fragmented markets that are poorly connected; and at the national level, many of the above factors apply in addition to stagnant or declining productivity and poor market organization of key staple foods.

The functioning of the rice markets is constrained by various problems and obstacles: imperfect market information for buying and selling rice; lack of cash and credit availability to finance short-run inventories and processing operations; insufficient facilities for storage and transportation; no uniform system of common grade standards to facilitate trading at a distance; lack of management skills; and unsuitable legal codes to enforce contracts (Barrett, 2001). Therefore, analyzing the channels of rice distribution and the functioning of the rice markets is an important issue. Efficient marketing system and processing opportunities are still lacking; therefore, potentialities for commercialization have not been exploited for in most areas of Nigeria which induces spatiality. Equally, farmer's experience derived from their life-long attachment on farming has not yet been well documented which would be of great value for the development and recommendation of proper crop management strategies in future and price stability. Since a large number of people are depended on farming for their livelihood, the emerging scenario of marketing variability must be understood to make necessary changes in farming system or identifying possible and viable solutions to the problems facing the rice farmers towards spatially paddy rice marketing.

The study however, analysed specifically the factors that influence spatiality in price of paddy rice in the area; determined the marketing costs and returns of the product marketed at spatial market locations; determined the effect of spatial price on the quantity sold for the agricultural product; and determined the price elasticity's of paddy rice in the define market location.

II. Materials and methods

The study area is Ebonyi North Zone of Ebonyi State. The area is made up of four Local Government Areas - Abakaliki, Ebonyi, Izzi, and Ohaukwu Local Government Areas. According to NPC, (2006) Ebonyi North has a population of 340,217 male and 368,926 female making a total of 709,143 people with a total land area of 1700.75 square kilometre. From the four Local Governments Areas of the zone, two major markets each were purposively selected to give a total of eight markets. The markets selected are: *Nwida* and *Nkwegu* in Abakaliki LGA, *Iboko* and *Izziogo* in Izzi LGA, *Ogbala* and *Kpirikiri* in Ebonyi LGA, *Okwo* and *Effium* in Ohaukwu LGA. From each of the markets, fifteen paddy rice marketers were randomly selected to give a sample size of 120 respondents. Primary data were collected using structured questionnaires. Data collected were analyzed using both descriptive and inferential statistics.

III. Simple regression model

$Y = f(x)$

$Y = \alpha_0 + \alpha_1 x_1$ .... Explicit non stochastic

$Y = \alpha_0 + \alpha_1 x_1 + et$ ....Explicit stochastic

Where:

Y = Quantity sold in Kg

x_1 = Spatial prices

α_0 = constant

α_1 = regression coefficient

et = Stochastic error term

IV. Gross margin model

Gm = TR – TVC

Profit (π) = Gm – TC

TC = TVC – TFC

Benefit-Cost-Ratio (BCR) = TR/TVC

Where:

Gm = Gross margin

TR = total revenue

TVC = Total variable cost
π = profit
TC = Total cost
TFC = Total fixed cost

V.   Results

Factor analysis was used to analyze the factors influencing spatial price of paddy rice in the area. The purpose was to analyze the factors and then interpret variables that load high using Kaiser (1950)'s rule of thumb in which a variables with co-efficient of ≥0.30 were identified as having strong influence (Table 1). The result of the analysis shows that infrastructural factors influencing spatial price of paddy rice are; the cost of transportation, availability of storage facilities. Again, the economic factors that influenced spatial price of paddy rice are; the number of paddy buyers, market information, market organisation, and individual price fixing. This finding corroborates Girapunthong *et al.* (2003) who posited that market boundaries covered by each trader are generally narrow; as a result of a number of factors contribute to market separation. This can be attributed to the occurrence of temporal and spatial frictions resulting from high transport costs, primarily because of poor roads and road networks. Secondly, the inadequate price information about other markets can result to poor information transmission channels, inefficient communication systems and absence of official (government) price communication/media (Nigerian Institute of Social and Economic Research (NISER), 2001). The third factor is the incidence of individualized price formation processes resulting from haggling. This can be attributable to lack of product homogeneity and standardized units of measurement. Finally, the presence of market associations may limit the market access of poor rural farmers who may be discriminated against by the capital rich wholesaler. The majority of farmers and retailers have poor access to credit, which may reduce their ability to respond to price changes.

The result of simple regression analysis (Table 2) shows that the coefficient of multiple determination (R^2) was 0.768 which indicates that about 77% in the total variations in dependent variable (quantity of paddy rice sold) was influenced by the independent variable (spatial price) in the area. The coefficient of spatiality of price was positively related to the quantity of paddy rice sold in the area, signifying that every one unit increase in spatial price in the price of paddy rice will bring about an increase in the quantity of paddy rice sold in the area.

Table 3 shows that price of rice vary significantly at different markets in Ebonyi north zone of Ebonyi State. This was justified as a 50kg of rice was sold at ₦5400, ₦4800, ₦5000, and ₦4800 in Ohaukwu, Abakaliki, Izzi, and Ebonyi Local Government Areas respectively. However, despite the spatiality of prices in the markets the coefficients of elasticity in each of the market locations were elastic; thus depicting that that in every ₦1 increase in the price of paddy rice will result into a unit increase in the quantity of paddy rice marketed in the zone. This finding was attributed to the fact that farmers are very sensitive to the market forces as they will normally prefer to sell their products at the time when there will be an upward increase in price so as to create incentive for their product.

Profitability measure of paddy rice was determined using gross margin analysis (Table 4). In each of the spatial markets, 100 bags of 50kg of paddy rice were used as yardstick. From the analysis, it was observed that in Izzi Local Government Area, the total variable cost was ₦537,000.00, total fixed cost was ₦14,600 and the profit was ₦1,148,400.00. A Benefit Cost Ratio (BCR) analysis shows 1: 3.08. Signifying that in every N1 spent in marketing paddy rice, a profit of ₦2.08 was realised as return to investment. In Ohaukwu Local Government Area, the total variable cost was ₦709,000.00, total fixed cost was ₦14,600 and the profit was ₦956,400.00. A Benefit Cost Ratio (BCR) analysis shows 1: 2.32. Signifying that in every ₦1 spent in marketing paddy rice in the area, a profit of ₦1.32k was realised as return to investment. In Ebonyi Local Government Area, the total variable cost was N516,000.00, total fixed cost was ₦14,400 and the profit was ₦1,419,600.00. The cost benefit ratio indicates 1: 3.17. This signifies that in every ₦1 spent in marketing paddy rice in the area, a profit of ₦2.17 was realised as return to investment. In Abakaliki Local Government Area, the total variable cost was ₦506,000.00, total fixed cost ₦13,600 and the profit was ₦1,480,400.00. A Benefit Cost Ratio (BCR) analysis shows 1: 3.21. This implies that in every ₦1 spent in marketing paddy rice in the area, a profit of ₦2.21k was realised as return to investment. Consequent upon the general profitability of paddy rice marketing in the area, the individual Local Government Area market analysis shows that marketing of paddy rice is most profitable in Ohaukwu LGA.

VI.   Conclusion

The spatiality in the price of paddy rice has been found to be elastic and positively related to the quantity of paddy marketed in the study area. Based on the findings, the study recommended that the provision of marketing infrastructures such as good roads to enhance easy delivery of paddy to the point of demand. Again, government market agency should provide and enforce the use of a standard unit of measure to enhance uniformity in the price of paddy in the area.

References

[1]   Anderson, K. 2009. Distortions to Agricultural Incentives:A   Global Perspective, 1955–2007 . Washington, DC: Palgrave MacMillan and The World Bank. 5 (10), 63-68

[2]   Barrett, C. B. 2001. Measuring Integration and Efficiency in International Agricultural Markets. American Journal   of Agricultural Economics. 23: 19-32.

[3]   Faminow, M. D. and Benson, B. l. 1990. Integration of Spatial market. American Journal Agricultural Economics   72: 49-62.

[4]   Girapunthong, N. VanSickle, J. J. and Renwick, A. 2003. Price Asymmetry in the United States Fresh Tomato   Market. Journal of Food Distribution Research. 34 (3): 51-9.

[5]   Goodwin, B. K. and Schroeder, T. C. 1990. Testing Perfect spatial market integration: An Application to regional   US Cattle markets. American Journal Agricultural Economics 12: 173-86.

[6]   Nigerian Institute of Social and Economic Research (NISER). 2001. .Price and Trade Incentives in Nigerian Crop, Livestock, Fisheries and Forestry Production. Final Research Report Submitted by the Agriculture and   Rural   Development Department of NISER to the Federal Ministry of Agriculture and Rural Development   and the World Bank, Abuja. March. 2002.

[7]   National Population Commission (NPC), 2006. Census Figure of Ebonyi North Zone of Ebonyi State, Nigeria.

[8]   Ojo, M.O. 1998. Some implications of Government Economics Policies for the Financing and Development of   Agriculture   in Nigeria. Central Bank of Nigeria Publication, Ibadan. Pp. 16-24.

[9]   Ravillion, M. 1986. Testing Market Integration. American Journal of Agricultural Economics. 68: 102-109.

[10]   Sexton, R. J. Kling, C. L. and Carman, H. H. 1991. Market Integration, Efficiency of Arbitrage, and   Imperfect Competition: Methodology and application to U. S. Celery. American Journal of Agricultural Economics   72: 568-580.

[11]   Tomek, W. G. and Robinson, K. L. 1990. Agricultural Product Prices. Cornell University Press, Ithaca, USA   Pp.347-460

[12]   Zanias, G. P. 1999. Seasonality and Spatial Integration in Agricultural (product) Markets. Agricultural Economics,   20: 253-262.

Table 1: Varimax Related Component Factor on Factors influencing spatial price of paddy rice marketing

Variable	Factor I Infrastructural constraints	Factor II Economic constraints
Transportation	0.775	-0.237
Number of buyers	-0.143	0.799
Market information	0.193	0.193
Availability of storage facility	0.732	-0.048
Market organisation	-0.181	0.356
Good policy	-0.110	0.642
Individual price fixing	0.323	0.690

Source: Field survey, 2012

Table 2: Simple Regression Result of the Effect of Spatial price on the quantity of Paddy Rice Sold in the Area

Variables	Coefficient	Std Error	t-value
Constant	-11.676	22.166	-0.527
Spatial price	0.007	0.008	0.900
R^2	0.768		
D.W	1.354		
F-statistics	0.809		

Source: Computed from field data, 2012.

Table 3: Price Elasticity of Paddy Rice Marketing In Ebonyi North Zone of Ebonyi State

Market location	Price of paddy/50kg/Naira($\textrm{N}$)	Co-efficient of elasticity	Remark
Ohaukwu	5,400	1.25	Elastic
Abakaliki	4800	2.5	Elastic
Izzi	5000	1.43	Elastic
Ebonyi	4800	1.45	Elastic

Source: Computed Field Survey, 2012

Table 4: Costs and Returns of Paddy Rice Marketing in Ebonyi North Zone

Variable	Ohaukwu	Izzi	Ebonyi	Abakaliki
Total variable cost (TVC)	709,000	537,000	516, 000	506,000
Total fixed cost (TFC)	14,600	14,600	14,400	13,600
Total revenue (TR)	1,680,000	1,700,000	1,950,000	2,000,000
Gross margin (GM) = TR-TVC	971,000	1,163,000	1,434,000	1,494,000
PROFIT = TR – TFC	956,400	1,148,400	1,419,600	1,480,400
BCR = TR ÷ TVC	1: 2.32	1: 3.08	1: 3.17	1: 3.21
Return to investment	1.32	2.08	2.17	2.21