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Pulse, Export and Staple Convenience Food: Market Analysis in West Africa

by Fabinin Nina Akem

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Pulse, Export and Staple Convenience Food: Market Analysis in West Africa

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Abstract

Regional continental trade and the integration of markets has attracted interest in Sub-Saharan Africa. Agricultural markets still leave more to be desired for pro-growth strategies of the continent towards trade development. Using prominent food categories of the agricultural sector in this region, the study examines market dynamics between pulses, export and other staple convenience food crops. Spatial analysis evaluates market inter-dependencies between regional and domestic markets using a vector error correction model. Symmetric and asymmetric estimations are done in each market for comparison purposes. Findings suggest heterogenous market effects across commodities horizontally and vertically for value-added product forms on the food chain. Tailored market development policies can better the overall functioning of agri-food markets and boost the convergence of markets as well as trade integration and expansion.

Keywords: Agricultural markets, Value-addition, Price linkages, West Africa

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1. Introduction

The need for continental economic integration and trade expansion has attracted recent interest in sub-Saharan Africa (SSA) and agri-food markets, such as the African Continental Free Trade Area (AfCFTA). Such trade agreement measures substantiate the need for enabling domestic and cross-border policies that can facilitate the implementation needed. Understanding the trade sector in the region might be necessary for guided development and market policy insights towards the market and trade expansion potentials for streamlining border measures and its trade policy reforms. These insights can facilitate complete reforms for specific and aggregate measures that maximize trade potentials. AfCFTA comes with gains in all sectors (World Bank, 2020). Despite potential to boost productivity and resource allocation across sectors and countries, output in agriculture might however face contractions relatively, with declining output by the mid 2030s despite growing faster in the regions of SSA (World Bank, 2020).

Trade expansion and integration across borders has the potential of lifting about 30 million people from extreme poverty while providing more employment in agriculture (World Bank, 2020). Access to agricultural markets is notably vital in supporting poverty alleviation strategies and the broad development agenda for SSA which has been the talk for decades (Barrett, 2008; Taylor et al, 2009).

Growth rates in the agricultural sector have not been able to meet poverty reduction goals in West Africa (Hollinger and Staatz, 2015). The integration of markets and expansion of trade can offer opportunities towards better profits and incomes as the poor obtain access to higher value chains. Trans-border trade in this region is yet inefficient (Elbehri et al, 2013).

Relevant output losses have been incurred in recent times with a steep fall in commodity prices (World Bank, 2020). With population pressures and increasing global food demand (Berger, 2017), there is an impending need and opportunity for output and market expansion potentials that are yet unexploited. Recent crisis such as the pandemic contribute to food insecurity as food prices face an upward trend in many areas, with heterogenous impacts across countries (World Bank, 2020). Border closures have disproportionately affected particularly small-scale cross-border traders and those in the agricultural sector, hence showing the shortfall in trade facilitation measures domestically and across the borders (World Bank, 2020). Food price trends, signals, and volatility are vital in the effort towards alleviating rural poverty for farmers (Timmer, 2017).

Africa accounts for less than 3 percent of global trade (World Bank, 2020). The markets for traditionally consumed export crops, pulses and other food staples can have food security implications in SSA, as well as for income generation, employment and alleviating poverty incidences (e.g see Elbehri et al, 2013; Snapp et al, 2018); existing challenges with long-standing strategies and efforts towards being curbed.

Notably, market opportunities exist for West African food producers following from amongst others increasing output prices as well as dietary aspirations (Hollinger and Staatz, 2015), but are these food markets integrated? Inadequate market links in food markets offset long-

standing pro-poor development strategies (Taylor et al, 2009), as even more recently, several countries in West Africa have been flagged for caution on impending food insecurity (WFP and FAO, 2021), despite existing agricultural engagement levels. Rising food prices in recent times can significantly impact food access, and the vulnerability of households to food insecurity consequently (WFP and FAO, 2021).

Literature has posited that if producers can practice free trade arbitrage, the convergence of markets can be facilitated (Cachia, 2014). We hence employ producer prices in this study to examine market dynamics in these markets.

Pulses and other food staples, as well as export cash crops can together broadly signify an important component of the food chain and agricultural sector of the economy in SSA, with domestic and cross-border trade market potentials that can boost the sector. While export crops can generate foreign exchange revenue, staple foods produced and consumed domestically support the survival of local trade and farmers. Understanding the market of basic staple and pulse food can provide development policy insights to better the hunger situation through better affordability, availability, and accessibility. Understanding the market for an export has implications towards intraregional and international trade for foreign exchange earnings and growth of the economy especially for developing countries; further enhancing market participation that can provide the potential to boost income per capita and alleviate existing poverty levels.

Understanding these markets is important as they constitute raw material base on the supply side for other food, industrial and livestock products. The love of variety by consumers and consumer preference have been associated with diversification and alternate product forms (see

theories of industrial organization e.g Hotelling, 1929; Lancaster, 1966). Cashew (*Anacardium occidentale*) production is notably prominent in Africa, with about 80% production in the region of West Africa (Hollinger and Staatz, 2015). Cassava (*Manihot esculenta*) and its value-added products, as well as cowpea (*Vigna unguiculata*) are crucial in diets and largely consumed as basic staple and convenience food and pulse in Benin respectively (Katsumata et al, 2007). The study examines cross-border trade for an export crop (cashew), and domestic trade for pulse food (cowpea) and other basic convenient staples (cassava and its value-added products) nationally.

The study hence attempts to contribute to extant literature by (a) examining market adjustment responses to ascertain the presence of any key players that can influence the growth and pace of regional integration and hence aggregate regional market expansion (b) establish producer price mechanisms for basic staple foods and the convergence of these markets towards the welfare of market participants (c) link adjustment responses for diversification on the value chain of basic food staple and convenience food of domestic origin, hence the potential for expanding its market and promote local market participation. Processing on the cassava value chain is dominated by the artisanal sector and small-scale operators, providing employment to many (Hollinger and Staatz, 2015). (d) the study compares the price mechanisms for the markets of an export cash crop, pulses, and a traditional staple convenience food crop. Many value chains are disintegrated with negligible spatial and vertical coordination, as well as unstable links across actor niches in this region (Hollinger and Staatz, 2015).

The remaining part of the study is organized as follows. Section two presents the markets and a review of literature, section three presents the data and statistics, section four presents the

method, section five presents the findings and discussion, while section six concludes with policy insights and limitations.

2. Markets for Cassava, Cowpea and Cashew in Benin and West Africa

While Africa aggregately accounts for a great share of cashew production globally, about 80 percent of its production is accounted for by West Africa (Hollinger and Staatz, 2015). However, it occupies a small trade share in the global market despite cashew constituting a major commodity player in the global market and an export commodity for foreign exchange in this region (Hollinger and Staatz, 2015). The region's share in the world market is on an upward trend, further with growing international, and domestic demand typically from countries like Benin and Nigeria amongst others (Hollinger and Staatz, 2015). The cashew industry exhibits growth potential and keeps attracting interest (Hollinger and Staatz, 2015).

In export trade, West African cashew and cassava exports grew higher than the rest of the world, and these portend promising prospects for the expansion of regional and global markets and offering market opportunities in the coming years (Hollinger and Staatz, 2015). This can offer a strategic path toward trade integration. The share of cassava production for non-food uses has also been on the rise in recent decades, but however, for major cassava producing countries in the region such as Benin, growth rate has been at a relatively slower rate, yet literature on the cassava staple value chain is relatively sparse in the region generally (Elbehri et al, 2013). Demand prospects are notably prominent in the cashew market while the cassava value chain has insights for the opportunities and challenges of West African agriculture (Hollinger and Staatz, 2015).

Pulses as part of staple crops are prominent in West Africa with cowpea as the most important of pulses in the dry areas of Tropical Africa (Snapp et al, 2018). Cassava and cowpea as basic staple food are vital in food diets and nationally consumed across Benin (Katsumata et al., 2007).

Growth in the consumption of cassava and its value-added products, as well as pulses especially cowpea, exhibit growth per capita despite projected decreases in yield in the case of cowpea. These can constitute market implications for the welfare of market actors (Hollinger and Staatz, 2015). Considering a growing and diversifying market in West Africa, the integration of its markets domestically and internationally has development prominence and trade and market opportunities especially given that eleven of the countries in this region are on the LDCs list (Lauzon and Bossard, 2006).

3. Literature Review

The literature on global agri-food value chains and price transmission is burgeoning and an important area of research interest is on the transformation of products especially in Sub-Saharan Africa where this niche remains insufficiently exploited despite market and livelihood potentials particularly for the small-scale farm producers. As pricing is a critical factor for food markets in SSA, an understanding of the performance of these markets is important for the strengthening of price policies that can support welfare on the production and consumption sides through food availability, affordability, and accessibility, and an overall attempt for pro-poor hunger alleviating measures. This can be further buttressed by the presence of food commodity alternatives that diversify food production lines creating more income streams

whilst the possibility of managing post-harvest losses in the case of perishable commodities especially, as well as increasing consumption choices for consumers.

Recent literature has taken interest in the value-added chain of agri-food commodities, examining the transmission of prices on the vertical chain (e.g., Gizaw et al., 2021). Important questions that could be asked include (a) what happens to the transmission of prices in the long run when a product is transformed in form? In another case, (b) what will be the adjustment responses to shocks for value added transformed commodities? Additionally, given the possibility for non-linearities in markets (c) what is the nature of linear adjustments compared to non-linear adjustment responses given the direction, speed, and magnitude of the adjustments (see Meyer and von Cramon-Taubadel, 2004). Examining the asymmetric price transmission process is hence important to further detail the price mechanism for rising and falling prices. Gizaw et al. (2021) have examined the fresh and smoked salmon value chain. Findings empirically show some level of asymmetric adjustments for the unprocessed fresh salmon value chain.

If we talk of cross-border trade, the integration of markets is also key to its performance, as the prices tend to converge if producers freely practice arbitrage (Cachia, 2017). Understanding the pricing and the transmission of prices is essential for policy (von Cramon-Taubadel, 2017). Compared to Asia and Latin America, Conforti (2004) empirically found that African markets can exhibit lower transmission of prices. Given the vertical transmission of local prices domestically, Rahman (2015) examines the price transmission for pulses in India and findings show the existence of asymmetry.

Extant literature has documented spatial and vertical price flows in developing countries (Abdulai, 2000; Mai et al., 2018). Baquedano and Liefert (2014) examine the integration of markets in developing countries and empirically reveal slow adjustment of domestic prices back to equilibrium. Inconclusive findings have however been found for the integration of export crop markets (Conforti, 2004). Other studies have shown evidence of slow price transmission rates between international and agri-markets in Africa, as well as limited to no growth in the price volatility of the staple food market in Africa (Minot, 2011; Minot, 2014). Ceballos et al., (2017) have further found that income per capita is a significant factor that accounts for differentials in the food price pass-through across countries.

In terms of methodology, recent studies that examine agri-food value chains and the differentiation of commodities have employed different methods for insights. Bittmann et al., (2020) employ a distance measure within an error-correction model in the German fish market. They show that the differentiation of commodities influences the equilibrium market dynamics. Landazuri-Tveteraas et al. (2018) examined the price transmission in the salmon supply chain. In their study, the authors employ a Johansen bivariate time-series approach. Findings showed that more processing is associated with reduced price transmission to the retail prices. Loy and Weiss (2019) employed a panel-error-correction model to examine product differentiation and cost pass-through in the German yoghurt market. Findings showed that more differentiated products are associated with more sluggish adjustments to common cost shocks. Acosta et al. (2019) also suggested the simultaneous use of econometric and market structure methods in modelling price transmission.

In summary, despite different empirical methods used in analyzing value chains in agri-food markets, evidence has pointed towards an important role of value addition and product

differentiation on the performance of markets and its effect for market actors and participants. The current study employs symmetric and asymmetric analysis at the different levels of the value-added chain to further provide robust findings for the price transmission process when value is added at each individual stage and changing commodity forms (Jaffry, 2004). Hence, empirical policy insights for a developing economy market can direct development policy measures for broad development goals. Regional trade across national borders as well as domestic trade within a country are further assessed. The study also compares the market dynamics across a regional export commodity, a staple convenience food, and a pulse commodity for insights.

4. Data

Data for cowpea, cassava and its value-added products (cassava flour, tapioca, ordinary garri, fine garri) are obtained from the Ministry of Agriculture in Benin, while cashew price data was obtained from the National Federation of Benin Cashew Nut Producers in Benin, and inclusive of three other West African countries (Nigeria, Burkina Faso, Guinea). The southern and central parts of Benin are notably the major cassava growing areas (Agre et al., 2016). Hence these regions constitute the sample areas for cassava. Based on available data, Dantokpa market is sampled in the Southern region of Benin and Glazoué in the Central region for cassava flour, tapioca, ordinary garri, fine garri, over the period from February 2010 to September 2016 for the producer prices. For cassava, the producer price data covers the period from September 2013 to October 2016 in Dantokpa (Southern) and Savalou (Central Benin) based on available data. Table one presents a summary of sampled communes within Benin used for analysis of the cassava value-chain. Data for cowpea is monthly from January to December 2016.

Table 1: Data sample description

Commodity	Region	Department	Commune	Period
Cassava	Central	Collines	Savalou	September 2013 to October 2016
	Southern	Littoral	Cotonou (Dantokpa)	
Cassava flour	Central	Collines	Glazoué	February 2010 to September 2016
	Southern	Littoral	Cotonou (Dantokpa)	
Tapioca (cassava root starch)	Central	Collines	Glazoué	February 2010 to September 2016
	Southern	Littoral	Cotonou (Dantokpa)	
Ordinary garri	Central	Collines	Glazoué	February 2010 to September 2016
	Southern	Littoral	Cotonou (Dantokpa)	
Fine garri	Central	Collines	Glazoué	February 2010 to September 2016
	Southern	Littoral	Cotonou (Dantokpa)	
Cowpea	Northern	Alibori	Banikoara	January to December 2016
		Alibori	Kandi	

For cashew, data includes weekly producer prices within two annual cashew marketing seasons in 2019 and 2020 for four countries in West Africa (Benin, Nigeria, Burkina Faso, Guinea). Data for Benin and Nigeria covers eleven weeks while data for Burkina Faso and Guinea covers seven weeks. About half of the total area of cashew cultivated is in the Northern parts of Benin (Issaka, 2007). Hence data for cashew in the Northern Kouandé commune is used for Benin.

Prices for cassava which serve as an input to the other commodities on the value chain are least, as expected. When value is added, the value-added commodity price appreciates. While the majority of value-added commodities (ordinary garri, fine garri) seem to move together closely, there is a more considerable distinction for cassava flour and tapioca. Variance may be a factor of the nature of processing needs, further in terms of quality and grading. Descriptive statistics of the data are presented in table two.

Table 2: Descriptive statistics of Commodities by market

Commodity	Market	Mean	Std. Dev.
Cashew	Benin	304.5	83.854
	Nigeria	313.182	62.049
	Guinea	288.214	44.458
	Burkina Faso	320	100.250
Cassava	Savalou	81.316	15.968
	Dantokpa	214.737	108.022
Cassava flour	Glazoué	395.938	82.738
	Dantokpa	557.688	109.090
Tapioca	Glazoué	618	94.097
	Dantokpa	694.313	100.643
Ordinary garri	Glazoué	192.813	37.677
	Dantokpa	330.263	78.152
Fine garri	Glazoué	229.563	49.824
	Dantokpa	404.313	95.592
Cowpea	Banikoara	450	47.673
	Kandi	500	36.927

Source: Own computation

Note: Prices are given in CFA Franc. The CFA Franc is the official currency of West Africa, 1 XOF is equivalent to about 0.00181 USD

As seen on table two, average prices of cashew are most affordable in Guinea (288.214) as compared to Burkina Faso (320) based on the sample data. The products on the cassava value chain are averagely more affordable in the Central part of Benin (Savalou) compared to the

Southern part (Dantokpa). There is evidence of the existence of spatial price differentials based on the sample.

Diagnostic checks on variable parameters are presented as shown on table three for commodity markets under consideration. Variables are stationary at first difference following the Augmented Dickey Fuller (ADF) test.

Table 3: Empirical testing

Market	Stationary I(1)	Cointegrated
Cashew (Benin-Nigeria)	Yes	Yes
Cashew (Guinea-Burkina Faso)	Yes	Yes
Cassava	Yes	Yes
Cassava flour	Yes	Yes
Tapioca	Yes	Yes
Ordinary garri	Yes	Yes
Fine garri	Yes	Yes
Cowpea	Yes	Yes

Source: Own computation

Findings of cointegration from the Engle and Granger (1987) procedure are presented under the null hypothesis of no cointegration. The Breusch-Godfrey test is used to check for serial correlation under the null hypothesis of no serial correlation. Findings are shown in table four.

Table 4: Test of Serial correlation

Market	Prob > chi2
Cashew (Benin-Nigeria)	0.1350
Cashew (Guinea-Burkina Faso)	0.1860
Cassava	0.2797

Cassava flour	0.6157
Tapioca	0.6395
Ordinary garri	0.3730
Fine garri	0.9755
Cowpea	0.3295

Source: Own computation

5. Methodology

Employing a non-linear cointegration approach and to capture non-linearities in addition to symmetric error correction estimates, the study employs an asymmetric vector error correction model (see von Cramon-Taubadel, 1998). The long-run and short-run relationships can be specified as follows.

$$P_t^b = \alpha_1 + \alpha_2 P_t^a + \epsilon_t \quad (1)$$

$$dP_t^b = \gamma_1 + \gamma_2 (\epsilon_{t-1})^+ + \gamma_3 (\epsilon_{t-1})^- + \gamma_4 dP_{t-1}^a + \dots + \mu_t \quad (2)$$

Where P_t^b is the price in market b at time t, P_t^a is the price of market a at time t, and ϵ_t is the disturbance term. d represents the first-difference operator, γ_1 is the intercept, γ_2 and γ_3 are the speed of adjustment coefficients back to long-run cointegrating relationship for positive and negative discrepancies respectively following the cointegrating equation and the disturbance term from (1). α_1 and α_2 are long-run coefficients to be estimated. Assuming symmetry in the adjustment process following (1), the second stage estimation following Engle and Granger (1987) is thus:

$$dP_t^b = \gamma_1 + \gamma_2 \epsilon_{t-1} + \dots + \epsilon_t \quad (3)$$

Where ϵ_t is the random error. The estimations following cointegration for (2) and (3) can be summarised in table five.

Table 5: Error correction adjustment process

Symmetric adjustment process	Asymmetric adjustment process	
	Above the equilibrium (1)	Below the equilibrium (1)
$d \epsilon_t = \rho \epsilon_{t-1} + \mu_t$ Where $\rho \neq 0$	$\epsilon_{t-1} \geq 0$ (positive process)	$\epsilon_{t-1} < 0$ (negative process)

6. Findings

Table six presents long-run estimates for markets under consideration. Short-run estimates are presented for both symmetric and asymmetric adjustments.

Table 6: Long-run and Short-run Estimates

		Dependent variable			
		P_t^b	dP_t^b	$dP_t^b (+)$	$dP_t^b (-)$
Cashew	(Benin-Nigeria)	0.971*** (.054)			
	Benin		-0.111 (.341)	-0.650 (1.627)	0.180 (.770)
	Nigeria		0.169 (.271)	-0.762 (.736)	0.672 (.447)
Cashew	Guinea-Burkina Faso)	0.861*** (.049)			
	Guinea		-0.266 (.331)	-0.460 (.399)	0.449 (.447)
	Burkina Faso		0.219 (.499)	-0.206 (.179)	1.785 (1.814)

Cassava	(Savalou-Dantokpa)	0.298*** (.031)			
	Savalou		-0.082* (.047)	-0.289** (.116)	0.197 (.121)
	Dantokpa		0.301 (.308)	0.141 (.091)	0.832 (1.136)
Cassava flour	(Glazoué-Dantokpa)	0.695*** (.022)			
	Glazoué		-0.087 (.142)	-0.434*** (.159)	0.237 (.209)
	Dantokpa		0.540** (.241)	-0.427*** (.158)	1.443*** (.296)
Tapioca	(Glazoué-Dantokpa)	0.882*** (.014)			
	Glazoué		-0.100** (.041)	-0.113* (.067)	-0.084 (.066)
	Dantokpa		0.076 (.048)	0.046 (.010)	0.092 (.102)
Ordinary garri	(Glazoué-Dantokpa)	0.573*** (.009)			
	Glazoué		-0.105* (.062)	-0.185** (.087)	-0.046 (.104)
	Dantokpa		0.308 (.198)	0.122 (.273)	0.444 (.395)
Fine garri	(Glazoué-Dantokpa)	0.558*** (.012)			
	Glazoué		0.059 (.037)	-0.003 (.104)	0.098 (.069)
	Dantokpa		0.461** (.226)	0.198 (.374)	0.629 (.409)
Cowpea	(Banikoara-Kandi)	0.900*** (.021)			
	Banikoara		-0.239 (.286)	-0.231 (.788)	-0.247 (.668)
	Kandi		0.580 (.521)	0.374 (.954)	0.778 (.727)

Source: Own computation

Robust standard errors are in parenthesis. ***p<0.01, **p<0.05, *p<0.1

Spatial price transmission is fastest in regional markets of cashew between Benin and Nigeria (0.971) and slowest in the input market upstream of cassava in domestic markets. The spatial transmission of prices in the long run is faster for value-added processed cassava forms

compared to its raw input cassava, for all the value-added commodities under consideration. Value-addition may hence enhance performance of markets through faster price transmission rates. The long run price transmission parameters are all significantly different from zero at one percent level. Price transmission for differentiated commodity attributes (ordinary garri and fine garri) is slower compared to other value-added commodities (tapioca, cassava flour). Loy and Weiss (2019) have found that product differentiation is associated with slower price transmission rates. Significant convergence to long-run equilibrium is however only noticeable in some markets. When non-linearities are considered for rising and falling prices, over correction is noticeable in some market. Slow adjustments back from disequilibrium may support the need for trade integration that may propel competition and the potential for faster adjustments and stability of markets. This provides a caveat for future research. These findings may suggest spatial dependencies of commodity markets, for instance in the tapioca market, the central market appears to respond to changes more than the South market, hence the Southern market may exhibit lesser dependence toward market conditions in the Central region. This may be in line with the sampled Southern market as a prominent market (national and international) in the region of West Africa and Benin.

7. Conclusion

Continental and regional trade has recently attracted interest in SSA. This presents potentials for trade expansion and integration of markets for better economic output in these developing regions. Prominent food categories are examined in this study for market dynamics and possible development policy insights. Spatial markets for pulse, export and other staple convenience food are evaluated as well as symmetric and asymmetric convergences for disequilibria. Using a vector error correction model, time series techniques are employed.

Spatial market dependencies may exist among markets and affect the formation of complete markets. Price transmission is higher for export and pulses food commodities compared to staple convenience foods. Tailored policy towards convenient staple food crops, export crops and pulses can enhance the state of the agricultural market and output towards broad development strategies especially for the poorest farmers through trade. The findings may hence provide development policy insights to strengthen needed agricultural policies for intra-regional and inter-regional markets. Augmenting available institutional and technological support facilities can boost the expansion of markets in developing countries especially in value-added processing, for domestic and regional trade integration. Findings should be generalized with caution given the sample sizes of communes representing markets as well as the period of data coverage.

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