

Can Private Investment Sustain Cocoa Subsector Output in Nigeria? Empirical Evidence using Vector Error Correction Model: 1980-2016

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Abstract

This study was carried out to analyse effect of private investment on cocoa output in Nigeria using Vector error correction model. Based on the availability of data, secondary data consisting of annual times series covering a period of 37 years (1980-2016) were obtained from World Bank data base, food and agriculture organization and United Nations conference trade and development (UNCTAD). Data were analysed using vector error correction model (VECM) Impulse response and Variance decomposition. Results showed that the direction of cocoa (-0.001) and FDI (-0.000) were negative and significant at 1% and 5% level of significance. This implies that the direction of growth of cocoa decelerated over the period under review. In contrast, gross domestic private investment (0.003) was positive and significant at 1% level of significance. This implies that the direction of GDP is accelerated over the period under review. Results showed that the coefficient of determination (R^2) was 0.616 indicating that 61.6% variation in output of cocoa output were explained by cocoa output in the previous year, foreign direct investment in the previous year, gross domestic private investment in the previous year and labour in the previous year. This study showed that a unit increase in labour will decrease cocoa output by 16.65% and 3.25% respectively. Furthermore, results showed that cocoa output responded negatively to foreign direct investment and gross domestic private investment in both short and long run. In addition, results also showed that cocoa output responded positively to labour in both short and long run. The result showed that in the short run cocoa output contributed to itself by 82.09%, FDI contributed to cocoa output by 4.23%, GDP contributed to cocoa output by 3.98% and labour by 9.68%. The result also reviewed that in the long run cocoa output contributed to itself by 80.16%, FDI contributed to cocoa output by 4.91%. GDP contributed by 4.97% and labour by 9.93%. In conclusion, cocoa output responded negatively to foreign direct investment and gross domestic private investment in both short and long run. Finally, foreign direct investment contributed mostly to cocoa output in the short run while gross domestic private investment contributed mostly to cocoa output in the long run. It was recommended that

incentives such as credit facilities, tax reduction and improved seed varieties should be given to domestic and foreign private investors in order to significantly sustain the subsector.

Keywords: Private Investment, Cocoa Output, Error Correction Model

Introduction

Agriculture has contributed immensely to the growth and development of the Nigerian's economy, with high potentials for employment generation, food security and poverty reduction. Prior to the discovery of oil, Agricultural sector in the early 1960s served as the major source of employment, income and foreign exchange earnings for Nigeria. As at 1961, Nigeria was the leading exporter of groundnut with a world's share of 42%. The country also had 27% of the world's palm oil export, 18% of cocoa and 1.4% of cotton as the major West African cotton exporter. Up to the early 1970s, agriculture accounted for well over 80 percent of Nigeria's Gross Domestic Product (GDP) and the major value of the country's exports (Oluigbo, 2012). Unfortunately, the future, potentials and prospect of agricultural sector was lost immediately after the discovery of crude oil in the late 1960s and the huge financial gains benefitted from it made the government to shift its priority from agriculture to crude oil and relied on food importation as a means of feeding her citizens (Azih, 2011).

Nigerian economy is often described as a mixed economy. A mixed economy connotes a framework in which allocative mechanism in respect of what is to be saved, invested, produced and at what prices, is left to the forces of the market and not to any planning authority or government. The existence of the state is merely to buttress the mechanism and improve its efficiency (Aromoloran, 1998; Udo, 2016). It means that in a mixed economy, private sector should play the leading role while the public sector provides the enabling economic environment. It has been established that private investment is a critical driver of economic growth, indeed Guimaraes and Unteroberdoerster (2006), investigated similar issues with data from Malaysia and found that there is an evidence for a stable long-run relationship between real output growth and investment. Balls (2005) holds similar views that employment possibilities are created through investment and new technologies, thus increasing the revenues, which finally determine economic growth.

In spite of the various agricultural programmes and policies initiated by different administrations for the development of Agriculture in Nigeria, there has not been any phenomenal growth in agricultural output since the 1970s (Akpaeti *et al.*, 2014). Therefore, this study analysed effect of private investment on Cocoa subsector output using vector error correction model.

Methodology

Study Area: Nigeria derives its name from river Niger, it got her independence in 1960 and it is located at western region of Africa. Nigeria has a land mass area of 923,768.00 sq kilometres and lies between latitude 40 and 140 North of the equator and longitudes 30 and 140 East of the Greenwich meridian. It is bounded on the West by the Republic of Benin on the North by the Republic of Niger and on the East by the Federal Republic of Cameroun. On the North-East border is lake Chad while also extends into the Republic of Niger and Chad and touches the Northernmost part of the Republic of Cameroun. On the South, the Nigerian coast- line is bathed by the Atlantic Ocean.

Method of Data Collection: Based on the availability of data, secondary data consisting of annual times series covering a period of 37 years (1980-2016) were obtained from World

Bank data base, food and agriculture organization and United Nations conference trade and development (UNCTAD).

Techniques of Data Analysis: Growth model was used to ascertain direction and growth rates. vector error correction model (VECM) was used to analyse effect of private investment on cocoa output. Impulse response was used to examine response of cocoa output to a unit shock in private investment and Variance decomposition was used to assess contribution of private investment to cocoa output overtime.

Model Specification

VECM model for the effect of private investment on response of agricultural subsector output

In order to estimate the relationship between the variables if cointegration is found, the corresponding vector error correction equation will be estimated as

$$\ln C_{t-i} = \beta_0 + \beta_1 \ln FDI_{t-i} + \beta_2 \ln DI_{t-i} + \beta_3 \ln Lb_{t-i} + \gamma ECT_{t-i} + \varepsilon_t$$

Where

C_{t-i} = Cocoa subsector output (tons)

FDI_{t-i} = foreign direct investment (Naira)

DI_{t-i} = Domestic Private Investment (Naira)

Lb_{t-i} = labour (Mandays)

ECT_{t-i} = Error correction Term

ε_t = error term

Results and Discussion

TREND OF COCOA OUTPUT

The trend of cocoa is presented in Table 1 and figure 1. The result showed that cocoa output ranged between 140000 metric tons to 485000 metric ton with the mean of 289097.9 metric tons over the period under review. This implies that between the period of 1980 to 2016, an average of 289097.9 metric tons of cocoa was produced in Nigeria. This could be due to the government policies and programmes on cocoa production in Nigeria. This could also be due to the type of inputs used in cocoa production, availability of labor and capital, the area of land cultivated and environmental factors could also increase or decrease cocoa output. Specifically, the result showed that cocoa output decreases along the following periods as follows: between 1980 to 1983, it decreases from 156000 metric tons to 140000 metric tons; between 1984 to 1987, it decrease from 160800 metric tons to 150000 metric tons; between 1989 to 1990, it decrease from 256000 metric tons to 244000 metric tons; between 1994 to 1995, it decreased from 306000 metric tons to 203000 metric tons; in 1998 it was 107461 metric tons ; and finally , across 2004, 2009, and 2015, cocoa outputs were 360570, 363510, and 195000 metric tons respectively. The decrease in cocoa output over these periods could be due to pest and diseases attack , inadequate credit grants to farmers to boost their cocoa farming capacity, limited or fragmented land that discourages mechanization and environmental factors could also reduce the yield of cocoa over the period under review.

The result further showed that the output of cocoa increased over the period under review as follows: 1981, 1988, 1996, 1998, 2000, 2005, 2010 and 2016 and their corresponding outputs are 153000 metric tons, 253000 metric tons, 323000 metric tons, 370000 metric tons, 485000 metric tons, 399200 metric tons and 236521 metric tons respectively. This increase in cocoa output could be due to the following reasons; use of improved variety of cocoa with high

yielding capacity and pest resistant, cocoa farm mechanization, prosper execution and implementation of cocoa policies and programmes, proper handling of cocoa seedlings, inclusion of private and public sector in cocoa production, adequate funding of cocoa project and planting of cocoa seedlings in a conducive and favorable environment could increase its output to a large extent.

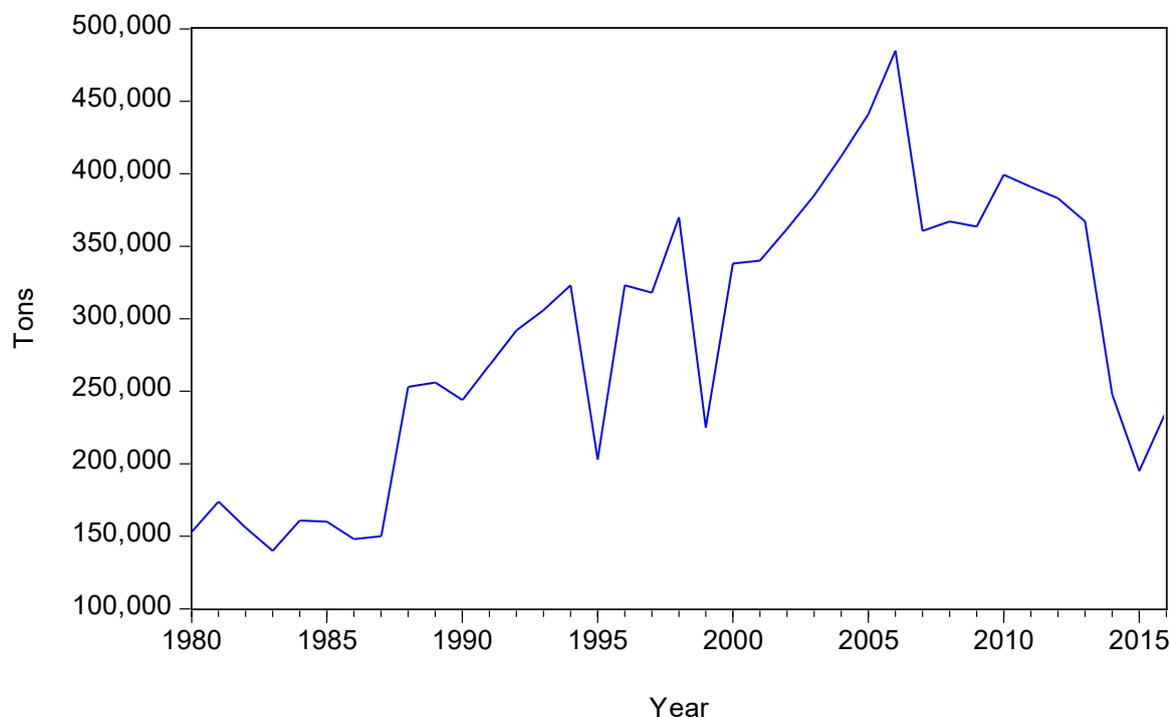


Figure 1: Trend of cocoa output

Table 1

Summary Statistic

Variable	Cocoa	FDI	GDPI
Minimum	140000.0	2.46E+09	4.18E+09
Maximum	485000.0	1.01E+11	2.19E+10
Mean	289097.9	2.96E+10	1.02E+10
Observations	37	37	37

Direction of Growth

The result of the direction of growth is presented in Table 2. The result showed that the direction of cocoa (-0.001) and FDI(-0.000) were negative and significant at 1% and 5% level of significance. This implies that the direction of growth of cocoa was decelerated over the period under review. This could be due to inconsistency in government agricultural targeted programmes on cocoa in Nigeria. FDI is also decelerated over the period under review and it could be due to the fiscal and monetary policy set up by the Nigeria government. In contrast, the result showed that gross domestic private investment (0.003) was positive and significant at 1% level of significance. This implies that the direction of GDPI is accelerated over the period under review. The acceleration of GDPI could be due to flexible macroeconomic policies that attract domestic private investors. These policies may be in the form of tax reduction, tax holiday, stable exchange rate and interest rate and adequate security that will guarantee the safety of life and properties could accelerate GDPI in Nigeria.

Furthermore, the result of growth rate is presented in Table 3. The result showed the growth rate were positive for cocoa, FDI and their corresponding values are 8.95% and 12.26% respectively for instantaneous growth rate and 9.36% and 13.04% for compound growth rate. Conversely, the result also showed that the growth rate of GDPI was negative with instantaneous and compound growth rates of -12.01 and -11.31 respectively.

Table 2
Direction of Growth

	Cocoa	FDI	GDPI
Constant	11.709	21.668	23.335
@Trend	0.089	0.122	-0.120
@Trend ²	-0.001***	-0.000***	0.003***
t-value	-5.962	-3.230	8.317
R ²	0.725	0.988	0.713
F-value	48.671	1515.284	45.762
Akaike criterion	-0.389	-1.348	0.457
Durbin-watson stat	1.249	0.376	0542
Pro(f-statistic)	0.000***	0.000***	0.000***
Decision	Decelerated	Decelerated	Accelerated

*** indicates stationary at 1% level of significance

Table 3
Instantaneous and Compound Growth Rate

	Instantaneous %	Compound Growth %
Foreign direct investment (FDI)	12.26	13.04
Gross domestic private investment (GDPI)	-12.01	-11.31
Cocoa	8.95	9.36

Stationarity Test (Unit Root Test)

The result of the stationarity test is presented in table 4. The result showed that all the variables were stationary at first difference.

Table 4

Augmented Dickey-Fuller Unit Root Test Result

Variables	Level		First difference		Decision
	t-statistic	Probability	t-statistic	Probability	
Cocoa	-2.15	0.2262	-7.80	0.0000***	1(1)
FDI	-1.25	0.6393	-5.17	0.0002***	1(1)
GDP	-1.35	0.5949	-5.17	0.0010***	1(1)
Labour	-0.00	0.9522	-9.75	0.0000***	1(1)

*** indicate stationary at 1% level of significance

**MacKinnon-Haug-Michelis (1999) p-values Source: Eview computation,2018

Cointegration between private investment and cocoa

The result of cointegration test between private investment and cocoa output is presented in Table 5. The result showed trace statistic (67.42) was greater than critical value (63.87) indicating that there is long run relationship between private investment and cocoa output with one cointegration equation

Table 5

Unrestricted Cointegration Rank Test Result On Cocoa

Hypothesized	Trace	0.05		
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.598861	67.42832	63.87610	0.0244
At most 1	0.489660	35.45763	42.91525	0.2267
At most 2	0.201296	11.91389	25.87211	0.8179
At most 3	0.109197	4.047128	12.51798	0.7353

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Eview computation,2018

Effect Private Investment on Cocoa Output

The result of the effects of private investment on cocoa is presented in Table 6. The result showed one cointegrating equation. The result of the cointegrating equation showed that the coefficient of determination (R^2) was 0.616 indicating that 61.6% variation in output of cocoa output were explained by cocoa output in the previous year, foreign direct investment in the previous year, gross domestic private investment in the previous year and labour in the previous year. The result further showed that in the long run labour was the only variable that significantly affected cocoa output. Therefore, the null hypothesis that states that GDP and FDI have no significant effect on cocoa output is accepted. Specifically, the coefficient of labour (-16.65) was positive and significant at 10% level. This implies that a unit increase in labour will reduce the output of cocoa by 16.65%. This could be due to marginal product of labour, that is, changes in output that result from employing an additional unit of labour while holding other factors constant. The output will continue to drop until labour becomes negative. It could also be due lack incentives and motivation by the employers of labour which

makes the labourers to put less effort in the production process. It could also be due to the drudgery involved in cocoa farming that gets the active and agile youths discouraged in cocoa farming activities.

The result further showed that in the short run, labour was the only variable that significantly affected cocoa output. Specifically, the coefficient of labour (-3.25) was negative and significant at 10% level. This implies that a unit increase in labour would decrease the output by 3.52%. This could be due to rural urban migration by the young active youth in search of white collar jobs thereby leaving cocoa farming to the old men and women in the village. This result disagrees with Audu et al (2017) who found that that labour contributed positively to the output of crop production.

Table 6
Effect of Private Investment on Cocoa Output

Cointegrating Eq:	CointEq1			
D(LNCOCOA(-1))	1.000000			
D(LNFDI(-1))	-0.604782			
	[-0.58056]			
D(LNGDPI(-1))	0.462108			
	[1.43312]			
D(LNLABOUR(-1))	-16.65782*			
	[-7.70152]			
C	0.488010			
Error Correction:	D(LNCOCOA,2)	D(LNFDI,2)	D(LNGDPI,2)	D(LNLABOUR,2)
CointEq1	-0.23	0.000889	-0.083032	0.101338
	[-2.82]	[0.03030]	[-0.78915]	[8.17974]
D(LNCOCOA(-1),2)	-0.388346	0.009822	-0.076906	-0.121684
	[-2.77845]	[0.20017]	[-0.43681]	[-5.86972]
D(LNFDI(-1),2)	-0.697225	-0.555589	0.024835	-0.030312
	[-1.60594]	[-3.64533]	[0.04541]	[-0.47073]
D(LNGDPI(-1),2)	-0.005591	0.120407	-0.236947	-0.040609
	[-0.03763]	[2.30878]	[-1.26620]	[-1.84301]
D(LNLABOUR(-1),2)	-3.258138*	-0.013513	-0.582662	0.261761
	[-3.77470]	[-0.04459]	[-0.53590]	[2.04466]
C	0.001091	-0.003116	0.007307	-0.001270
	[0.02697]	[-0.21942]	[0.14340]	[-0.21162]
R-squared	0.616274	0.379460	0.125515	0.857143
Adj. R-squared	0.547752	0.268650	-0.030643	0.831632
Sum sq. resids	1.550978	0.191139	2.460947	0.034119
S.E. equation	0.235355	0.082622	0.296464	0.034908
F-statistic	8.993751	3.424405	0.803767	33.59995
Log likelihood	4.243162	39.83508	-3.605064	69.12830
Akaike AIC	0.103343	-1.990299	0.565004	-3.713430
Schwarz SC	0.372701	-1.720941	0.834362	-3.444072

Mean dependent	0.008889	-0.000528	0.008059	0.000183
S.D. dependent	0.349974	0.096612	0.292024	0.085073

Determinant resid covariance (dof adj.)	3.38E-08
Determinant resid covariance	1.55E-08
Log likelihood	112.6734
Akaike information criterion	-4.980790
Schwarz criterion	-3.723787

*indicate stationary at 10% level of significance respectively

Impulse Response on the Effect of Private Investment on cocoa Output

The result of the unit shock of private investment on cocoa output overtime is presented in Figure 2. The graph showed that cocoa output responded positively to itself in both short (5yrs) and long run (10yrs). The graph also showed that cocoa output responded negatively to foreign direct investment and gross domestic private investment in both short and long run. The result further showed that cocoa output responded positively to labour in both short and long run

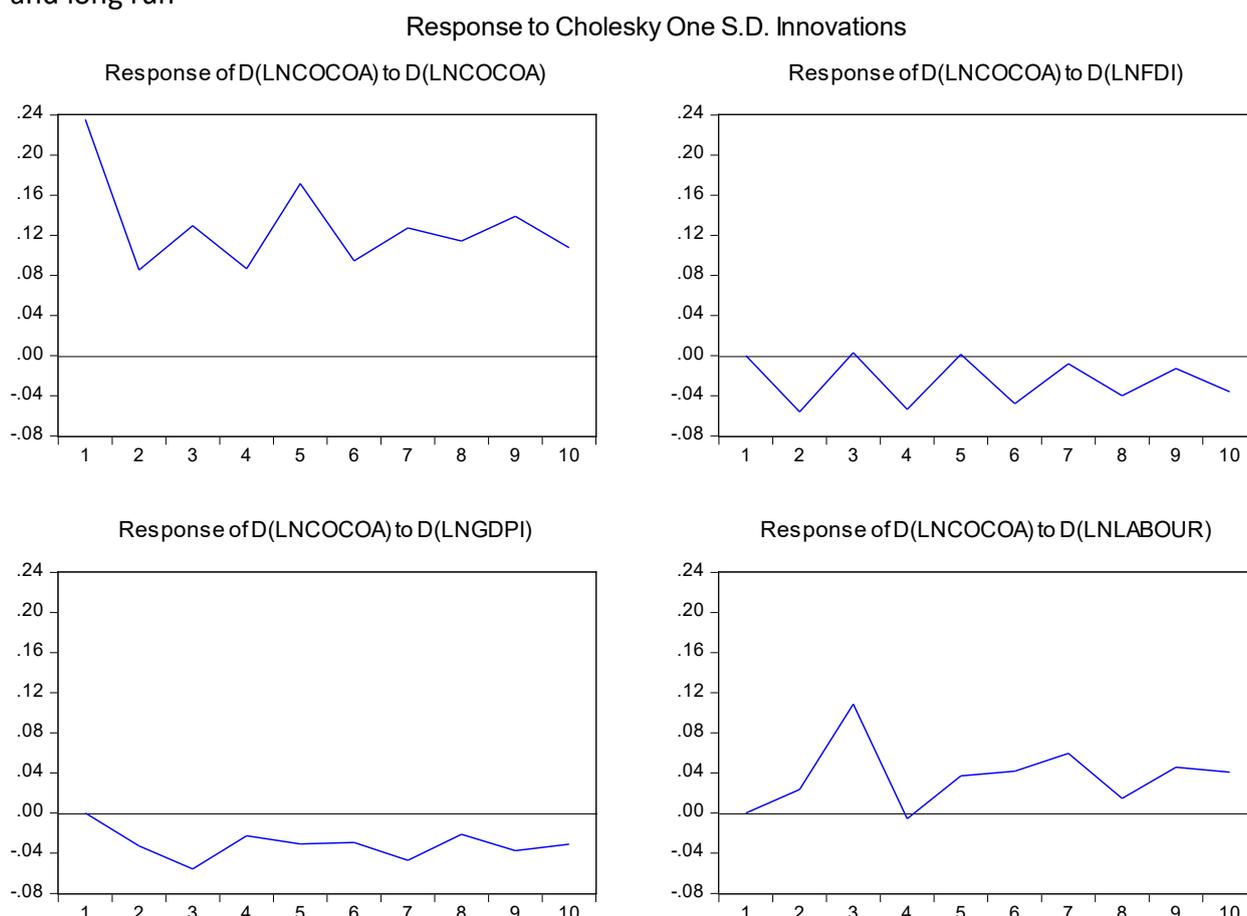


Figure 2.

Variance Decomposition on Effects private Investment on Cocoa

the result of the contribution of private investment to cassava output over time is presented in Table 7. The result showed that in the short run cocoa output contributed to itself by

82.09%, FDI contributed to cocoa output by 4.23, GDPi contributed to cocoa output by 3.98% and labour by 9.68. The result further showed that in the long run cocoa output contributed to itself by 80.16%, FDI contributed to cocoa output by 4.91%. GDPi contributed by 4.97% and labour by 9.93%.

Table 7

Variance Decomposition for Cocoa Output

Period	S.E.	D(LNCOCOA)	D(LNFDI)	D(LNGDPI)	D(LNLABOUR)
1	0.235355	100.0000	0.000000	0.000000	0.000000
2	0.259659	92.97704	4.625397	1.583351	0.814209
3	0.314838	80.18819	3.154971	4.219721	12.43712
4	0.331728	79.04828	5.449481	4.270190	11.23205
5	0.376512	82.09686	4.231592	3.983974	9.687572
6	0.394430	80.55877	5.320131	4.177955	9.943140
7	0.421436	79.68917	4.696862	4.905754	10.70821
8	0.439213	80.13468	5.144929	4.749896	9.970497
9	0.464610	80.56139	4.673213	4.890107	9.875291
10	0.480992	80.16523	4.918636	4.979754	9.936383

Conclusion And Recommendations

This study was carried out to analyse effect of private investment on Cocoa subsector output using vector error correction model. The result found that trend of cocoa output undulated and decelerated, foreign direct investment also decelerated while gross domestic private investment accelerated during the period of study. Also, results show that both foreign direct investment and gross domestic private investment have no significant effect on Cocoa output during the period under review. Furthermore, that cocoa output responded negatively to foreign direct investment and gross domestic private investment in both short and long run. Finally, foreign direct investment contributed mostly to cocoa output in the short run while gross domestic private investment contributed mostly to cocoa output in the long run.

It was therefore recommended that:

- i) Given that private investment does not significantly affect cocoa output, incentives such as credit facilities, tax reduction and improve seed varieties should be given to domestic and foreign private investors through in order to significantly sustain the subsector.
- ii) Targeted programmes such as youth empowerment scheme aimed at reducing rural and urban migration should be set up, given that labour negatively affect cocoa output in both long and short run.

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