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REGIONAL MARKET INTEGRATION AND PRICE TRANSMISSION IN SUPPLY AND CONSUMER MARKETS

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Abstract

Following food surges, prices of most staple food commodities in most developing countries mirrored the surges suggesting global price transmission. In Kenyan context, arid and semi-arid areas suffer persistently from hunger and highly depend on markets. The study pinpoints importance of regional markets in demand and supply market shocks response for enhanced poverty, food and nutrition insecurity reduction. Unfortunately, unpredictable price shocks make planning and decision risky process for economic agents reducing their equanimity in market development investment. In light of this, price volatility act as a disincentive for producers' investment and consumers purchasing decisions affecting sustainable agricultural productivity. In this viewpoint, the study investigates spatial market integration and price transmission for grain white maize in eight selected markets of East Africa mainly Kenya, United Republic of Tanzania and Uganda. It employs time series monthly wholesale price data, CPI and United States Dollar exchange rates from 2006 to 2014. Threshold autoregressive error correction model is used to capture dynamic behaviour, persistence and asymmetries. The study concludes that selected markets are integrated but price shock adjustment takes between 2 to 11 months. The estimated transaction costs by the model are 0.1 to 2.2 percent of the mean price in the markets. Unfortunately, speed of price adjustment is higher in case of negative deviations inimical to net food buyers in absence of price stabilization mechanisms. In this regard, speed of price adjustment from outer band regimes is estimated to be faster between Eldoret and Makueni where 31percent of half the shock is eliminated in approximately 2 months. We conclude that transactions costs in price adjustment should be accounted for in price analysis. For sustainability long term interventions mainly investment in rural road network, markets and information systems is deemed necessary. Additionally, irrigation technology in arid and semi areas for improved productivity and enhanced household resilience is warranted.

Keywords: Price transmission, market integration, arid and semi-arid areas, price volatility and market shocks.

Introduction

Since the remarkable soaring global food commodity price crisis the nominal prices of most staple foods increased by more than 50% (TADESSE *ET AL.*, 2013). The surges coupled with global financial and economic crisis are major concern for global food policy makers. In many developing countries mainly sub-Saharan Africa (SSA), Kenya included prices of staple foods mirrored the movements suggesting high degree of co-movement and price transmission to domestic prices (BAQUEDANO and LIEFERT, 2014). Cognizant of this, food price volatility might accelerate food insecurity problems raising concern on access by poor net consumers (BALLARD *ET AL.*, 2013). In Kenyan context, maize price volatility is of great importance to households as price fluctuations might benefit producers or be a threat to consumers and vice versa. This is because despite maize being major staple food commodity and the most traded its demand outweighs supply due to erratic rains contributing to food insecurity and poverty. Moreover, major maize producing areas are spatially separated from major consuming areas leading to high transaction costs which make maize rather expensive food commodity in deficit areas. In food policy, economic theory affirms that markets allocate scarce resources from surplus to deficit regions absorbing demand and supply shocks arising from uncertainties and risks. In this context, Kenya being a net importer of grain maize in East Africa necessitates investigation of market integration and price transmission. The study investigates spatial market integration and price transmission in selected supply and demand markets. It provides insights for production and consumption investment decisions and enhanced market integration through sustainable infrastructure development and institutional reforms.

Methods

The study investigates spatial market integration and price transmission for grain white maize in eight selected markets of East Africa mainly Kenya, United Republic of Tanzania and Uganda. In Kenyan context, Makueni and Meru North are selected to represent maize deficit rural marginal areas. More so, Nakuru and Eldoret represent maize surplus producing zones. Additionally, Nairobi and Mombasa represent urban and sea port areas. Likewise, Dares Salaam and Kampala in Tanzania and Uganda respectively are selected to represent East Africa regional export markets. Time series monthly grain maize wholesale price data, CPI and United States Dollar exchange rates from 2006 to 2014 are used. Consumer Price Index (CPI 2005= 100 as base year) is used to deflate the data. A transaction cost embedded switching regime threshold dependent autoregressive error correction model is used to determine speed of price disequilibrium adjustment from one market to another. The model captures potential symmetric price adjustment processes based on the assumption of constant transaction costs for the period under investigation. In this context, threshold is defined as the minimum proportional differences before exceeding price adjustment towards equilibrium. If the threshold is exceeded then it allows price spread to display differently inside and outside the parity bound. Due to discern evident of gradual changes, time trend is incorporated in threshold determination based on HANSEN and SEO, (2002) grid search procedure. Price disequilibrium adjustment is estimated as the number of months required for one-half of deviation to be eliminated. In this regard, adjustment speed is the rate at which one market price reacts to correct market disequilibrium following market price shock in another market. In this viewpoint, Makueni is selected to represent central market used in determination of speed of shock adjustment to equilibrium and transmission to other markets. The model estimation procedure is based on MEYER (2004) as;

$$\Delta ds_t - tc_t = \alpha(ds_{t-1} - tc_{t-1}) + \sum_{n-1}^{n} \alpha_n \Delta(ds_{t-n} - tc_{t-n}) + \varepsilon_t \text{; s.t } |ds_t| > tc_t \text{ (regime 1)} \tag{1}$$

$$\Delta ds_t + tc_t = \alpha(ds_{t-1} + tc_{t-1}) + \sum_{n-1}^{n} \alpha_n \Delta(ds_{t-n} - tc_{t-n}) + \varepsilon_t \text{; s.t} |ds_t| < tc_t \text{ (regime 2} \tag{2}$$

$$\Delta ds_t = \psi + \beta_0 ds_{t-1} + \sum_{n-1}^{n} \beta_n \Delta ds_{t-n} + \varepsilon_t \text{; s.t } |ds_t| \le tc_t \text{ (regime 3)} \tag{3}$$

where $ds_t = Z_t^j - Z_t^k$ is price spread between markets j and k at period t; Δ is first difference operator $\Delta ds_t = ds_t - ds_{t-1}$; tc is long run transaction costs at time t and ε_t is error term. Z_t^j denotes price in market j at time t; Z_t^k price in market k at time t. In equation $(1-3)$ the time taken for price adjustment to move half way back to its threshold (half life) is estimated. Half- life is used to assess the speed of adjustment back to the parity bound in regimes 1 and 2 as (4);

$$h_l = \{In(0.5)/In(1+\rho)\} \tag{4}$$

where h_l represent half-life time. In this view point it is obvious shorter half-lives imply effective price transmission.

Results and discussions

Though, maize markets in East Africa are found to be integrated, they exhibit price volatility with selected Kenyan markets having highest wholesale prices compared to Uganda and Tanzania. The findings show coefficient of variation between (Cv) 20.7 to 29.7 percent.

Table 1: Bidirectional grain maize price adjustment TAR estimates of selected pair of markets for the period between 2006 and 2014

Market pair(k/j)	Distance (Km)	α(Adjustment factor) (SE)	θ(j)	Half life (adjustment time in months)
Makueni-Nakuru	294	-0.061(0.012)	6.08	11.03
Makueni-Eldoret	454	-0.310(0.022)	41.27	1.87
Makueni- Nairobi	187	-0.180(0.015)	45.16	3.49
Makueni- Mombasa	330	-0.098(0.013)	20.07	6.71
Makueni - Dares Salaam	587	-0.084(0.011)	7.30	7.92
Makueni -Kampala	608	-0.119(0.014)	8.42	5.43

*, ** and *** denote significance at the 10 %, 5% and 1% level respectively. SE: denotes Standard error; α: adjustment coefficient on the lagged price difference (i.e. percentage of mean price in the two markets); Half life: measured in months and calculated as $h = [\ln(0.5)/\ln(1+\alpha)]$

Source: Authors' computation from time series data 2006 to 2014.

The secular rise and decline of prices indicates price volatility at different time trends suggesting possibilities of shocks, seasonality, risks and uncertainties in maize supply and demand. The temporal price fluctuations attributed to supply and demand shocks gives clear indication of years of deficit and surplus in production and consumption. The findings of threshold autoregressive error correction model are presented in Table 1. It is evident price shock adjustment is estimated at 2 to 11 months. Likewise, the estimated transaction costs are 0.1 to 2.2 percent of the mean price in the markets. The finding indicate that speed of price adjustment from outer band regimes is faster between Eldoret and Makueni where 31 percent of half the shock is eliminated in 2 months. The model estimates transaction cost of 2 percent of the mean price in Eldoret and Makueni. Unfortunately, speed of price adjustment is high in case of negative deviations inimical to net food buyers in marginalized areas in absence of price stabilization policies. However,faster price shock adjustment might be due to arbitragers who respond faster to eliminate shocks by increasing or decreasing supplies (DERCON, 1995). The findings reveal that speed of price adjustment from outer band regimes between Nairobi and Makueni is estimated at 3.5 months where an approximated 18 percent of half the shock is eliminated. In this context, the model estimates transaction cost of 1.5 percent of the mean price between Nairobi and Makueni. On the other hand, Makueni and Nakuru take long time to adjust where 0.8 percent of half of the shocks is eliminated in approximately 11months. This might translate into paradox of scarce in a world of plenty due to information asymmetry.

Conclusions and recommendations

Selected markets are found to be co-integrated suggesting they do not drift far apart exhibiting long-run steady linear equilibrium relationship. Unfortunately, to eliminate half of the price shock it takes between 2 to 11 months. This implies paradox of localized scarcities and abundances. We conclude that transactions costs in equilibrium price adjustment should be accounted for in price transmission analysis. Specifically for Kenya, in **short term** there is need for social protection interventions mainly properly designed and funded **Hunger Social Safety Net Programme** to help households build their assets. However, in **medium term** there is need to enhance **maize buffer stocks** through locally based strategic grain reserves to cushion households against abrupt shocks, risks and uncertainties. **In long term**, for sustainability investment in **infrastructure** mainly road network, markets and information systems is deemed necessary. Additionally, there is need for proactive rather than reactive interventions and adequate policies especially **irrigation technology** in arid and semi areas for improved productivity and enhanced household resilience in agriculture and rural development.

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