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Trade liberalization policy and competitiveness of Nigeria's cocoa exports (1961-2016)

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Abstract

Nigeria's cocoa market share has been declining consistently over time and trade policies have been used by the government to improve export earnings and growth of the subsector. This study analyzed the effect of trade liberalization policy on competitiveness of Nigeria's cocoa export from 1961-2016 using market share as the measure of competitiveness. Vector error correction model (VECM) was applied to data obtained from secondary sources. The result of the VECM revealed that the error correction coefficient (-0.258) was negative and significant ($p \leq 0.01$). Trade policy did not influence competitiveness whereas production quantity and export quantity positively influenced competitiveness while world price of Nigeria's cocoa, interest rate on agricultural loans and exchange rate had a negative influence on competitiveness. Hence, government should pay specific attention to monetary policies and cocoa production rather than trade policies.

Keywords: Cocoa competitiveness, macro-economic variables, market share, trade liberalization policy.

1. Introduction

Nigeria is the fourth leading producer of cocoa in the world, after Ivory Coast, Ghana, Indonesia (FAO, 2015), although, only about three percent of the product is consumed as food (FAO, 2012). Cocoa occupied a pride of place in the Nigerian economy in the 1960s to the early 1970s; prior to the oil boom era along with cotton, groundnut, palm oil products and rubber which were principal export crops of the country. In 1986, Nigeria liberalized cocoa trade, becoming the first African country to do so. This followed the liberalization of foreign exchange. The Nigerian Government unilaterally abolished marketing boards due to reported inefficiencies (Gilbert and Varangis, 2002). However, Nwachukwu *et al.*, (2010), asserted that overall, export crop liberalization, including cocoa liberalization, led to a declining use of agricultural inputs, poorer quality of cocoa beans. Specifically, the switch to private trade led to lesser quality control and declining export coordination, with lesser opportunities for forward selling, sales by tender and sales on CIF basis with negative implications for the country's market share in the global market.

Nwachukwu *et al.*, (2010), identified low yields, inconsistent production patterns, disease incidence, pest attack and little agricultural mechanization as key factors leading to decreasing cocoa production in Nigeria. Additionally, the ageing of cocoa producing trees also play a role in the decrease of productivity as about 60 percent of cocoa farms are over 40 years old. Overall, farms in Southern/southern Eastern Nigeria tend to be younger and generally more productive (Nwachukwu *et al.,* 2010). Nigeria has not been able to meet its daily price (2129.19 US$/ton) of cocoa beans target set-aside by the International Cocoa Organisation (ICCO, 2017) resulting in huge revenue losses of about US$ 1 billion annually (NBS, 2017). Nigeria formerly received

premium on cocoa but following the dismantling of the Nigerian cocoa board and relaxation in quality control in the 1990s, no longer does (Oxfam, 2012). Thus, the country has gradually lost its competitiveness on the world market.

Several studies have dwelt on trade liberalization and Nigeria's cocoa export determinants but few on trade liberalization and cocoa competitiveness determinants in Nigeria. Studies such as Taiwo (2016); Boansi (2013); Nwachukwu (2013); Verter and Becvarova (2014), Yusuf and Akinlade (2011) have examined Nigeria's cocoa export determinants. This study however, differs from previous studies on the county as it does not study competitiveness between two countries or among West African countries but studies Nigeria's cocoa share (competitiveness) in cocoa global market, using the market share (competitiveness index) to measure the country's competitiveness. The market share is an appropriate index for comparing competitiveness of a country's product with the rest of the world (Biswajit, 2008). The advantage of using market share over other measures of competitiveness is that it is accurate when dealing with a single product and also, is less dependent upon macro environmental variables such as the state of the economy or changes in tax policy. Further, this study analyzed the effect of trade liberalization policy on the competitiveness of Nigeria's cocoa export, using the more robust and appropriate econometric tool vector error correction model (VECM), because it's given eigen values (λ) are also used to test cointegration hypothesis, it has a nice interpretation with short term and long term equation, offers possibility to apply vector autoregressive model to integrated multivariate time series and also allows for two or more endogenous variables. This study first describes the current position of Nigeria's cocoa market share in the world market and further examines the factors influencing the nation's competitiveness in the world market.

2. Trend in Nigeria's market share of cocoa in the world Market before and since trade liberalization

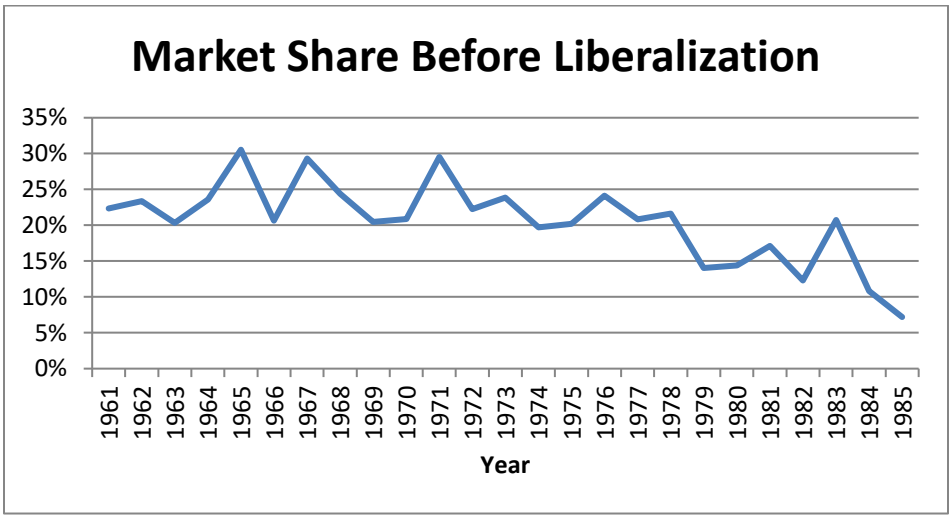

Figure 1: Nigeria's cocoa Market share from 1961 – 1985
Source: Authors' computation, (2018).

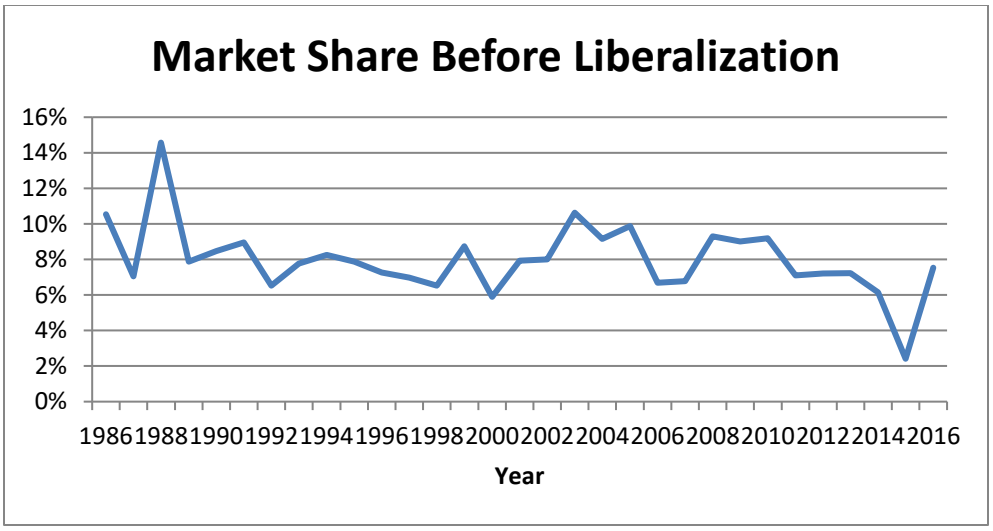

Figure 2: Nigeria's cocoa Market share from 1986 – 2016
Source: Authors' computation, (2018).

3. Theoretical framework

The Ricardian theory of comparative advantage is the mainstay model used to explain competitiveness. The Ricardian model of international trade proposes that countries specialize in goods in which they hold the greatest relative advantage in total factor productivity. Assuming an industry consisting of a number of firms that produces identical output faces market demand is given by the following:

Qt = *Q(Pt, Zt)*……...……(1)

Where Q, is the total quantity demanded, *P*t is the market price, Zt is a vector of exogenous variables such as the prices of substitutes and income, and *t* is a time subscript. Since *Q* and *P* are determined simultaneously, the demand function can also be written in inverse form, *P*t = *P(Qt, Z).* Suppose also that the aggregate marginal cost *t* facing the industry is given by

$MCt, = MC(Q_t, W_t)$……..(2)

Where *Wt* is a vector of exogenous variables such as input costs. Assuming that the industry is perfectly competitive, equilibrium price and quantity will be determined by

Pt = P(Qt, Zt) = MCt = MC(QtWt)…….....…..(3)

More generally, if the industry is imperfectly competitive, equilibrium is where perceived industry marginal revenue equals industry marginal cost. If industry revenue is defined as

Rt = PQt = P(Qt, Zt)Qt,

The equilibrium condition can be rewritten as:

$MR(\lambda) = [P(Qt, Z,) + dP/dQt(QtZt)Qt]=MC(Qt, Wt)$…..…..(4)

λ can be interpreted as an index of market power being exerted in an industry, that is, the wedge, in equilibrium, between industry price and industry marginal cost. The value of λ falls in the range $0 \leq \lambda \leq 1$; if the industry is perfectly competitive, the parameter λ = 0, and (4) becomes the usual condition that price equals marginal cost. If the industry is either a monopoly or firms demonstrate perfectly collusive behavior, λ= 1.

4. Methodology

Data source

Annual time series data obtained from secondary sources covering (1961-2916) was used for this study. Sources include the Central Bank of Nigeria (CBN), Bank of Agriculture (BOA) and Food and Agriculture Organization (FAO).

Market share is the share of total exports of a given product from the region under study in total world exports of the same product (Biswajit, 2008). It is given as:

$$MS_a^i = \frac{XS_a^i}{XS_a^w} \times 100 \quad \text{..... (1)}$$

Where *XS* refers to exports, subscript *a* to a commodity, and *i* to home country, and *w* to the world.

Model specification

Vector Error Correction Model was used to analyze trade liberalization policy and competitiveness of Nigeria's cocoa export. The econometric model for the vector error correction model is:

$$\boldsymbol{lnmktsh = (\beta_0 + \beta_1 lnpric_t + \beta_2 lnarea_t + \beta_3 lnexch_t + \beta_4 lnprod_t + \beta_5 lnint_t + \beta_6 lnexp_t + \beta_7 lninf_t \beta_7 Libr_t + lnECM_{t-1} + \mu_t)} \text{……..……(2)}$$

Where

lnmktsh= log of market share for cocoa.
lnpric = log of world price of cocoa (in US$).
lnarea = log of area harvested of Nigeria cocoa (in hectares).
lnexch = log of currency exchange rate (in Naira/US$).
lnprod = log of quantity of cocoa produced (in tons).
lnint = log of interest rate on agricultural loans (percentage).
lnexp = log of export supply of agricultural cocoa (in tons).
lninf = log of rate of inflation in the economy (percentage).
libr = Trade liberalization policy (1= before liberalization and 0= after liberalization)
β's = unknown parameters to be estimated.
ECMt = error correction factor.

Unit root test

Annual time series data is prone to spurious regression results when *x* and *y* series are non-stationary (random walk). Time series data is the difference to produce other sets of observations such as the first-difference and the second-difference values. The order of integration using Augmented Dickey- Fuller (ADF) and Philips-Perron (PP) unit root tests (Muhamed, 2008) as presented in model 3.

X level x_t

X 1st - differenced value $x_t - x_{t-1}$

X 2nd - differenced value $x_t - x_{t-2}$…….(3)

Cointegration test

This approach involved the investigation of long run equilibrium relationship among the series that have the same order of integration through the application of the Johansen cointegration test. The model of the cointegration is illustrated as follows:

$$LR_{trace}(r/n) = -T\sum_{i=r+1}^{n} \ln(1-\hat{\lambda}_i) \quad \text{…….(4)}$$

$$LR_{\max}(r/n+1) = -T\ln(1-\hat{\lambda}) \quad \text{…….(5)}$$

Model 4 test for trace, whereas model 5 tests for maximal Eigenvalue statistics. Where λ is the estimated values of the characteristic roots obtained, and *T* is the sample size or number.

5. Results and discussion

The order of integration using both ADF and PP unit root tests is presented on Table 1. The test resultsshowed that three variables (*Lnmktsh, Lnexp and Lninf*) were stationary at level while six variables (*Lnpric, Lnarea, Lnexch, Lnprod, Lnint and Libr*) became stationary at first difference.

Table 1: Unit root test result

Variable	**ADF**		**PP**	
	I(0)	I(1)	I(0)	I(1)
Lnmktsh	-5.799***	-12.977***	-5.996***	-15.535***
Lnpric	-3.085	-9.558***	-2.990	-11.061***
Lnarea	-1.845	-6.392***	-2.009	-6.321***
Lnexch	-1.420	-5.954***	-1.600	-6.047***
Lnprod	-2.829	-10.146***	-2.652	-10.705***
Lnint	-1.442	-7.993***	-1.319	-8.076***
Lnexp	-3.623**	-11.967***	-3.631**	-14.136***
Lninf	-4.710***	-6.732***	-4.687***	-7.119***
Libr	-1.869	-7.284***	-1.980	-7.284***
Critical value				
1%	-4.139	-4.141	-4.139	-4.141
5%	-3.495	-3.496	-3.495	-3.496
10%	-3.177	-3.178	-3.177	-3.178

Note: The asterisks (**, ***) denote statistically significant level at 5%, and 1% respectively

Source: Authors' Computation, 2018.

Johansen cointegration test result

The result of cointegration test is presented on Table 2. The model selection for cointegration was computed using the Schwarz information criterion, known as lag-order selection criteria, where lags of 2 was chosen and proceed to run the Johansen cointegration test. According to the table, the null hypothesis of no cointegration was rejected by both statistics. The two statistics used showed that the variables have long run relationship since there were six (6) cointegrating equations.

Table 2: Cointegration test result

Hypothesized No of CE(s)	Trace test k=2		Maximum Eigen value test k=2	
	Statistic	5% critical value	Statistic	5% critical value
None	385.0920	192.89	85.8322	57.12
At most 1	299.2598	156.00	81.9734	51.42
At most 2	217.2864	124.24	67.9216	45.28
At most 3	149.3649	94.15	50.6123	39.37
At most 4	98.7526	68.52	36.3715	33.46
At most 5	62.3811	47.21	30.0621	27.07
At most 6	32.3189	29.68	18.5804	20.97
At most 7	13.7385*	15.41	10.6646	14.07
At most 8	3.0740	3.76	3.0740	3.76

Source: Authors' Computation, 2018.

The result of the VECM is presented on Table 3. The coefficient of multiple determinations (R^2) is 0.8591, implying that 85.91% variation in the dependent variable is explained by the independent variables. The estimation results indicate that the value of ECM to be -0.258. The negative value of the ECM implies that the model is dynamically stable and this implies that 1 percent of the disturbance in the short run is corrected for each year at 25.8 percent speed of adjustment. The result show that trade liberalization policy is not significant and does not affect cocoa competitiveness. The coefficient of world price of cocoa in US$ is negative and significant at ($p \leq 0.01$), indicating that a dollar increase in the world price will lead to a fall in Nigeria's market share by 36.5%. This result corroborates the findings of Asante-Poku and Angelucci (2013). The coefficient of exchange rate is negative and significant ($p \leq 0.01$), implying that a percentage increase in exchange rate will lead to 37.15% decrease in Nigeria's market share. This result is in accordance with Yusuf and Yusuf (2007); Okoruwa *et al.,* (2003). The coefficient of production quantity is positive and significant ($p \leq 0.01$), this implies that a percentage increase in quantity of cocoa produced will lead to 21.60% increase in Nigeria's market share. This result supports the result of Nwachukwu (2013) and Boansi (2013). The coefficient of interest rate on agricultural loan is negative and significant ($p \leq 0.05$), indicating that a percentage increase in interest rate on agricultural loan will lead to 17.18% decrease percent in Nigeria's market share. This result is in consonance with the findings of Taiwo (2016). The coefficient of export quantity is positive and significant ($p \leq 0.01$), this implies that a percentage increase in quantity of cocoa exported will lead to 65.85% increase in Nigeria's market share. This result supports the result of Nwachukwu (2013).

Table 3: Estimated Vector Error Correction Model

Error Correction	D(Market share)	D(World price)	D(area harvested)	D(Exchange rate)	D(Production quantity)	D(Interest rate)	D(Export quantity)	D(Inflation rate)	D(Deregulation policy)
Ecm	-0.258*** (2.48)	-0.4074 (-1.00)	-0.106*** (-2.01)	-0.157*** (-2.09)	0.1260 (1.23)	0.0635 (0.37)	0.009 (0.06)	-0.021 (-0.28)	0.840*** (-2.32)
D(World price(-1))	-0.365*** (2.09)	0.1366 (0.44)	-0.2484** (-1.90)	-0.1398 (-0.75)	0.1404 (0.55)	0.1579 (0.89)	0.2442 (0.56)	2.2044 (0.014)**	0.0265 (0.14)
D(Area harvested (-1))	1.1976 (1.06)	-1.6322 (-1.90)	-0.3563 (-0.98)	-0.7642 (1.47)	-0.3408 (-0.48)	0.0989 (0.20)	0.3650 (0.30)	-3.9481 (-1.58)	0.1549 (0.30)
D(Exchange rate (-1))	-0.3715** (2.40)	0.1512 (0.41)	0.7875 (-0.50)	0.1456 (0.64)	-0.0086 (-0.03)	-0.1345 (-0.63)	1.1033 (2.09)	-1.399 (-1.28)	0.5371** (2.38)
D(Production quantity (-1))	0.2160*** (2.44)	0.1767 (0.69)	-0.0895 (-0.82)	0.2273 (1.46)	-0.9684*** (-4.54)	-0.16024 (-1.08)	0.2917 (0.80)	-1.1119 (-1.48)	0.2595 (1.67)
D(Interest rate (-1))	-0.1718** (2.18)	0.2444 (0.94)	-0.0016 (-0.02)	0.0928 (0.59)	-0.2795 (-1.29)	-0.5380** (-3.54)	0.5387 (1.46)	1.7056 (2.24)	-0.0012 (-0.01)
D(Export quantity (-1))	0.6585** (-2.51)	-0.0334 (-0.17)	-0.0468 (-0.55)	0.1327 (1.10)	0.1554 (0.94)	0.0238 (0.21)	-1.066*** (-3.79)	-0.6401 (-1.10)	0.5815 (-0.46)
D(Inflation rate (-1)))	-0.0786 (-2.51)	0.1410* (1.65)	-0.0152 (-0.42)	-0.0530 (-1.02)	0.0800 (1.13)	0.0228 (0.21)	-0.0580 (-1.38)	0.2076 (0.83)	-0.0621 (-1.20)
D(Deregulation Policy)	-0.1596 (-0.33)	-0.2605 (-0.70)	0.1981 (1.26)	0.1116 (0.50)	-0.0767 (-0.25)	0.2950 (1.39)	-0.7216 (-1.38)	0.8461 (0.78)	-0.7916 (-0.35)
C	-0.1398 (-0.26)	-0.1076 (-0.26)	-0.0151 (-0.87)	0.0134 (0.54)	-0.0152 (-0.45)	0.0037 (0.16)	0.0222 (0.38)	0.0030 (0.03)	0.0143 (0.58)
R-squared	0.8591	0.8217	0.6149	0.7209	0.7622	0.7455	0.7887	0.7158	0.4531
P>chi2	0.0000	0.0000	0.0081	0.0000	0.0000	0.0000	0.0000	0.0000	0.4652

Note: Figures in parentheses are z-values associated with the respective parameters.
The asterisks (**, ***) denote statistically significant level at 5%, and 1% respectively.
Source: Authors' Computation, 2018.

6. Conclusion

Having investigated the effect of trade liberalization policy on the competitiveness of Nigeria's cocoa export. It is established that trade liberalization policy does not influence cocoa competitiveness. Further, it is established that increasing production quantity and export quantity while lowering interest rates and exchange rates will improve cocoa competitiveness in the long run. This study therefore recommends that government should pay specific attention to monetary policies and production than trade policies.

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Appendix I: Pre-estimation tests results

Table A1: Nigeria's Cocoa market share estimate (1961-2016)

Year	Production (metric tons)	Cocoa export	World export	Market Share (%)
1961	197000	186860	836594	22.34

1962	182000	197770	845671	23.39
1963	223000	177410	872117	20.34
1964	298300	199980	846971	23.61
1965	184600	305550	1000579	30.54
1966	267200	193252	935942	20.65
1967	238000	248181	847324	29.29
1968	191800	208882	857088	24.37
1969	220800	173605	847840	20.48
1970	304800	195907	939228	20.86
1971	256600	271738	920823	29.51
1972	241100	227532	1023248	22.24
1973	215000	213897	896119	23.87
1974	214000	197125	999538	19.72
1975	216000	194692	964933	20.18
1976	181000	222966	924749	24.11
1977	193000	167521	803752	20.84
1978	157000	192761	891896	21.61
1979	151000	114147	814074	14.02
1980	153000	133861	929698	14.40
1981	174000	194567	1135901	17.13
1982	156000	136656	1112170	12.29
1983	140000	206024	993126	20.75
1984	160800	130800	1209994	10.81
1985	160000	92891	1290673	7.20
1986	148000	148426	1407397	10.55
1987	150000	106000	1503199	7.05
1988	253000	211766	1453485	14.57
1989	256000	138940	1765246	7.87
1990	244000	147915	1745208	8.48
1991	268000	155691	1737686	8.96
1992	292000	108024	1656655	6.52
1993	306000	152079	1957842	7.77
1994	323000	142361	1723045	8.26
1995	203000	132713	1686711	7.87
1996	323000	170009	2340492	7.26
1997	318000	140000	2005404	6.98
1998	370000	128065	1962488	6.53
1999	225000	196377	2245728	8.74
2000	338000	139000	2361064	5.89
2001	340000	175272	2210735	7.93
2002	362000	180723	2258244	8.00

2003	385000	230560	2169035	10.63
2004	412000	255000	2783119	9.16
2005	441000	267700	2709346	9.88
2006	485000	189500	2831203	6.69
2007	360570	174900	2582310	6.77
2008	367020	227303	2445928	9.29
2009	363510	247000	2741787	9.01
2010	399200	226634	2464381	9.20
2011	391000	219000	3086407	7.10
2012	383000	199800	2772787	7.21
2013	367000	182900	2532084	7.22
2014	248000	189985	3088306	6.15
2015	195000	76197	3157669	2.41
2016	236521	227494	3022663	7.53

Source: Computed from FAOSTAT, (2018).

Table A2: Lag order selection criteria

Lag	Log L	LR	FPE	AIC	HQIC	SBIC
0	-22.7045		0.148335	0.92959	0.944065	0.967469
1	-10.5354	24.338	0.095727	0.491585	0.520534	0.567343
2	-8.1321	4.8066	0.09061	0.436553	0.479977*	0.55019*
3	-7.93889	0.38641	0.09354	0.468192	0.52609	0.619708
4	-5.87792	4.1219*	0.089756*	0.426585*	0.498959	0.61598

Source: Authors' Computation, 2018.

Appendix II: Post-estimation tests results

Table A3: Daigonistic test results

Tests	F-statistics	Probability
Breusch-Pagan Heteroscedasticity test	11.79	0.0006
Ramsey Reset test	0.78	0.5102
Durbin Watson test	2.064	

Source: Authors' Computation, 2018.