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Agricultural Value Added and Economic Development in the CEMAC Zone

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Abstract

Sustained economic growth and development is an important economic policy objective to all economies in the world. It is even more important for countries of the CEMAC sub-region whose development index remains very low. Sustained economic growth is therefore the surest means to fight against poverty and move the economies of CEMAC member countries towards emergence. Using data from 1990 to 2020, this study examines the effect of agricultural value added on economic development within the CEMAC economies. Data was scrutinized for stationarity using the Levin Lin Chu (LLC). Furthermore, the panel fixed effect, Random effect and the generalised least square techniques were used to examine the effect of agricultural value added on economic development of economies within the CEMAC zone. The result shows that, agricultural value added has a positive effect on economic development, implying that there is a direct and significant relationship between agricultural value added and economic development. Precisely, indicating that the further a country within the CEMAC subregion enhances agronomic transformation, the better it levels of economic development. Policy recommendation are equally discussed.

Keywords: agricultural value added, economic development

1. Introduction

Agriculture is a foundation of growth for national economies, a poverty reduction tool, a unique source of livelihoods and a development instrument (World Bank, 2007). Increased agricultural sector's output provided the initial industrial surge in some European Union countries, Canada, the United States of America and Japan and (USA) during the Industrial revolution (Rostow, 1990). Consequently, the agricultural revolution led to the industrial revolution, which started in England during the 18th century and spread to Japan during the 19th century (Clark, 2002). The agricultural sector is not only significant in developed countries. In Africa, the agricultural sector is the backbone of economies and approximately 70 percent of the rural populace for poverty alleviation, food security, economic growth and development are dependent on the agricultural sector (Omorogiuwa et al., 2014). Additionally, the agricultural sector contributes about 32 percent to economic growth, provides 65 percent employment and remains the main source of rural livelihood (Musvoto et al., 2015). Apart from Northern Africa, which is somewhat richer than the rest of the continent and Southern Africa where mining and other industries play a significant role, the rest of the continent's population and workforce are heavily agricultural, with approximately 60% of the labour force involved in agriculture (Dial, 2006). From 1960 to present, agricultural output per hectare has expanded by over 250 percent (Alston et al., 2010). In some cases, this expansion has been led by developing economies.

Given that all six economies of the central African sub region are within the sub-Saharan African sub region, a greater proportion of this population dependents on agricultural productivity. At the dawn of the 21st Century, agriculture remains a fundamental instrument for sustainable development and the consequent reduction of poverty especially in developing economics which are largely dependent on it (Byerlee, 2008). Promoting agriculture is imperative for the achievement of Sustainable Development Goals of reducing poverty and hunger. The management system of agricultural projects is the driving force of growth and development. It should be noted that the management of agribusiness has a bearing on production and consequently on rural development (Mosier & Thilmany, 2016). Although the general goal of the agribusiness is to improve food security and standard of living by developing the Research and Technology (R&T) sector, the effectiveness of the management strategies (coordination, planning, monitoring and control, capacity building and providing access to market) of these projects shows significant variations; this leads to variations in the level of economic development (production, employment, income, capacity building, investment, saving and consumption, expansion of farms, etc). Agricultural value chain within the CEMAC sub region has remain wanting in the past decades due to the non-availability of necessary technological requirements for enhancement (UNICEF, 2021).

Based on the vitality of the agricultural sector in enhancing and developing agrarian economies and the need to encourage agronomic transformation, this study set out to investigate the effect of agricultural value added on economic development for economies of the CEMAC zone. To achieve this objective, data was gathered from the world development indicator database for macroeconomic variables and the united nation development program database for human development data, for a time period spanning from 1990 to 2020 for six CEMAC economies. The panel fixed effect, random effect and the generalised least square technique were employed to achieve the objective. The results demonstrate that agricultural value added robustly enhances economic development within the CEMAC zone.

The rest of this manuscript is organised as follows, section two will look at the literature, section three will look at the methodology, section four presents the results and finally section five presents the conclusion.

2. Literature Appraisal

This part of the study centres on the theoretical issues and the empirical literature review. The section begins by explaining the essential key theory relevant to this paper. The empirical literature was also reviewed, and it focuses on the previous works to provide explanations of the relationship between the various variables used in the study.

2.1 Theoretical Review

The link between agricultural transformation and economic development can be understood from the established theoretical model of Rostow (1960) that is the Rostow's growth model. Within the framework of Rostow's five stages of growth, he argues that at the first stage of growth (traditional society) there is a subsistent, agricultural-based economy with intensive labour and low levels of trading, and a population that does not have a scientific perspective on the world and technology. In stage two (Preconditions to Take-off), the society begins to develop manufacturing and a more national as opposed to regional outlook, while in stage three (Take-off stage) there is the existence of intensive growth, in which industrialization begins to occur, and workers and institutions become concentrated around a new industry. Stage four (drive to maturity) occurs in the long run and is characterised by rising standards of living, the use of technology increases, and the national economy grows and diversifies, while stage five (mass consumption) is characterised with mass production and consumerism. From the Rostow perspective, one can deduce that agronomic transformation becomes effective in the third stage and as such drive the economy to growth and development through enhancement in standard of living and welfare in stage four. This will imply that agronomic transformation enhances economic development.

2.2 Empirical Literature

Many studies have tried to examine the linkage between agricultural activities and economic growth and development. The determinant of agriculture productivity growth and their impact on economic growth in a selected seven economies was examine by Awan and Aslam (2015). Results show that due to low agriculture productivity in the emerging economies and the income gap between emerging and advanced countries, productivity have negative effects on the economic growth in the selected emerging economies. Equally, Ceylan and Özkan (2013), analysed agricultural value added and economic growth within the framework of the European Union integration process using an extended Solow growth model and panel data analysis tools. The results of the two-way random effects estimation revealed that, the agricultural value added elasticity of per capita income was 0.025 for the 1995-2007 period, and 0.22 for the 2002-2007 period. The study also revealed that agriculture retains its economic importance, and that average per capita income among EU members is higher than among non-members due to exogenous factors. Adeyemo *et al.*, (2015), explored the relationship between agriculture value added and current account balances in Nigeria, spanning 1980 to 2013. The study found that the variables incorporated in the model were stationary at first difference. The empirical result indicated that agriculture value

added enhanced the national income of Nigeria.

Shombe (2008) approved the existence of the agricultural export-led economic performance in Tanzania. Sanjuan-Lopez and Dawson (2010) studied with panel cointegration methodology and panel Granger causality the link amongst GDP, agricultural and non-agricultural exports of over 42 nations. They established that there is a long-run connection, with agricultural exports having an elasticity of 0.07 and the non-agricultural export elasticity of GDP was 0.13. The Granger causality displayed unidirectional causality running from agricultural export to economic growth. Henneberry and Curry (2010) employed three simultaneous equations to investigate the link amongst agricultural exports and import and GDP in Pakistan. They concluded for a positive connection between GDP and export from agriculture. Oluwatoyese *et al*. (2016) employed the Vector Error Correction Model (VECM) method to analyse the connection amongst agricultural export, oil export and economic growth in Nigeria over the period of 1981-2014. They established in the long term that the agriculture export and oil export cause economic growth. Bakari and Mabrouki (2017) investigated the contribution of agricultural exports on economic growth in South Eastern European Countries during the period of 2006-2016. They employed the correlation analysis and the static gravity model, and they found that agricultural exports have a positive and strong correlation with GDP. Runganga et al. (2021), ascertain the impact of agriculture on economic growth in Zimbabwe using the Autoregressive Distributed Lag (ARDL) estimation technique, employing data from 1970 to 2018. In both the short run and long run, the study found that inflation, government expenditure, and gross fixed capital formation have a positive impact on economic growth. The study also found that agricultural production has a positive impact on economic growth in the short run, and no impact on economic growth was found in the long run.

From the aforementioned studies, it can be deduced that relatively few studies have look at the effect of agricultural value added on economic development. Even among the few extant studies, most have focused on economic growth and not development. Equally, the extant literature has focused more on agricultural trade activities with limited works on transformation of the agricultural sector. This study feels this gap by examining agricultural transformation economic development within the CEMAC zone.

3. Methodology

3.1 Data and Model Specification

The study aims to explore the association between agriculture value added and economic development for economies of the Central African Economic and Monetary Community (CEMAC) zone. This study uses a pooled data set consisting of annual observations spanning from 1990 to 2020 for a set of six CEMAC economies. The data used in the study was collected from two principal sources. The data for agricultural value added (AVA), external debt (Exdbt), domestic credit to private sector (Credt), Trade openness (OPEN), Foreign direct investment inflow (FDI), Domestic investment (DINV) and Remittances influence (Remit) were collected from the World development indicator (2022). AVA denotes Agriculture, forestry, and fishing, value added (constant 2015 US$) which measures the different transformation made on agricultural products to render them more valuable in market value. Exdbt is external debt stock as a percentage of gross national income, FDI is foreign direct investment net inflows (BOP, current US dollars), OPEN is sum of export and import of goods and services as a percentage of GDP. DINV is measured as gross fixed capital formation (constant 2010 US dollars), Remit denotes remittances inflow measure as personal remittances received as percentage of GDP. Economic development (DEV) is measured using the human development index. Development is the human development index which comprises of measures of long and healthy life captured by life expectancy index, access to education captured by an index of expected years of schooling of children at school-entry age and mean years of schooling of the adult population, and finally decent standard of living captured by an index of gross national income per capita for the price level of the country. The human development data is obtained from the united nation development programme (UNDP, 2022) databased. Based on the aforementioned defined variables, the functional form of the model employed in this study is given as follows.

$$\text{DEV} = \text{f(AVA, Credt, Exdbt, OPEN, FDI, DINV, Remit)} \quad (1)$$

From the functional form, we specify the econometric model within a panel framework as follows.

$$LDEV_{it} = \partial_0 + \partial_1 LAVA_{it} + \partial_2 LOPEN_{it} + \partial_3 \text{LCredt}_{it} + \partial_4 LFDI_{it} + \partial_5 \text{LExdbt}_{it} + \partial_6 LDINV_{it} + \partial_7 L\text{Remit}_{it} + \varepsilon_{it} \quad (2)$$

Where ε denotes the error term. i and t stand for the individual countries considered and the time dimension of the study respectively. Note that all the variables have now been transform in their logarithmic form in order to linearized and interpret coefficient as elasticities. ∂_a, ∂_i where i = 1,……, 7 denotes the different parameters to be estimated in the model.

3.2 Empirical Approach

In order to examine the effect of value added in agriculture on economic development, we employ two estimation technique. We first estimate our model using the panel fixe and random effect technique and check for possible problems of cross correlation and heteroscedasticity. Typically, panel regression takes two likely possibilities namely the fixed effect (FE) and the random effect (RE). The random effects or variance components of panel models owes its origin with an English astronomer George Biddell Airy, who published a monograph in 1861, in which he made explicit use of a variance components model for the analysis of astronomical panel data (Nerlove, 2002). The RE model assumes that an entity's error term is not correlated with the independent variables. This gives the latitude for time-invariant variables to play a role as explanatory variables.

On the other hand, Nerlove (2002) asserts that the fixed effects model of panel data techniques originated from the least square methods in the work of Gauss (1809) and Legendre (1806). The FE explores the relationship between the independent and dependent within an entity such as country, person, company, etc. with each of the entities having its own individual distinctiveness that may or may not influence the independent variable(s). For example, in a cross-sectional time series study on CEMAC countries, there are peculiar features about these countries that are time-invariant such as their culture, colonial heritage, language etc., which influence some macroeconomic and microeconomic determinants of the independent variables, which when not controlled for will eventually exaggerate their impact on the dependent variable or even bias the entire results obtained using them.

However, both the fixe effect and the random effect does not account for the problem of cross correlation and heteroscedasticity. In this regard in order to ensure robustness of outcome, we check for this aforementioned problems. The validation of this problem guide the selection of the generalized least square technique which corrects for them. We use the generalized least squares panel method (GLS). This methodology is employed because it has many advantages over commonly used estimating methodologies in the literature like the Panel ordinary least square; fixed effect and random effect estimators. In the presence of heteroskedasticity, serial correlations, and cross-sectional correlations, the suggested GLS estimator outperforms the ordinary least squares (OLS). Note that before proceeding with the estimation of the aforementioned techniques, we will first use the Levin Lin Chou (LLC) test to determinant the order of integration of our variables.

4. Results and Discussion

Before proceeding to the regression analyses, we first present that pairwise correlation of the different variables and equally the unit root test outcome. The result of the pairwise correlation matrix of the different variables presented in Table 1 demonstrate that there exists negative correlation between agricultural value added and economic development and equally a negative correlation between external debt and agricultural value added. Further outcome shows that there is positive relationship between foreign direct investment, domestic investment, credit to private sector, remittances and trade openness on economic development. However, correlation matrix does to actual give the effect of this variables on development, therefore the need for empirical regression.

Table 1. Pairwise correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) LDEV	1.000							
(2) LAVA	-0.511	1.000						
(3) LFDI	0.112	-0.122	1.000					
(4) LDINV	0.720	-0.057	0.237	1.000				
(5) LCredt	0.441	-0.033	-0.081	0.224	1.000			
(6) LExdbt	-0.044	-0.488	-0.216	-0.421	-0.187	1.000		
(7) LRemit	0.311	0.188	0.090	0.683	0.222	-0.233	1.000	
(8) LOPEN	0.294	-0.248	0.099	0.311	-0.142	0.133	0.148	1.000

Source: Computed by author using STATA 14.

Form the pairwise correlation, we proceeded to conduct the unit root test of the different variables. the outcome of the unit root test presented in Table 2 demonstrate that, economic development, agricultural value added, domestic investment, external debt, credit to private sector and remittances where observed to nonstationary at since the null hypothesis of the LLC test of series containing unit root could not be rejected. However, at first difference, the null hypothesis is rejected for all these variables and as such they become stationary at order one. Meanwhile FDI and trade openness are stationary at level. Form the unit root test, we proceed with regression analyses.

Table 2. Unit root test

Variable	LLC test		Decision
	Coefficient	P Value	
LDEV	1.7198	0.9573	
D(LDEV)	-3.1552	0.0008	I(1)
LAVA	-0.7187	0.2362	
D(LAVA)	-4.4249	0.0000	I(1)
LFDI	-2.2779	0.0114	I(0)
LDINV	-0.3003	0.3820	
D(LDINV)	-4.3687	0.0000	I(1)
LOPEN	-3.0240	0.0012	I(0)
LExdbt	0.3396	0.6329	
D(LExdbt)	-3.2103	0.0007	I(1)
LCredt	-0.9916	0.1607	
D(LCredt)	-6.7415	0.0000	I(1)
LRemit	0.3110	0.6221	
D. LRemit	-4.9414	0.0000	I(1)

Source: Computed by author using STATA 14.

In order to examine the effect of agriculture value added on human development, we employ the fixed and random effect estimation techniques and then subsequently employ the generalized least square technique.

Table 3. Hausman (1978) specification test

	Coef.
Chi-square test value	8.491
P-value	0.075

Source: Computed by author using STATA 14.

Before proceeding to present the outcome of the fixed and random effect estimate, we first commence by estimating the two models and testing the efficient estimate using the Hausman (1978) specification test. The result of the Hausman specification test presented in Table 3 indicate that The Chi square test statistics is 8.491 with a reported p-value of 0.075 which is significant at 10 percent. The outcome shows that the null hypothesis is rejected at the 10 percent level of significance. This further means that the coefficient of the random effect model is not consistent as well as efficient therefore we will interpret the fixed effect model.

Table 4. Random and fixe effect result of Agricultural value added on economic development

	(1)	(2)
VARIABLES	FE	RE
DV(LHDI)		
D(LAVA)	0.0472*	0.0577**
	(0.0245)	(0.0244)
D(LCredt)	0.0267***	0.0284***
	(0.00509)	(0.00514)
D(LExdbt)	0.00160	0.00121

	(0.00461)	(0.00461)
LOPEN	0.00209	0.000341
	(0.00400)	(0.00273)
LFDI	0.000566	0.000642
	(0.000982)	(0.00101)
D(LDINV)	0.0122*	0.0150**
	(0.00617)	(0.00597)
D(LRemit)	-0.00224	-0.00276
	(0.00199)	(0.00203)
Constant	-0.00672	0.000187
	(0.0172)	(0.0119)
Observations	95	95
R-squared-Between	0.7766	0.891
F statistics	5.16 [0.000]	43.23[0.000]
Number of country	5	5

Note: () Standard errors in parentheses, [] denote P values. *** p<0.01, ** p<0.05, * p<0.1

Source: Authors computation from STATA 14.

The result of the Fixed effect (FE) estimate is presented in column 1 of Table 4. The outcome shows that Agricultural value added has a positive and significant effect on economic development. This value is seen to be significant at 10%. The result shows that a 1% increase in agricultural value added leads to a 0.0472% increase in economic development everything being equal. Equally though the random effect results are not consistently efficient, it outcome is in line with the FE effect outcome in terms of sign and significance. These results indicate the contribution of agricultural transformation or structural change in the agricultural sector on the development of economies of the CEAMC. As to what concern the different control variables employed, credit to private sector portray a positive effect on economic development (LHDI). The outcome shows that increase in domestic credit to the private sector leads to an increase in economic development. This result indicates that a 1% increase in the provision of credit to private sectors lead to 0.0267% increase in economic development. This outcome is statistically significant at the 1% level of significant and consistent with the RE effect result.

Furthermore, external debt is observed to have a positive effect on economic development. A unit percentage increase in external debt increases economic development by 0.0016%. However, this result is statistically significant. Equally, trade openness indicates a positive effect on economic development. This shows that increase in openness leads to an increase in economic development within the CEMAC ZONE. The trade openness outcome is seen to be statistically insignificant. In the same rationale, domestic investment has a positive but insignificant effect (at 10%) on economic development within the CEMAC zone. A unit percentage increase in domestic capital formation increases economic development by 0.0122%. Foreign capital inflow is having a positive effect on economic development in the CEMAC zone. However, the outcome is not significant. to add, remittances inflow has negative but insignificant effect on economic development within the CEMAC zone. The F statistics is seen to have a coefficient of 5.16 and a p value of 0.000 which is significant at 1%. This shows global fitness of the estimated result. Equally, the r square of 0.7766 shows that the independent variables included in the model explain the dependent variable by 77.66%.

Table 5. Robustness check Cross-sectional time-series FGLS regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	GLS	GLS	GLS	GLS	GLS	GLS	GLS
DV (LHDI)							
D(LAVA)	0.0418***	0.0422***	0.0549***	0.0261*	0.0265*	0.0291**	0.0243*
	(0.0120)	(0.0118)	(0.0131)	(0.0154)	(0.0154)	(0.0148)	(0.0143)
D(LCredt)		0.00962***	0.0154***	0.0129***	0.0130***	0.0119***	0.0117***

		(0.00305)	(0.00399)	(0.00380)	(0.00381)	(0.00372)	(0.00360)
D(LExdbt)			-0.00337	-0.00116	-0.00129	0.00151	8.61e-06
			(0.00304)	(0.00292)	(0.00293)	(0.00309)	(0.00305)
LOPEN				0.00368***	0.00364***	0.00252**	0.00159
				(0.00105)	(0.00105)	(0.00110)	(0.00111)
LFDI					-0.000492	-0.000283	0.000168
					(0.00117)	(0.00114)	(0.00115)
D(LDINV)						0.00902**	0.00879**
						(0.00353)	(0.00344)
D(LRemit)							0.0267***
							(0.0101)
Constant	0.00376***	0.00385***	0.00389***	-0.0108**	-0.00951*	-0.00578	-0.00225
	(0.00111)	(0.00100)	(0.000981)	(0.00427)	(0.00513)	(0.00524)	(0.00532)
Observations	180	180	150	150	150	150	150
Chi-square	12.13(0.001)	21.24(0.000)	29.89(0.000)	46.23(0.000)	46.05(0.000)	52.04(0.000)	61.88(0.000)
Number of countries	6	6	5	5	5	5	5

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source: Authors computation from STATA 14.

Based on the outcome presented in table 5 using the generalised least square technique, different simulations are employed. From the outcome, column one shows the baseline regression without any control variable. The result shows that, agricultural value added is positively affecting economic development within the economies of the CEMAC zone. This outcome is in line with that of the FE and RE estimate in table 5. This further shows that our outcome is results from other estimation approach which control for possible problems of cross correlation, heteroscedasticity among others. Furthermore, when we add other control variables and simulate form column 2 to column 7, our results remain consistently positive and statistically significant for agricultural value added. However, the introduction of trade openness, foreign direct investment and remittances partial out some degree of significances of agricultural value added whereas, domestic investment seemingly augment the level of significances.

With regard to the different control variables employed, we observed that domestic credit to private sector remain positive and statistically significant for all the simulated models. This outcome is consistent with that obtained for the FE and RE technique. Furthermore, trade openness, domestic investment and remittances are equally positively related with economic development. These variables are equally seen to be significant. The outcome for remittances inflow deviate from the negative outcome obtained from the FE and RE models. This shows that controlling for cross correlation partial out the negative effect of remittance inflow on economic development. With regard to external debt and foreign direct investment inflow, we observe fluctuation of the sign, based on the different control variables employed. For the global fitness of the estimated models, the WALD Chi^2 statistics is seen to be significant. This shows global fitness of the estimated result. Hence the results obtained are reliable and good for inference.

The outcome is in line with the study of Adeyemo *et al.,* (2015) that settled on the fact that agriculture value added enhance national income of Nigeria. It is in the same vein with the outcome of Tiffin and Irz (2006) that found out that agricultural value added is the causal variable for economic development in developing countries while the direction of causality in developed countries is unclear. This results are in line with the theoretical views of the Rostow theory on the interaction of the agricultural sector and development.

5. Conclusion

This study was aimed at examining the effect of agricultural value added on the level of development in the CEMAC sub region. To achieve this objective, data on development which is capture by human development index is obtained from the United nations development programme database (2022), meanwhile data for agricultural value added and other control variables was obtained from the world development index databased.

The data was scrutinized for stationarity using the Levin Lin Chu (LLC). Furthermore, the panel fixed effect, Random effect and the generalised least square techniques were used to examine the effect of agricultural value added on economic development of economies within the CEMAC zone. The results that, the coefficient of the log of agricultural value added was positive implying that there is a direct and significant relationship between agricultural value added and economic development. Precisely, indicating that the further a country enhance agronomic transformation, the better it levels of economic development will be for the CEMAC economies. This study as such recommend that, there is need for government within this sub-region to engage in measures that will add value to agricultural goods and hence attract the much-needed foreign reserve. This can be done by opening agro-processing firms, encourage public-private partnership in agriculture, offer attractive loans to private sector and offer an attractive investment code to foreign direct investors and researchers in agro-processing domain.

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