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Trade-Led Growth Hypothesis or Growth-Led Trade Hypothesis: An Empirical Analysis of the West African Monetary Zone (WAMZ) Countries

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ABSTRACT
The paper investigated the trade-led growth hypothesis or growth-led trade hypothesis in WAMZ countries (Nigeria, Gambia, Ghana, Guinea, Liberia and Sierra Leone). Individual country and cross-sectional analysis were done and for the individual country analysis, FMOLS, DOLS, and CCR were considered with Granger causality. The estimated results confirmed the import-led growth hypothesis for Nigeria, Guinea, and Liberia, a trade-led growth hypothesis for the Gambia and Sierra Loan and export-led growth was supported for Ghana. For cross country analysis, FMOLS, DOLS and Granger causality tests were used and trade-led growth hypothesis (both export-led and import-led growth) was valid in WAMZ countries but imports were the most significant variable that influences economic growth than exports. The paper recommended that export promotion policy in WAMZ should focus on manufacturing exports and import substitution policy in WAMZ should focus on importing raw-material and technology for more products in order to accelerate economic growth in WAMZ.

Keyword: Trade-led Hypothesis, Panel data, and WAMZ

JEL Classification: F10, F33, F43, F53

1. Introduction

No country is self-complacent, hence the need for countries to come together and interact through trade (foreign trade). Foreign trade is the transaction of goods and services across the border. The study of foreign trade has been a lively and controversial issue in an economy because foreign trade brings along blessings and courses (Gokmenoglu *et al.*, 2015). For example, foreign trade in goods and services brings

economies of different countries closely linked to one another now than ever before and this can lead to technology transfer which will bring about economic growth for both countries (Evans, 2013; Fapetu & Owoeye, 2017). It also helps in the production of goods that a country is richly endowed by natural resources which will lead to specialization and this will increase World output and more consumption baskets. Despite the fact that foreign trade brings along some blessings, there are courses attached to it because if a country engages in too more importation, the infant industries at home will die if tariffs are not put in place. This is the case in Africa nowadays because of trade liberalization that makes them open their economy to the rest of the World without tariffs. Also, countries that produce primary products have the tendency that their prices will fluctuate in the international market and such at disadvantage compare to countries exporting manufacturing products. In respectively of these courses, the blessings of foreign trade outweigh the courses and these have made foreign trade inevitable and as a consequence, no country wants to engage in autarky because trade is a win-win game and not a zero-sum game.

The advent of foreign trade in Africa countries has ratified the answering of questions of whether the growth of Africa economies are trade-led or growth driven trade? Trade-led can be export-led growth (when export leads to growth) or import-led growth (when import boosts economic growth) and also, growth-driven trade can occur when economic growth is the one that drives both export and import (Akter & Bulbul, 2017; Sağlam & Egeli, 2018). This study seeks to provide answers to the above questions by looking into trade-led growth hypothesis or growth-driven trade hypothesis in West African Monetary Zone (WAMZ) which comprises of six countries (Nigeria, Gambia, Ghana, Guinea, Liberia, and Sierra Leone).

Following a detailed review of previous empirical literature that is depicted in Table 1, the empirical literature can be grouped into three strands. Studies on trade-led (i.e both export-led and import-led) growth hypothesis (Nasrin & Koli, 2018; Fapetu & Owoeye, 2017; Akter & Bulbul, 2017; Moroke & Manoto, 2015; Al-Assaf & Al-Abdulrazag, 2014; Hye *et al.*, 2013; Narayan *et al.*, 2007; Kosekahyaoglu, 2006) and some confirmed both export-led and import-led growth while some only conformed export-led growth. Also, there are studies that investigated only export-led growth both an individual country and cross country analysis (Gatawa, and Lawal, 2017; Gokmenoglu *et al.*, 2015; Daoud & Basha, 2015; Kumar, 2015; Santos *et al.*, 2013; Allaro, 2012; Alimi, 2012; Alimi & Muse, 2012; Tingvall & Ljungwall, 2012; Hye & Siddiqui, 2011; Taban & Aktar, 2008; Furuoka, 2007) while the third group were those that included control variables in testing the export-led growth hypothesis (Kalaitzi & Cleeve, 2018; Sağlam & Egeli; 2018; Chia, 2016; Ahmad *et al.*, 2016; Hassan & Murtala, 2016; Ogbokor, 2016; Syarif, 2015; Kumari & Malhotra, 2014; Evans, 2013; Ramzi & Hernandez, 2011; Chigusiwa *et al.*, 2011; Medina-Smith & CNUCED. 2001; Alhajhoj, 2007; Amrinto, 2006; Konya, 2004).For the studies on export-led growth and with those that added control variables,

some confirmed export-led growth hypothesis and others confirmed the growth-driven export hypothesis.

Based on the methodologies of the studies reviewed, the common methods used was VAR, VECM Granger causality for both short-run and long-run with impulse response function and variance decomposition while few run Pairwise Granger causality test. Also, fixed and random panel analysis, panel OLS and GMM and dynamic panel data techniques with granger causality test were the common techniques by cross country studies while studies that are based on individual countries utilized autoregressive distributed lag (ARDL) approach, Granger causality test, and OLS. Among the studies reviewed on cross country, only Chia (2016) that make used of panel co-integration fully modified OLS (FMOLS) and dynamic OLS (DOLS) and these methodologies will be considered appropriate for this study but the difference is that this research work will consider both individual country analysis and their balance panel analysis and canonical co-integrating regression (CCR) will be added to FMOLS and DOLS for individual country analysis.

Table 1: A Brief Summary of the Related Economic Literature on the Exports/Imports-led Growth Hypothesis

Study	Sample	Period of study	Methodology					Conclusions
			Data set	Economic growth	Exports/Imports	Econometric technique	Other variables	
Akter & Bulbul (2017)	8	2001 – 2015 Developing Eight (D-8)	Cross-sectional	Gross domestic product (GDP)	Total exports and total imports	Vector autoregressive (VAR) model and vector error correction model (VECM)		Both import and export-led to economic growth in both short-run and long-run
Hye *et al.*, (2013)	6	1971 – 2009 for Pakistan and Bangladesh; 1960 – 2009 for India and Sri Lanka; 1965 – 2009 for Nepal and 1981 – 2009 for Bhutan	Time series 4 separate years	GDP	Exports and imports	Granger causality test		The export-led growth model is relevant to all countries except Pakistan, while the import-led growth model is relevant to all countries. The growth-led export model applies to all countries except Bangladesh and Nepal. The growth-led import model and export-import model are relevant to all countries in the sample.
Chia (2016)	3	1985 - 2014	Cross-sectional	Real GDP	Exports	Panel co-integration, fully modified OLS (FMOLS) and dynamic OLS (DOLS)	Investment and government expenditure	Export-oriented growth strategy is valid in the Sub-Saharan African (SSA) countries
Daoud & Basha (2015)	3	1976 to 2013	Cross-sectional 3 separate years	Real GDP	Total real Exports	ECM and Granger causality test		Supports export-led growth hypothesis
Sağlam &	16	1990 – 2015	Cross	Real GDP	Net export	Dynamic panel	Domestic	Supports the export-led

Egeli (2018)			sectional			data techniques	demand (consumption + investment + government expenditure)	growth hypothesis and domestic-demand-led growth
Razmi & Hernandez (2011)	64	**1950 – 2007**	Cross-sectional data averaged over 3-year intervals	Real GDP per capita	Manufactured export and import	Panel OLS and GMM	Industry value-added, external balance on goods and services, gross fixed capital formation and export concentration index (Herfindahl–Hirschmann index)	Exports destined for industrialized countries is the most robust correlate of real per capita GDP growth
Konya (2004)	25	1960 - 1997 for all countries, except Hungary (1970 - 1998), Korea and Mexico (1960 - 1998)	Cross-sectional	Real GDP	Real exports and real imports	Vector autoregressive (VAR) and Granger causality test	Openness	There is no causality between exports and growth (NC) in Luxembourg and in the Netherlands, exports cause growth (ECG) in Iceland, growth causes exports (GCE) in Canada, Japan, and Korea, and there is two-way causality between exports and growth (TWC) in Sweden and in the UK. Although with less certainty, we also conclude that there is NC in Denmark, France, Greece, Hungary and

								Norway, ECG in Australia, Austria, and Ireland, and GCE in Finland, Portugal, and the USA. However, in the case of Belgium, Italy, Mexico, New Zealand, Spain, and Switzerland the results are too controversial to make a simple choice.
Narayan *et al.*, (2007)	2	1960 – 2001 for Fiji and 1961-1999 for Papua New Guinea	Cross-sectional	GDP	Exports and imports	Johansen co-integration and Granger Causality test		Supports evidence of export-led growth in the long-run for Fiji and evidence of export-led growth in the short-run for Papua New Guinea.
Syarif (2015)	5	2004 - 2014	Cross-sectional	GDP growth rate	Export growth rate	Fixed and random panel analysis	Growth of the labor force and Gross domestic investment as a percentage of the GDP	Export growth is significant and gives a positive impact on economic growth in ASEAN.
Tingvall & Ljungwall (2012)	68		Cross-sectional	Growth	Export	Meta-regression analysis		Exports have been more significant for growth in China than in other countries
Evans (2013)	4	1970 - 2012	Cross-sectional	GDP	Exports of goods and services and imports of goods and services	Granger causality, impulse response function, and variance decomposition.	Money and quasi money (M2) as % of GDP	Evidence of finance-led, export-led and import-led growth in South Africa and Kenya, finance-led and imports-led growth in Nigeria and only finance-led growth in Ghana.
Furuoka (2007)	3	1985 – 2002	Cross sectional	GDP	Exports	Johansen co-integration test,		Evidence of growth-driven export.

						Granger causality test and panel co-integration test		
Kumari & Malhotra (2014).	2	1980 - 2012	Time series	GDP per capita	Exports of goods and service and imports of goods and service	Johansen co-integration & Toda-Yamamoto approach	Gross capital formation and labour	Unidirectional causality running from GDP per capita to exports and no causation between imports and GDP per capita in India while there is strong evidence of bi-directional causality from GDP per capita to exports/imports and vice versa.
Kosekahyaoglu (2006)	8	1980 – 2005 for Turkey and China, 1980 – 2004 for Argentina, Brazil, and India, 1992 – 2005 for the Czech Republic, Hungary, and Poland	Cross-sectional	GDP	Exports and imports	Granger causality test		Export-led growth hypothesis is not supported only in cases of Argentina, and Brazil and that there is a strong unidirectional causality running from exports to growth for Turkey, the Czech Republic, Hungary, Poland, India, and China.
Santos *et al.*, (2013)	23	1995 - 2010	Cross-sectional	Real per capita GDP growth rate	Food and agricultural exports, fuel, ores and metals exports and manufactures exports. And high technology exports	Granger causality	Population growth, gross capital formation, inflation, number of partners, partner's growth	Economic growth is foster through export specialization in high value-added products, such as manufactures and high technology. Moreover, higher growth is fostered by export diversification across

							HHI-destination and HHI-product	partners while enlarging the portfolio of partners
Moroke & Manoto (2015)	1	1998 and 2013	Quarterly time series	GDP	Exports and imports	VECM and Granger causality test		Supports both export-led growth and import –led growth hypothesis for South Africa
Alhajhoj (2007)	1	1970 – 2005	Time series	Real GDP	Real exports and real imports	VAR and Granger causality test	Real private consumption, real government expenditure, real investment and growth rate of World GDP.	Supports the export-led hypothesis and export also influence other economic activities.
Allaro (2012)	1	1974 – 2009	Time series	Real GDP	Real exports	Granger Causality test		Supports the export-led hypothesis because export growth causes economic growth.
Nasrin & Koli (2018)	1	1971 - 2015	Time series	GDP	Exports and imports	OLS, VECM and Granger Causality test		Supports the export-led growth hypothesis but do not support the import-led growth hypothesis
Gokmenoglu *et al.*, (2015)	1	1980 - 2013	Time series	Real GDP	Real exports	Johansen co-integration test and Granger Causality test		Supports growth-led export hypothesis
Amrinto (2006)	1	1981 - 2004	Annual and quarterly Time series	Real GDP growth	Real exports growth of goods and Services	ECM and Granger Causality test	Real gross fixed capital formation and real effective exchange rates index	Supports export-led growth hypothesis
Hye & Siddiqui (2011)	1	1985 - 2008	Time series	Real GDP growth	Real exports	Autoregressive distributed lag (ARDL) approach	Terms of trade	Supports export-led growth hypothesis

						and rolling window regression method		
Kumar (2015)	1	1980 - 2009	Time series	The growth rate of GDP	The growth rate of exports	Granger causality test		Supports bilateral causality between GDP and exports
Chigusiwa *et al.* (2011)	1	1977 - 2006	Time series	GDP	Primary goods exports, manufactured goods exports, and capital goods imports	Bounds testing (ARDL) approach	Capital and labour	Supports the export-led growth hypothesis in Zimbabwe
Medina-Smith & CNUCED. (2001)	1	1950 - 1997	Time series	Real GDP	Real export of goods and services	ECM and Granger causality test	real gross domestic investment and population	Supports export-led growth hypothesis in Costa Rica"s
Kalaitzi & Cleeve (2018)	1	1981 – 2012	Time series	GDP	Primary exports and manufactured Exports and import of goods and services	Granger causality test	Gross capital formation and population	Manufactured exports contribute more to economic growth than primary exports in the long-run and Growth-Led Exports (GLE) hypothesis is valid in the long-run for UAE
Hassan & Murtala (2016)	1	1970 - 2012	Time series	GDP	Exports	Granger causality test, impulse response analysis, and VAR	Foreign direct investment (FDI)	Supports growth-led exports hypothesis
Taban & Aktar (2008)	1	1980:1 - 2007:2	Time series	Real GDP	Export	Johansen co-integration and ECM		Supports the hypothesis that there is a long-run and short-run bidirectional causality relationship between export growth and real GDP growth in Turkey
Ahmad *et al.*,	1	1977 - 2012	Time	GDP per	Export,	ARDL	FDI, exchange	Supports exports-led

(2016)			series	capita			rate, infant mortality rate, and inflation	growth hypothesis.
Ogbokor (2016)	1	1990 - 2013	Quarterly time series	Real GDP	Exports	VAR and Granger causality	Exchange rate and FDI	Supports exports-led growth hypothesis
Awokuse (2003)	1	1961:1 - 2000:4	Quarterly time series	GDP	Exports	VECM and Granger causality test	Capital, labour, real terms of trade and a foreign output shock	Supports exports-led growth hypothesis
Al-Assaf & Al-Abdulrazag (2014)	1	1980 - 2012	Time series	Real GDP	Real exports and real imports	ARDL		Exports affect output growth positively in both the short-run and in the long-run.
Alimi (2012)	1	1970 - 2009	Time series	GDP	Exports	Fully modified ordinary least square (FMOLS), Granger causality econometric techniques and VECM		Supports exports-led growth and growth-driven exports hypothesis
Alimi & Muse (2012)	1	1970 - 2009	Time series	GDP	Total export, oil export and non-oil export	VAR Granger causality/exogeneity wald tests		Supports growth-driven exports hypothesis
Gatawa, and Lawal (2017)	1	1960 - 2015	Time series	Real GDP	Oil exports and non-oil exports	ARDL approach		Oil exports are directly related to GDP while non-oil exports are not and also, there is a long-run relationship between GDP and both components of exports (oil and non-oil) which can be used to determine the possible direction of GDP.

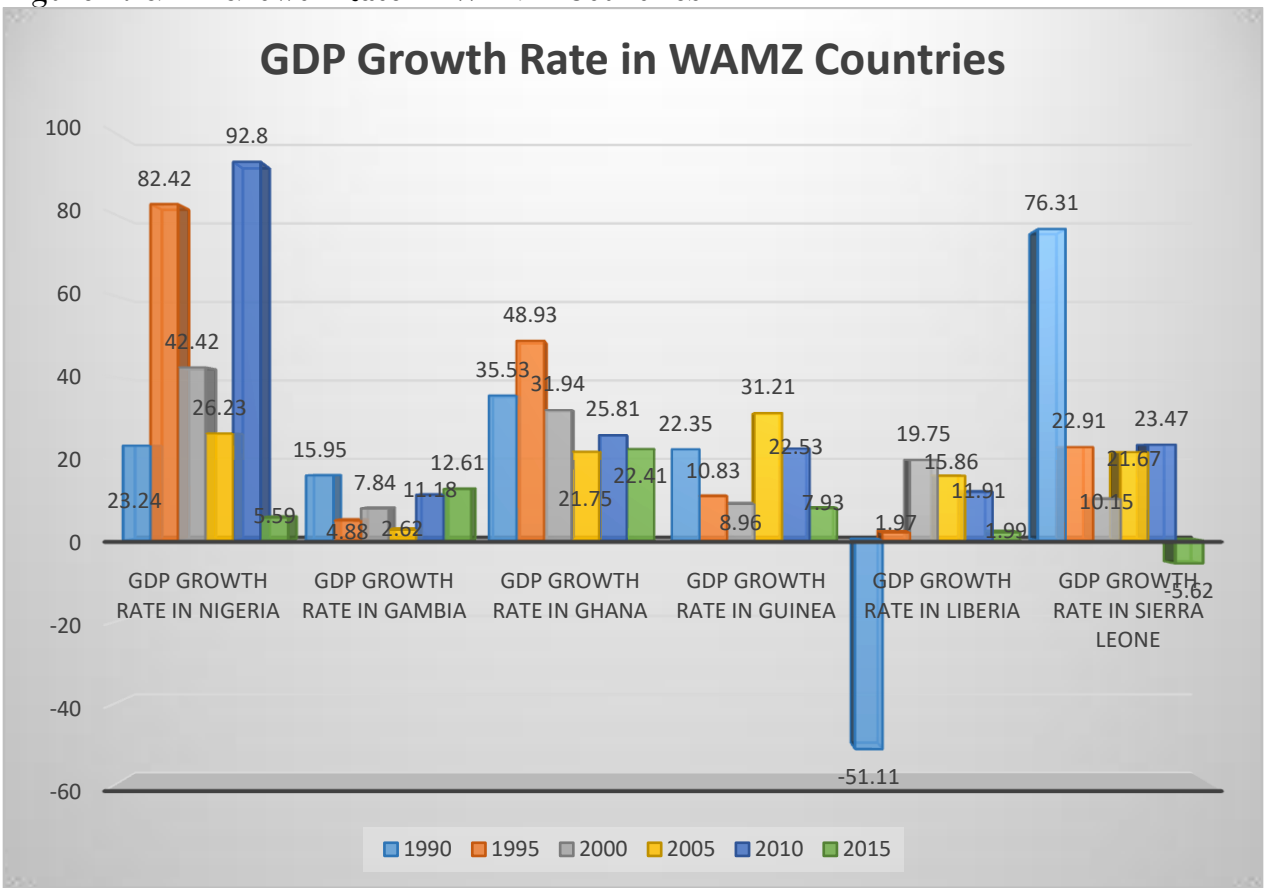
Fapetu & Owoeye (2017)	1	1981 - 2014	Time series	GDP	Oil exports value, non-oil exports value and import value	Granger causality test		There is a long-run relationship between economic growth, non-oil export, oil export, and import. Also, non-oil export trade is more relevant to the growth of Nigeria than oil export trade.

Source: Author's Computation

2. Stylized Faction GDP, Exports and Imports Growth Rate in WAMZ Countries

The trend of economic growth, exports, and imports of goods and services for WAMZ countries depicted in Figure 1. From the GDP growth rate of all countries in WAMZ, it was observed that Sierra Leone recorded the highest GDP growth rate in 1990 with 76.31% while Liberia GDP growth rate was negative with -51.11% but in 1995, Nigeria dominate in term of the highest GDP growth with 82.42% and Liberia has the least growth rate with 1.97% which is a recovery from the past negative growth rate recorded in 1990. In the same vein, Nigeria also recorded the highest GDP growth rate in 2000 with 42.42% and Guinearecorded the lowest GDP growth rate for the period with 8.96%. Furthermore, Nigeria's GDP growth rate still sustains the highest figure for the period of 2005 and 2010 with 26.23% and 92.8% respectively while Gambia GDP growth rate was the least for the two-period with 2.62% and 11.18% respectively. In 2015, Ghana recorded the highest in terms of GDP growth rate with 22.41% and that of Sierra Leone was the lowest with -5.62%

Figure 1: GDP Growth Rate in WAMZ Countries

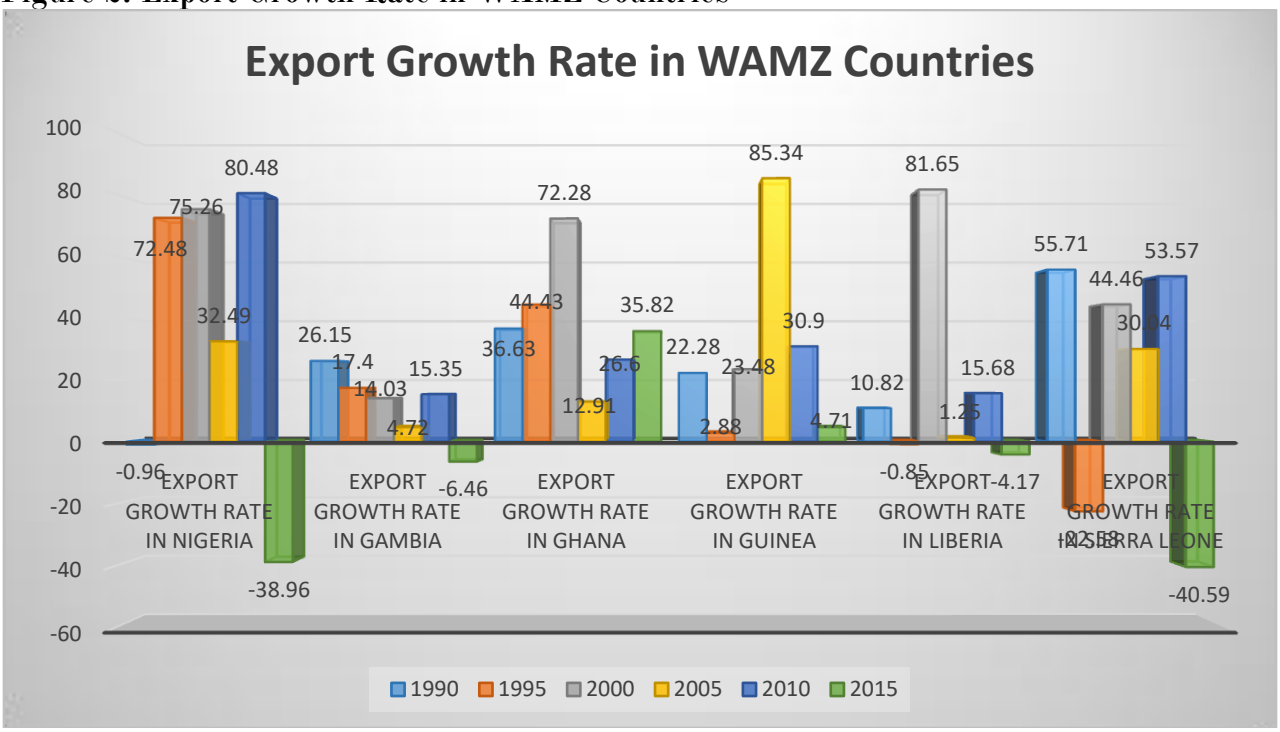


Source: Author's Computation

Based on their export in Figure 2, Sierra Leone recorded the highest in 1990 with 55.71% and the export growth rate in Nigeria was-0.96% but the reverse was the case in 1995 when the growth rate of export in Nigeria recorded the highest with 72.48% and

that of Sierra Leone was -22.58%. Furthermore, Guinea recorded the highest export growth rate in 2005 and Liberia recorded the lowest with just 1.25% growth rate. In the same vein, Nigeria recorded the highest export growth rate with 80.48% and the Gambia is the least with 15.35% and it was observed that in 2015, almost all the countries recorded negative growth rate in their export while only Ghana and Guinea recorded positive and Ghana growth rate was the highest with 35.82% and growth rate of export in Sierra Leone was the lowest with -40.59%.

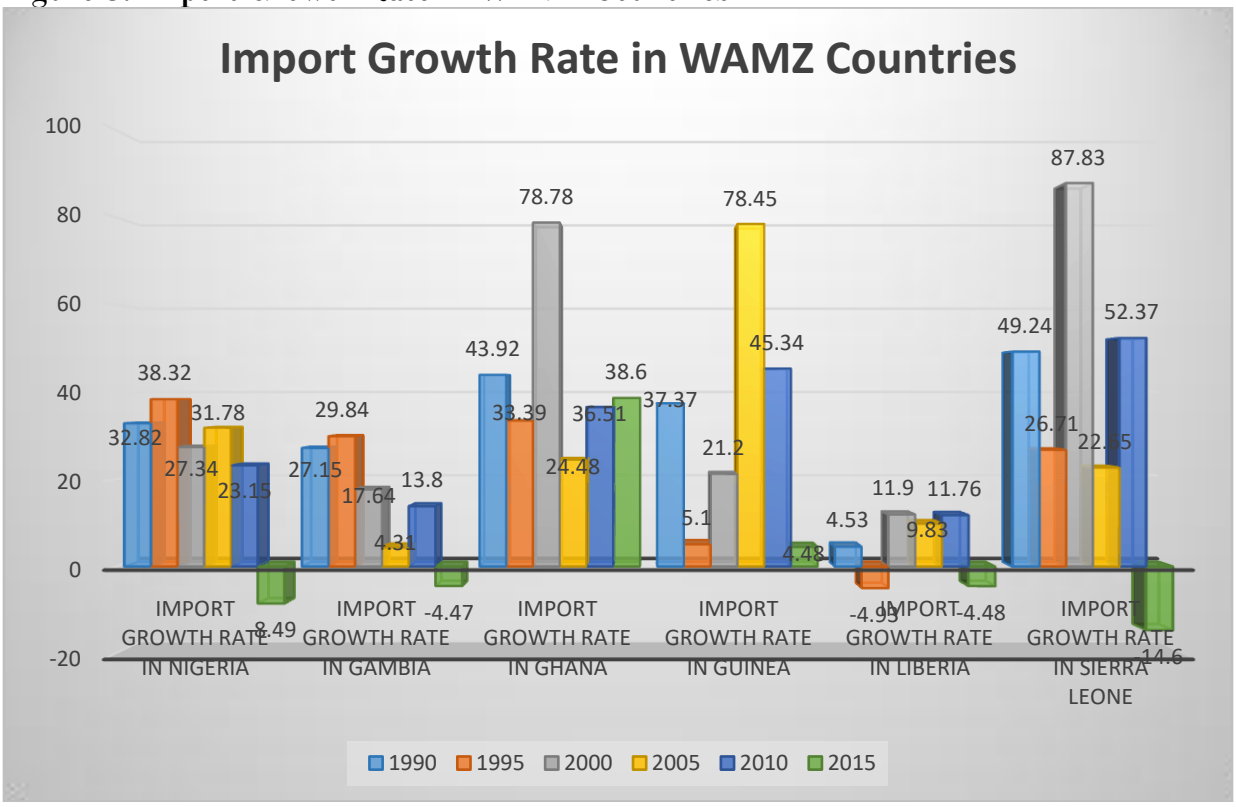
Figure 2: Export Growth Rate in WAMZ Countries



Source: Author's Computation

Import growth rate was also considered in Figure 3and Sierra Leone recorded 49.24% growth rate in 1990 which was the highest compared with other countries and Liberia import growth rate was very low in this period with 4.53% but in 1995, import in Nigeria increases to 38.32% to become the highest and that of Liberia enter negative of -4.93% to become the least growth rate for the years. Also, imports in Sierra Leone skyrocketed to 87.83% while that of Liberia was 11.9% and by 2005, imports in Liberia drop to 9.83% and that of Guinea increases to 78.45%. Furthermore, Sierra Leone import grows to 52.37% and that of Liberia growth rate was 11.76% which is an increase over the period and in 2015, the growth rate of import of most of the countries was negatively exhibiting the same trend like that of export and it is only Ghana and Guinea that was positive and that of Ghana recorded the highest of 38.6%.

Figure 3: Import Growth Rate in WAMZ Countries



Source: Author's Computation

3. Methodology and Data Source

The research work uses fully modified ordinary least squares (FMOLS), dynamic ordinary least squares (DOLS) approach with the Granger causality test. FMOLS regression was designed by Phillips and Hansen (1990) to provide optimal estimates of co-integrating regressions. The method modifies least-squares to account for serial correlation effects and for the endogeneity in the regressors that results from the existence of a co-integrating relationship. This paper provides a general framework that makes it possible to study the asymptotic behavior of FMOLS in models with the full rank I(1) regressors, models with I(1)and I(0)regressors, models with unit roots, and models with only stationary regressors. The Stock and Watson DOLS approach is a single equation approach that corrects for regressor endogeneity because you can include leads and lags of first differences of the regressors, and it also corrects for serially correlated errors (Hayakawa&Kurozumi, 2006). Also, the Granger causality test is used to examine the direction of causality among the variables (*LNY*, *LNX*, and *LNM*).

$$H_0 : \rho_{ij} = \rho_{ji} \operatorname{cor}(\xi_{2it}, \xi_{2jt}) = 0$$
$$H_0 : \rho_{ij} = \rho_{ji} \neq 0 \qquad (1)$$

The null hypothesis states that there is no causality running from the independent variable to the dependent variable. The multivariate analysis of the causal relationship between *LNY*, *LNX*, and *LNM* is depicted below.

$$\Delta LNY_{i,t} = \delta_0 + \sum_{it=1}^{p} \delta_1 \Delta LNY_{i,t-1} + \sum_{it=1}^{p} \delta_1 \Delta LNY_{i,t-2} + \ldots + \sum_{it=n}^{p} \delta_n \Delta LNY_{i,t-n} + \sum_{it=1}^{p} \phi_1 \Delta LNX_{i,t-1}$$
$$+ \ldots + \sum_{it=n}^{p} \phi_n \Delta LNX_{i,t-n} + \sum_{it=1}^{p} \lambda_1 \Delta LM_{i,t-1} + \ldots + \sum_{it=n}^{p} \lambda_n \Delta LNM_{i,t-n} + \varepsilon_{1t} \quad (2)$$

$$\Delta LNX_{i,t} = \delta_0 + \sum_{it=1}^{p} \delta_1 \Delta LNX_{i,t-1} + \sum_{it=1}^{p} \delta_1 \Delta LNX_{i,t-2} + \ldots + \sum_{it=n}^{p} \delta_n \Delta LNX_{i,t-n} + \sum_{it=1}^{p} \phi_1 \Delta LNM_{i,t-1}$$
$$+ \ldots + \sum_{it=n}^{p} \phi_n \Delta LNM_{i,t-n} + \sum_{it=1}^{p} \lambda_1 \Delta LY_{i,t-1} + \ldots + \sum_{it=n}^{p} \lambda_n \Delta LNY_{i,t-n} + \varepsilon_{2t} \quad (3)$$

$$\Delta LNM_{i,t} = \delta_0 + \sum_{it=1}^{p} \delta_1 \Delta LNM_{i,t-1} + \sum_{it=1}^{p} \delta_2 \Delta LNM_{i,t-2} + \ldots + \sum_{it=n}^{p} \delta_n \Delta LNM_{i,t-n} + \sum_{it=1}^{p} \phi_1 \Delta LNY_{i,t-1}$$
$$+ \ldots + \sum_{it=n}^{p} \phi_n \Delta LNY_{i,t-n} + \sum_{it=1}^{p} \lambda_1 \Delta LNX_{i,t-1} + \ldots + \sum_{it=n}^{p} \lambda_n \Delta LNX_{i,t-n} + \varepsilon_{3t} \quad (4)$$

Therefore, *LNY* is the logarithm of gross domestic product, *LNX*is the logarithm of exports and *LNM* is the logarithm of imports while Δindicates the variables at first difference as well as $i = 1, 2, 3, \ldots, N$; $t = 1, 2, 3, \ldots, T$. The annual data were drawn from World Development Indicator (WDI, 2017) and the series GDP, exports and imports of goods and services are in current LCU dollar. For individual country analysis, annual data from 1961 to 2015 for Nigeria, Ghana and Liberia; 1967 to 2015 for the Gambia; 1986 to 2015 for Guinea and 1964 to 2015 Sierra Leone while for the balanced panel, the data ranges from 1986 to 2015. This type of analysis was previously considered by Evans, (2013) in his work testing finance-led, export-led and import-led growth hypotheses on four Sub-Saharan African economies.

4 Empirical Results

Individual Analysis for WAMZ Countries

The ADF and PP unit root test results reported in Table 2 indicate that GDP, export and import were not stationary at level but after differencing them once, they were found to be stationary at first difference. Therefore, all the series in this exhibit order I(1) that is the first difference

Table 2: ADF and PP Unit Root Tests for Individual Country in WAMZ

			Nigeria	Gambia	Ghana	Guinea	Liberia	Sierra Leone
LNY	ADF	Level	1.146	0.766	0.585	-0.592	-1.615	-0.465
		1st Diff.	-6.239***	-5.833***	-4.975***	-2.716*	-4.050**	-3.254**
	PP	Level	-1.057	-0.914	0.759	-1.105	-1.199	-0.055
		1st Diff.	-6.210***	-5.833***	-5.097***	-2.691*	-4.138***	-3.142**
LNX	ADF	Level	-0.539	-1.272	0.832	-0.701	-2.957**	0.077
		1st Diff.	-8.368***	-5.500***	-5.347***	-5.610***	-7.599***	-5.502***
	PP	Level	-0.539	-1.219	1.161	-0.698	-2.934**	-0.082
		1st Diff.	-8.365***	-5.500***	-5.332***	-5.601***	-8.605***	-5.565***
LNM	ADF	Level	0.070	-1.376	1.230	-0.356	-1.933	0.291
		1st Diff.	-6.160***	-5.23***	-5.547***	-4.222***	-9.238*	-6.140***
	PP	Level	0.070	-1.252	0.981	-0.349	-1.777	0.173
		1st Diff.	-6.186***	-5.205***	-5.479***	-4.355**	-9.238***	-6.127***

Source: Author's Computation

*Note: *, **, and *** denote rejection of the null of non-stationary at 10%, 5% and 1% levels of significance.*

The long-run relationship among the series was considered using the Johansen co-integration test reported in Table 3 and it indicates that only data for Ghana that has the long-run relationship while long-run does not exist for other countries.

Table 3: Johansen Test for Co-integration for Individual Country in WAMZ

		Trace Statistics	Max. Statistics
Country	Maximum Rank	LNY, LNX & LNM	LNY, LNX & LNM
Nigeria	0	23.369	15.830
	1	7.539	7.185
	2	0.353	0.353
Gambia	0	21.176	13.473
	1	7.704	6.130
	2	1.574	1.574
Ghana	0	33.699**	23.261**
	1	10.438	10.425
	2	0.013	0.013
Guinea	0	24.728	18.477

	1	6.250	4.688
	2	1.562	1.562
Liberia	0	26.765	15.847
	1	10.918	10.096
	2	0.015	0.822
Sierra Leone	0	30.100**	18.252
	1	11.848	0.199
	2	0.730	0.014

Source: Author's Computation
*Note: ** denote 5% levels of significance.*

For the test of serial correlation effects and for the endogeneity that results from the existence of co-integrating relationships in Table 4, the research work considered fully modified OLS (FMOLS), dynamic OLS (DOLS) and canonical co-integrating regression (CCR) in estimating the trade-led growth hypothesis in WAMZ countries. The estimated coefficients of imports by FMOLS, DOLS, and CCR are positive and statistically significant at 1% and10% level in Nigeria, Guinea, and Liberia. Therefore, it is import-led growth that is valid in Nigeria Guinea and Liberia which is against the finding by Alimi and Muse (2012) and Chia, (2016) who confirms the existence of export-led growth for Nigeria and Guinea. Also, the estimated coefficients of both export and import confirms the trade-led growth hypothesis for Gambia and Sierra Loan which concur withMoroke & Manoto (2015) and Akter & Bulbul (2017) while export-led growth was supported for Ghana and it is in line with (Amrinto, 2006; Hye & Siddiqui, 2011 &Nasrin & Koli, 2018).

Table 4: FMOLS, DOLS and CCR Estimationsfor Individual Country in WAMZ

Nigeria			
Variables	***FMOLS***	***DOLS***	***CCR***
LNX	0.256(0.171)	0.406(0.113)	0.242(0.258)
LNM	0.689(0.001)***	0.524(0.058)*	0.705(0.003)***
Cons_	3.075(0.000)***	3.458(0.000)***	3.0164(0.000)***
The Gambia			
Variables	***FMOLS***	***DOLS***	***CCR***
LNX	0.489(0.055)**	0.570(0.031)**	0.507(0.042)**
LNM	0.589(0.015)**	0.506(0.041)**	0.575(0.016)**
Cons_	-0.551(0.410)	-0.362(0.549)	-0.632(0.327)
Ghana			
Variables	***FMOLS***	***DOLS***	***CCR***
LNX	1.503(0.032)**	1.429(0.093)*	1.498(0.057)*
LNM	-0.563(0.403)	-0.499(0.541)	-0.560(0.460)
Cons_	2.614(0.000)***	2.585(0.000)***	2.643(0.000)***
Guinea			
Variables	***FMOLS***	***DOLS***	***CCR***
LNX	0.407(0.195)	0.369(0.162)	0.401(0.225)
LNM	0.490(0.081)*	0.530(0.076)*	0.500(0.092)*
Cons_	4.128(0.005)***	4.232(0.001)***	4.027(0.006)***
Liberia			

Variables	*FMOLS*	*DOLS*	*CCR*
LNX	-0.296(0.151)	-0.404(0.205)	-0.314(0.155)
LNM	0.743(0.000)***	0.766(0.004)***	0.760(0.000)***
Cons_	11.128(0.000)***	12.742(0.002)***	11.120(0.000)***
Sierra Leone			
Variables	*FMOLS*	*DOLS*	*CCR*
LNX	0.352(0.0744)*	0.388(0.116)	0.346(0.099)*
LNM	0.640(0.001)***	0.610(0.011)**	0.645(0.002)***
Cons_	1.554(0.000)***	1.450(0.001)***	1.566(0.000)***

Source: Author's Computation

*Note: *, **, and *** denote 10%, 5% and 1% levels of significance.*

The result of Pairwise Granger causality test Table 5 confirm that the null hypothesis of no causality from exports to growth in Nigeria cannot be rejected at orthodox significance levels indicating that the export-led growth hypothesis for exports is not valid in Nigeria but causality run from growth to import in Nigeria indicating that the import-led growth hypothesis for imports a is not valid in Nigeria and also, causality run from export to import in Nigeria. From the result, it could be deduced that growth in Nigeria come through importation and this is the case in the country because most of her product is imported from China. Furthermore, the result confirms that the null hypothesis of no causality from exports to growth and imports to growth in the Gambia can be rejected at orthodox significance levels indicating that the export-led growth hypothesis for exports and import-led growth hypothesis for imports is valid in the Gambia. Also, causality runs from exports to imports in the Gambia indicating that most of the exports in the Gambia stimulate imports of goods and services. Ghana economy exhibit a bi-causality between export and growth and also bi-causality between imports and growth. Therefore, the null hypothesis of no causality from exports to growth and imports to growth in Ghana as well as growth-led exports/imports can be rejected at orthodox significance levels indicating that the export-led growth hypothesis for exports and import-led growth hypothesis for imports as well as growth-led exports/imports is valid in Ghana. Since exports/imports led to growth and growth led to export/import expansion in Ghana, their export also clues to more imports for the country.

In the same manner, causality run from export to growth in Guinea indicating that the null hypothesis of no causality from exports to growth in Guinea can be rejected at conventional significance levels indicating that the export-led growth hypothesis for exports is valid in Guinea. Therefore, only their exports of goods and services help the economy to grow but imports do not. Also, it was affirmed that causality only runs from growth to import in Liberia indicating that as their economy experience growth, there is need to invest in more technology to product which is not available in the country, this gives more room for the country to open the economy to the rest of the World for import and this stimulates more imports of goods and services. For Sierra Leone, causality runs from growth to exports and also, causality runs from imports to growth as well as from growth to imports while only exports granger cause imports. Therefore, import-led

growth and growth-led imports/exports hypothesis are confirmed for Sierra Leone. This implies that growth stimulates exports for Sierra Leone and also, growth stimulate import, as well as imports, stimulate growth while only export stimulates import for Sierra Leone. This result was in line with FMOLS, DOLS and CCR estimated above except for Ghana and Guinea.

Table 5: Pairwise Granger Causality Tests

	F-statistics(p-Value)	LNX	LNM	Decision
	LNY			
Nigeria				
1) Y and X				
LNY	-	0.115(0.736)	-	
LNX	1.266(0.266)	-	-	No
2) Y and M				
LNY	-		3.784(0.057)*	
LNM	0.602(0.441)	-	-	Y → M
3) X and M		-		
LNX	-		17.962(0.000)***	
LNM	-	0.003(0.441)	-	X → M
The Gambia				
1) Y and X				
LNY	-	0.368(0.547)	-	Y → X
LNX	20.219(0.000)***	-	-	
2) Y and M				
LNY	-	-	0.036(0.851)	Y ← M
LNM	8.229(0.006)***	-	-	
3) X and M				
LNX	-	-	3.850(0.0558)*	X → M
LNM	-	0.027(0.870)	-	
Ghana				
1) Y and X				
LNY	-	24.003(0.000)***	-	Y ↔ X
LNX	18.710(0.000)***	-	-	
2) Y and M		-		
LNY	-		22.717(0.000)***	Y ↔ M
LNM	24.588(0.000)***	-	-	
3) X and M		-		
LNX	-			X → M
LNM	-	-	7.683(0.008)**	
		0.462(0.500)	-	

Guinea				
1) Y and X				
LNY	-	0.103(0.750)	-	Y ← X
LNX	10.810(0.000)***	-	-	
2) Y and M				
LNY	-	-	0.511(0.481)	No
LNM	1.627(0.213)	-	-	
3) X and M				
LNX	-	-	2.424(0.132)	No
LNM	-	0.252(0.252)	-	
Liberia				
1) Y and X				
LNY	-	2.726(0.105)	-	No
LNX	0.491(0.481)	-	-	
2) Y and M				
LNY	-	-	2.983(0.090)*	Y → M
LNM	0.326(0.570)	-	-	
3) X and M				
LNX	-	-	0.903(0.346)	No
LNM	-	1.280(0.263)	-	
Sierra Leone				
1) Y and X				
LNY	-	7.559(0.008)	-	Y → X
LNX	1.053(0.310)	***	-	
2) Y and M		-		
LNY	-		22.826(0.000)	Y ↔ M
LNM	10.959(0.002)***	-	***	
3) X and M		-	-	
LNX	-			X → M
LNM	-	-	5.034(0.029)*	
		0.004(0.948)	*	
			-	

Source: Author's Computation

*Notes: *, ** and *** denote significance at 10%, 5% and 1% levels, respectively. Figures in parentheses are p-values.*

Group Analysis for WAMZ Countries

Table 6 reports the descriptive statistics and GDP has the highest mean of 25.28% and exports have the lowest mean of 24.08% while all the variables fall within their maximum and minimum. Also, GDP is negatively skewed while exports and imports are positively skewed and the Jarque-Bera statistic rejects the null hypothesis of normal distribution at the 1%, 5% and 10% level of significance for all the variables. All the variables exhibit platykurtic from the result of the kurtosis because a distribution with a coefficient smaller than 3 is platykurtic while distribution larger than 3 is said to be leptokurtic.

Table 6: Group Descriptive Statistics

	LNY	LNX	LNM
Mean	25.283	24.079	24.339
Median	24.927	23.575	23.581
Maximum	32.187	30.759	30.878
Minimum	17.750	15.953	16.147
Std. Dev.	4.093	3.928	3.797
Skewness	-0.018	0.005	0.025
Kurtosis	1.658	1.772	1.815
Jargue-Bera	13.524(0.001)**	11.317(0.003)**	10.549(0.005)**
Observations	180	180	180

Source: Author's Computation

*Note: ** denote 5% levels of significance.*

After the group descriptive statistics, the next is the precondition of panel unit root tests before proceeding optimal lag length and panel co-integration test. Panel unit root testing emerged from time series unit root testing in Table 7. The major difference to time series testing of unit roots is that it has to consider the asymptotic behavior of the time-series dimension *and* the cross-sectional dimension. The way in which N and T converge to infinity is critical if one wants to determine the asymptotic behavior of estimators and tests used for nonstationary panels (Levin *et al*, 2002). The Levin, Lin & Chu t*, Im, Pesaran and Shin W-stat, ADF - Fisher Chi-square and PP - Fisher Chi-square were conducted both in level and first difference with constant and without constant. The result shows that unit root in level cannot be rejected while after the first difference, the unit root is stationary. Both the Im-Pesaran-Shin and Fisher-type test relax the restrictive assumption of Levin-Lin-Chu that ρ_i must be the same for all series under the alternative hypothesis (Im *et al*, 2003). Also, when N is small, the empirical size of both tests is close to its nominal size of 5 percent. (Fisher shows some distortions at $N = 100$).

Table 7: Panel Unit Root

Series	**LNY**		**LNX**		**LNM**	
Level	**No Trend**	**Trend**	**No Trend**	**Trend**	**No Trend**	**Trend**
Levin, Lin & Chu t*	-2.693	-1.058	-1.762	1.733	-2.719	0.789
Im, Pesaran and Shin W-stat	-0.299	-0.774	0.135	0.721	0.153	1.307
ADF - Fisher Chi-square	12.261	13.182	10.916	7.706	10.805	5.373
PP - Fisher Chi-square	37.075	21.283	25.519	19.727	53.566	11.096
First Difference	**No Trend**	**Trend**	**No Trend**	**Trend**	**No Trend**	**Trend**
Levin, Lin & Chu t*	-0.876	0.455***	-0.546***	1.303***	-2.440***	-1.701**
Im, Pesaran and Shin W-stat	-3.636***	-2.953***	-4.757***	-3.078***	-5.310***	-5.431***
ADF - Fisher Chi-square	35.440***	29.111***	44.628***	34.259***	51.731***	51.545***
PP - Fisher Chi-square	72.452***	63.908***	115.33***	109.424***	101.244***	94.957***

Source: Author's Computation

*Note: *, **, and *** denote rejection of the null of non-stationary at 10%, 5% and 1% levels of significance. SBC is used to select the lag length.*

There is a need for optimal lag length before conducting the Pedroni panel co-integration test, the optimum lag length of the model VAR is selectedbased on the least values of Akaike information criterion (AIC) and the Schwarz criterion (SIC) and this is presented in Table 8.The study make used of up to three lags and the results supported the choice of optimum lag one based on Schwarz criterion because Schwarz criterion is superior to Akaike information criterion. Therefore, the minimum lag option for the study is based on lag one and this were used for further analysis in the study.

Table 8: Minimum Information Criterion

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-687.0076	NA	1.004994	8.518612	8.575790	8.541827
1	-0.947176	1338.241	0.000236	0.159842	0.388553*	0.252702
2	19.14390	38.4458 8*	0.000205 *	0.022915*	0.423159	0.18542 0*
3	26.02440	12.91156	0.000211	0.049082	0.620859	0.281232

Source: Author's Computation

* indicates lag order selected by the criterion, LR: sequentially modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion & HQ: Hannan-Quinn information criterion

Pedroni's co-integration test is applied after testing for the stationary of the variables which was confirmed that all the variables were stationary in the first difference. Pedroni's panel co-integration tests were used because it takes into consideration heterogeneity into account that is the using of specific parameters that were allowed to vary across individual members of the sample. Seven different co-integration statistics were proposed to capture the within (pooled) and between (group mean) effects which are classified into two categories according to Pedroni'sco-integration tests. For the tests based on "Within", the alternative hypothesis is $\rho_i = \rho < 1$ for all i, while the tests based on "Between" dimension, the alternative hypothesis is $\rho_i < 1$, for all i. the result from Table 9indicates that the Pedroni's co-integration tests with four within-group tests and three between-group tests suggest the presence of co-integration relationship among the variables.

Table 9: Pedroni Panel Co-integration Test Results (Dependent Variable: GDP)

	Within Dimension	
	Without Trend	***With Trend***
Panel v-stat	0.883	-0.211
Panel rho-stat	0.174	1.560
Panel PP-stat	-0.093***	0.863*
Panel ADF-stat	0.370**	0.215***
	Between Dimension	

	Without Trend	*With Trend*
Panel rho-stat	1.160	1.858
Panel PP-stat	0.331***	0.555*
Panel ADF-stat	1.365***	0.427**

Source: Author's Computation

*Notes: *, **, *** denote significance level at 10%, 5%, and 1% levels, respectively. The maximum lags on Schwartz information criterion (SIC) are 1.*

Table 10 reports the results of modified OLS (FMOLS) and dynamic OLS (DOLS) in other to test for a long-run relationship between the variables in a panel framework as well as testing for serial correlation effects and for the endogeneity. The estimated coefficients of export and import by FMOLS and DOLS are positive and statistically significant at 1% and 5% level for WAMZ countries indicating that the empirical result supports trade-led growth hypothesis that is both export-led and import-led growth hypothesis is valid in WAMZ countries. Also, the explanatory variables (export and import) can explain 99.1% of the total variation in GDP. The evidence from the study was in line with the finding of Akter & Bulbul (2017) that considered a cross country analysis and with Moroke & Manoto (2015) that examined quarterly time series data for South Africa.

Table 10: Results of FMOLS and DOLS Panel Weighted Estimations

Variables	*FMOLS*	*DOLS*
LNX	0.064(0.016)**	0.260(0.041)**
LNM	0.840(0.000)***	0.632(0.000)***
R^2	0.991	0.992
Adjusted R^2	0.991	0.991

Source: Author's Computation

*Notes: ** and *** denote significance at 5% and 1% levels, respectively. Figures in parentheses are p-values.*

Since both export and import led to growth in WAMZ countries, it is better to know there relative importance that is how they contributed to growth in their hierarchal order. Therefore, standardized beta weights will be considered and this is presented in Table 11. Standardized beta weights are often used to compare the strength of prediction across variables when predictors are placed on a common scale so that each has the same mean and standard deviation.

Standardized Beta Test

$$= \text{Coefficient of Unstandardised Beta for the I.V}\left(\frac{Standard\ Deviation\ of\ the\ D.V.in\ Quesetion}{Standard\ Deviation\ of\ the\ I.V\ in\ Question}\right)$$

Where I.V means independent variable and D.V means dependent variable

Table 11: The Standardized Beta Result and Ranking Order (Ascending)

Variables	*Standard Deviation Value*	*Unstandardized Beta*		*Standardized Beta*	
		FMOLS	***DOLS***	***FMOLS***	***DOLS***
LNY	4.093				
LNX	3.928	0.064	0.260	0.067	0.271
LNM	3.797	0.840	0.632	0.905	0.681

	Standardized Beta		*Ranking Order*
	FMOLS	***DOLS***	
LNM	0.905	0.681	First
LNX	0.067	0.271	Second

Source: Author's Computation

The standardized beta analysis affirms the ranking order of significance that imports are the most significant variable that influences economic growth to follow by exports. Therefore, a 1 standard deviation increase in change in imports holding exports constant on the average, will increase the standard deviation of GDP by 0.905% and 0.681% respectively while a 1 standard deviation increase in change in exports holding imports constant on the average, will increase the standard deviation of GDP by 0.067% and 0.271% respectively. This is expected because WAMZ countries fall under developing nations and they tend to imports more of technology for fast economic growth.

Table 12 reports the stacked test common Granger causality tests and bidirectional causality runs for both exports and growth in WAMZ countries indicating that the exports-led growth hypothesis is valid and growth-driven export hypothesis also valid (Furuoka, 2007 and Kumar, 2015). Also, bilateral causality run between GDP and imports among WAMZ countries as both import-led growth and growth-driven imports are confirmed (Akter & Bulbul, 2017). Therefore, bi-directional causality from GDP to exports/imports and vice versa is valid for WAMZ countries indicating that trade-led and growth-driven trade is valid for WAMZ (Hye *et al.*, 2013 and Kumari & Malhotra, 2014). Furthermore, unidirectional causality running from exports to imports indicating that only exports stimulate imports for WAMZ countries and imports do not direct their exports.

Table 12: Stacked test Common Coefficients Granger Causality Tests

	F-statistics(p-Value)			
WAMZ Countries	LNY	LNX	LNM	Decision
1) Y and X				
LNY	-	36.023(0.000)*	-	Y ↔ X
LNX	6.416(0.0122)**	**	-	
2) Y and M		-		
LNY	-		35.458(0.000)***	Y ↔ M
LNM	11.913(0.000)***	-	-	-
3) X and M		-		
LNX	-		9.878(0.002)***	X → M
LNM	-	-	-	
		0.503(0.479)		

Source: Author's Computation

*Notes: ** and *** denote significance at 5% and 1% levels, respectively. Figures in parentheses are p-values.*

5. Conclusion and policy implication

This paper investigates the trade-led growth hypothesis or growth-led trade hypothesis in WAMZ countries (Nigeria, Gambia, Ghana, Guinea, Liberia and Sierra Leone) from 1986 to 2015. Individual country and cross-sectional analysis were done and for the individual country analysis, FMOLS, DOLS, and CCR were considered with Granger causality. The estimated results confirmed the import-led growth hypothesis for Nigeria, Guinea, and Liberia, a trade-led growth hypothesis for the Gambia and Sierra Loan and export-led growth was supported for Ghana. For cross country analysis, FMOLS, DOLS and Granger causality tests were used and trade-led growth hypothesis (both export-led and import-led growth) was valid in WAMZ countries but imports were the most significant variable that influences economic growth than exports.

The policies emulated from the study is that WAMZ countries should only imports raw-materials and technology for them to secure their infant industries and this will help them to produce more output for both the domestic and international market. WAMZ countries should exports more of secondary products (manufacturing exports) whose prices are stable in the international market than primary products and this can only be done by investing more in research and technology. Also, export promotion policy in WAMZ should focus on manufacturing exports and import substitution policy in WAMZ should focus on importing raw-material and technology for more production in order to accelerate economic growth in WAMZ.

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