The Determinants of Demand for Nigeria's Agricultural Export Commodities

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Abstract: This study examined those factors that influence the demand for Nigeria's agricultural export commodities. It relied on secondary data collected from the publications of the Federal Office of Statistics, Central Bank of Nigeria, World Bank and International Monetary Fund. The data were analyzed using descriptive statistics and the Auto-regressive Distributed Lag (ADL) model. The paper found out that the proportion of agricultural export commodities to total export has continued to decline. The current and expected per capita income of the importing countries, and the expected quantity of cocoa imported are positively associated with the demand for these agricultural while the current and expected relative prices of these commodities are negatively associated with the demand of agricultural export commodities. In addition, the traditional agricultural export commodities are inelastic in the short run while those of the non-traditional agricultural commodities are elastic in the long run. It is recommended that Nigeria should make these export commodities' prices to be cheap in order to increase the level of demand in the importing countries.

Key words: Agricultural commodities, determinants, export demand, ADL

INTRODUCTION

Agricultural commodity trade has played a prominent role in Nigeria's economic development. Such important roles include the provision of employment for over 50% of the labour force directly and indirectly involved, supply of food and raw materials for domestics and foreign industries, provision of income sources (for a large proportion of the population) and provision of foreign exchange earnings for use in its sub-sectors and other sectors of the economy.

Agricultural commodity exports (of Nigeria) can be categorized into two namely traditional and non-traditional agricultural commodities. The prominent traditional commodity exports include cocoa, palm oil, palm kernel, rubber, cotton, groundnut and kola nut among others while the non-traditional include pineapple, cashew, eggs, processed fruits and alcoholic beverages etc which have emerge as the most demanded products in the international market (UNIDO, 1992).

The export crop sub-sector of the agricultural sector was responsible for an average of 58.4% of annual foreign exchange revenue from 1960-1970 (Philip, 1996). However, the situation has since changed negatively as the entire sector contributed to foreign exchange earnings an average of about 5.3% annually between 1971 -85 and less than 4 percent from 1980 to 2001 (CBN 2002).

During much of the 1970s, Nigerian experienced substantial capital inflow, largely from oil export. The high revenue from oil export coupled with the implicit taxation of agricultural export commodities by the erstwhile commodity boards and the restrictive agricultural price policies which shifted the terms of trade against the agricultural sector were responsive for the dismal performance of the agricultural export sub sector.

In bid to correct this pattern and other distortions in the economy, the SAP was adopted in 1986 and implemented to restructure the consumption and production patterns of the economy as well as eliminating the price distortions and heavy dependence on crude oil export and import of consumer and producer goods (Ihimodu, 1993). The SAP on one hand had short run positive effect on farmers producing the traditional agricultural commodities such as tea, coffee, cocoa, and rubber due to the low income and price elasticity coefficients for these commodities. One the other, SAP opened up the export of new commodities that have become popularly demanded internationally. These include tomatoes, pepper, eggs and pineapple among others. And according tot Islam and subramanian (1989) and Matthews (1994) these conventional commodities are important vehicles for the future growth of tropical developing countries.

This study is different from others in the sense that earlier ones focused mainly on individual traditional agricultural export commodities or a combination of two or more (Olayide, 1972; Oni, 1972; Ajobo, 1992; Tijani, 1998; Imaghiagbe, 2000). Not only is there no know study of Nigeria's non-traditional agricultural commodity exports, there is also no known comparative analytical

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study of both category (traditional and non-traditional) of agricultural export for Niger although Islam and subramanian (1989), Matthew (1994) had carried out some studies outside Nigeria.

The objective of this study therefore is to comparatively and economically analyse the demand characteristics of selected Nigerian traditional and non-traditional agricultural commodity exports. Specifically we want to (i) estimate the determinants of export of the selected Nigeria's traditional and non-traditional exports and (ii) determine the elasticity of demand for the selected commodities.

Theoretical framework: Nigeria's supply of agricultural commodity export depends on the difference between the total national output of such commodities and the sum of total domestic demand and quantity smuggled out of the country. Mathematically, this can be represented as

$$N_{sil} = N_{uit} - (N_{Dit} + N_{Git})$$

N_{sil} = Total national export supply of agricultural commodity i in year

N_{uit} = Total national output of agricultural commodity i in year t

N_{Dit} = Total national domestic demand of agricultural commodity i in year t

N_{Git} = Total quantity of agricultural commodity it smuggled out in year t

When the domestic price is very competitive and demand is high due to increase in domestic income or other favourable factors, there will be a reduction in supply to world market and vice versa. Furthermore the degree of smuggling also tends to lower or increase the available supply for world market. According to Stevens (1989) economic performance of the consuming countries and their reliability equally affects the prospects of agricultural commodity producers as measured by the income elasticity of demand. Unfavourable changes in the structure of demand and output, taste, technological progress and agricultural protection s in can spur a decline in demand for agricultural commodity exports by the consuming centres despite favourable movement in their economic performance, just as some of these changes can equally cause a decline in supply from exporting countries.

MATERIALS AND METHODS

Aggregate time-series data on the quantity and prices (Free on Board (fob)) of selected traditional (cocoa, cotton

and palm produce) and non-traditional (spices and nuts) agricultural commodities from 1980-2002 were extracted from the FOS (Federal Office of Statistics) (Nigeria Trade Summary); Central Bank of Nigeria (CBN) (Annual Report and Statement of Accounts, Statistical Bulletin, Economic and Financial Review); World Bank (World Development Indicators) and IMF (International Financial Statistics) publications. Other data extracted were those of the GNP per capita and the GNP deflators of the importing countries and the direction of trade of agricultural commodity export from Nigeria between 1980 and 2002.

The data were analyzed with the aid of descriptive statistics and the Auto-regressive Distributed Lag (ADL) model. Models are model with lagged dependent and independent explanatory variables. Due to its over-parameterization and the likelihood of multicollinearity, an unrestricted ADL formation will likely yield inefficient estimates of individual coefficients. To overcome this problem, a more parsimonious parameterization with limited number of lags is adopted. This is a restricted ADL (Sims, 1974). The demand function for agricultural exports commodity from Nigeria s with developing country exports (Goldstein and Khan, 1985) is implicitly specified as:

$$Qd_i = (Y_r, P_{ei}, P_i) \qquad (1)$$

Where

Qd_i = Quantity of the ith agricultural commodity exported.

Y_r = Average per capita income of importing country(ies) obtained by dividing their national income or GNP by the total population

P_{ei} = International price of the ith agricultural export commodity in the international market. This is approximately equal to the free on board (fob) price.

P_i = Average price level or GNP deflators of the importing countries. It (price level) is the ratio of a country's purchasing power parity rate (a measure of the relative purchasing power of different countries over equivalent goods and services) to its official exchange rate for United States dollars.

The above equation in its explicit form is written as

$$Qd_i = a_o + a_1 Y_r + a_2 (P_{ei}/P_i) + e_i \qquad (2)$$

The double log form of this equation was estimated following (Islam and subramanian 1989 and Baye 1998). This is specified as:

$$logQd_i = loga_o + a_1 logY_r + a_2 log(P_{ei}/P_i) + e_i \qquad (3)$$

It is expected that $a_1 > 0$ and $a_2 < 0$ as measures of income and price elasticity of demand, respectively.

The estimated ADL version of Eq. 3 is given in Eq. 4 with a lag length of 1 as:

$$\text{Log}Qd_t = \text{Log}a_o + a_{11}\,\text{Log}Y_{rt} + a_{12}\,\text{Log}Y_{rt-1} + a_{21}\,\text{Log}(P_{ei}/P_i)_t + a_{22}\,\text{Log}(P_{ei}/P_i)_{t-1} + a_{23}\,\text{Log}Qd_{it-1} \qquad (4)$$

Where Qd_{it-1} is the expected quantity of agricultural export in year t -1. It is applicable for the adjustment of exports to excess demand in the consuming centres. This adjustment is measured by a_{31}, which is expected to be greater than zero. The coefficient of adjustment can thus be obtained as:

$$D = 1 - a_{3i} \qquad (5)$$

D is expected to have a value between zero and unity (0<D<1). But when it is greater than unity (D>1), we have an overly adjusted model (Houthakker and Khan, 1969; Khan 1974; Okonkwo, 1989). This coefficient of adjustment is applicable for determining the long-run elasticity vis-à-vis the stability of an export commodity to changes in incomes and prices in consuming markets. Therefore,

$$\text{Long run elasticity} = \frac{\text{Short run elasticity}}{\text{Coefficient of adjustment}}$$

The sign of the adjustment coefficient determines the relationship between the short-run and long run elasticity. Hence, if D<0, then short-run effects are greater than long-run effects, whereas when D>0, then long-run effects are more important (Houthakker and Khan,1969).

However, when ADL is used in modeling an economic relationship, the Durbin-Watson statistics normally used in detecting autocorrelation becomes inconclusive. Hence, a modified Durbin's h is used. This is presented as:

$$h = (1 - 0.5\delta)\sqrt{n/1\text{-n (var }Q_{t-1})}$$

Where δ = Durbin-Watson statistics, n is the sample size and var Q_{t-1} is the estimated sampling variance of the coefficient of lagged dependent variable in the OLS regression. If h>1.645, then there is the presence of autocorrelation (Gujarati, 1988).

RESULTS AND DISCUSSION

Trends in agricultural export: The table below shows the contribution of agricultural export to total export since the pre independence era.

Table 1: Share of agricultural export in total export

Period	Total export Nm	Agricultural export Nm	% in Total
1955-59	271.80	234	86.1
1960-64	358.00	284.6	79.5
1965-69	520.50	295.6	51.8
1970-74	1198.90	182.2	15.2
1975-79	1761.20	89.8	5.1
1980-84	1317.90	41.2	3.0
1985-89	5044.10	181.6	3.6
1990-94	16593.0	34.5	2.1
1995-99	86092.3	1377.5	1.6
2000-02	76085.0	1521.7	2.0

Source: CBN Annual Report and Statement of Accounts (Various Issues)

Table 2: Result of ADL regression of export of some nigerian commodities 1980-2002

Variables	Cocoa	Cotton	Palm-produce
Constant	-16.92 (0.73)	44.62 (0.98)	24.54 (1.14)
$\text{Log}Y_{rt}$	0.33 (0.18)	1.91 (0.53)	0.70 (0.46)
$\text{Log}Y_{rt-1}$	1.69 (2.87)***	0.21 (2.10)**	0.50 (2.40)**
$\text{Log}(P_{ei}/P_i)_t$	-0.73 (0.56)	-0.07 (2.02)**	-0.53(2.79)***
$\text{Log}(P_{ei}/P_i)_{t-1}$	-1.94 (1.97)**	-2.17 (1.79)*	-0.55 (0.90)
$\text{Log}Qd_{t-1}$	0.22 (2.57)**	0.14 (1.96)**	0.16 (2.27)**
R^2	0.66	0.64	0.73
LRE	0.28	0.16	0.19
Durbin's h	0.17	0.46	0.14

Source: Computer Printout of ADL Regression. Figures in bracket are t-values

It can be observed that agricultural export dropped from 86% of the total export in 1955-59 period to about 15.2% in the oil boom era and to its lowest ebb of 1.6% just before the turn of the century.

The results of the analysis for the traditional agricultural commodity export crops are presented in Table 2. From Table 2, it is observed that about 66 percent of the variability in the export of Nigeria's cocoa is accounted for by the explanatory variables included in the model. As for the cotton, the R^2 is 0.64 while that of palm produce is 0.73. The Durbin's h values obtained for the models shows that there is no autocorrelation of the error terms in any of the models since the Durbin's h are less than 1.645.

The significant determinants of the export of Nigeria cocoa are the expected per capita income of the importing countries, the expected relative price of cocoa in the importing countries and the expected quantity of cocoa imported. To be precise, a 1% increase in the expected per capita income of the importing countries and the expected quantity of export, the quantity of cocoa exported is increased by 1.69 and 0.22%, respectively. On the other hand, a percent increase in the expected relative price of cocoa in the importing countries will lead to 1.94% reduction in the export of Nigeria cocoa. The long run elasticity coefficient for cocoa export for Nigeria is negative and less than unity, connoting that the world demand for Nigeria's is inelastic in the long run.

As for cotton, the expected per capita income, current and expected relative prices and the expected quantity of

export are significant determinants of cotton export from Nigeria. A percentage increase in the expected per capita national income and expected quantity of cotton export would lead to 0.21 and 0.14% increase in the quantity of cotton exported. The current and expected relative prices of cotton if increased by 1% would engender 0.07 and 2.17% reduction in the quantity of cotton exported. In the long run, the world demand for Nigeria's cotton is inelastic, judging from the long run elasticity coefficient of 0.16.

The palm produce exported by Nigeria is significantly affected by the expected per capita national income; current relative price and expected quantity of palm produce export. The analysis revealed that a percent increase in the expected per capita national income and expected quantity of palm produce exported would increase the quantity of palm produce exported by 0.50 and 0.16%, respectively. In addition, the quantity of palm produce exported by Nigerian is decreased by 0.53% for every 1% increase in the current relative price of palm produce in the importing countries. The long run situation of palm produce export is not quite different from the earlier two commodities. A coefficient of 0.19 means that the degree responsiveness of Nigeria's palm produce export is inelastic.

The factors responsible for the quantity of non-traditional agricultural commodity export of Nigeria are shown in the table below for spices and nuts.

From the Table above, the two models have coefficients of multiple determination (R^2) of 0.92 and 0.94, respectively for quantities of spice and nut's exports. This means that 92 and 94% of the variability in the exports of spices and nuts, respectively are accounted for by the explanatory variables included in the models. The Durbin's h statistics show the absence of autocorrelation since they are each less than 1.645 as outlined in the methodology. All the regressors included in the two models are significant at either 1 or 5% level and have the expected signs.

The results show that a% increase in the current and expected per capita national income and expected quantity of export of spices, respectively would lead to 6.03, 7.33 and 0.62% increase in the quantity of export of spices. As for the relative prices, a unit increases in both the current and expected relative prices would lead to 10.76 and 2.59% reduction in the quantity of spices exported by Nigeria. In contrast to the traditional export commodities, the long run elasticity c oefficient o f Nigeria export of spices is 1.63, meaning that the market for Nigeria spices will increase more than proportionate increase in the determining factors.

The determinants of nuts export are similar to those of spices. The analysis revealed that a percent increase in the current and expected per capita national income, and the expected quantity of nuts' export would lead to 3.41, 1.47 and 0.74% increase in the quantity of nuts' export. In addition, a percent increase in the current and expected relative prices would lead to 2.40 and 2.68% reduction in the demand for Nigeria's nut by her partners. Finally, a long run elasticity coefficient of nut export is 2.85. This shows an elastic situation. Hence, there is the hope for raising the market for Nigeria nut in the long run in the international market.

CONCLUSION

This study has revealed that the proportion of agricultural commodities export has continued to decrease by the day. It has also shown that the demand for convectional export commodities are inelastic in the long run while those of the non-convectional commodities is elastic in the long run. In addition, current and expected per capita national income, expected quantity of export, and current and expected relative prices are important determinants of the demand for Nigeria's agricultural export commodities.

Based on the findings of this study, the recommendations are implied since those variables considered are outside the control of Nigeria, the source of the export commodities. All that can be done is to proactive in nature.

Most of the nation's agricultural export commodity especially the traditional export crops are no longer competitive in the world market and as such are dwindling in their foreign exchange earning capacity due to the inelastic nature of these commodities to the importing countries per capita GNP caused among others by poor quality and standards. There is therefore urgent need for the federal government and other stakeholders in Nigerian agriculture to revamp the export crops subsector by ensuring good quality of produce that will be of competitive standard in the world market.

Table 3: Result of adl regression on export data of nigerian spices and nuts 1980-2002

Variables	Spices	Nuts
Constant	-33.26 (4.26)***	76.58 (11.7)***
$LogY_{rt}$	6.03 (2.27)**	3.41 (2.59)***
$LogY_{rt-1}$	7.33 (2.780)***	1.47 (3.4)***
$Log(P_{ei}/P_i)_t$	-10.76 (2.15)**	2.40 (2.84)***
$Log(P_{ei}/P_i)_{t-1}$	-2.59 (2.08)**	-2.68 (3.6)***
$LogQd_{t-1}$	0.62 (2.80)***	0.74 (32.9)***
R^2	0.92	0.94
D	0.38	0.26
LRE	1.63	2.85
Durbin's h	-0.17	-0.43

Source: Computer Printout of ADL Regression. Figures in bracket are t-values

Also there is need to add value to these crops (turn them into finished or semi-finished products) before they are exported in order to meet up with changing taste worldwide.

Furthermore, emphasis should be placed on the non-traditional export crops that possess higher income elasticity for higher foreign exchange earning for the country.

In conclusion, for Nigeria to remain relevant in a world whose demand for agricultural export commodities has shifted from the conventional crops to processed, semi-processed or easily processed commodities, an updated information gathering and dissemination on export demand in vital. There is need to monitor the economic activities of the importing countries, while effort should move from the traditional and unprocessed commodities to the non-traditional (and semi processed or easily processed) ones with higher income and price elasticity of demand.

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