Assessing the Effectiveness of Inter-regional Trade in Ghana's Soybean Markets

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Research Question

Is there price transmission across domestic and international soybean markets in Ghana?

Background

Lack of effective commercialization policies have the tendency of impeding economic growth and development. Several economic reforms have been implemented with the objective of integrating domestic and foreign markets. However, scholars and development practitioners have long deliberated on the effectiveness of these reforms (Mafimisebi, 2012). Meanwhile some studies have suggested market efficiency and integration as outcomes of these reforms (Nielsen et al., 2006).

Market integration facilitates the efficient movement of commodities among markets which leads to market expansion and increased competition with the ultimate objective of increasing overall market efficiency (Melitz, 2012). Due to variability in local production, markets that are poorly integrated record higher price instability (Antonaci et al., 2014). The relatively high price impacts positively on farmers' income and at the same time negatively affect consumers.

Ghana has witnessed major infrastructural development after the trade liberalization policy which is expected to influence spatial price transmission (SPT). SPT is subject to change over time in response to learning, policy changes, and investments in infrastructure (Negassa and Myers, 2007). Inland location of soybean production zones and high cost of internal transport hinders Ghana's competition in international soybean trade (Gage et al., 2012) therefore analyzing inter-regional trade is more appropriate. We employ a vector autoregressive framework to model price transmission across regional soybean markets in Ghana. Effective trade policies can be formulated based on empirical evidence which this study seeks to provide.

Method

Market Selection

Monthly data of wholesale prices collected from January, 2011 to May, 2017 by the trade and marketing team of the ADVANCE project, ACDI/VOCA in six regions of Ghana.

Regions: Upper West, Upper East, Northern, Brong-Ahafo, Ashanti, and Greater Accra regions. Selected regional Markets are Wa, Bolgatanga, Tamale, Techiman, Kumasi, and Accra (shown in the map above).

Data

Table 1: Summary statistic of soybean prices

Prices	Mean	Std. Dev.	Min.	Max.
Bolgatanga	0.442	0.134	0.248	0.800
Kumasi	0.470	0.116	0.240	0.721
Tamale	0.357	0.124	0.189	0.712
Techiman	0.433	0.098	0.249	0.705
Wa	0.390	0.107	0.218	0.648
International	0.327	0.063	0.236	0.466

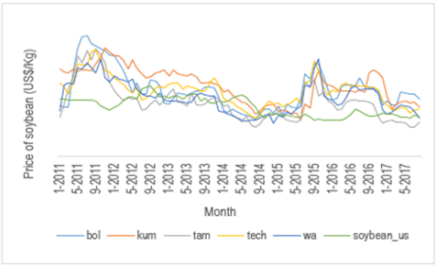

Figure 1: Prices in levels

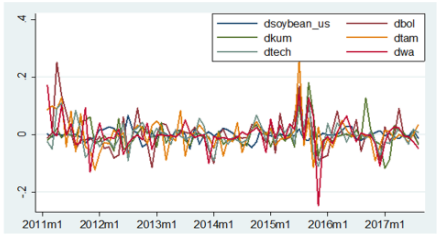

Figure 2: Prices in first difference

Market Selection

Vector Error Correction Model (VECM)

$$\triangle P^d_{i,t} = \alpha_0 + \psi ECT_{t-1} + \sum_{k=1} a_{11} \triangle P^d_{j,t-k} + \sum_{k=1} b_{11} \triangle P^i_{t-k} + \varepsilon_{it} \quad (1)$$

where $\triangle P^d_{i,t}$ is contemporaneous first difference of domestic prices $\triangle P^d_{j,t-k}$ is vector of all other prices, $\triangle P^d_{t-k}$ are lags of price difference; $\triangle P^i_{t-k}$ is the is the vector containing the international soybean prices ε_{it} is the error terms; ECT_{t-1} is the deviation of the system with respect to the long-run parity. The ECT after normalizing with one of the domestic prices (i) is as follows:

$$ECT_{t-1} = P^d_{i,t-1} - constant - \sum_{j=1} \beta_j P^d_{j,t-1} - \sum_{k=1} \gamma \triangle P^i_{t-k} \quad (2)$$

The coefficient ψ in equation (1) show how the prices in the system respond to disequilibrium from the long run parity. A negative sign on ψ guarantees that prices are returning to equilibrium.

Results

Table 2: VECM model estimation

	(1) D_lsoybean_us	(2) D_lkum	(3) D_ltech	(4) D_ltam	(5) D_lwa	(6) D_lbol
α_1	-0.080**	0.116*	0.011	0.280***	0.047	-0.194**
	(0.038)	(0.064)	(0.062)	(0.093)	(0.072)	(0.076)
Constant	-0.005	-0.003	-0.008	-0.004	-0.011	-0.008
	(0.007)	(0.011)	(0.011)	(0.016)	(0.012)	(0.013)
Number of lags	2	2	2	2	2	2
Stability	Stable, 5 unit moduli imposed					
Lagrange-multiplier test (10 lags)	Chi2 = 31.59 (0.678)			No autocorrelation		
Normality	Chi2 = 8.34 (0.75)			Normality		
Observations	80	80	80	80	80	80

Note: *** p<0.01, ** p<0.05, * p<0.10. P values in parenthesis for Lagrange-multiplier and Normality tests.

Establishing relationships among regional and international markets

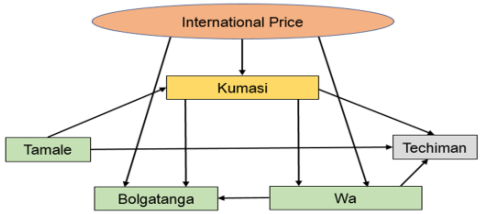

Figure 3: Granger Causality Test

Discussion and Conclusion

Our results show cointegration relationship suggesting that markets are co-moving together. There is evidence that international price Granger cause Kumasi, Bolgatanga, and Wa markets. Intuitively, and following the law of one price, these three markets are the most connected in terms of price information. Hence, a policy design that focuses on improving competitiveness at these markets would improve price signals to the other regional markets. This may lead to integration among the markets and eventually increase production and income of farm households in rural Ghana.

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