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THE RELATIONSHIP BETWEEN DOMESTIC AGRICULTURAL INVESTMENTS AND ECONOMIC GROWTH IN GHANA

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Abstract

We investigated the contribution to economic growth emerging from Ghana's investment intodomestic agriculture. To this effect, time series data spanning 1965 to 2020 was used. For data analysis, stationarity was achieved using Augmented Dicky-Fuller and Phillips-Perron test; the ARDL bounds approach adopted for cointegration; finally, the Error Correction Model and Granger causality test were used for determining the long-run and short-run causal effects. From the results, in both long-run and short-run, the nation's domestic agricultural investment was not a positive contributor to economic growth. Positive contribution to economic growth was from investment in other sectors (industrial and service sectors) and trade openness index. Moreover, government expenditure index contributed negativelyto economic growth. In the short-run, unidirectional causality was from economic growth to government expenditure index, other sector investments to economic growth, and economic growth to trade openness index. In this study, we strongly advocate for considerable government domestic investment into the agricultural sector besides other sector investments, and further relaxing trade policies since it is the only surety to achieving the government's two-fold agenda of zero tolerance for hunger and poverty while simultaneously increasing agriculture's contribution to economic growth with partial dependence on donor funds.

Key words**:** *agricultural growth, domestic investment, economic growth, granger causality*

INTRODUCTION

Governments' domestic agricultural investmentsplay a crucial role when determining the prevailing food security situations in developing economies [30]. Decision to eliminate hunger and poverty in most African countries by implementing sustainable agricultural policies aligns positively with the United Nation's Sustainable Development Goals [18]. The inappropriate budgetary allocation among the various economic sectors has slowed sustainable development in Africa. Globally, agriculture is perceived to be a major player in economic transformation [17]. According to Aneani et al. [3], the sector in Ghana, employs approximately one-third of the working labor force, contributes almost 64% of foreign exchange earnings. Despite the sector's progress, rural farmers still live in a deplorable state. Moreover, the majority are operating on a smallholder basis with the lack of farming inputs and practicing rain-fed agriculture as a means of survival [4]. How this sector promotes economic welfare in its entirety remains unsolved. Early literature in low-income countries on agriculture's contribution to economic growth tries to clarify these issues [15, 27, 29]. Inherent problems such as ineffective agricultural policies, use of traditional farming methods, and low capital investment have propelled others to challenge the assertion that agriculture always promotes economic growth [14, 22].

A vast literature exists on the economic impacts of domestic agriculture investments, while others concentrated on the impact of governments' investment on other sectors. These results differ because fiscal policies and economic situations differ in these countries.

The significant impacts of domestic agriculture investments on agricultural growth and poverty reduction in the long-run exists for countries such as China, and India [13], and African countries such as Zambia, Kenya, Tunisia, and Congo [1, 6].

Best to our knowledge, Ghana lacks empirical study on how domestic agricultural investment promotes economic growth. This study establishes whether domestic investment into agriculture sector in the face of other sector investments, trade openness, and government expenditure enhances economic growth. This study contributes to existing literature by providing an operational framework on budget allocation particularly to the actors in the agricultural sector.

MATERIALS AND METHODS

Data Sources

Secondary data (annual time series from 1965-2020)from Bank of Ghana and Ministry of Food and Agriculture was used. Economic growth was taken as gross domestic product (GDP) in Ghana cedis (GH₵), government's domestic investment into the agricultural sector in GH₵, and government's investment into the industrial and service sectors referred to as other sector investments in GH₵. Trade openness index (%) calculated by summing trade flows (imports and exports) in goods and services and dividing them by GDP was also considered. Finally, general government expenditure index (%) representing a function of total government expenditure comprising of other expenses besides those incurred from investments into the major economic sectors.

Empirical Strategy

Since dataset is an annual time series type, we first performed a stationarity test using the Phillips-Perron (PP) and the Augmented Dicky Fuller (ADF) tests. Secondly, after specifying the autoregressive distributed lag model (ARDL), with reference to a set of information criteria such as final prediction error (FPE), Schwarz information criterion (SC), Hannah-Quinn criterion (HQ), and Akaike criterion (AC), the optimum lag lengths were determined for each variable. The bounds test was used in the third stage to determine the existence of any cointegration relationship. Where cointegration relationship exists, causality must be inferred from these two models (long-run and short-run). Fourthly, long-run model was estimated by an error correction model instead of the vectors error correction model (VECM) due to the presence of one cointegrating relationship. The fifth stage involved a pair wise Granger causality test for the short-run causal effects. Finally, the robustness and credibility of the models were checked by sets of diagnostic tests such as Breusch-Pagan-Godfrey, Harvey, Glejser, Jarque-Bera, and ARCH.

Unit Root Test

The study used the ADF test per the specification of Dickey & Fuller [9], Dickey et al. [10], Elliott et al. [12], and the PP test following Philips &Perron [26]. The test equation is specified as follows:

$$\Delta Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \beta_3 Y_{t-3} + \cdots + \beta_i Y_{t-i} + \varepsilon_t \quad (1)$$

where:

Y_t is the time series data on gross domestic product growth to be tested. β_0 and β_1 represents intercepts and the coefficient of interest involving the unit root test ε_t is the error term, β_2, β_3 ... β_i are the augmented lagged difference parameters of Y_t, indicating the ith order of autoregressive processes. The null hypothesis to be tested in the unit root analysis is specified as:

$H_0: \beta = 0$, presence of unit root (non-stationary)

$H_1: \beta \neq 0$, no unit root (stationary)

ARDL Bounds Cointegration Test

After performing a stationary test, the series is likely to be integrated of I (0) - level stationary, I (1) - stationary after first difference, and integrated of different orders, thus I (0) and I (1) series. Once stationarity is achieved among the series, a cointegration test is necessary to establish the long-run relationship and short-run dynamics among the variables. Depending on the order of integration, these two cointegration tests; Engle-Granger cointegration and the Johansen cointegration are best suited for I (0), or I (1) series. The third approach to cointegration, used here, is the bounds cointegration test convenient for a combination of I (0) and I (1) orders. A major advantage of the bounds test as revealed by Pesaranet al. [24, 25] is that it produces unbiased long-run estimates.

The generalized ARDL (p, q) model is specified as:

$$Y_t = \gamma_{0i} + \sum_{i=1}^{p} \delta_i Y_{t-i} + \sum_{i=1}^{q} \beta_i X_{t-i} + \varepsilon_t \quad (2)$$

where:

Y_t is a vector and the variables in (X_t) are allowed to be purely $I(0)$ or $I(1)$; β and δ are coefficients; γ is a constant; i = 1, …, k; p, q are optimal lag orders for dependent and independent variables; ε_{it} is the error terms (independent or serially uncorrelated). To perform the bounds test for cointegration, the conditional ARDL (p, q_1, q_2, q_3, q_4) model with 5 variables is specified as:

$$\begin{aligned}\Delta lngdp_t = {} & a_{01} + b_{11} lngdp_{t-i} + b_{21} lnasiv_{t-i} + b_{31} lnosiv_{t-i} + b_{41} lngvexp_{t-i} + b_{51} lntop_{t-i} \\ & + \sum_{i=1}^{p} a_{1i}\,\Delta lngdp_{t-i} + \sum_{i=1}^{q} a_{2i}\,\Delta lnasiv_{t-i} + \sum_{i=1}^{q} a_{3i}\,\Delta lnosiv_{t-i} \\ & + \sum_{i=1}^{q} a_{4i}\,\Delta lngvexp_{t-i} + \sum_{i=1}^{q} a_{5i}\,\Delta lntop_{t-i} + \varepsilon_{1t} \qquad (3)\end{aligned}$$

$$\begin{aligned}\Delta lnasiv_t = {} & a_{02} + b_{12} lngdp_{t-i} + b_{22} lnasiv_{t-i} + b_{32} lnosiv_{t-i} + b_{42} lngvexp_{t-i} + b_{52} lntop_{t-i} \\ & + \sum_{i=1}^{p} a_{1i}\,\Delta lnasiv_{t-i} + \sum_{i=1}^{q} a_{2i}\,\Delta lngdp_{t-i} + \sum_{i=1}^{q} a_{3i}\,\Delta lnosiv_{t-i} \\ & + \sum_{i=1}^{q} a_{4i}\,\Delta lngvexp_{t-i} + \sum_{i=1}^{q} a_{5i}\,\Delta lntop_{t-i} + \varepsilon_{2t} \qquad (4)\end{aligned}$$

$$\begin{aligned}\Delta lngvexp_t = {} & a_{03} + b_{13} lngdp_{t-i} + b_{23} lnasiv_{t-i} + b_{33} lnosiv_{t-i} + b_{43} lngvexp_{t-i} + b_{53} lntop_{t-i} \\ & + \sum_{i=1}^{p} a_{1i}\,\Delta lngvexp_{t-i} + \sum_{i=1}^{q} a_{2i}\,\Delta lnasiv_{t-i} + \sum_{i=1}^{q} a_{3i}\,\Delta lngdp_{t-i} \\ & + \sum_{i=1}^{q} a_{4i}\,\Delta lnosiv_{t-i} + \sum_{i=1}^{q} a_{5i}\,\Delta lntop_{t-i} + \varepsilon_{3t} \qquad (5)\end{aligned}$$

$$\begin{aligned}\Delta lntop_t = {} & a_{04} + b_{14} lngdp_{t-i} + b_{24} lnasiv_{t-i} + b_{34} lnosiv_{t-i} + b_{44} lngvexp_{t-i} + b_{54} lntop_{t-i} \\ & + \sum_{i=1}^{p} a_{1i}\,\Delta lntop_{t-i} + \sum_{i=1}^{q} a_{2i}\,\Delta lnasiv_{t-i} + \sum_{i=1}^{q} a_{3i}\,\Delta lngdp_{t-i} \\ & + \sum_{i=1}^{q} a_{4i}\,\Delta lnosiv_{t-i} + \sum_{i=1}^{q} a_{5i}\,\Delta lngvexp_{t-i} + \varepsilon_{4t} \qquad (6)\end{aligned}$$

$$\begin{aligned}\Delta lnosiv_t = {} & a_{05} + b_{15} lngdp_{t-i} + b_{25} lnasiv_{t-i} + b_{35} lnosiv_{t-i} + b_{45} lngvexp_{t-i} + b_{55} lntop_{t-i} \\ & + \sum_{i=1}^{p} a_{1i}\,\Delta lnosiv_{t-i} + \sum_{i=1}^{q} a_{2i}\,\Delta lnasiv_{t-i} + \sum_{i=1}^{q} a_{3i}\,\Delta lngdp_{t-i} \\ & + \sum_{i=1}^{q} a_{4i}\,\Delta lngvexp_{t-i} + \sum_{i=1}^{q} a_{5i}\,\Delta lntop_{t-i} + \varepsilon_{5t} \qquad (7)\end{aligned}$$

where the natural log of each variable is defined as follows: lngdp for Gross domestic product, lnasiv for agriculture sector investments, lngvexp for government expenditure index, lnosiv and lntop for other sectors investments and trade openness index. Δ and ε_t are the difference operator and error terms respectively. After selecting the appropriate lag lengths for each dependent variable, thus 1, 3, 1, 4, 2 per the order of equations (3) to (7), we proceeded with the bounds test. The hypothesis for the bounds test is specified as:

$$H_0 : b_{1i} = b_{2i} = b_{3i} = b_{4i} = b_{5i} = 0$$

$$H_1 : b_{1i} \neq b_{2i} \neq b_{3i} \neq b_{4i} \neq b_{5i} \neq 0$$

where:
i=1,2,3,4,5

The null hypothesis stipulates that the coefficients of the long-run equations are all equal to zero implying no cointegration among the variables in the selected model, and vice versa for the alternative hypothesis. If the null hypothesis is accepted, only a short-run model is specified. The bounds test depends on the joint F- statistics which is compared to the critical values of the *I* (0) or *I* (1) bound preferable at a 5% significance level. When the F-value is greater than the upper bound *I* (1) critical values then cointegration exists, and otherwise, if it is less than the lower bound, *I* (0) critical values. The test is inconclusive if the F-value lies between the *I* (0) and *I* (1) critical bounds.

The Long-Run Error Correction Model (ECM)

The outcome of the bounds cointegration test (presented in the results section) indicated one cointegration relationship when gross domestic product was the dependent variable. Similar to the study of Narayan & Smyth [19] and Odhiambo [20], the short-run dynamic parameters associated with the long-run estimate were obtained by estimating an ECM instead of VECM due to the presence of only onecointegration equation. The coefficient of the lagged error correction-term is expected to bear a negative sign to justify the use of the bounds test and the existence of long-term equilibrium. The *t*-statistics on the explanatory variables in the error correction model indicates the short-run causal effects. Similar to the study of Ohen et al. [21], a parsimonious and more reliable result was achieved by eliminating insignificant lags from the over-parameterized model.

The long-run model and the error correction model (ECM) are specified as:

$$lngdp_t = a_0 + \sum_{i=1}^{p} a_{1i}\, lngdp_{t-i} + \sum_{i=1}^{q} a_{2i}\, lnasiv_{t-i} + \sum_{i=1}^{q} a_{3i}\, lnosiv_{t-i} + \sum_{i=1}^{q} a_{4i}\, lngvexp_{t-i} + \sum_{i=1}^{q} a_{5i}\, lntop_{t-i} + \varepsilon_t \quad (8)$$

$$\Delta lngdp_t = a_0 + \sum_{i=1}^{p} a_{1i}\, \Delta lngdp_{t-i} + \sum_{i=1}^{q} a_{2i}\, \Delta lnasiv_{t-i} + \sum_{i=1}^{q} a_{3i}\, \Delta lnosiv_{t-i} + \sum_{i=1}^{q} a_{4i}\, \Delta lngvexp_{t-i} + \sum_{i=1}^{q} a_{5i}\, \Delta lntop_{t-i} + \lambda ECT_{t-1} + g\varepsilon_t \quad (9)$$

where:

$\lambda = (1 - \sum_{i=1}^{p} \delta_i)$, speed of adjustment parameter with a negative sign

$ECT = (lngdp_{t-i} - \theta X_t)$, error term; the extracted residuals from the regression of the long-run equation

$\theta = \frac{\sum_{i=0}^{q} \beta_i}{\alpha}$, is the long-run parameter

$a_{1i}, a_{2i}, a_{3i}, a_{4i}, a_{5i}$ are the short-run dynamic coefficients. All the rest are previously defined.

The Pairwise Granger Causality Test and Robustness Analysis

Although cointegration generally indicates the presence of causality, at least in one direction, the true direction of causality may be lacking among the variables. The direction of causality, in this case, can be detected through the ECM by using the *t*-statistics of the regressors. Also, short-run causal effects can be obtained through the *F*-statistics from either the pairwise Granger causality test or the Walds test. The hypothesis underpinning the pairwise Granger causality is expressed as:

H_0 : no Granger causality

H_1 : the null hypothesis is not true

The decision criteria is to reject the null hypothesis if the probability value of the *F*-statistics is ≤ 0.05, and vice versa.

RESULTS AND DISCUSSIONS

Descriptive Analysis

From Table 1 which portrays descriptive statistics, the average gross domestic product (GPD) for the period under consideration was ₵ 34,205.20 billion (approximately $ 6.38 billion at a current exchange rate of 1$ to ₵6.36, where ₵ represents Ghana Cedis) with a standard deviation of 516.43. In the year 2020, nominal GDP for Ghana stands at $ 66.75 billion while per capita GDP is $ 2,266, against $ 62.54 billion and $ 2,032 for the year 2019. Average agriculture sector investments representing total domestic agriculture sector expenditure by the government was ₵126.01 million with possible outliners represented by minimum and maximum of 6.43 and 497 respectively. The government expenditure index was 18.34%, trade openness index was 55.27%, and finally, average investment in the two major sectors (industry and service) was ₵1,088 billion.

Table 1. Descriptive statistics

Variable*	Mean	Std. Dev.	Min.	Max.
Gross domestic product (GDP)	34,205.20	516.43	16.60	312,550.23
Agriculture sector investments (ASIV)	126.01	138.32	6.43	497.32
Government expenditure index (GVEXP)	18.34	3.33	11.84	30.53
Trade openness index (TOP)	55.27	27.28	6.32	86·02
Other sector investments (OSIV)	1,088.70	185.98	47.23	5,789.34

*GDP and OSIV in billion cedis, ASIV in million cedis, GVEXP and TOP in %.

Source: Authors' calculation based on national data.

Stationarity Test

Table 2 indicates stationarity test results using constant and trend specifications. Only government expenditure index gained stationarity at levels *I*(0). Hence, the null hypothesis that the series have unit roots and non-stationary at levels was accepted. However, the data series gained stationarity after their first difference. Since all the variables exhibit stationarity, cointegration relationship existing among them can be established using the appropriate test. The bounds cointegration test is used instead of the Johansen test which is strictly designed for *I*(0) or *I* (1) order of integration.

Table 2. Results of unit root test

Variables	ADF		PP	
	Level	First difference	Level	First difference
Gross domestic product (InGDP)	-2.631	-6.449***	-2.563	-6.525***
Agricultural sector investments (InASIV)	-2.469	-3.697**	-2.112	-7.453***
Government expenditure index (InGVEXP)	-5.273***	-7.307	-5.273***	-19.424
Trade openness index (InTOP)	-2.311	-5.483***	-2.098	-5.265***
Other sectors investments (InOSIV)	-2.062	-7.318***	-2.062	-7.331***

***, ** and *denotes significance levels at 1%, 5%, and 10% respectively. The critical values are -4.140, -3.512 and -3.376 for significance levels at 1%, 5%, and 10% respectively.

Source: Authors' calculation based on national data.

Bounds Cointegration Analysis

The unit roots test results revealed a combination of both level and first difference stationarity. The bounds test was used for determining the level of relationship between variables when each is used as a dependent variable. Table 3 indicates the results. With lag lengths mentioned previously, equations 3, 4, 5, 6, and 7, were estimate 5.27, 2.26, 2.55, 1.37 and 2.30 were obtained as the F-statistics. A long-run relationship exists among the variables because *In*GDP in equation (3) with F-value of 5.27was higher than upper-bound critical value of 4.01 at 5% level.

Table 3. Results of bounds cointegration test (lags: 1, 3, 1, 4, 2)

Variables	AIC Lags	F-stat.	Outcome	Estimation
InGDP	1	5.27	cointegration	ECM (error correction model)
InASIV	3	2.56	no cointegration	ARDL (short-run model)
InGVEXP	1	2.55	no cointegration	ARDL (short-run model)
InTOP	4	1.37	no cointegration	ARDL (short-run model)
InOSIV	2	2.30	no cointegration	ARDL (short-run model)
Lower-bound critical value at 5%	2.86			
Upper-bound critical value at 5%	4.01			

Source: Authors' calculation based on national data.

The ARDL Long-Run Estimates and Error Correction Model

The Long-Run Model

Results are indicated in Table 4 below. Long-run growth in the economy was determined by investments into the industrial and services sectors. Government spending as well as transparency in trade were also among the determinants. Government's monetary allocation to the agricultural sector was not a predictor of economic growth for the study period. At 5%, a negative (-0.349) impact on economic growth emerged from Government expenditure index. As opposed to government expenditure index, the coefficient of trade openness index was positive and significant at 1%. At a 10% significant level, government's investment into other sectors was positive and a possible determinant of economic growth. Agricultural sector investments although recorded a positive coefficient of 0.027 did not significantly influence economic growth in this study.

Table 4. ARDL approach for the estimated long-run coefficients

Variable	Coef.	Std. Error	t-stat.
Constant	-1.042	0.409	-2.546
InASIV	0.027	0.040	0.675
InGVEXP	-0.349**	0.136	-2.552
InTOP	0.178***	0.058	3.687
InOSIV	0.154*	0.070	2.077
Model Diagnostics			
R-squared	0.998	Mean dependent variable	20.49
Adjusted R-squared	0.997	Durbin-Watson Statistics	2.053
F-statistic	523.523	Prob (F-statistic)	0.000

***, ** and * denotes significance levels at 1%, 5% and 10% respectively.Dependent variable denoted as *InGDP

Source: Authors' calculation.

The Error Correction Model

In Table 5, the estimated ECM indicates how the short-run coefficients are associated with the long-run relationship. An *F*-statistics of 5.07 at 1% implies the short-run model variables totally explain GDP growth (dependent variable). The R^2 value shows that 63% of the change in economic growth can be precisely explained by the models' selected independent variables. The absence of first-order autocorrelation in the error terms is indicated by the Durbin-Watson's statistics of

2.01. An additional indicator that we are not performing a spurious regression is the Durbin-Watson's value higher than the R^2. Per our expectation, at 1% significance level, coefficient of the lagged error correction term (ECT) is negative (-1.008) indicating a long-run relationship among the variables in our model results previously indicated in Table 4. It shows that more than 100 percent of the past year's instability or disequilibrium is amended before the present year ends. The short-run parameters indicate that government expenditure at 5% with negative coefficient and trade openness at 5% significant level with positive coefficient had an important impact on economic growth. This implies the presence of causality in at least one direction.

Table 5. Error correction representation for the selected ARDL model

Variable*	Coef.	Std. Error	t-stat.
Constant	0.003	0.041	0.081
ΔInASIV	0.050	0.059	0.851
ΔInGVEXP	-0.277**	0.130	-2.416
ΔInTOP	0.255**	0.100	2.544
ΔInOSIV	0.146	0.095	1.535
ECT	-1.008***	0.251	-4.011
Model Diagnostics			
R-squared	0.632	Akaike info criterion	0.836
Log-likelihood	29.15	Schwarz criterion	0.575
F-statistic	5.078	Hannan-Quinn criterion	0.736
Prob(F-statistic)	0.000	Durbin-Watson	2.013

***, ** and * denotes significance levels at 1%, 5% and 10% respectively. *InGDP as a dependent variable
Source: Authors' calculation based on national data.

The Pairwise Granger Causality Test

At 5% we determined the short-term causality. We relied on the results from the pairwise Granger causality test. Table 6, shows no causality between economic growth and agricultural investments and vice versa. Government expenditure and domestic agricultural investment reveals the lack of causality in both directions. Hence, confirming the neutrality idea of no Granger causality as well. Causality exists between other sector investments and economic growth, economic growth and government expenditure index, as well as trade openness index. No causality exists between trade openness and domestic agriculture sector investments. Similarly, the study maintained the neutrality concept of no Granger causality between other sector investments and domestic agriculture sector investments.

Table 6. Pairwise Granger causality test results on the direction of causality

Variable	F-statistics					Direction of causality
	InGDP	InASIV	InGVEXP	InOSIV	InTOP	
InGDP	-	1.971	2.050	3.517*	1.381	InOSIVIntoInGDP
InASIV	0.135	-	1.245	0.234	0.402	-
InGVEXP	3.329*	0.411	-	0.139	2.025	InGDPIntoInGVEXP
InOSIV	0.464	3.083	2.682	-	0.907	-
InTOP	4.215*	2.199	1.249	1.570	-	InGDPIntoInTOP

* denotes statistical significance at 5% level.
Source: Authors'calculation based on national data.

Model DiagnosticsTests

A shown in Table 7, diagnostic tests were performed to verify the robustness and credibility of our models.

The results of heteroskedasticity tests such as ARCH, Breusch-Pagan-Godfrey, Harvey, Glejser fits well with our assumption of the lack of heteroskedasticity since probabilities exceed 5%. Breusch-Godfrey serial correlation for all models was higher than 5% supporting the null hypothesis.

Hence, our models are not suffering from serial correlation.

The normality test of Jarque-Bera indicates that our residuals are normally distributed.

Table 7. Model diagnostics tests

Diagnostics tests	Dependent variables				
	InGDP	InASIV	InGVEXP	InTOP	InOSIV
Heteroskedasticity ARCH	0.163	0.187	0.961	0.108	0.691
HeteroskedasticityBreusch-Pagan-Godfrey	0.416	0.608	0.875	0.062	0.998
Heteroskedasticity Harvey	0.576	0.478	0.487	0.330	0.893
HeteroskedasticityGlejser	0.455	0.443	0.569	0.158	0.997
Breusch-Godfrey serial correlation LM	0.204	0.543	0.833	0.890	0.541
Jarque-Bera	0.112	0.923	0.123	0.563	0.113

Source: Authors' calculation based on national data.

Adequate investments into the agriculture sector is very important for developing countries since it goes a long way to reduce hunger and poverty as well as promoting local production either at the subsistence or commercial level. The high rate of food importation by most African countries has eased the problem of severe food shortages, however, the high food prices make it difficult for the poor to afford. Similar to Ghana, many children in other Sub-Saharan African countries continue to suffer from malnutrition which automatically undermines one prime aim of the United Nations Sustainable Development goals - ending hunger, achieving food security, and improved nutrition [18]. Though some sectors are considered very important than others, it is evident that all the economic sectors of a country are interlinked and somehow dependent on each other. From Table 4, the long-run coefficient of domestic agriculture sector investments was positive, but was not a determinant of economy growth due to inadequate investments and the other inherent problems facing the sector. However, the minuscule growth recorded in the sector could be attributed to the influx of foreign direct investments and projects executed by development partners [5]. This result contradicts the findings of [8, 16, 28] and in line with [22, 28]. The problems facing the Ghanaian agriculture sector includes: (1) years of insufficient budgetary allocations leading to distraction of major supportingservices such as research and development, and extension mechanisms [7]; (2) limited financial incentives for farmers due poor organization of available financial institutions [4]; (3) low productivity resulting from the lack of modern irrigation facilitates; (4) lack of requisite amenities such as roads, warehouses, electricity necessary for both farming and non-farming activities; (5) massive food importation due to lack of well-functioning processing plants, consequently degrading the value of locally produced items; (6) customary system of land ownership resulting in conflicts and its subsequent discouragement of agricultural investors; and (7) rural-urban migration by young energetic people due to the deteriorating living conditions in rural areas, hence depriving the agriculture sector of the requisite human capital [23]. Also, the negatively signed coefficient of general government expenditure can be attributed to the fact that a larger portion of government's expenditure goes into the payment of salaries, running of programs such as free compulsory basic education, school feeding, free national health insurance scheme, food aid, and disaster relief. As opposed to government expenditure index, the coefficient of trade openness index was positive and significant at 1%. Per the long run estimates, and consistent with [5], transparency in trade increases economic growth by 17.8%. Also, economic growth was positively enhanced by other sector investments. This disputes the previous works of [1]. Certainly, in 2019, economic sectors GDP additions was service-47.2%, industrial-34.2%, and agriculture-18.6%. A negative ECT in table 5 shows an existence of long-run relationship, as well as causality among the variables. Government expenditure and trade openness produced a short-run term effect on the economy. Alfa & Garba [2] stated the positive impact of Trade openness on economic growth, especially for low and middle-income countries. It aids in improving imports and exports, leading to effective and efficient production processes resulting from technological advancement. Nevertheless, trade is not the sole factor to determine the economic growth status of a country. The reason the developed economies have lower value in this metric is that they have diversified economies, which are increasingly dominated by domestic services, and lower share of export-oriented industries as a part of the overall economy. However, due to the various economic activities taking place in a country, the total gross domestic product can also be impacted by other government expenditure. In a nutshell, the need for trade in less developed economies is higher compared to developed ones because the latter can supply the domestic market from their capacity but not the former. Also, in the short-run, government's investments into other sectors as well as the agriculture sector investments were positive but did not cause any significant economic growth in this model. This is true especially for investments made in the service sector because start-up costs involved are high as well as production and sales levels become profitable over time. From Table 6, Granger causality was used as a good predictor of causality rather that those discovered in the ECM. Causality in the short-run existed between government expenditure and economic growth, as well as trade openness and economic growth. Finally, causality existed between growth in the economy and investments into the services and industrial sectors respectively. The above discovery suggests that government should endeavour to enact relevant policies, properly allocate its budget, and promote trade and investment in the country if short-run economic growth is desired.

CONCLUSIONS

Data from 1965 to 2020 was used to demonstrate causal relationship between economic growth and domestic agriculture investments, other sector investments, trade openness, and government expenditure. Long-run and short-run estimates indicated investments into domestic agriculture to be non-determinant of economic growth; indicating that growth in the economy from 1965-2020emerged from other sectors as well as other economic activities. However, based on this result we cannot completely nullify the fact that agriculture does not cause economic growth in Ghana because many studies have tried to justify that the growth achieved in the agricultural sector is from foreign direct investments and donor-funded projects without considering domestic government investment in their models [5, 11]. An example is the on-going five-year program (2017- 2022) dubbed “Planting for Food and Jobs’’ solely sponsored by the Canadian government to revamp the agriculture sector. In the long-run, while trade openness and other sector investments positively contributed to economic growth, government expenditure though significant, negatively affected economic growth since a larger portion of this figure goes into the payment of civil servants’ salaries and rural livelihood projects. Lack of causality existed from agricultural investments to economic growth and vice versa. A unidirectional one existed from other sector investments to economic growth, economic growth to government expenditure, and economic growth to trade openness. Since less developed economies are opting for self-sufficiency and development instead of donor funds and foreign aids which comes with many constraints, we strongly advocate enacting relevant government policies that seek to make trade policies more flexible, as well as placing emphasis on domestic agricultural investments. Specifically, such policy instruments should be aimed at: (1) allocating the agreed 10% of government’s budget during the initiation of CAADP in 2013 to the agricultural sector; (2) establishing stringent monitoring and evaluation platforms to prevent diversion of funds intended for agricultural purposes; (3) developing rural areas as well as basic amenities to encourage young graduates and extension agents to reside and work in agricultural communities; and (4) making farming credit readily available to qualified smallholder farmers.

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