

EFFECTS OF PRICE AND EXCHANGE RATE FLUCTUATIONS ON AGRICULTURAL EXPORTS IN NIGERIA

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ABSTRACT

The study focused on the effects of price and exchange rate fluctuations on Agricultural exports (cocoa) in Nigeria. Secondary data were collected from the publications of Central Bank of Nigeria (CBN): Statistical Bulletin, Economic and Financial Reviews, Bullion and Annual Reports and Statement of Accounts (various issues). Other sources included the Trade Summary and Abstracts of Statistics published by the Federal Bureau of Statistics and the International Statistics of the IMF. An export supply function for cocoa was specified and estimated using the Ordinary Least Squares Regression. Results showed that exchange rate fluctuations and agricultural credits positively affect cocoa exports in Nigeria. Results also revealed that relative prices of cocoa are insignificantly related to quantity of export, however, it has a negative sign which is in line with the a priori expectation. The result, therefore, implies a positive significant effect of exchange rate volatility on cocoa exports in Nigeria. The recommendation that agricultural credit schemes should be restructured in a way that should meet the needs of farmers; and such credit facilities should be made available and accessible to cocoa farmers in order to boost their production capacity. Exchange rate has impacted positively on cocoa export in Nigeria, hence, there should be a free market determination of exchange rate for export of cocoa in Nigeria

Keywords: *Cocoa, Exports Effects, Price, Exchange Rate*

INTRODUCTION

Agricultural activities in Nigeria centre on crop production, animal husbandry, fishing, food processing and forestry; and majority of the operators produce in small scale. The system of cultivation includes shifting cultivation, crop rotation, mixed farming and small-scale irrigated agriculture, which is practiced in the North. Livestock farming is largely nomadic while fishing is mainly artisanal with low technical inputs (Eyo, 2005). Before 1970's, agriculture was the pride of the Nigerian economy and it contributed over 60% to the Gross Domestic Product (Famoriyo, 1981). It also

effectively provided employment for over 70% of the population and met the food, raw materials and foreign exchange needs of the country. However, since the discovery of crude oil in early 1970's, and the increase in prices of crude oil, petroleum sub-sector gained pre-eminence over agriculture, while the value of agricultural exports to the total imports consistently declined. However, the 1986 devaluation of the naira increased the demand for agricultural products and raised prices of agricultural commodities over the years (Adubi and Okunmadewa, 1995). The fluctuations, frequency and instability of the exchange rate movements since the beginning of the floating exchange rate have raised a concern about the impact of such movements on agricultural trade flow in Nigeria (Okunmadewa, 1999).

Between 1970 and 1977, there was stability in both prices and exchange rate of cocoa export in Nigeria. This was as a result of controlled export prices by the Nigeria commodity board. Between 1978 and 1982 there was an upsurge of exchange rate which was due to the introduction of both managed float and dollar pegged systems of exchange rate policies in the country. The fluctuation, therefore, reduced the quantity of cocoa export. Between 1982 and 1985 (pre-SAP era) there was stability in both managed float and dollar pegged systems of exchange rate relative to prices of cocoa. Failure of the Breton Woods system to maintain exchange rate policies affected African countries including Nigeria. The country had since 1986 experienced erratic changes in her exchange rates partly due to fluctuations in the major currencies of developed countries such as dollars, pound sterling and Swiss franc. This has become a major source of internal economic shock since Nigeria has strong links with developed countries in trade and payments as well as monetary arrangements. However, most of the empirical work in this area is generally unable to establish a statistically significant link between exchange rate fluctuations and agricultural export.

In a developing economy like Nigeria, where export price fluctuates as a result of currency devaluation which is expected to be an incentive for export growth, the primary concern is the nature and magnitude of risk introduced by the price and exchange rate movements in agricultural exports. Many researchers who conducted researches on the effects of price and exchange rate movements on agricultural tradable had inconclusive results, leaving a gap in this area. For instance Kargbo (2006), found that prices, real exchange rates, domestic production capacity, and real incomes have significant impacts on the agricultural export. Studies by IMF (1984) and DeGrauwe (1988) show that exchange rate variability causes fluctuations in export revenue. In spite of the government effort to improve export, the agricultural sector is yet to respond to such policy signals, instead the performance of the agricultural exports remain dismal and discouraging. Of the massive documents on the effects of exchange rate volatility on macroeconomic variables, only very few had attempted to identify the role of third world countries' exchange rate volatility on domestic macroeconomic variables (Clark, 2007).

The theory of export otherwise known as the international trade theory as it is known today sprang from the works of Adam Smith, precisely from his "An Enquiry

into the Nature and causes of Wealth of Nations", published in 1776. Nevertheless, before Adam Smith, the prevailing idea that surrounded export was that of the mercantilist school of thought which was based on the belief that the total wealth of the world was fixed. Hence, as countries would involve in trade freely, material gains achieved by some nations would be at the expense of, at least, some other nations. The mercantilists maintained that a country's wealth was measured by its holdings of gold and silver (Mahoney, Trigg, Griffin and Pustay 1958). This required the countries to maximize the difference between its exports and imports by promoting exports and discouraging imports. Precisely, the mercantilists posited that a nation, which imported more goods than it exported abroad, would lose gold and silver, which were the measures of wealth then, in paying for the imported goods. Succinctly, the mercantilists restricted trade policy was refuted by Adam Smith (1776) in his work "An Enquiry into the Nature and Causes of the Wealth of Nations", which became the basis for export trade postulate of the classical and neoclassical economists, (Essien, 2006).

Heckscher-Ohlin Export Theory

Two Independent Swedish Economists: Eli Heckscher and Bertil Ohlin in 1933, postulated a theory called *Heckscher - Ohlin theory* of export (trade). The theory states that the main determinant of the pattern of production, specialization and export among regions is the relative availability of factor supplies. Regions or countries have different factor endowments and factor supplies. Therefore, some countries that are rich in capital will export capital-intensive goods and countries that have much labour will export labour-intensive goods. Heckscher - Ohlin theory presents the issue that international and interregional differences in production costs occur because of the differences in the supply of production factors (Ball, McCulloch, 1999). Those goods that require a large amount of the abundant, that is, less costly, factor will have lower production costs, enabling them to export for less in international markets (Salvatore, 1995).

Johnson (1969) argued that prices and exchange rate are perfectly flexible and any shock arising from the changes in the nominal exchange rate will be absorbed through changes in prices, leaving the Real Effective Exchange Rate (REER) and trade volumes unchanged. Hence, export may be negatively correlated with exchange rate variability. Ether (1973) found out that uncertainty of exchange rate is detrimental to world trade. In contrast, De-Grauwe (1988) found that exchange rate variability is an insignificant factor for exporters. Thus, the search for the true relationship between price, exchange rate volatilities and export volumes up-surged in 1970's. The controversy thus, generated a vast empirical literature. With respect to Nigeria, Uganda and other less developed countries, Adubi and Okunmadewa (2000), Kyle and Swisnen (1994), Riedel and Donges (1977), and Kwanshie (1997) found a large significant influence of Real Exchange Rate (RER) on agricultural exports. In their separate findings, they found that exchange rate volatility has a stronger negative

effect on exports in Nigeria. Sheldon and McCorrison (2002), in their study on estimating the effects of exchange rate volatility on export volumes found that exchange rate instability thus discourages agricultural production and export by causing volatility in both the cost of inputs and in expected export revenues. This confirms the result obtained by De Grawue and Bellefoid (1986). Steinherr (1989) demonstrated that long-run changes in exchange rate seem to have more significant impacts on trade volumes than do short run exchange rate fluctuations. Vianne and Vires (1992) argued that even if appropriate monetary measures are made available, short-run exchange rate volatility still affects trade because it increases exchange rate volatility.

Dovoodian (1999), Krugman (1989), Mundell (2002) and Wei (1999) argued that the elimination of imperfection is rather costly as a basis to avoid exchange rate risk particularly in developing countries. This leads to the conventional argument that price and exchange rate volatilities cause revenue uncertainty that will affect trade due to risk aversion, irreversible investment in productive capital or both (Ether, 1973; Demers, 1991; Sercu, 1992). De Grawue (1988) illustrated how the relationship between exchanges rate volatility, whether long-run or short-run, and trade flows is analytically indeterminate which allows for sufficient flexibility in assumptions. This suggests that the effects of exchange rate volatility on trade volumes remain a fundamentally empirical issue. The empirical literature on this issue is mixed. Several researchers have found that exchange rate uncertainty may induce marginal producers and traders to shift from traded to non-traded goods thereby affecting trade volumes (Arize 2000, 2004, Broda and Romlis 2004, Chowdhury 1993 and Pozo 1992).

Cho, Sheldon and McCorrison (2002) found that there is strong negative impact of exchange rate uncertainty on agricultural trade compared to other sectors for a simple bilateral trade flows across countries. Using monthly data disaggregated by markets of destination and sectors, De Vita and Abbott (2004) found that, UK exports to the EU14, in aggregate and across sectors are largely unaffected by short-term exchange rate volatility. In Cameroon for instance, studies of agricultural export behavior by Amin (1996) and Tshibaka (1997) estimated the effects of exchange rate policies on prices of export crops and on Cameroon's agricultural export competitiveness. The results from the OLS estimation showed that the ratio of the prices, and income were statistically significant at 5% level, and the signs were in line with the priori expectations. The response of cocoa and cotton to foreign income was fairly elastic for cocoa and fairly inelastic for cotton.

Weis (2007) found that till date there is no study that compares the impact of exchange rate volatility on agricultural exports versus trade volume from other sectors of a developing country to the United States. The main objective of this study is to establish a quantitative relationship among price, exchange rate fluctuations and cocoa exports in Nigeria. The specific objective of the study is to determine the effect of price and exchange rate fluctuations on cocoa export in Nigeria.

RESEARCH METHODOLOGY

The data were obtained from the publications of Central Bank of Nigeria (CBN), namely the Statistical Bulletin, Economic and Financial reviews, Bullion (various) and Annual Reports and Statement of Account(various issues) Other sources were the Trade Summary and Abstracts of Statistics published by the Federal Bureau of Statistics and the International and Statistics of the IMF. The empirical models are specified based on the set objective of the study.

Agricultural export supply model

An agricultural export supply model as shown in equation 1 is used to analyse the specific objective of the study. The model is of the form:

$$Q_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 \Delta RP_t + \alpha_3 \Delta CRE_t + \alpha_4 EV_t + e_t \quad \dots\dots\dots 1$$

Where: Q_t = export quantity (tons)

α_0 = Constant

$\alpha_1 - 4$ = parameters to be estimated

Y_{t-1} = real GDP (Income) of importing country lagged one year (\$US)

ΔRP = relative prices (ratio of export price to domestic price).

ΔCRE_t = Agricultural export credit (NM)

EV_t = Exchange rate volatility

e_t = Stochastic error term satisfying the normal classical regression assumption.

The agricultural export supply model for the cocoa is modeled following the Subramanian (1989).

Cocoa Export Function

The export supply function of cocoa is specified as follows:

$$Q_{cct} = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 RC_t + \alpha_3 CRE_t + \alpha_4 EV_t + e_t \quad \dots\dots\dots 2$$

Where:

Q_{cct} = Export quantity of cocoa (tons)

Y_{t-1} = Real GDP (income of importing country lagged one year (\$US)

RC_t = Relative prices of cocoa (ratio of export price to domestic price)

CRE_t = Agric export credit (NM)

EV_t = Exchange rate volatility

e_t = Stochastic error term

Measure of Volatility

The study embraces the procedures used by Clark (2004) to measure the volatility of exchange rate. The commonest measure of exchange rate volatility is the standard deviation of the growth rate of real exchange rate (v).

$$V_{t+1} = \frac{\alpha_{01}}{m} \left[\sum_{i=1}^m (R_{t+i-1} - R_{t+i-2})^2 \right]^{1/2} \quad \dots\dots\dots 3$$

Where:

R = Natural log of bilateral real exchange rate.

M = Order of moving average.

An alternative measure of exchange rate volatility is defined as the varying -twelve month coefficient of variation (cv) of the real exchange rate. Given as:-

$$CV_{t-m} = \frac{\sum_{i=1}^m (R_{t+i-1} - R_{t+i-2})^2}{E} 1^{1/2} \dots\dots\dots 4$$

Where: E = Mean of the bilateral real exchange rate between months t and $t - m$,
 cv = coefficient of variation (a measure of exchange rate variability). It should be noted that in the vast literature on exchange rate volatility and trade, there is no consensus on the appropriate method of measuring such volatility. This lack of agreement reflects a number of factors which include changes in price and exchange rates and macro economic environment (Clark, 2004) argues that theory cannot provide definitive guidance as to which measure is most suitable. However, the study has to some extent dictate the standard deviation of the growth rate real exchange (v) as most suitable for developing economies. The underlying idea forecasted, based on the past values of the rate and countries engaging in agricultural exports trade would naturally make an effort to developing such forecast.

Estimation techniques and Equations

Equations 2 and 4 were estimated by Ordinary Least Square (OLS). The Augmented Dickey - Fuller (ADF) test was used to determine the time series properties of the variables as specified and defined in equation 1. The Augmented Dickey - Fuller (ADF) test was used to estimate for the presence of a unit root. The ADF test assumes that the data generating process is autoregressive to the first order. This is done so that the auto regression in the error term would not be biased to the test. The ADF include first difference lags in such a way that the error term is distributed as a white noise.

RESULTS AND DISCUSSION

Table 1 shows the results of the unit root test statistics for the variables studied. A comparison of the ADF test statistics with the Mckinon critical values reveals that the variables: relative prices of cocoa, Income of importing country, exchange rate volatility, are stationary at first difference, suggesting the rejection of the null hypothesis of non - stationarity of the variables. The stationarity of the variables at first difference indicates that depending on their lagged structure (levels/order) used, the variables (relative prices, exchange rate variability, agricultural credit and income) show a trend.

Table 2 shows the regression results of the estimation of the cocoa export function in Nigeria. The results reveal that the coefficients of agricultural credit (CREt) and exchange rate fluctuation are significant at 1% and 10% respectively. The result

implies that an increase in agricultural credit to cocoa farmers will correspondingly leads to an increase in quantity of cocoa exported by the farmers. The results also revealed that relative prices of cocoa are insignificant relative to quantity of export. However, it has a negative sign which is in line with a priori expectation. This result is in contrast to a research carried out by Kwanshie (1997) on exchange rate and trade liberalization of non-oil exports in Nigeria, who found that the relative prices of palm kernel, rubber and groundnut were significant at 5% in all the commodities except for cocoa. The result also is in contrast with the research conducted by Riedel and Donges (1977), Ghura (1994), Kyle and Swisues (1994) and Jarvis (2004). Their results revealed that price elasticities of cocoa export are greater than unity. This implies that, a limited response of export supply to relative price changes can be attributed to the price constraining nature of the international market price of cocoa.

In Co'tde'Ivoire, Trivedi and Akaiyama (2005) findings in evaluating pricing policies for perennial crops vary across commodities, while coffee was highly sensitive to price factors, cocoa was less price sensitive. The results also revealed that exchange rate volatility was significant at 10%. This may imply that exchange rate volatility has a negative impact on cocoa export in Nigeria. The result also implies that, as exchange rate volatility increases, it causes a corresponding reduction in cocoa export in Nigeria, thereby reallocating resources to other crop sectors. This result is in line with the research findings by Adubi and Okunmadewa (1999), which show that exchange rate volatility impacts on cocoa export negatively while price factors positively affect (encourages) cocoa export in Nigeria. This result is in contrast with the research findings by Garba (1998) who found out that exchange rate volatility was significant at 10% level and that it had the expected positive sign suggesting that the nominal devaluation of the Naira/US\$ exchange rate had a positive impact on agricultural export commodities in Nigeria. The R² and F- Statistics values indicate that the export functions specified are good fits of the data used. Durbin - Watson value of 2.11 indicate that there is no autocorrelation.

CONCLUSION AND RECOMMENDATIONS

The study primarily aimed at determining the effect of price and exchange rate volatility on cocoa export in Nigeria. The study was based on export supply function. The ordinary least square (OLS) regression was used to estimate the coefficients of the variables influencing cocoa exports in Nigeria. The OLS regression estimates reveals that agricultural credit and exchange rate volatility have a positive impact on export of cocoa in Nigeria. The ADF test statistics reveals that there is evidence of stationarity only at the first difference of the variables. The OLS regression results show that exchange rate volatility and relative price have a negative effect on cocoa export in Nigeria. The result revealed a positive significant effect of exchange rate volatility on cocoa export in Nigeria. The results also show that agricultural credit has a positive significant effect on export of cocoa, in Nigeria. The relative prices, though insignificant, do not have direct negative effect on export of cocoa.

Based on the findings of the study, the following measures are suggested. Agricultural credit schemes should be restructured in a way that should meet the need of the farmers; such credit facilities should be made available and accessible to cocoa farmers in order to boost their production capacity. Exchange rate has impacted positively on cocoa export in Nigeria; hence, there should be a free market determination of exchange rate for export of cocoa in Nigeria.

Table1: Unit Root Test Statistics

Variables	ADF Test Statistics	Critical Value of ADF at 1%.
Q_{cct}	-2.674	-4.244
ΔQ_{cct}	-6.105*	-4.263
R_{ct}	-3.744	-4.253
R_{ct}	-5.091*	-4.263
Y_{t-1}	-4.629*	-4.253
Y_{t-1}	-3.179	-4.356
CRE_t	-3.067	-4.356
CRE_t	-9.031*	-4.253
EV_t	-4.948*	-4.244
EV_t	-6.836*	-4.263

Note: Lag length selected automatically based on Akaika Information Criterion (AIC) and Schwarz Information Criterion (SIC). Variables are as defined on equation 2. *= Stationary at 1 percent level.

Table 2: Results of the Estimation of cocoa Export Function

Variables	Co-efficient	Standard Error	T-Statistics
Constant	182.96	26.727	6.8453***
Y_{t-1}	0.000409	0.000463	0.8839
R_{ct}	-0.421679	1.29723	-0.3251
CRE_t	0.532195	0.15599	3.4119***
EV_t	0.545752	0.30602	1.7834*
R^2	0.4303		
R^2 Adjusted	0.3568		
F-statistics	5.852		
DW	2.11		

*, *** = Mean significant at 10% and 1% respectively

N/B: Variables are as defined on equation 2.

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