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.

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**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 Government 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 Iziogo 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

\[ Y = f(x) \]
\[ Y = \alpha_0 + \alpha_1 x_1 \] \hspace{1cm} \text{Explicit non stochastic}
\[ Y = \alpha_0 + \alpha_1 x_1 + \varepsilon \] \hspace{1cm} \text{Explicit stochastic}

Where:
- \( Y \) = Quantity sold in Kg
- \( x_1 \) = Spatial prices
- \( \alpha_0 \) = constant
- \( \alpha_1 \) = regression coefficient
- \( \varepsilon \) = Stochastic error term

IV. Gross margin model

\[ GI = TR - TVC \]
\[ Profit (\pi) = GI - TC \]
\[ TC = TVC - TFC \]
\[ Benefit-Cost-Ratio (BCR) = \frac{TR}{TVC} \]

Where:
- \( GI \) = 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 costructural 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 whlochers. 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 N5400, N4800, N5000, and N4800 in Ohaukwu, Abakaliki, Izi, 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 N1 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 Izi Local Government Area, the total variable cost was N537,000.00, total fixed cost was N14,600 and the profit was N1,148,400.00. A Benefit Cost Ratio (BCR) analysis shows 1: 3.08. Signifying that in every N1 spent in marketing paddy rice, a profit of N2.08 was realised as return to investment. In Ohaukwu Local Government Area, the total variable cost was N709,000.00, total fixed cost was N14,600 and the profit was N956,400.00. A Benefit Cost Ratio (BCR) analysis shows 1: 2.32. Signifying that in every N1 spent in marketing paddy rice in the area, a profit of N1.32k was realised as return to investment. In Ebonyi Local Government Area, the total variable cost was N516,000.00, total fixed cost was N14,400 and the profit was N4,419,600.00. The cost benefit ratio indicates 1: 3.17. This signifies that in every N1 spent in marketing paddy rice in the area, a profit of N2.17 was realised as return to investment. In Abakaliki Local Government Area, the total variable cost was N506,000.00, total fixed cost N13,600 and the profit was N4,480,400.00. A Benefit Cost Ratio (BCR) analysis shows 1: 2.21. This implies that in every N1 spent in marketing paddy rice in the area, a profit of N2.21k was realised as return to investment. Consequently 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.
Table 1: Varimax Related Component Factor on Factors influencing spatial price of paddy rice marketing

<table>
<thead>
<tr>
<th>Variable</th>
<th>Factor I: Infrastructural constraints</th>
<th>Factor II: Economic constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation</td>
<td>0.775</td>
<td>-0.237</td>
</tr>
<tr>
<td>Number of buyers</td>
<td>-0.143</td>
<td>0.799</td>
</tr>
<tr>
<td>Market information</td>
<td>0.193</td>
<td>0.193</td>
</tr>
<tr>
<td>Availability of storage facility</td>
<td>0.732</td>
<td>-0.048</td>
</tr>
<tr>
<td>Market organisation</td>
<td>-0.181</td>
<td>0.356</td>
</tr>
<tr>
<td>Good policy</td>
<td>-0.110</td>
<td>0.642</td>
</tr>
<tr>
<td>Individual price fixing</td>
<td>0.323</td>
<td>0.690</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Std Error</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-11.676</td>
<td>22.166</td>
<td>-0.527</td>
</tr>
<tr>
<td>Spatial price</td>
<td>0.007</td>
<td>0.008</td>
<td>0.900</td>
</tr>
<tr>
<td>R²</td>
<td>0.768</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D.W</td>
<td>1.354</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-statistics</td>
<td>0.809</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Computed from field data, 2012.

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

<table>
<thead>
<tr>
<th>Market location</th>
<th>Price of paddy/50kg/Naira($)</th>
<th>Co-efficient of elasticity</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohaukwu</td>
<td>5,400</td>
<td>1.25</td>
<td>Elastic</td>
</tr>
<tr>
<td>Abakaliki</td>
<td>4800</td>
<td>2.5</td>
<td>Elastic</td>
</tr>
<tr>
<td>Izzi</td>
<td>5000</td>
<td>1.43</td>
<td>Elastic</td>
</tr>
<tr>
<td>Ebonyi</td>
<td>4800</td>
<td>1.45</td>
<td>Elastic</td>
</tr>
</tbody>
</table>

Source: Computed Field Survey, 2012

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

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

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References


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