EMERGING ISSUES IN ECONOMIC POLICY AND DEVELOPMENT IN NIGERIA
Essays in Honour of:
Professor Willie Jeremiah Okowa
&
Professor Tamunopriye Jones Agiobenebo
Both of Department of Economics, University of Port Harcourt, Nigeria Feb. 10, 2023

Chapter 7

Characterizing the Determinants of Agricultural Export Trade in Crude Oil Producing Countries in Africa (COPCA)

ANOWOR, Oluchukwu F.
Department of Economics, Godfrey Okoye University, Enugu, Nigeria
ORCID ID: http://orcid.org/0000-0001-8959-0411

KALU, Ijeoma E.
Department of Economics, University of Port Harcourt, Nigeria
ORCID ID: https://orcid.org/0000-0003-1652-3562

ODO, Augustine C.
Department of Economics, Godfrey Okoye University, Enugu, Nigeria
ORCID ID: https://orcid.org/0000-0003-0093-7031

OKORIE, George Chisom
Department of Economics, Godfrey Okoye University, Enugu, Nigeria
ORCID ID: https://orcid.org/0000-0003-2396-2408

***Corresponding author:** oluchukwuanowor@gmail.com; oluchukwuanowor@gouni.edu.ng
+2348038038228

Abstract

Strings of literature on agriculture mainly concentrated on its impact on growth. A few, though country-specific, fussed with scanty factors of agricultural-output with varying-methods and techniques of analyses. Typically, Crude-Oil-Producing-Countries-in-Africa (COPCA) appear repeatedly in scholarly works with notable gaps for decades as yet to maximize their potentials in

agriculture especially after the discovery of oil. This study becomes imperative on the account of the need to reconsider agriculture and agricultural-export-trade as principal-contestant and as a petroleum-economy substitute by dint of the intensified-global-call for decarbonating the earth. The foremost contribution of this paper to extant-literature is to uncover the crucial variables that determine agricultural export-trade in eighteen COPCA countries by identifying four Generalized Method of Moment models (GMM_I, GMM_II, GMM_III, and GMM_IV). The results evinced indications of low agricultural output and exports from the COPCA as such domestic agricultural commodity price, world agricultural commodity price, number of persons employed in agriculture as a proportion of total employment, exchange rate, inflation, degree of openness, and as well as a domestic agricultural investment could not exert significant impact on the agricultural export. This is attributed to policy bias in favour of the oil sector which crowds out productivity in agricultural and other sectors.

Keywords: Export trade; Agricultural output; SDG 7; Trade policies; COPCA; GMM

JEL classification: F18; F31; P16; Q17; Q27; Q32; Q37; Q42

Introduction

Trade policies have been on the spotlight among pertinent regional and/or national issues throughout much of history. Intrinsically, the economic, political and socio-cultural significance of trade has been on the rise in addition steadily exerting a pool on the interests of policy-makers, decision-makers, analysts and investors. The underlying rationale across the globe why countries should engage in external trade include inter alia, the need for growth and development through the benefits accruable from trade relations; and same time searching for additional resources to meet the intensifying demands for better quality of life (see: Oviemuno, 2007; Iqbal & Zahid, 1998; Sun & Heshmati, 2010; Anowor & Agbarakwe, 2015; Onodugo, Anowor and Ofoegbu (2019); Ochinanwata *et al*, 2020). The proponents of globalization make

reference that globalization entails increased interactions, inter-dependence and inter-connectedness of people and economies as such speeding up of movements and exchange of products, factors, ideas and cultural practices between and among nations and population around the globe. Incidentally, export trade has been the principal tool of globalization; and this explains why the global economy is expeditiously declining as the wrecks of COVID-19 pandemic which apparently halts external trade prevails.

Agricultural performances, as in this case, agricultural export trade performance remains one of the bases to assess the trends in economic activities within nations and regions. A pro-sustainable economic policy is on the presumption that economic policy is significantly inclusive if the outcomes were able to untie individuals, countries and regions from the shackles of poverty, inequality and unemployment. The objectives of agricultural policies in most developing

economies are targeted towards import substitution and protection of domestic production against competing imports hence the imposition of export tax and export quotas. Achieving these objectives have often led to infrastructural investments like irrigation projects, and other capital inputs, and subsidizing of prices of inputs.

Copious of analysts sought to explain the features of agricultural policy that could promote growth and ensure sustainable development. Agba *et al* (2018) propose for policies that could encourage foreign direct investment as the skills and knowledge together with technologies that accompany foreign direct investment are enriched with the potentials of boosting the efficient performance of the agricultural sector. Policy submission from Kannan (2011) is that expenditures on agricultural research and extension, irrigation projects, fertilizers and other agricultural inputs are essential determinants of growth and sustainable development. Anowor, Ukwueni and Ezekwem (2013) submit that agricultural outputs and exports in Sub-Saharan African economies are repressed by insufficient basic amenities such as power supply, motorable roads, access to healthcare, water supply and generally lack of access to productive inputs and output markets. Onodugo, Anowor, Ifediora and Aliyu (2019) opine that there are anticipations that efficient agricultural activities could significantly contribute towards poverty reduction mainly because of its demand linkage and also because agricultural related activities tend to be more labour intensive and less import intensive than manufacturing activities. Some other scholars like Phillai (2012), Ajao (2012), and Enu & Attah-Obeng (2013) hold forth that proportion of irrigated area, cropping intensity, size of labour force, farm size, real exchange rate, real GDP per capita, land quality, malaria, education and technological change are the key macro-economic factors that influence agricultural productivity.

As can be observed from above, those studies were specifically on agricultural policies that could promote growth and ensure sustainable development and as such should demand for efficient extension of the policies either directly or indirectly on characterizing the key determinants of agricultural export trade. Consequently, this study is primarily concern about the key determinants of agricultural export trade in crude oil producing countries in Africa (COPCA). There seems to be constraints that directly and/or indirectly affecting agricultural export trade in these countries despite the critical importance of agriculture in Sub-Saharan Africa. Oil reserve has grown in Africa in the last three decades by over 25% and this incidentally transformed Africa into a vital player and crucial target in global production and extraction of oil resource (African Development Bank, 2019). Crude oil producing countries in Africa (COPCA) comprised: Nigeria, Angola, Algeria, Egypt, Republic of the Congo, Ghana, Libya, Gabon, Equatorial Guinea, Chad, Cameroon, Sudan, Ivory Coast, Tunisia, Congo, Niger, Morocco and Mauritania. Given the dominance of agriculture in these countries' labour force where more than 70% of the working population is engaged in some agricultural activities, a development strategy that gives considerable emphasis on agricultural growth is supposedly desirable.

Furthermore, the above-mentioned countries have highly diversified agro-ecological conditions going by the fact that they are naturally endowed with a huge expanse of arable land, rivers, streams, lakes, forests, and grasslands, as well as a large active population that can sustain a highly productive and profitable agricultural sector. These provide the possibilities for the production of a wide range of exportable agricultural products. Sadly, the emergence of petro-dollar following the discovering of oil instituted a detrimental neglect of agriculture. National revenue as a result of oil exports brusquely increased in the 1970s through the 1990s and early 2000s which led to Dutch disease syndrome; squeezing profitability, as noted by Bautista (1990), Amoro and Shen (2013), Agbarakwe, Anowor and Ikue (2018) in Agric-tradable goods both by directly bidding resources away from them and by the appreciation of the real exchange rate due to the increase in money supply and the inflation rate while the nominal exchange rate was held fixed.

Several programmes were introduced in respective countries to promote agricultural production and export but the frustration according to Onodugo et al (2019) has been that the agricultural sector has not been able to attain its export-trading potentials in spite of these stimulation programmes and policies.

This study is particularly worried about to what extent have determinants of agricultural export trade impacted on Volume of Agricultural Export (AXP) in the18 crude oil producing countries in Africa (COPCA); and to what extent have determinants of agricultural export trade impacted on agricultural export with respect to the Ratio of Agricultural Export to total-Export (AXP/EX) in crude oil producing countries in Africa (COPCA). The foregoing is reasonable in the case of the eighteen (18) petroleum producing and exporting countries in Africa; however, given the number of the cross-sectional units (countries), the appeal is intuitively improbable in the case of an individual country hence panel analyses have space for anticipated results.

This study becomes imperative since the considerations of previous literature on agricultural-export relationship are yet to explore the contributing factors of agricultural export trade across COPCA. More so, there is need to reconsider agriculture and agricultural sector as principal contestant and as petroleum-economy substitute in the economies within and among the COPCA in view of the global shift in energy demand from petroleum to renewable alternative sources of energy in addition to the intensified global call for decarbonating the earth. Similarly, among the targets of Goal 7 of Sustainable Development Goals (SDGs) is to increase substantially, in anticipation from agricultural produce, the share of clean and renewable energy in the global energy mix. Perceptibly, this SDGs Goal 7 steers towards enhance access to cleaner and efficient energy via renewable sources.

Literature Review

Departing from the Ricardian comparative advantage theory, Heckscher-Ohlin model by forecasting the patterns of commerce and production based on the factor endowments of trading partners put forth as such "that countries should export products that use their abundant and cheap factor(s) of production and import products that use the countries' scarce factor(s)". In the factor endowment model, comparative advantage is determined by differences in endowments of factors across economies instead of differences in technology. The innovation of the factor endowment theory is that an economy will export commodities that use its abundant factor intensively. Prominent among the contemporary debates on trade discourse and globalization is the increasing popularity of the policy of trade liberalization and degree of openness to external world. In this effect, developing a wide range of interconnected approach to agricultural export determinants and capabilities of agricultural output could have a significant impact on the debate.

Eita (2016) employed gravity model approach to investigate the determinants of exports in Namibia, the result revealed that GDP cause exports to increase but per capita GDP does not have statistical impact on export. The work of Allaro (2011) analyzing export determinants and performance of oilseeds in Ethiopia with a time series data found that the major determinants of oilseeds were nominal exchange rate and real GDP. Investigating the determinants of agricultural exports in South Africa Idsardi (2010) also employed gravity model to establish that GDP has positive and significant impact on agricultural exports. But Helga (2005), Leite (2008) and Hatab, Romstad and Huo (2010) on a contrary view respectively found that GDP of the exporting countries in the case of Iceland, Colombia and Egypt does not affect her exports. They conclude that this could be as a result of the increase in consumption of and demand for domestically produced commodities by this means leaving only an insufficient amount available for export purpose.

Using cointegration approach to investigate the determinants of agricultural export of Nigeria, Folawewo and Olakojo (2010) establish that domestic agricultural output was the most significant factor that affected growth of agricultural exports. Majeed and Ahmad (2006) employed a panel data model for 75 countries to investigate the internal determinants of exports, the study revealed that export performance can be explained by indirect tax, official development assistance, total labour force and national savings. However, private foreign investment was found to have statistically insignificant impact on volumes of export. Anagaw and Demissie (2012) adopted VAR model to investigate the determinants of export performance of Ethiopia; the study found that the growth of Ethiopia's exports could only be influenced by trade-openness of the current year in the short-run whereas trade-openness and financial development significantly impacted Ethiopia's exports in the long-run. Ethiopia's exports were found to be elastic to its real GDP whereas it is inelastic with respect to the rest of the other determinants.

Shane, Roe, and Somwaru (2008) in an attempt to appraise the determinants of growth of agricultural exports of the United States of America and found that the real GDP of the importing country was the weightiest determinant affecting the growth of agricultural exports in the country. The study therefore concluded that the real income of the importing country is the most important factor that affects a country's exports. However, the study observed a negative but significant relationship between real exchange rate and the volume of exports. Petreski and Kostoska (2009) in analyzing the macroeconomic variables on import and export employed a vector auto-regression model and establishe that exports were positively affected by real exchange rate, unit labour cost, and industrial production but fiscal burden was not a significant determinant of exports.

Methodology

In preference for simplicity over ornate estimation techniques that often make it thorny to identify pure independent effects, this paper establishes two hypotheses (i) the extent determinants of agricultural export trade have impacted on Volume of Agricultural Export (AXP) in COPCA, (ii) the extent determinants of agricultural export trade have impacted on agricultural export with respect to the Ratio of Agricultural Export to total-Export (AXP/EX) in COPCA. The focal contribution of this paper is to characterizes the key determinants of agricultural export trade particularly in COPCA.

This study took insight from the work of Ogunkola, Bankole and Adewuyi (2006): an explicitly Cobb-Douglas production function which derives the determinants of output growth in which economic policy, in particular export trade policy is developed as specified thus:

$$Q = AK^{\beta}L^{1-\beta} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where Q is output, K is capital, L is labour and A is the measure of efficiency and total factor productivity which are linearly related to trade policy. The analytical framework adopted in this study leans on the work of Sun and Heshmati (2010) in estimating external trade and its effects on economic growth in China as below:

$$U_{it} = \lambda_0 + \lambda_1(NEXPR_{it}) + \lambda_2(HTEXPR_{it}) + \lambda_3(TelR_{it}) + \lambda_4(East) + \lambda_5(West) + \lambda_6 Year + \omega_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Where technical efficiency (*U*) is a liner function of net export ratio (*NEXPR*), high tech export ratio (*HTEXPR*), capacity of local office telephone exchanges per labour (*TelR)*, two dummy location variables as east (*East*) and west (*West*), and years (*Year)*; and ω is the random error.

To modify the model to capture the objectives of this study, we consider the principal factors that can potentially play a consequential role in the determination of agricultural exports in COPCA. The functional relationship of the panel data regression technique; hence, the panel data regression models are specified in functional relationships as below:

AXP = f (DQAI, WACP, INF, DOP, INTR, AGEP, EXCH, DACP, INFD, GFCF) …… (3)

AXP/EX = f (DQAI, WACP, INF, DOP, INTR, AGEP, EXCH, DACP, INFD, GFCF) ..…… (4)

Where:

AXP = Volume of Agricultural Export

AXP/EX = Ratio of Agricultural Export to total-Export

DQAI = Domestic Agricultural Output index

WACP = World Agricultural commodity Price

INF = Inflation Rate

DOP = Degree of Openness

INTR = Interest Rate

AGEP = Number employed in agriculture as a proportion of total employment

EXCH = Real Exchange Rate

DACP = Domestic Agricultural Commodity Price DACP

INFD = Infrastructural Development

GFCF = Gross Fixed Capital Formation

Hence, (3) and (4) are respectively transformed into (5) and (6) thus:

$$lnAXP_{it} = \pi_0 + \pi_1 DQAI_{it} + \pi_2 WACP_{it} + \pi_3 INF_{it} + \pi_4 DOP_{it} + \pi_5 INTR_{it} + \pi_6 AGEP_{it} + \pi_7 EXCH_{it} + \pi_8 DACP_{it} + \pi_9 INFD_{it} + \pi_{10} GFCF_{it} + \upsilon_{it} \ldots\ldots (5)$$

$$lnAXP/EX_{it} = \gamma_0 + \gamma_1 DQAI_{it} + \gamma_2 WACP_{it} + \gamma_3 INF_{it} + \gamma_4 DOP_{it} + \gamma_5 INTR_{it} + \gamma_6 AGEP_{it} + \gamma_7 EXCH_{it} + \gamma_8 DACP_{it} + \gamma_9 INFD_{it} + \gamma_{10} GFCF_{it} + \varpi_{it} \ldots\ldots (6)$$

The components υ *and* ϖ represent the country-specific effects which are time invariant; π_{it} and ϖ_{it} represent the country-specific shocks and varies over time. As proposed by Arellano and Bond (1991), the first-differenced operation is applied in order to remove individual time-invariant effects (υ *and* ϖ) which are the sources of inconsistency. Estimation obtained by Ordinary Least Square (OLS) would be upward biased and inconsistent because of the correlation between the lag of dependent variable and the residual. Consequently, this study employed Generalized Method of Moments (GMM) estimation technique to control the unobserved country-specific effects, also control the first-difference non-stationarity variables, and overcome the endogeneity of the

independent variables by using instruments and check for the presence of autocorrelation (Saci et al., 2009).

This study used annual data over the period 1980-2018 for a panel of eighteen (18) crude oil producing countries in Africa (COPCA) to take explicit account of individual-specific heterogeneity. These countries include: Nigeria, Angola, Algeria, Egypt, Republic of the Congo, Ghana, Libya, Gabon, Equatorial Guinea, Chad, Cameroon, Sudan, Ivory Coast, Tunisia, Congo, Niger, Morocco and Mauritania. The data required have been collected from Food and Agriculture Organization of the United Nation (http://faostat.fao.org/), Penn World data pwt version 10.0 (https://rdrr.io/cran/pwt10/man/pwt10.0.html) and World Bank (http://worldbank.org).

RESULTS

In this section, we first present in table 1 the results of the generalized method of moment (GMM_I and GMM_II) estimations of the determinants of agricultural export trade in oil exporting countries using the volume of agricultural export (AXP) as the dependent variable in the baseline results. The identified determinants are Real Exchange Rate (EXCH), Interest Rate (INTR), Inflation Rate (INF), World Agricultural commodity Price (WACP), Domestic Agricultural Commodity Price (DACP), Domestic Agricultural Output index (DQAI), Number employed in agriculture as a proportion of total employment (AGEP) and Degree of Openness (DOP). Included among the covariates are government capital expenditure representing Infrastructural Development (INFD) and Gross Fixed Capital Formation (GFCF), which are the proxy for domestic agricultural supports in GMM_I and GMM_II respectively.

Then, in table 2, we checked for the sensitivity of our results by using as the dependent variable volume of agricultural export as a ratio of total export as a measure of agricultural export (AXP/EX) while the independent variables as identified in GMM_I and GMM_II are retained in GMM_III and GMM_VI respectively.

Major findings

The volume of agricultural export (AXP):

The baseline results presented in table 1 below show that although domestic agricultural output index(ndqai) has positive relationship with agricultural export in GMM_I and GMM_II, the impact is not distinguishable from zero. One can explain the evidence above as an indication of low agricultural output from these oil exporting countries. Similarly, world agricultural commodity price could not exert a significant impact on the agricultural export. This may not be unrelated with the fact that most countries in Africa export only primary or unprocessed agricultural products which may not command high prices internationally and also the fact that oil revenue dominates their foreign earnings. Turning attention to inflation rate, the coefficients in the two models are not significant different from zero.

Table I: Baseline Models

VARIABLES	GMM_I Volume of Agric Export	GMMII Volume of Agric export
L_2.lnaxp	0.233*	0.241*
	(0.135)	(0.134)
Lndqai	0.738	0.787
	(0.551)	(0.525)
Lnwacp	0.440	0.432
	(0.331)	(0.340)
INF	-0.000087	0.000595
	(0.00438)	(0.00433)
lndop_	0.0928	0.0735
	(0.0759)	(0.0777)
INTR	-0.0228***	-0.0253***
	(0.00605)	(0.00577)
agep	0.00672	-0.000295
	(0.0164)	(0.0160)
Lnexch	0.173	0.212
	(0.238)	(0.241)
Lndacp	-0.286**	-0.269*
	(0.142)	(0.144)
Lninfd	0.180	
	(0.249)	
Lngfcf		0.106
		(0.0724)
Observations	156	156
Number of crossid	12	12
Country effect	YES	YES
year effect	NO	NO
Hansen_test	0.436	0.169
Hansen Prob	0.509	0.681
Sargan_test	0.956	0.123
Sargan Prob	0.328	0.725
AR(1)_test	-1.835	-1.871
AR(1)_P-value	0.0665	0.0614
AR(2)_test	0.456	0.593
AR(2)_P-value	0.648	0.553
No. of Instruments	11	11

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Ratio of Agricultural Export to total-Export (AXP/EX):

To examine the robustness of our results, we estimated models III and IV as shown in Table 2. For models III and IV, the dependent variable for each model was replaced with the agricultural export to total trade ratio. The results show that domestic agricultural output index(ndqai) has positive relationship with ratio of agricultural export to total trade in GMM_III and GMM_IV, but the impact is not distinguishable from zero only in GMM_III. Thus, our results could not provide robust evidence that domestic agricultural output is one of the major determinants of agricultural export, because with specific to model IV, the coefficient turned significant. We find robust evidence that the world agricultural commodity price could not also exert a significant impact on the agricultural export, for the same reason as already highlighted. Turning to inflation rate, the coefficients in the two models are not significantly different from zero, suggesting that inflation is not a significant determinant. We again find a change in the sign of the coefficient of inflation from negative on GMM_I to positive on GMM_III

Table II: Sensitivity Test

VARIABLES	GMM_III Volume of Agric export to total export ratio	GMM_IV Volume of Agric export to total Export ratio
L2.lnAXP_EX	0.253***	0.264***
	(0.0894)	(0.0858)
lndqai	0.755	0.863*
	(0.523)	(0.516)
lnwacp	-0.302	-0.188
	(0.367)	(0.336)
INF	0.00199	0.00186
	(0.00460)	(0.00499)
lndop_	0.722***	0.754***
	(0.0932)	(0.0937)
INTR	-0.0254	-0.0298
	(0.0196)	(0.0188)
agep	0.0280**	0.0189
	(0.0113)	(0.0134)
lnexch	0.795***	0.842***
	(0.259)	(0.239)
lndacp	-0.673***	-0.666***
	(0.144)	(0.140)
linfd	0.244	
	(0.292)	
lngfcf		0.114
		(0.0845)
Observations	156	156
Number of crossid	12	12
Country effect	YES	YES
year effect	NO	NO
Hansen_test	0.230	0.635
Hansen Prob	0.631	0.425
Sargan_test	0.270	0.754
Sargan Prob	0.603	0.385
AR(1)_test	-1.849	-1.813
AR(1)_P-value	0.0645	0.0699
AR(2)_test	0.434	0.131
AR(2) _P-value	0.664	0.896
No. of Instruments	11	11

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Discussion

Baseline Models (AXP):

The degree of openness lnDOP has a positive but non-significant impact on the volume of agricultural export in both GMM_I and GMM_II models of table 1. These findings contradict the evidence from the study by Anagaw and Demissie (2012) that degree of openness determines agricultural exports. The negative signs for the coefficient of interest rate in the two models align with the expected sign. Conventionally, a rise in interest rate reduces the profitability on investment and hence reduces both the investment and the output of agriculture. Moreover, interest rate did exert significant influence on agricultural export within the period under review. The coefficient of -0.0228 and -0.0253 for GMM_I and GMM_II show that the volume of agricultural export will go down by 0.023 and 0.023 percent respectively for one per cent increase in interest rate. The number employed in agriculture as a proportion of total employment (agep) could not exert significant impact on agricultural export. The reason may not be farfetched because countries involved are oil exporting and policies are biased in favour of oil sector. The estimated coefficients of exchange rate in both models though not significant positive is correctly signed, suggesting that exchange rate depreciation is positively related agricultural export. This is because depreciation of a country's currency relative to another currency improves the country's competitive advantage relative to other countries in the export of agricultural products, and hence increases the country's agricultural export. Domestic agricultural commodity price(lndacp) from the results of table is significantly negative in both GMM_I and GMM_II. What this depicts is that a rise in the domestic price of agricultural commodities, reduces the export of agricultural products. The coefficient of -0.286 and -0.269 for GMM_I and GMM_II show that the volume of agricultural export will go down by 0. 286 and 0.269 percent respectively for one per cent increase in domestic agricultural commodity price(lndacp). Government capital expenditure as proxy for domestic agricultural supports(lninfd) in GMM_I and gross fixed capital formation (lnGFCF) as alternative measure for domestic agricultural supports in GMM_II which are measures of infrastructural development did not exert significant influence on agricultural export. This may be an indication of poor infrastructural development in agriculture in these oil exporting countries.

Sensitivity Test (AXP/EX):

The degree of openness, lnDOP, still has a positive impact on the agricultural export to total trade ratio in both GMM_III and GMM_IV models, but has turned significant. The coefficient of 0.722 and 0.754 for GMM_III and GMM_IV show the extent to which the ratio of agricultural export to total trade will go by one percent rise in trade openness. The negative signs for the coefficient of interest rate in the two models align with the expected sign. However, interest rate is found not to be a significant determinant of export of agriculture, and the coefficient estimates are non-

robustness either. The number employed in agriculture as a proportion of total employment (agep) could not exert significant impact on agricultural export as shown in model_II, similar to the baseline results, but it turned significant in model_III. The estimated coefficients of the current value of exchange rate in both models are significantly positive and correctly signed, showing that exchange rate depreciation is a major determinant of agricultural export. The robustness of the exchange rate variables as a major determinant of agricultural export could not be established. Domestic agricultural commodity price(lndacp) from the results of table is significantly negative in both GMM_III and GMM_IV. This merely confirms the robustness of the domestic agricultural commodity price as a determinant of agricultural export. The coefficient of -0.673 and -0.66 for domestic agricultural commodity price show that the agricultural export will go down by 0.673 and 0.66 percent respectively for one per cent increase in domestic agricultural commodity price(lndacp). Government capital expenditure as proxy for domestic agricultural supports(lninfd) in GMM1 and gross fixed capital formation (lnGFCF) as alternative measure for domestic agricultural supports in GMM2 which are measures of infrastructural development, similar to the baseline results did not exert significant influence on agricultural export. As to the lack of robustness of some of the estimated coefficients of the control variables, it lends support for the absence of consensus in the empirical literature on the determinants of agricultural export.

Diagnostic Tests

For the statistical inference of the estimated coefficients to be valid, the following must be satisfied; a) rejection of the null hypothesis of non-autocorrelation for the AR (1) test, b) non-rejection of the null hypothesis of non-autocorrelation for the AR (2) test, c) and non-rejection of the null hypothesis of valid instruments for the Sargan's/Hansen's test. In table 1 and 2, the reports of the Sargan test statistic which examines the overidentification restrictions and hence tests whether the instruments are uncorrelated with the error terms in the estimated equation was conducted. The null hypothesis that the instruments as a group are exogenous or valid for the four GMM models was not rejected, implying that the Sargan test statistics for all models appear with a p-value greater than 0.10, hence we are unable to reject the null hypothesis.

The second test is the first autocorrelation test AR (1) with the null hypothesis of no autocorrelation between the difference of the residuals. The study rejected the null hypothesis of non-autocorrelation for the AR(1) for all four models since first autocorrelation test appear with p-value less than greater than 0.10, suggesting the error terms are AR(1). On the other hand, the null hypothesis of non-autocorrelation for the AR(2) was validated for all four models since the test for second autocorrelation appear with p-value greater than greater than 0.10, suggesting they are free from AR(2).

Conclusions and Recommendations

In view of the results, low agricultural output and exports from the COPCA as such domestic agricultural commodity price, world agricultural commodity price, number of persons employed in agriculture as a proportion of total employment, exchange rate, inflation, degree of openness, and as well as a domestic agricultural investment could not exert significant impact on the agricultural export. This is attributed to policy bias in favour of the oil sector which crowds out agricultural and other sectors. However, interest rate, infrastructural development, and domestic agricultural output index exert significant influence on agricultural export.

This therefore buttressed the fact that increase in expenditure in infrastructure boosts agricultural output and hence export. In line with the policy implication of the findings, policy attention should be geared towards economic diversifications in COPCA; more so, this study suggests that agricultural export trade in COPCA could be expanded if resourceful attentions are on the specified variables. Hence there is need for efficient policies that could widen agricultural output and support export trades.

List of abbreviations

AXP = Volume of Agricultural Export
AXP/EX = Ratio of Agricultural Export to total-Export
COPCA = Crude-Oil-Producing-Countries-in-Africa
COVID-19 = Coronavirus Disease 2019
GMM = Generalized Method of Moment
SDGs = Sustainable Development Goals

References

African Development Bank. (2019). Oil and Gas in Africa: Supplement to the African Development Report, Oxford University Press Inc., New York. https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/Oil%20and%20Gas%20in%20Africa.pdf

Agba D. Z., Adewara. S.O., Nwanji, T., Yusuf, M., Adzer K.T., & Abbah. B. (2018). Does Foreign Direct Investments Impact Agricultural Output in Nigeria? An Error Correction Modelling Approach. *Journal of Economics and Sustainable Development*, *9*(4), 67-77

Agbarakwe, H. U., Anowor, O. F. & Ikue J. (2018). Foreign resources and economic growth in English speaking ECOWAS countries. *Opción (Universidad del Zulia, Venezuela)*, 34 (14), 117–136. http://produccioncientificaluz.org/index.php/opcion/article/view/23928

Ajao, O. A. (2012). Determinants of agricultural productivity growth in sub-Saharan Africa: 1961-2003. *Tropical and subtropical Agro-ecosystems*, *15*, 575-582

Allaro, H. B. (2011). Export Performance of Oilseeds and its Determinants in Ethiopia, *American Journal of Economics*, 1 (1), 1-14. https://doi.org/10.5923/j.economics.20110101.01.

Amoro, G. and Shen, Y. (2013) The Determinants of Agricultural Export: Cocoa and Rubber in Cote D'Ivoire. International Journal of Economics and Finance, 5, 228-233. https://doi.org/10.5539/ijef.v5n1p228

Anagaw, B. K. and Demissie, W. M. (2012). Determinants of Export Performance in Ethiopia: Var Model Analysis. *Journal of Research in Commerce & Management*, 2 (5): 94 -109.

Anowor, O. F., & Agbarakwe, H. U. (2015). Foreign Trade and Nigerian Economy. *Developing Country Studies*, *5* (6), 77 - 82.

http://www.iiste.org/Journals/index.php/DCS/article/view/20923/21167.

Anowor, O. F., Ukwueni, N. O. & Ezekwem, S. O. *(*2013). Agricultural Productivity and Poverty Alleviation: An Econometric Analysis. *American Journal of Sustainable Cities & Society*. 2 (1), 109–129. http://www.rspublication.com/ajscs/ajsas.html or http://rspublication.com/ajscs/jan%2013/8.pdf.

Arellano, M. and S. Bond, 1991. Some tests of specification for panel data: Monte carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58: 277-297.

Bautista, R. M, (1990). Price and Trade Policies for Agricultural Development, *The World Economy,*

Wiley Blackwell, 13(1), 89-109. https://doi.org/10.1111/j.1467-9701.1990.tb00742.x

Enu, P., & Attah-Obeng, P. (2013). Which macro factors influence agricultural production in Ghana? *Academic Research International*, *4*(5), 333-346

Folawewo, A. O. and Olakojo, S. A. (2010). Determinants of Agricultural Exports in Oil Exporting Economy: Empirical Evidence from Nigeria. *Journal of Economics Theory, 4: 84-92.* doi: 10.3923/jeth.2010.84.92

Hatab, A., Romstad, E. and Huo, X. (2010). Determinants of Egyptian Agricultural Exports: A Gravity Model Approach, *Modern Economy*, 1(3), 134-143 doi: 10.4236/me.2010.13015

Helga Kristjánsdóttir, 2005. A Gravity Model for Exports from Iceland, CAM Working Papers 2005-14. http://www.econ.ku.dk/cam/wp0910/wp0406/2005-14.pdf/

Idsardi, E. (2010) "The Determinants of Agricultural Export Growth in South Africa, 48th Agricultural Economists Association of South Africa (AEASA) Conference. Cape Town, South Africa. https://ageconsearch.umn.edu/record/96639?ln=en

Iqbal, M., & Zahid, G. M. (1998). Determinants of macroeconomic economic growth in Pakistan. *The Pakistan Journal of Economic Growth and Development, 37* (2), 25 – 148.

Joel Hinaunye Eita, (2016). Estimating Export Potential For A Small Open Economy Using A Gravity Model Approach: Evidence From Namibia, *Journal of Developing Areas*, 50(4), 273-288. 10.1353/jda.2016.0165

Kannan, E. (2011). Total factor productivity growth and its determinants in Karnataka agriculture. Working paper 265. Available at https://ideas.repec.org/p/sch/wpaper/265 .html

Leite, Correia João The Determinants of Colombian Exports: An Empirical Analysis Using the Gravity Model Desarrollo y Sociedad, núm. 61, enero-junio, 2008, pp. 165-205 http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S0120-35842008000100005

Majeed, M. T., & Ahmad, E. (2006). Determinants of exports in developing countries. *The Pakistan Development Review*, 45(4 Part II), 1265– 1276. https://core.ac.uk/download/pdf/7202686.pdf

Nadeem, M., Azam, M. & Islam, R. (2012). An Investigation of the Various Factors Influence on Exports, *Global Journal of Management and Business Research*, 12(19), 1-7

Ochinanwata, C., Uzomba, P. C., Onodugo, V. A. & Anowor, O. F. (2020), Does External Trade Improve Life Expectancy? A Long Run Equilibrium Analysis on English Speaking West African Countries, *Solid State Technology*, 63(5): 778–796

http://solidstatetechnology.us/index.php/JSST/article/view/1627

Ogunkola, E. O., Bankole, A. S. and Adewuyi, A. O. (2006). An evaluation of the impact of Nigeria's trade and investment policy reforms. Final Report at African Economic Research Consortium (AERC), Nairobi, Kenya. 10.4314/ajep.v13i1.44184

Onodugo, V. A.; Anowor, O. F.; Ifediora, C.; & Aliyu N. (2019). Evaluation of Supply Chain Management Effects on Consumer Preference for Cowpea Quality Features and Price Trend in Niger State. *International Journal of Supply Chain Management,* 8(3), 503 – 516. https://ojs.excelingtech.co.uk/index.php/IJSCM/article/view/3295

Onodugo, V. A., Anowor, O. F., & Ofoegbu, G. N. (2018). The effectiveness of monetary policy in tackling inflation in emerging economy. *Opción (Universidad del Zulia, Venezuela),* 34(14), 314 – 355. http://produccioncientificaluz.org/index.php/opcion/article/view/30262

Onodugo, V. A.; Nwonye, N. G.; Anowor, O. F. & Ofoegbu, G. N. (2019). Attaining Inclusive Growth in a Developing Economy on the Wings of Micro, Small and Medium Scale Enterprises, *Amazonia Investiga,* 8(24), 239 – 252. https://www.amazoniainvestiga.info/index.php/amazonia/article/view/977

Oviemuno, A. O. (2007). International trade as an engine of growth on developing countries, a case study of Nigeria (1980-2003). *Journal of Economics Perspective*, *12* (4), 45 - 62.

Petreski, G. and Kostoska, O. (2009). Modeling the Determinants of Exports and Imports: Assessment of the Macedonia Competitive Performance. *Journal of Marketing*, 7 (2), 36-58. http://www.mnmk.ro/documents/2009/4_Petreski_Kostoska_FFF.pdf

Phillai, T. (2012). An empirical study of determinants of output in agriculture. *International Journal of Research in Social Science*, *2*(3), 236-245

Saci, K., G. Giorgioni and K. Holden, 2009. Does financial development affect growth? Applied Economics, 41: 1701–1707.

Shane, M., Roe, T. and Somwaru, A. (2008). Exchange Rates, Foreign Income, and U.S. Agricultural Exports. Agricultural and Resource Economics Review, 37 (2): 160-175. https://doi.org/10.22004/ag.econ.45666

Sharma, K., 2003. "Factors determining India's export performance," *Journal of Asian Economics*, 14(3), 435-446. 10.1016/S1049-0078(03)00036-8

Sun, P., & Heshmati, A. (2010). *International Trade and its Effects on Economic Growth in China*. Bonn, Germany: IZA Discussion Paper No. 5151. Published in: *China Economic Policy Review*, 2012, 1(2), 35-60.

Yusuf, S. A. & Yusuf, W.A., 2007. Determinants of Selected Agricultural Export Crops in Nigeria: An Ecm Approach, 2007 Second International Conference, August 20-22, 2007, Accra, Ghana 52181, African Association of Agricultural Economists (AAAE). https://doi.org/10.22004/ag.econ.52181