Analysis of the Structure and Performance of the Beans Marketing System in Nairobi

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ABSTRACT

Beans are widely grown as a major food crop in Eastern and Southern Africa. It is the most important staple food crop after maize in Kenya (ECABREN, 2000). The beans industry in Kenya is faced with problems of shortages, seasonal supply and price fluctuations and inadequate information on production, marketing and consumption. These problems are more acute in urban areas. This paper analyzes the structure and performance of the beans marketing system in Nairobi metropolitan area, the single most important beans market in Kenya. Data from a sample of 102 traders augmented by secondary data were used to analyze the marketing system by applying descriptive statistics, concentration ratios and co-integration models. The results showed that the beans marketing structure approached that of pure competition; however, lack of capital was a barrier to entry into the wholesale and retail trade. The Johansen likelihood-based vector autoregressive model showed that there was no significant co-integration of the major markets in the city possibly due to inefficient market information flow.

Key words: Beans, Competitive Structure, Co-integration and Efficiency.

INTRODUCTION

Beans as a crop is widely grown as a major staple food in Eastern and Southern Africa where it is recognized as the second most important source of human dietary protein and third most important source of calories (Pachico, 1993). According to the Eastern and Central Africa Bean Research Network (EACABREN) (2000), beans (*Phaseolus vulgaris L.*) constitute the most important food crop after maize in Kenya. The quantity of beans produced in Kenya is inadequate and cannot meet the needs of the country. As a result Kenya remains a net importer of beans mainly from Uganda and Tanzania. The annual imports from Uganda unrecorded by the customs authorities were estimated at 9,300 MT (Ackelo-Ogutu and Echessah, (1997); Korir, 2005). With increasing population and urbanization, there is bound to be persistent supply shortages

in the face of rising demand. The current beans deficit in the country indicates an apparent problem of local market failure to stimulate production. Other problems facing the beans industry include seasonal price fluctuations and lack of statistical data on beans marketing. The objective of the study was to analyze the structure and performance of the marketing system of dry common beans in the Kenya's Nairobi metropolitan area, which forms the single most important beans market in the country.

The type of market structure that prevails in this important market is a major factor that would determine the efficiency of the marketing system in the beans sub-sector. Marketing efficiency is evaluated in this paper by considering the extent of market integration. Barrett and Li (2002) suggest that market integration might be most usefully defined as tradability or contestability between markets. This implies the transfer of excess demand from one market to another, manifest in the physical flow of the commodity, the transmission of price shocks from one market to another, or both. According to Fackler and Goodwin (2001), the actions of spatial arbitrageurs will ensure that the prices of a homogeneous good at any two locations will differ by, at most, the cost of transferring the good from the region with the lower price to the region with the higher price.

Co-integration used in this study is known to have certain shortcomings associated with spurious regression results (McNew and Fackler, 1997). As an approach to market analysis, it places too much emphasis on only one market variable, price; and its results are also sensitive to the length of the price time series. This is a disadvantage because there is a short food price time series available in developing countries such as Kenya (Baulch, 1997). The weaknesses are reduced when the markets are known and this is possible when market structure is considered. However, despite the weaknesses, co-

integration tests have the advantage of allowing consistent inferences to be drawn in situations where the individual price series are non-stationary. The other advantage is that they take into account the problems of common inflationary and seasonal price trends, which simple correlation does not.

METHODOLOGY

The information and data used in the study were obtained from both primary and secondary sources. Primary data resulted from a survey of 102 beans traders in Nairobi city that is a major beans consuming region in Kenya. The Central Bureau of Statistics in the Ministry of Planning and National Development provided the price series data of the four major markets in the study area. The study employed concentration ratio and co-integration model as the major methods of analysis. Concentration ratios were used to assess market structure. In this context, concentration ratio is the proportion of the total industry sales contributed by the *m* largest firms ranked in order of their market shares (*m = 2, 4, 8...*) (Korir, 2005). In addition, the barriers to entry and the degree of market transparency were used as measures of market structure before considering market performance.

This paper emphasizes economic efficiency assessment by analyzing market integration as a measure of market performance. The extent of market integration was measured by analyzing the existence of co-integration of the average monthly prices of beans in four major markets of Nairobi (Gikomba, Kangemi, Kibera and Kawangware) based on Johansen model. The data covered a period of 22 months.

The Johansen likelihood-based vector autoregressive model used is as shown below (Johansen, 1995):

$X_t = \Pi_1 X_{t-1} + \ldots + \Pi_k X_{t-k} + \Phi D_t + \varepsilon_t$, $t = 1 \ldots T$

Where X_t = Matrix of beans prices at a given time t.

Π = The coefficient associated with the autoregressive process.

Φ= The coefficient of the seasonal dummy, D_t.

k = Number of lags or lag length.

Following Johansen (1995), the model was converted into an error correction model in order to test the hypothesis of co-integration as shown below:

$\Delta X_t = \Pi X_{t-1} + \Sigma \Gamma_i \Delta X_{t-k} + \Phi D_t + \varepsilon_t$

Where X_t, Π and k are as already defined; and

Γ = The short run coefficient associated with the lagged X.

The Model was then estimated using the ordinary least squares method (OLS). The test of the hypothesis of co-integration of the price series was done using the Augmented Dickey-Fuller (ADF) test. Again, following McNew and Fackler (1997), if there is a unit root then the price series are not co-integrated. However, the null hypothesis of no co-integration is rejected if **P** is significantly different from zero.

Although our choice of this model is based on its advanced statistical and econometric refinement as already pointed out it has certain limitations in that it places too much emphasis on price as the only market variable. In retrospect, the approach could also be an advantage where transaction costs and traded volumes data are not available but it must be reckoned that the approach does not provide sufficient information to explain activities in markets. This weakness is improved in this paper by the inclusion of market structure analysis approach using the concentration ratio suggested above. In

addition, the impulse response analysis has been used to measure the effect that a price shock in one market will have on the other markets.

RESULTS AND DISCUSSION

The results of the concentration ratio analysis indicated that the largest 4 and 8 retailers had a low to moderately concentrated structure with a combined market share of 19.29% and 33.92 % respectively. However, in the wholesale trade, the largest 4 and 8 firms controlled 34.76% and 59.84% of the market share respectively, resulting into a market structure that is moderately concentrated with a competitive fringe. From this analysis, it appears that the beans market structure in Nairobi approaches that of pure competition.

Analysis of barriers to entry into the beans trade was carried out to provide more understanding of the market structure. The majority (87.5%) of the wholesalers had an average working capital of about KSh. 10,000, with a maximum amount of Ksh. 1 million. This is not a small amount in terms of the average per capita income in Kenya. Thus lack of capital is a serious constraint for entry into the beans trade in Nairobi. Since market transparency helps in decision-making within the entire marketing system, the study also analyzed qualitatively the status of market transparency in the market as measured by sources and flow of information among the traders. The results indicated that majority (93.2%) of the beans traders relied on two market information sources, mainly, that of word of mouth from friends/ business colleagues/ relatives, and that of trader's own market observation. Hence, government policies that support information provision and institution building are necessary to support the traders (Goodhue et al, 1998) and to improve market efficiency.

With respect to co-integration analysis, the average monthly retail beans prices of the four major markets were used. First, graphical plots of the price series and the first differences of the series were generated to detect any manifestation of co-integration among the series. A test of stationarity of the various price series using the Augmented Dickey-Fuller (ADF) approach was done followed by the related ADF tests for stationarity using the first differences of the data series (Table 1). To probe further existence of co-integration among the four markets, the error correction model matrix was generated as shown in Table 2.

The Augmented Dickey–Fuller (ADF) test confirmed that the price series are not stationary of order 1. But the results confirm that correlation exists for each market price series since the test statistics are significant in at least one of the lags (except for Gikomba market) (see Table 1).

TABLE 1 *Unit root tests for 4 markets using the first difference of the price series.*

| | Unit root tests for: | | | |
	Gikomba	Kangemi	Kibera	Kawangware
DF	-8.56	-8.94	-11.02	-5.11
ADF (1)	0.541	-3.87	-7.61	-3.83
ADF (2)	0.922	-2.57	-9.09	-5.67
ADF (3)	0.925	-1.92	-8.65	-3.40
ADF (4)	0.973	-3.34	-7.74	-3.25
ADF (5)	0.904	-1.57	-5.03	-2.91

Source: Calculated using data from the Central Bureau of Statistics, 2001, 2002,2003.

Note: 95% critical value for the Augmented Dickey-Fuller statistic = -3.76.

A series of model selection procedures were then done to come up with an error correction model matrix (Table 2). The coefficients that result from the selected models were then tested for their significance using the t-statistic. The results are shown in Table 2. The labels X1, X2, X3 and X4 represent Gikomba, Kangemi, Kibera and Kawangware markets respectively. The following interactions are significant: $\Delta X4$ and $X1_{t-1}$, $\Delta X4$ and $X2_{t-1}$, $\Delta X4$ and $X3_{t-1}$, $\Delta X4$ and $X4_{t-1}$. All the other pairs of markets, except Kawangware, do not have significant co-integration. Thus it can be concluded that despite the market liberalization reforms that took place during the last decade, market integration has not been fully realized in Nairobi beans markets and this is attributed to poor market information flow.

TABLE 2 *Error correction model matrix.*

Π	$X1_{t-1}$	$X2_{t-1}$	$X3_{t-1}$	$X4_{t-1}$
$\Delta X1$	0.018 (0.12)	0.01 (0.12)	-0.02 (-0.12)	-0.03 (-0.12)
$\Delta X2$	-0.14 (-0.66)	-0.07 (-0.66)	0.12 (0.70)	-0.22 (0.66)
$\Delta X3$	0.20 (1.75)	0.10 (1.75)	-0.17 (-1.75)	-0.33 (-1.75)
$\Delta X4$	0.44 (7.01)	0.22 (7.01)	-0.38 (-7.01)	-0.72 (-7.01)

Source: Calculated using data from the Central Bureau of Statistics, 2001,2002,2003.

Finally, impulse response analysis showed that a price change in Kibera does not have any effect on beans prices in all the other markets (Figure 1). However, a price change in Gikomba market induces price changes in the other three markets, which stabilize to maintain a long–term equilibrium after two months (Figure 2).

Such knowledge of the impact of price changes is suitable for policy makers when they are considering market interventions such as subsidies and taxation and allows for estimation of the likely outcome of the policies made.
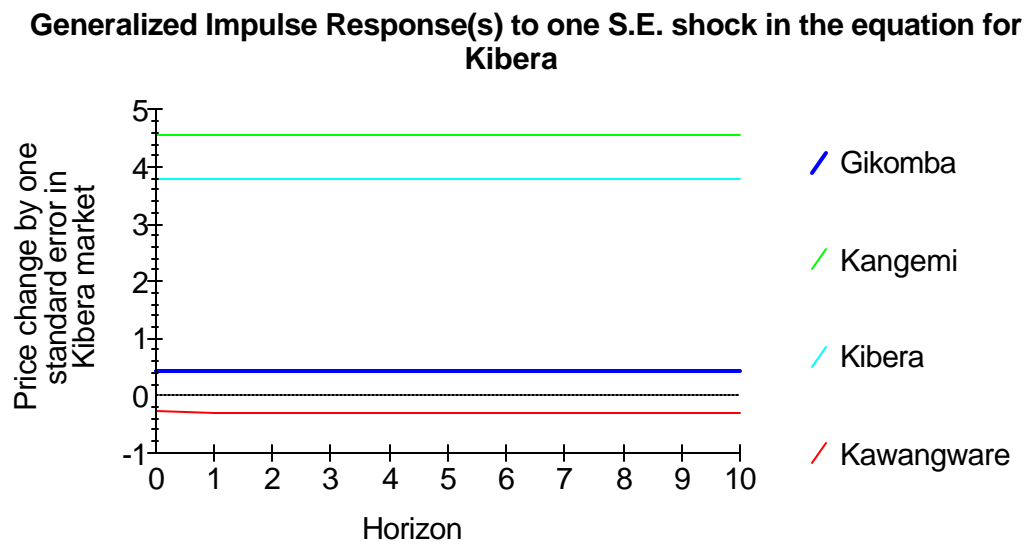

Generalized Impulse Response(s) to one S.E. shock in the equation for Kibera

FIGURE 1: Generalized impulse response(s) to one standard error shock on the equation for Kibera market.

Source: Plotted using data from the Central Bureau of Statistics, 2001,2002,2003.
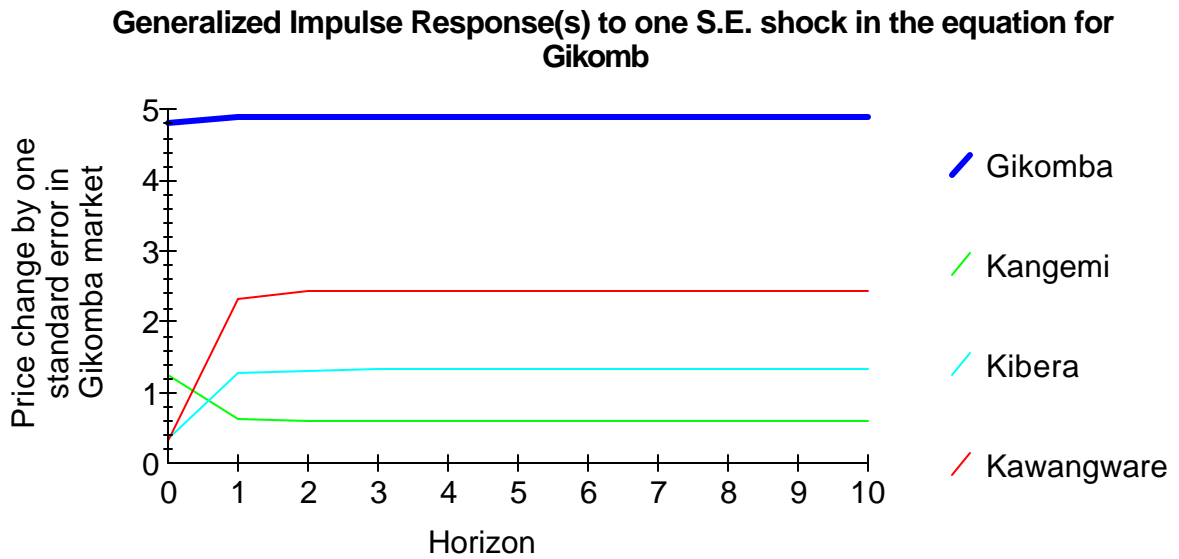
Generalized Impulse Response(s) to one S.E. shock in the equation for Gikomb

Figure with y-axis "Price change by one standard error in Gikomba market" (0 to 5) and x-axis "Horizon" (0 to 10). Legend: Gikomba, Kangemi, Kibera, Kawangware.

Figure 2   *Generalized impulse response(s) to one standard error shock in the equation for Gikomba.*

Source: Plotted using data from the Central Bureau of Statistics, 2001,2002,2003.

CONCLUSION

Market concentration ratios showed that the structure of the beans market in Nairobi approaches that of pure competition. However, lack of capital was found to be a major barrier to entry into the wholesale business. Personal savings and borrowing from friends and relatives were the major source on investible funds among the majority of traders. It was also found that the main source of market information for traders was word of mouth from friends, business colleagues, relatives and trader's own market observations (93.2% of the respondents). Both these aspects render the marketing system less efficient and tend to attract petty traders rather than big-time investors as had been hoped would be the case in pre-market liberalization era.

The market performance analysis using co-integration model showed that the Nairobi beans market was not fully integrated; an observation we attribute to inefficiency and lack of market information. Impulse response analysis showed that slight price changes in the markets maintain a long–term equilibrium after one month.

Since Nairobi metropolitan market is the major outlet for beans grown or imported into the country, there is need for government intervention in terms of provision of market information, infrastructural development and incentive structure that would attract both large and small-scale traders.

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