Scientific
Research
Publishing

The Impact of Trade Openness on Economic Growth: The Case of Ghana and Nigeria

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Abstract

This study aims to determine the impacts of trade openness on economic growth in Ghana and Nigeria using panel data from 1998 to 2017. This study has trade openness, inflation, real exchange, and investment as independent variables and economic growth as a dependent variable. This study used pooled ordinary least squares (OLS), fixed effects, random effects, and a Hausman test with panel data to arrive at the results. Hausman's test was performed to indicate which model is suitable for the study. The result suggests that the random effect model is appropriate for the study. The results show that trade openness and real exchange rate positively and significantly impact economic growth using the random effect. In contrast, inflation and investment have an insignificant impact on economic growth using Random effect estimated models. The study indicated that there is no heteroskedasticity and also no autocorrelation results in the data. Therefore, it is recommended that governments of these countries implement measures and policies to manage the real exchange rate and trade effects to protect economic growth. About inflation, governments of these countries can put in measures to curb and control inflation since a rise in inflation has negative effects on economic growth.

Keywords

Trade Openness, Economic Growth, Investment, Inflation, Real Exchange Rate

1. Introduction

In international economic theory, it is widely accepted that trade openness may help improve economic growth quality (Kong et al., 2020). This problem has

gained traction in recent years because of the large disparity in the economic performance of nations, particularly emerging ones, as global trade integration grows (Bobek, 2018). Economists disagree on the relative importance of various economic, policy, and institutional factors that explain the differences in catching-up processes across transition economies. This is complicated, because many transition economies have already implemented and trade liberalization measures. So it's no wonder that the merits of trade liberalization are still hotly disputed in international and academic policy circles.

An important fact about the relationship between economic growth and trade openness is that trade openness brings forth growth. Colonization has been the main reason African countries experience low performance in economic growth. According to Sakyi (2010), Ghana's inherited industrial sector was underdeveloped primarily because her colonial rulers focused on extracting raw materials from the Gold Coast and, at the same time, creating an economic system deeply dependent on manufactured products from Britain. Nigeria's export performance has also been questionable. According to Nduka et al. (2013), unlike some other oil-producing countries in the World, Nigeria has not been able to diversify its export base to help the oil sector dominate almost all merchandise exports and contribute over 70% of its total foreign earnings.

Both Ghana and Nigeria have experimented with different exchange rates regimes, which might have implications for the trade-growth relationship. This led researchers to examine the relationship between trade openness and economic growth to develop policy implications for both economies. Not many investigations have been done to examine the relationship between the economy's growth in Ghana and Nigeria (Bigsten et al., 2000; Olufemi, 2004; Nduka et al., 2013).

The increasing trade volume between China and these countries has changed its foreign change. This is because imports from China are paid mainly in cash rather than with letters of credit (LCs), which has been distributing payments for a while. As a result, there has been a greater dependence on cash in foreign currency, which has accentuated seasonal pressures, particularly for the year-end holidays. Much of the demand for cash in foreign currency occurs in the forex office market. Therefore, changing the business model to multiple cash-based transactions, particularly with China, would have a greater impact on the exchange rate of the forex bureau. This may explain the relatively more significant depreciation observed in the forex office market and the consequent higher spreads between the forex office and the interbank markets. Accelerating Ghana's Gross Domestic Product (GDP) growth from 4.0 percent in 2009 has increased economic activity and a higher demand for imports. The Centre for Policy Analysis (CEPA) estimates they show that an increase in GDP by one percent generates a rise in imports by as much as 1.14% in the economy. Therefore, the expansion in the economy has resulted in greater demand for foreign exchange and additional pressure on the cedi to depreciate.

Between 2000 and 2014, Nigeria's gross domestic product (GDP) grew at an average of 7 percent per year. Following the oil price collapse in 2014-2016,

combined with negative production shocks, the gross domestic product (GDP) growth rate dropped to 2.7 percent in 2015. In 2016 during its first recession in 25 years, the economy contracted by 1.6 percent. Since 2015, economic growth has remained muted. Growth averaged 1.9 percent in 2018 and remained stable at 2 percent in the first half of 2019. Domestic demand prevails constrained by stagnating private consumption in the context of higher inflation (11 percent in the first half of 2019). Exports will generate jobs, boost economic growth, and furnish domestic companies with more knowledge in producing for foreign markets. Over time, companies will gain a competitive advantage in global trade, and research shows that exporters are more productive than companies that focus on domestic trade.

The relationship between trade openness and economic growth is not new. Much research about this relationship has been conducted in literature; however, the results are still not conclusive. Some studies have suggested a positive relationship between trade openness and economic growth (Das & Paul, 2011; Dollar & Kraay, 2004; Wang et al., 2004; Freund & Bolaky, 2008). Still, these studies failed to find the relationship between these variables. The main reason for the difference in the results of these studies lies within different methodologies used, using random and fixed effect model regression. As previously mentioned, few studies have been conducted to examine the relationship between economic growth. As far as I am concerned, no study has been carried out on either the Nigerian or Ghanaian economy to investigate the causal relationship between these two countries simultaneously using the ARDL model (autoregressive distributed lag). The only study that incorporated the two countries was conducted by (Osabuohien, 2007) who used the Johansen multivariate method for 1975 to 2004 only. Therefore, this study serves to bridge the gap. a) Economic growth and trade openness in Ghana and Nigeria. b) To analyze the "mercantilism, classical economist and Heckscher-Ohlin trade theories" model with the perspective of economic growth and trade openness. c) Policymakers would also benefit significantly if an explicit link between openness to trade and economic growth were made. d) This study will provide guidelines for the potential researchers to re-think the trade-growth relationship and contribute to the literature by exploring the new insights which are ignored in the available literature. e) This study will contribute to existing literature to produce an acceptable conclusion regarding the trade-growth relationship.

The structure of the paper is as follows. Section 2 gives a brief overview of the literature on the relationship between openness to trade and economic growth. Section 3 discusses the methodology used. The empirical evidence is presented in Section 4, while Section 5 shows the concluding remarks.

2. Literature Review

2.1. Theoretical Literature Review

The relationship between openness to trade and economic growth has sparked

many debates ongoing in empirical and theoretical literature around the world. This paper has benefited from summarizing the theoretical part into three groups: classical economist, mercantilism, and Heckscher-Ohlin trade theories.

On the one hand, mercantilism suggests that economic activity is a zero-sum game in which one country's economic benefit is at the cost. It is argued that exports should be more than imports, and the domestic industry should be protected from import competition for a country to be rich and powerful (Olasode et al., 2015; Nduka et al., 2013; Edwards, 1998; Pinas et al., 2020). On the other hand, classical economists argue that a nation cannot continue to maintain a positive trade balance continually. They thought that countries should produce and export goods with low-cost advantages, and the country itself should import a commodity with a higher absolute cost disadvantage. The argument is that a country partaking in foreign trade can have a strong positive growth strength for its economic growth (Keho, 2017; Olasode et al., 2015; Nduka et al., 2013). Meanwhile, Heckscher-Ohlin argues that if two countries want to trade, they must have the same technology, constant returns of scale, and a given factor-intensity relationship between the final products. The better-equipped country should produce large-scale goods so that trade helps stimulate economic growth (Heckscher, 1919; Ohlin, 1933).

2.2. Empirical Literature Review

On the empirical front, studies on trade opening and economic growth have been widely examined. There are large numbers of empirical studies on the correlation between trade and economic growth which have reported that trade has a strong positive impact on economic growth see (Keho, 2017; Frankel & Romer, 1999; Karras, 2003; Yanikkaya, 2003; Dollar & Kraay, 2004; Wang et al., 2004; Freund & Bolaky, 2008; Das & Paul, 2011; Marelli & Signorelli, 2011; Nowbutsing, 2014; Zarra-Nezhad, Hosseinpour, & Arman, 2014).

Keho (2017) established a positive effect of trade openness on Cote d'Ivoire's economic growth over the period from 1965 to 2014 by using the Autoregressive Distributed Lag bounds test to co-integrate the Toda and Yamamoto Granger causality tests. (Frankel & Romer, 1999) also points out some positive growth effects of trade openness using the ordinary least square technique. Karras (2003) observed that trade openness positively influences economic growth in China, applying ordinary least squares (OLS) covering the years 1976 to 2002. Yanikkaya (2003) and Dollar & Kraay (2004) found a positive impact of trade openness on economic growth, especially in developing countries, using panel data analysis. Wang et al. (2004) discovered that trade openness has a positive connection to economic growth, applying a panel of 79 countries covering 1970 to 1998. Freund & Bolaky (2008) point out the positive effect of trade openness on economic growth using panel data analysis from more than 100 countries.

Das & Paul (2011) found that trade openness has a positive effect on economic growth in Asia covering 1971 to 2009, applying Generalized Methods of Moments (GMM) of dynamic panel data. Marelli & Signorelli (2011) also reported a

discovery of a positive impact of trade openness on economic growth in China and India throughout 1980 to 2007 by applying a panel data analysis, and Nowbutsing (2014) found a positive connection between trade openness and economic growth for Indian Ocean Rim Countries covering the years 1997 to 2011 applying Fully Modified Ordinary Least Square. In Africa, a study by Yeboah, Naanwaab, Saleem and Akuffo (2012), discovered that trade openness had a positive relationship with GDP in 38 countries between 1980 and 2008. Likewise, Nduka et al. (2013) noticed that trade openness has a significant influence on economic growth in Nigeria.

Khobai et al. (2016) incorporated exchange rates, investments, and inflation as additional variables. The extended Dickey-Fuller (ADF), Dickey and Fuller (1981), Phillips & Perron (1988), and the DF-GLS test proposed by Elliot, Rothenberg, & Stock (1996) were used to test the stationarity of the data. The ARDL (autoregressive distributed lag) model examined the long-term relationship between the variables. The study showed that trade openness positively impacts economic growth and has a significant 1 percent effect in Ghana. In Nigeria, trade openness has a negative but insignificant impact on economic growth. The study suggested a long-term relationship between the variables for both countries.

Ijirshar (2019) assesses the impact of trade openness on economic growth among ECOWAS countries using secondary data from 1975 to 2017. The study uses non-stationary heterogeneous dynamic panel models by applying Pooled Mean Group (PMG) and Mean Group (MG) estimators since the time dimension was more than cross-sections. Applying the Hausman test, the Pooled Mean Group (PMG) estimator was favored. The study found that trade openness positively affects growth in ECOWAS countries in the long run but mixed effects in the short run.

Nketiah et al. (2019) examine the relationship between foreign direct investment, openness to trade, and economic growth in Ghana in the period after liberalization from 1975 to 2017. The Augmented Dickey-Fuller (ADF) test for unit root, regression analysis, descriptive analysis, and Pearson correlation was applied to investigate the relationships. The study exhibited that trade openness is the main factor affecting Ghana's economic growth (annual %). Adjei et al. (2019) examine the determinants of real exchange rate and its overall performance on Ghanaians economy from 1998 to 2016. The study revealed that trade openness and GDP are the main factors affecting the exchange rate in Ghana.

Kim, Lin, & Suen (2016) examined the relationship between economic growth, trade, as well as growth volatility using the Chudik and Pesaran (2013) Cross-Sectional, Augmented Autoregressive Distributed Lag (CS-ARDL) panel data approach covering the period from 1960 to 2011. The study used a sample of 73 developing and developed countries to account for the potential dynamic heterogeneity and cross-section dependence on the effects of trade. The results showed that greater international trade promotes economic growth and amplifies growth volatility in the long run. The study also showed large heterogeneity

in the effects of trade, depending on a country's financial system, development level, human capital, macroeconomic policies, corruption, and labor regulation. However, it could not capture most of the ECOWAS member countries where it is assumed that the effect may differ due to market and institutional imperfections.

With Malefane & Odhiambo (2018), the study uses the autoregressive distributed lag (ARDL) -bound test approach to investigate the dynamic effects of open trade on economic growth. According to the long-run empirical results obtained, it was found out that trade openness has a positive and significant impact on economic growth when the ratio of total trade to GDP is used as a proxy only, but not when the three other three proxies are employed. However, in the short run, when the first three proxies of openness are used, the study found trade openness to impact economic growth positively, but not so when the trade openness index is employed.

Musila & Yiheyis (2015) also use annual time series data to examine the effects of trade openness on economic growth and the level of investment in Kenya. The aggregate trade openness and trade-policy-induced openness are evaluated for different results. Controlling for several different factors, aggregate trade openness is found to positively affect the level of investment and the rate of economic growth. However, the effect on the latter is statistically insignificant. On the other hand, the study also discovered that trade-policy-induced openness has, in a significant way, negatively affected investment and the rate of economic growth. Granger Causality tests also suggest that a change in trade openness tends to influence the long-term rate of economic growth through the interaction with physical capital growth in the case of Kenya.

Iyoha & Okim (2017) use four estimators; pooled OLS, fixed effects model, random-effects model, and dynamic panel regression model. Although a dynamic panel data estimator was preferred to solve the problem of endogeneity, they found that exchange rate, investment, and exports were significant determinants of per capita. Real income growth has been and that exports have been consistently positively linked to growth, which means that trade has a significant positive impact on economic growth in ECOWAS member countries. This research, however, fell short in terms of the scope covered for the analysis and the conditions for deciding between the Pooled Mean Group (PMG) estimator and Mean Group (MG) estimator through the use of the Hausman test. The test would have decided whether the differences in estimated coefficients are systematic or not.

Adu-Gyamfi et al. (2020) determine the effects of trade openness and inflation on economic growth for nine West-African countries from 1998 to 2017. The study used pooled ordinary least squares (OLS), fixed effect (FE), and random effect (RE) tests with panel data to arrive at the results. The study found that openness in trade had a significant negative impact on economic growth (GDP) using the pooled OLS and a negligible impact using the fixed and random effects tests.

Wiredu et al. (2020) empirically examine the relationship between openness to trade and foreign direct investment (FDI) to economic growth for a committee from four West African countries (Côte d'Ivoire, Ghana, Nigeria, and Senegal) between 1998 and 2017. The static panel regression techniques were employed to assess the causal link of our regressors, namely, FDI, trade openness, investment, and inflation, to economic growth measured by Gross Domestic Product (GDP). The evidence from the statistical analysis suggests that aggregated trade openness does have a positive and significant impact on economic growth in Côte d'Ivoire, Ghana, Nigeria, and Senegal.

Olufemi (2004) discovered a one-way relationship between openness to trade and economic growth. This symbolizes that a rising level of trade openness will be extremely beneficial, depending on the level of economic growth in Nigeria. Nduka et al. (2013) also discovered a uni-directional relationship in causality ranging from economic growth to trade openness without feedback in the pre-Structural Adjustment Programme period (growth-led trade), while there exists a bi-directional relationship in causality ranging from economic growth to trade openness with a feedback effect in the post SAP period (growth-led trade and trade-led growth respectively). Bigsten et al. (2000) also discovered that exports positively impacted productivity growth in Zimbabwe, Kenya, and Ghana. Sakyi (2010) observed a positive and significant influence in both the short and long-run Ghana using an ARDL bounds analysis. Kwame (2013) also examined trade liberalization and economic growth in Ghana from 1986 to 2010. He observed that trade liberalization enhances GDP growth in Ghana in the long run but somehow hinders growth in the short run, using an ARDL approach. Many researchers or scholars have researched the topic. They were specifically concerned with policy interpretation variables, especially about trade, and to further clarify the existing ambiguity in the literature between trade and economic growth. Most of their research papers help to develop trade and economic growth models. Some interference affects the development of trade and economic growth. All of these will be explored in the literature.

3. The Situation of Trade in Nigeria and Ghana

3.1. Exports, Imports and GDP Trends in Nigeria

The graph shows the exports of goods and services, imports of services, and the GDP growth, all in percentages from 1998 to 2017 for Nigeria in Figure 1. The data was derived from World Development Indicators. The horizontal axis presents the percentage of GDP, and the vertical axis shows the years. The graph indicates that GDP growth was on the low until 2003 where it shot up to a little over 30% but came back on the normally low levels in 2005. The exports of goods and services have fluctuated throughout the years, as shown in the graph. It started at 30% in 1998 and then shot up to 50% in 2000, their highest point to date. It has gone downhill from there. As we can see, it hit a little over 10% in 2017. The imports of goods and services have fluctuations as well. As shown in

the graph, it started in 1998 above the 30% column but has fluctuated over time, and in 2017 the percentage is at 10% now. Generally, there has been a decline in GPD percentage from 1998-2017, per the graph in exports, imports of goods and services, and GDP growth.

3.2. Exports, Imports and GDP Trends in Ghana

The graph shows the exports of goods and services, imports of services, and the GDP growth in percentages from the year 1998 to 2017 for Ghana in **Figure 2**. The horizontal axis presents the percentage of GDP, and the vertical axis shows the years. The graph indicates that GDP growth was stable until 2011, where it rose a bit in percentage, but from 2012 to 2017, it went back to its stable state.
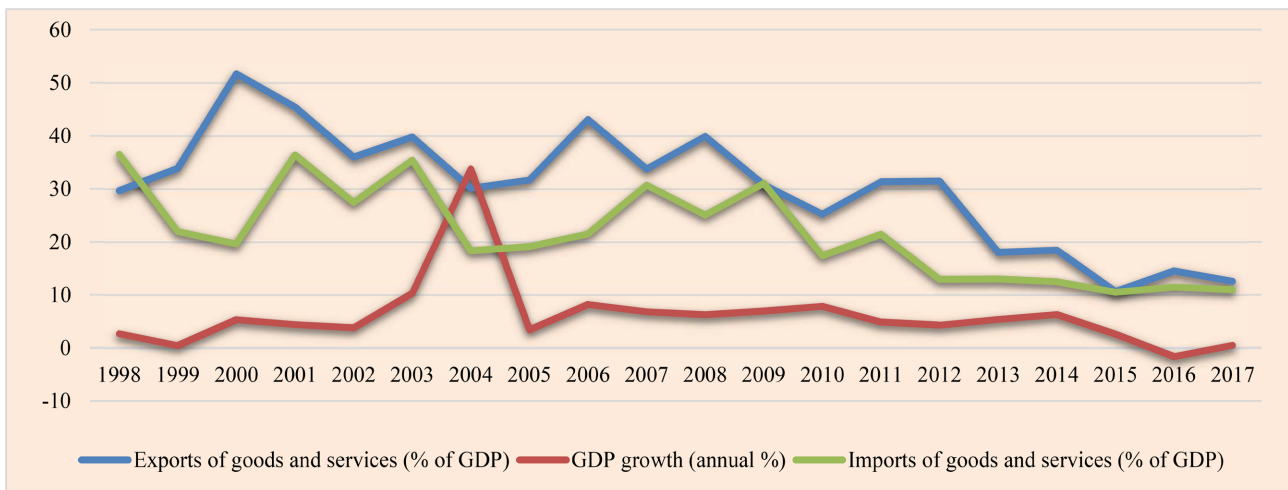

Figure 1. The trends in Exports of goods and services (% of GDP), Imports of goods and services (% of GDP), and GDP growth (annual %) in Nigeria.
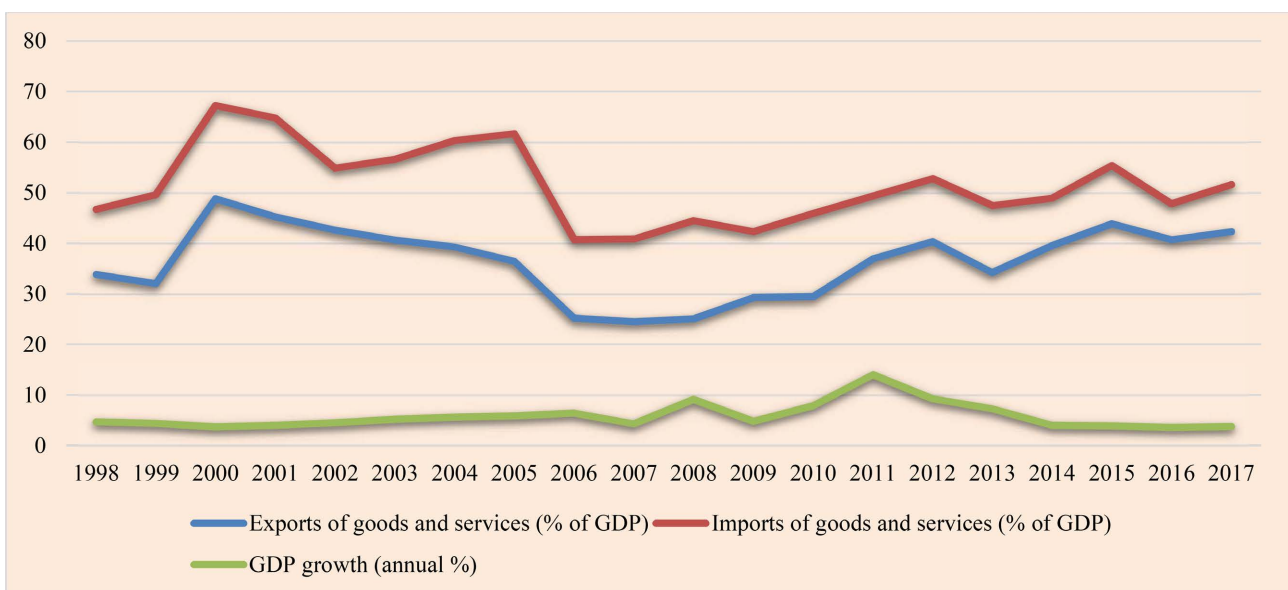

Figure 2. The trends of Exports of goods and services (% of GDP), Imports of goods and services (% of GDP) and GDP growth (annual %) in Ghana.

There isn't much of a difference throughout the years. The exports of goods and services have fluctuated throughout the years, as shown in the graph. It shot up to 50% in 2000 and declined as time passed and hit its lowest point in the years 2006 to 2008 but has since been on the rise after the decline. As shown in the graph, the imports of goods and services have been high in Ghana. There have been fluctuations as well in this sector. As shown in the graph, it hit its peak in 2000, as exports too were on the rise, and fluctuated since then. Its lowest percentage was recorded in 2006 where it went as low as 40% in the GDP for goods and services. It can be said that, although there have been major fluctuations in the imports of goods and services and exports of goods and services per GDP percentage, it has been a stable economy.

3.3. The Trend of Trade in Ghana and Nigeria

The graph shows the difference in trade between Ghana and Nigeria in Figure 3. As the graph depicts, trade-in Ghana from 1998 was 40% and rose gradually. In 2000 it obtained an increase which saw trade to hit the 50% mark. As seen in the graph, it declined slowly throughout the preceding years until it hit its lowest point in 2007. But it gradually found its feet and hits its highest point once again at 50% in 2001 and has found a little bit of stability since then. Whereas in Nigeria, in 1998, trade was at 65% and declined in 1998 to 55% but rose again to its peak, which is 80% in the year 2001. Since then, the trade-in in Nigeria has been fluctuating downwards. And now, as of 2017, the trade-in in Nigeria has hit a little above the 20% mark. It's fair to say fluctuation in trade in Ghana is lesser than that of Nigeria, making the economy in Ghana stable than that of Nigeria.

4. Data and Methodology

4.1. Data

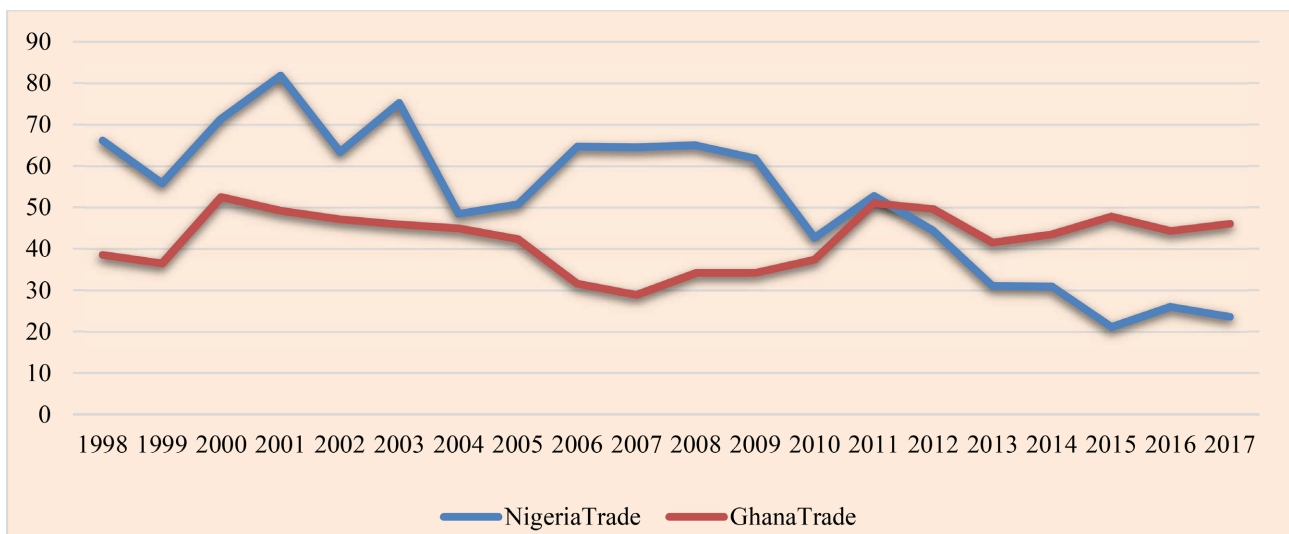This study provides an empirical analysis of the effects of trade openness on

Figure 3. The trend of trade in Ghana and Nigeria.

economic growth in Ghana and Nigeria. The dependent variable is economic growth, and the independent variables are openness to trade, investment, exchange rates, and inflation. The study uses yearly data covering the year 1985 to 2018. The data for this study are available from the World Bank website (World Bank, 2020). The data was sourced from the world bank development indicators and spans from 1985 to 2018. Table 1 presents a description of the variables in the study. Figure 4 shows the study model.

Model: This thesis model will consist of the following.

Table 1. Description of the variables.

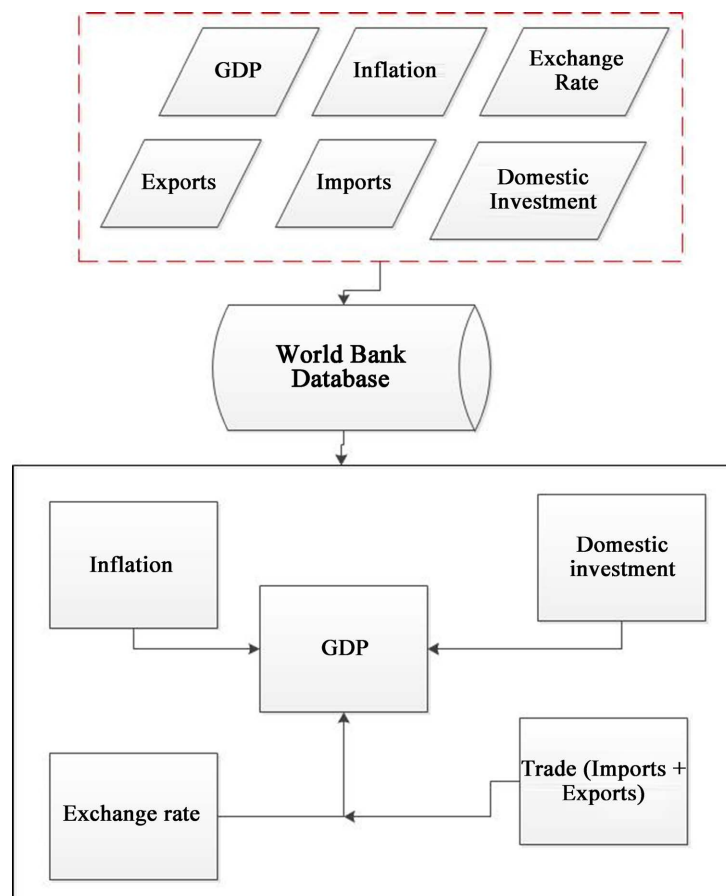| Variable	Description
GDP	Gross value added by all resident producers in the economy
Investments (GFCF)	Gross fixed capital formation in current prices
Trade (TRADE)	Imports plus exports
Real Exchange Rate (RER)	Local currency unit relative to the US dollar
Inflation (INFLA)	Consumer price index reflecting the percentage change in the cost of a basket of goods

Source: World Bank.

Figure 4. Conceptual diagram for the proposed study.

Table 2. Descriptive analysis test results.

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
logGDPGROWTH	40	1.59842	0.7150536	−0.7460468	3.518559
logGFCF	40	2.748247	0.4984304	1.697265	3.431628
logTRADE	40	4.173538	0.4251749	3.050426	4.754008
logINFLA	36	2.763759	0.7202926	1.052102	4.642685
logRER	40	4.655258	0.1807216	4.249491	4.973898

The descriptive statistics, which include means, standard deviations, minimum and maximum values of variables, are listed in the following table. Table 2 displays the outcomes of the variables used in the research. The results clarify that the average of the natural log of economic growth (GDP) is 1.5984, recording a minimum of −0.7461 and a maximum of 3.5186.

The natural log of trade (logTRADE) had a mean value of 4.1735 with a minimum value of 3.0504 and a maximum of 4.7540. The natural log of investment (logGFCF) has a mean percentage of 2.7483, with a minimum percent of 1.6973 and a maximum of 3.4316. The natural log of inflation (logINFLA) has a mean percentage of 2.7638, with a minimum percent of 1.0521 and a maximum of 4.6427. The last variable is the natural log of the real exchange rate (logRER), which has a mean percentage of 4.6553, with a minimum percent of 4.2495 and a maximum of 4.9739.

4.2. Methodology

4.2.1. Model Specification
The model specification examines the connection between trade openness, investments, exchange rates, inflation, and economic growth in Ghana and Nigeria.

4.2.2. Pooled Ordinary Least Square (OLS) Regression
Pooled OLS can be used to derive unbiased and consistent estimates of parameters even when constant time attributes are present (Wiredu et al., 2020; Nketiah et al., 2019). In short, Pooled regression is just another way of saying that you are assuming no id or time-fixed effects.

The ordinary linear econometric model that will be used in this study is as follows:

$$y_1 = \beta_0 + \beta_1 x_{it} + \beta_2 x_{it} + \cdots + \beta_n x_{it} + \mu_{it} \tag{1}$$

The study applied the impact of trade openness, investments, exchange rates, and inflation on economic growth in Ghana and Nigeria centering, on developing a simple economic growth model for Ghana and Nigeria as shown below:

$$\log \text{GDP}_{it} = \alpha + \beta_1 \log \text{TRADE}_{it} + \beta_2 \log \text{GFCF}_{it} + \beta_3 \log \text{RER}_{it} + \beta_4 \log \text{INFLA}_{it} + \mu_{it} \tag{2}$$

where GDP represents economic growth, TRADE is the trade openness, GFCF is the investment, INFLA stands for inflation, and RER represents the exchange

rates all for natural logarithms. The indexes i and t represent the countries and periods, respectively.

4.2.3. Fixed Effect Model

Following Jugurnath et al. (2016), which used both static panel regression techniques and dynamic panel estimate to analyze the impact of Foreign Direct Investment (FDI) on the economic growth for a panel of 32 Sub-Saharan African countries during the period 2008-2014 empirically. Fixed effects (FE) examine the connection between predictor and result variables within an entity (country, company, person, etc.) (Nketiah et al., 2020). Fixed effects remove the influence of those time-invariant components to evaluate the net influence of the predictors on the result variable. The equation for the FE model displays:

$$Y_{it} = \beta_1 X_{it} + a_i + \mu_{it} \tag{3}$$

where

$a_i \left(i = 1, \cdots, n \right)$ is the unknown intercept for each entity (n entity-specific intercepts).

Y_{it} is the dependent variable (DV) where i = entity and t = time;

X_{it} signifies one independent variable (IV);

β_1 is the coefficient for that IV;

μ_{it} is the error term

$$\log \text{GDP}_{it} = \alpha + \beta_1 \log \text{TRADE}_{it} + \beta_2 \log \text{GFCF}_{it} + \beta_3 \log \text{RER}_{it} \\ + \beta_4 \log \text{INFLA}_{it} + \cdots + \mu_{it} \tag{4}$$

where

GDP represents economic growth, TRADE is the trade openness, GFCF is the investment, INFLA stands for inflation, RER represents the exchange rates, and *In* stands for natural logarithms. The indexes *I* and *t* represent the countries and periods, respectively

4.2.4. Random Effects Model

The study follows Majumder and Donghui (2016), Wiredu et al. (2020), and Adu-Gyamfi et al. (2020), which used the random effect regression model. One advantage of random effects (RE) is that you can insert time-invariant variables (i.e., gender). In the FE model, these variables are received by the intercept. The RE model implies:

$$Y_{it} = \beta_1 X_{it} + a_i + \mu_{it} + \varepsilon_{it} \tag{5}$$

where

$a_i \left(i = 1, \cdots, n \right)$ is the unknown intercept for each entity (n entity-specific intercepts).

Y_{it} is the dependent variable (DV) where i = entity and t = time;

X_{it} signifies one independent variable (IV);

β_1 is the coefficient for that IV;

μ_{it} is the Between-entity error;

ε_{it} is the within-entity error;

$$\log \text{GDP}_{it} = \alpha + \beta_1 \log \text{TRADE}_{it} + \beta_2 \log \text{GFCF}_{it} + \beta_3 \log \text{RER}_{it}$$
$$+ \beta_4 \log \text{INFLA}_{it} + \cdots + u_{it} + \varepsilon_{it}$$

(6)

where

logGDP represents the natural log of economic growth, logTRADE is the natural log of trade openness, logGFCF is the natural log of investment, logIN-FLA stands for the natural log of inflation, and logRER represents the natural log of real exchange rates. All the variables are in natural logarithms form. The indexes i and t represent the countries and periods.

4.3. Results and Discussions

Table 3 presented the regression coefficients for the model estimating the impact of trade openness, investments, exchange rates, and inflation on economic growth (GDP) using Panel data. From the table, the model shows that trade (logTRADE) and real exchange rate (logRER) was significant at a 5% level in pooled OLS estimation. This study aligns with (Khobai et al., 2016; Keho, 2017; Kong et al., 2020; Nowbutsing, 2014). Investment (logGFGC) and inflation (logINFLA) recorded as insignificant at 5% level. This study is in line with (Adjei et al., 2019).

This suggests that logTRADE and logRER are good explanatory variables for economic growth (GDP) determinants in Ghana and Nigeria. The coefficient on

Table 3. Pooled OLS, fixed effect, and random effect regression test results.

Variable	Pooled OLS Robust Estimates	Fixed Effect Robust Estimates	Random Effect Estimates
Constant	0.000	0.000	0.000
	(−14.84555)	(−18.4190)	(−14.8456)
logGFCF	0.422	0.292	0.422
	(−0.1807)	(0.4257)	(−0.1807)
logTRADE	0.001*	0.001*	0.001*
	(0.9458)	(1.3860)	(0.9458)
logINFLA	0.308	0.211	0.308
	(0.1517)	(0.1848)	(0.1517)
logRER	0.000 *	0.000*	0.000*
	(2.6759)	(2.6598)	(2.6759)
R^2	0.4544	0.4821	0.4544
F-test	6.25	6.75	24.99
Hausman Test		Prob > Chi^2 = 0.4982	
Heteroskedasticity-robust Standard Error (FE)		Prob > chi^2 = 0.5367	
Testing for serial correlation (RE)			Prob > F = 0.3664

*Significance at 0.05.

the explanatory variables is positive except investment (logGFGC).

According to the tests conducted in Table 3, we can observe that under the static, fixed effect regression, investment (logGFCG) shares a positive coefficient and is insignificant at a 5% level whiles trade openness (logTRADE) and real exchange rate (logRER) both share a positive coefficient and significant at 5% level with a positive impact on economic growth (GDP) respectively. Inflation (INFLA) has an insignificant influence on economic growth. This suggests that logTRADE and logRER are good explanatory variables for determinants of economic growth in Ghana and Nigeria except for logGFCF and logINFLA. The coefficients are all positive.

Under the Random Effects model (see Table 3) shows that all the variables logGFCF, logTRADE, logINFLA, and logRER. This model describes a similar behavior as pooled ordinary least square (OLS) with parameter estimates of 0.001 for trade openness (logTRADE), demonstrating a positive and significant relationship at 5%. The coefficients are all positive except logGFCF. This signifies that GDP growth will decrease by 0.001 percent for every percentage rise in trade. Investment (logGFCF) and inflation (logINFLA) have negative and positive coefficients but are insignificant at a 5% level. The real exchange rate (RER) has a positive and statistically significant relationship with 5 percent with economic growth (GDP). From the random effect (RE) regression, its implications are described as having a coefficient estimate of 2.6759 percent, which symbolizes a lightly positive influence on economic growth (GDP). This suggests that logTRADE and logRER variables are good explanatory variables for determining economic growth in Ghana and Nigeria except for logGFCF and logINFLA.

Hausman test for the Exogeneity of the Unobserved Error Component. This indicates that the RE model is the appropriate model. The FE and RE are asymptotically equivalent if the unobserved effects are exogenous. If the null hypothesis is rejected, RE is inconsistent and prefers the FE model. If the null hypothesis cannot be rejected, random effects are preferred because it is a more efficient estimator. Hence, the statistic is positive and greater than 0.05, which shows obvious evidence that we do not reject the null hypothesis and conclude that the RE estimator is appropriate for the model.

The study test for heteroskedasticity was conducted to find out whether the results were robust or not. The null implies no homoskedasticity (or constant variance).. The study does not reject zero and concludes that there is no heteroscedasticity. The study also performed a serial correlation test to indicate whether the results are autocorrelation or not. The zero means no serial correlation. The study does not reject the null hypothesis and concludes that the data have no first-order autocorrelation.

5. Conclusions and Policy Implications

5.1. Conclusion

This study used the Pooled (OLS), Fixed Effect (FE), Random Effect (RE), and

Hausman tests to explore the impact of trade openness, investments, exchange rates, inflation on economic growth in Ghana and Nigeria. These were chosen because of the various benefits over the other tests. This implies covering the years from 1998 to 2017 in Ghana and Nigeria. The significant value of Prob > F = 0.001 found in Pooled OLS and Random effect designates a value less than a calculated significance level value, and the fixed effect is Prob > F = 0.006. Therefore, we can conclude that inflation, trade openness, real exchange rate, and investment have significant influences on economic growth. Additionally, the R-squared value obtained in this study provides proof that the independent variables: inflation (logINFLA), trade openness (logTRADE), real exchange rate (logRER), and investment (logGFCF), can describe the dependent variable. The o outcomes revealed a significant impact on the variables.

In analyzing the determinants of economic growth (GDP) using the pooled OLS test, trade openness (logTRADE) and real Exchange Rate (logRER) showed a significant relationship with economic growth among these countries with the inflation (logINFLA) and investment (logGFCF) not showing any significant impact on economic growth (GDP). The test results showed inflation (INFLA) has a significant negative impact on economic growth. Trade (logTRADE) also showed a similar trait exhibiting a significant effect against economic growth. However, the real exchange rate (logRER) showed a significant positive effect on GDP with investment (logGFCF), amounting to an insignificant effect on economic growth in Ghana and Nigeria.

Additionally, based on the fixed effect (FE) test evidence, a real exchange rate (logRER) showed a significant positive impact on economic growth. Inflation (logINFLA) and investment (logGFCF) had little bearing on economic growth (GDP). The natural log of trade (logTRADE) also significantly impacted economic growth.

Using the random effects test, real Exchange Rate (logRER) and trade openness (logTRADE) showed a significant relationship with economic growth (GDP). Inflation (logINFLA) and investment (logGFCF) established no significant relationship with economic growth (GDP). Gathering from the findings, the study exhibited that real exchange rate (logRER) and (logTRADE) among these countries had a significant impact on economic growth (GDP) in the various test runs.

Hausman test was carried to confirm which model is suitable for the study. The study implies that the RE model is suitable. The study also performed heteroscedasticity and serial correlation test to determine whether the data was robust and autocorrelative. The results showed that there is no heteroscedasticity or autocorrelation.

In summary, it can be said that openness to trade and economic growth in Ghana and Nigeria have a significantly positive impact. Several studies also indicate a positive significance between openness to trade and economic growth (Das & Paul, 2011; Marelli & Signorelli, 2011; Nowbutsing, 2014; Malefane & Odhiambo, 2018; Ijirshar, 2019).

5.2. Policy Implications

Trade openness and real exchange rate display a significant positive increase in economic growth. They have represented a significant role in the economic growth in Ghana and Nigeria economies by creating job opportunities, transmitting technology and know-how, and driving the local private sector to increase their performance in the competition. Further diversification is necessary to increase investments in Ghana and Nigeria to display more sustainability in the future. Statistical shreds of proof from the fixed effect and random effect tests determine that investment significantly negatively impacts economic growth in Ghana and Nigeria. Policymakers can develop political policies and corporate tax strategies by reviewing tax structures and funding in local productions, both on small and large systems. Export diversification strategies can be positively connected with economic growth. The state dominance of multinational companies is still far too heavy. Policymakers should improve green technology, which is now the trending tool to unlock Ghana and Nigeria's economies and energy potential. This will help eliminate poverty, build a more productive labor force, and meet the economic needs of Ghana and Nigeria and people; nevertheless, it will also assist in implementing international cooperation and improve growth and economic development. Therefore, the above conclusions highlight the economic significance of trade openness and the exchange rate and achieve new evidence for African economies.

It remained recommended that governments of Ghana and Nigeria should execute measures and strategies to manage the exchange rate and trade effects to protect economic growth. Regarding inflation, the governments of Ghana and Nigeria can put in measures to restrict and control inflation since an acceleration in inflation has negative influences on economic growth (GDP).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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