



Trade openness and economic growth: Evidence from the Economic Community of Western African States region

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Orientation: The establishment of the African Continental Free Trade Area has raised a new question regarding the link between gross domestic product (GDP) per capita and trade openness among economists and policymakers.

Research purpose: The purpose of this research is to provide an understanding of the potential free trade agreement between Economic Community of Western African States (ECOWAS) countries.

Motivation for the study: Trade liberalisation is seen as an avenue for African countries to achieve social and economic advancement. Therefore, establishing the contribution of trade to economic growth is of paramount importance to society, especially for developing economies.

Research approach, design and method: This study used two econometric tools – the autoregressive distributed lag (ARDL) bound testing approach and the pool mean group (PMG) model – to assess the link between trade openness and GDP per capita in ECOWAS. The data set covers the 15 ECOWAS member countries over the period 1990–2016.

Main findings: The study indicates the existence of a long-run relationship between the variables at 1% in all countries except for Ghana, Guinea-Bissau, Mali, Senegal and Togo. This implies that the variables are cointegrated; hence, the PMG can be used. The estimation reveals that trade openness has a negative impact on GDP per capita in the long run. The findings have important implications for policymakers in the ECOWAS region and other developing countries.

Practical/managerial implications: The paper invites policymakers in the region to carefully consider the outcome of the agreement in each member country and adjust accordingly with tariff barriers.

Contribution/value-add: Even though trade liberalisation can be beneficial, the lifting of trade barriers in all sectors among ECOWAS members will not contribute to growth. ECOWAS countries must decide the sectors they want to liberalise and also add value to their production of goods and services in order to fight poverty and boost income.

Keywords: trade openness; economic growth; ARDL model; PMG model; ECOWAS.

Introduction

Trade openness is seen as an avenue that can boost economic development in a developing country. As a result, developing countries have become more active in regional trade agreements (Dicaprio, Santo-Paulino & Sokolova 2017). With a population in Africa that is expected to double by 2050, the economic boost from intra-African trade is important not only for growth but also for global stability (United Nations 2017). Hence, regional integration is seen as a solution to rising unemployment and poverty.

It is well known that developing countries have enormous constraints in what they can bring to global trade and investment. Economic Community of Western African States (ECOWAS) countries export primary commodities that make them vulnerable to external shocks. Inadequate infrastructure and the small size of their domestic markets often limit their access to foreign markets (Clark, Dollar & Micco 2004; Gulati et al. 2007). Rising trade costs and limited access to technology and intermediate inputs for firms in developing countries constitute a barrier to entry into world markets, as well as participation in global value chains (Arvis et al. 2013).

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The relationship between trade liberalisation and economic growth has been extensively examined. Previous studies of economic growth theories have indicated that trade openness has the potential to boost economic growth in the long run (Edwards 1993; Grossman & Helpman 1991a; Romer 1990).

In his neoclassical model, Romer (1990) showed that free international trade can speed up growth. He also showed that economies with large stock of human capital experience faster growth. The model helps explain why growth is not observed in countries with low levels of human capital and shows that less developed economies can still benefit from globalisation.

East Asian economies have achieved remarkable growth in manufacturing, human and physical capital and macroeconomic stability through the promotion of trade (World Bank 1993). Stiglitz (1996) reveals that the impressive success of East Asian economies or the Asian miracle was in part because of trade openness. The prosperity achieved by East Asian economies encouraged other developing countries to embark on policies that would reduce export and import tariffs and other non-tariff barriers (Keho 2017).

However, the endogenous growth model asserts that the contribution of trade for economic growth rests on whether the force of comparative advantage orientates the economy's resources towards activities that generate long-run growth or away from such activities. The theory therefore suggests that technological and financial limitations do not allow developing countries to effectively adopt the new technologies of advanced economies (Zahongo 2016). This means that the growth efforts of trade may differ according to an economy's level of development.

Some theoretical studies note that trade openness may hamper long-run growth if the economy specialises in sectors with dynamic comparative disadvantage in terms of productivity growth or technological change (Hausmann, Hwang & Rodrik 2007; Lucas 1988; Redding 1999; Young 1991).

Developing countries export primary commodities which make them vulnerable to external shocks. Nevertheless, international trade is seen as an avenue that can boost economic development in a developing country.

Several studies have pointed out the positive growth effect of trade liberalisation (Asfaw 2014; Baldwin, Braconier & Forslid 2005; Barro & Sala-i-Martin 1997; Chang, Kaltani & Loayza 2009; Dollar & Kraay 2004; Keho 2017).

An early economic theory model, such as the classical theory of factor proportions developed by Heckscher-Ohlin, suggests that countries with similar supply structures or comparative advantages do not contribute significantly to bilateral trade. However, economies of scale or increasing returns are grounds for countries with similar supply structures to benefit from trade (Feenstra 2004).

Emerging economies like India and China, for instance, have benefitted immensely from trade liberalisation, with their global gross domestic products (GDPs) moving up from 3.6% and 4.14%, respectively, in 1990 to 7.62% and 18.33% respectively in 2017 (IMF 2018). However, economists argue that while there are winners in trade, there are also losers. This implies that those economies with trade losses experience a reduced share of the world GDP. This is the case in some developing economies with high protectionism such as Ethiopia and Cameroon. Global GDP in Ethiopia and Cameroon decreased from 0.072% and 0.08%, respectively, in 1990 to 0.015% and 0.065% in 2017 (IMF 2018).

The above findings are inconclusive because of the different proxies used for openness and the different methodologies employed.

Also, African leaders are set to establish the African Continental Free Trade Area. The agreement was signed by 44 African countries. The biggest absent was Nigeria, which hesitated after consulting unions and business leaders. Hence, the main objective of this study is to estimate the impact of trade openness on GDP per capita in ECOWAS, a free trade agreement that is already effective. This can serve as a guideline for a larger free trade agreement, such as the African Continental Free Trade Area.

In the long run, technology developed by leading economies determines the world's growth rate. Hence, a country open to trade would be able to learn from the technology used by these leading economies.

With this research agenda, the contribution of this article is twofold. Firstly, it includes new time series data from 1980 to 2016 which was not used in the previous studies. Secondly, it uses the autoregressive distributed lag (ARDL) cointegration model and the pool mean group (PMG) estimation model which leads to a more robust and consistent result for both the long-run and short-run relationships between growth and trade openness. This model is more appropriate than the fixed and random effects model used in a previous study (see Iyoha & Okim 2017), as the latter cannot control for variables such as exchange rate which varies over time. The added advantage of this approach is that it considers the fact that the long-run relationship between the variables is not constant but can change over time. The findings reveal that trade openness has a negative impact on GDP per capita in the long run. The structure of this article is as follows. The 'Literature review' section presents a review of the existing literature. The 'Model specification, estimation results and discussion' section presents the model specification, the estimation results and a discussion. The 'Conclusion' section summarises the main findings and provides some policy recommendations.

Literature review

Trade openness has received significant attention and has been widely discussed in both theoretical and empirical research. However, there is no consensus about the possible

effects of trade openness on economic growth. The literature is divided into two categories: theoretical and empirical literature studies.

Theoretical literature

The theoretical studies on the effect of trade barriers on economic growth have revealed mixed and vague results. Comparative advantage is seen as the main reason for countries to engage in trade. Countries tend to benefit from the specialisation of goods in which they have a comparative advantage. Early endogenous growth theories claim that less developed economies tend to converge towards advanced economies through trade and technological diffusion (Barro & Sala-i-Martin 1997; Grossman & Helpman 1991a; Romer 1990). Their model implies that countries more open to trade experience a faster growth rate.

Krugman (1990) lists the benefits of trade liberalisation for developing countries. He first opines that production patterns in low-income countries are time-consuming and skewed towards agriculture and manufacturing. Low-income countries have small markets and low per capita incomes. A liberalised trade policy therefore allows low cost producers to expand their output well above the demands of the domestic market. Secondly, an open trade policy allows countries to enjoy a constant return to scale over a wider range. Lastly, bureaucrats have better discretion over which industries to support or allocate limited foreign exchange in a regime of quantitative restriction.

Barro and Sala-i-Martin (1997) in their analysis maintained that trade liberalisation allows followers to converge towards leaders because copying is cheaper than innovation. As innovation starts to dwindle, the cost of imitation will rise and the followers' growth rate will fall. Such observations are generally found in cross-country data on economic growth and display a form of conditional convergence. In the same manner, Chang, Kaltani and Loayza (2005) claimed that trade liberalisation leads to technological development and an efficient allocation of resources.

On the other hand, Grossman and Helpman (1991b) noted that the effect of international trade on a country depends on its capacity to acquire foreign technology and adapt it to the local environment. This is supported by Rodriguez and Rodrik (2001) who detected little evidence of trade policies' impact on economic growth.

Some theorists argue that trade openness is prejudicial to economic growth when countries specialise in sectors in which development and research are not the core activities (Almeida & Fernandes 2008).

Empirical literature

Empirical evidence on the positive effects of trade openness on growth is abundant (Chang et al. 2009; Dollar & Kraay 2004; Fetahi-Vehapi, Sadiku & Petkovski 2015; Guei, Mugano & Le Roux 2017; Sikwila, Ruvimbo & Mosikari 2014).

In contrast, Yanikkaya (2003) in a cross-country empirical investigation claimed that trade barriers and economic growth in developing countries are positively and significantly correlated. Sarkar (2008) used a time series data analysis and showed that for the majority of the countries observed over the period 1961–2002, there is no long-run relationship between openness and economic growth. Rigobon and Rodrik (2005) found that trade has a significant negative impact on income levels. Similarly, Moyo and Khobai (2018) investigated trade liberalisation for 11 Southern African Development Community (SADC) countries and found that trade liberalisation has a negative impact on growth. Ulasan (2015) also disagrees with the trade-led growth hypothesis.

Iyoha and Okim (2017) investigated the impact of trade on economic growth in the ECOWAS region. Using the pooled ordinary least square (OLS), the fixed effect model, the random effect model and the dynamic panel regression model, they found that exports were consistently positively related to growth. They also found that the four regression equations had high coefficients of determination and F-statistic.

Lloyd, Ogundipe and Ojeaga (2014) examined the respective impacts of export diversification and composition of GDP growth and GDP per capita on the 15 ECOWAS countries. They employed the panel least-square technique for the periods 1975–2009 and 1990–2007, respectively and found that export diversification and manufacturing value-added index have a positive and significant impact on per capita income growth.

So far, studies have looked at the effect of exports and export diversification on economic growth of the ECOWAS countries. Data were assumed to be stationary or partially stationary and to exhibit a long-run relationship during the periods of study. This article will investigate the long-run relationship between the variables and the effects of trade openness on GDP per capita in the ECOWAS region.

Model specification, estimation results and discussion

Model specification

With the purpose of assessing the effects of trade openness on economic growth in the ECOWAS region, this section covers the data employed, the scope of the study and the model specification.

The variables used in this study include the following: GDP per capita growth rate, labour force, investment, financial development, exchange rate, external debt and trade openness. These variables are selected because these are important determinants of economic growth.

All variables were sourced from IMF (2018), World Bank (2018) and World Integrated Trade Solution (WITS 2018).

The study covered the period 1990–2016. Firstly, the study used a time series regression model on each of the 15 ECOWAS member countries to assess whether there is a long-run relationship between the explanatory variables. It then explored the relationship between economic growth and trade openness in the 15 ECOWAS member countries using a PMG model.

The article hypothesises that trade openness generates economic growth in the ECOWAS region. Founded on the neoclassical growth model, initiated by Solow (1956), the approach used in this study is that of the augmented neoclassical growth model developed by Mankiw, Romer and Weil (1992). This model was chosen for two reasons. Firstly, it augments the slow growth model by including the accumulation of physical and human capital. Secondly, the goal is to examine the relationship between trade openness and growth; hence, trade openness and several other policy-related variables are included in the equation.

The empirical research comprises two steps. The first step aims to test the presence of a long-run relationship between the variables for each country in the ECOWAS region. The second step examines the stationarity of the variable using unit root tests after the panel regression model has been determined.

The study used the PMG model developed by Pesaran, Shin and Smith (1999). This technique is useful since it estimates a regression for each observation and then averages them across groups so that the short-run coefficient, the error term and the intercept are different across units but similar across groups. The advantages of this approach over traditional methods are well documented in the literature (Zahonogo 2016).

The estimators of the PMG method are less sensitive to outliers. They are also consistent and efficient when parameter homogeneity holds. Under this condition, the article addresses the issue of endogeneity by augmenting the PMG parameters with lags of regressors. This helps to reduce the bias of the estimators and to ensure that the regression residuals are not serially correlated.

The PMG model takes into account trade openness, heterogeneity of the coefficients and other controlled variables and can be specified for the ECOWAS countries during the period 1990–2016 as follows:

$$Y_{it} = \beta_{0i} + \beta_{1i} \text{OPENN}_{it} + \beta_{2i} \text{LB}_{it} + \beta_{3i} \text{INV}_{it} + \beta_{4i} \text{FD}_{it} + \beta_{5i} \text{ER}_{it} + \beta_{6i} \text{DEBT}_{it} + \mu_i + \epsilon_i \quad [\text{Eqn 1}]$$

where Y_{it} = growth rate of GDP per capita at time t
 OPENN_{it} = trade openness (measured by the ratio of exports and imports to GDP) at time t
 LB_{it} = labour force at time t
 INV_{it} = investment (proxied by gross capital formation) at time t

FD_{it} = financial development (proxied by domestic credit provided by financial institutions) at time t
 ER_{it} = official exchange rate at time t
 DEBT_{it} = external debt stock at time t
 μ_i = country-specific effect
 ϵ_i = error term.

The ARDL dynamic specification for this relationship is expressed as follows:

$$Y_{it} = \lambda Y_{it-1} + \delta_{10i} \text{OPENN}_{it} + \delta_{20i} \text{LB}_{it} + \delta_{30i} \text{INV}_{it} + \delta_{40i} \text{FD}_{it} + \delta_{50i} \text{ER}_{it} + \delta_{60i} \text{DEBT}_{it} + \delta_{11i} \text{OPENN}_{it-1} + \delta_{21i} \text{LB}_{it-1} + \delta_{31i} \text{INV}_{it-1} + \delta_{41i} \text{FD}_{it-1} + \delta_{51i} \text{ER}_{it-1} + \delta_{61i} \text{DEBT}_{it-1} + \mu_i + \epsilon_{it} \quad [\text{Eqn 2}]$$

The ARDL bounds testing approach to cointegration is based on the following error correction model:

$$\Delta Y_{it} = \phi_i (Y_{it-1} - \beta_{0i} - \beta_{1i} \text{OPENN}_{it-1} - \beta_{2i} \text{LB}_{it-1} - \beta_{3i} \text{INV}_{it-1} - \beta_{4i} \text{FD}_{it-1} - \beta_{5i} \text{ER}_{it-1} - \beta_{6i} \text{DEBT}_{it-1}) + \delta_{i01} \Delta \text{OPENN}_{it} + \delta_{i02} \Delta \text{LB}_{it-1} + \delta_{i03} \Delta \text{INV}_{it-1} + \delta_{i04} \Delta \text{FD}_{it-1} + \delta_{i05} \Delta \text{ER}_{it-1} + \delta_{i05} \Delta \text{DEBT}_{it-1} + \mu_i + \epsilon_{it-1} \quad [\text{Eqn 3}]$$

where $\beta_{oi} = \mu_i / (1 - \lambda_i)$
 $\beta_{1i} = \delta_{10i} + \delta_{11i} / (1 - \lambda_i)$
 $\beta_{2i} = \delta_{20i} + \delta_{21i} / (1 - \lambda_i)$
 $\beta_{3i} = \delta_{30i} + \delta_{31i} / (1 - \lambda_i)$
 $\beta_{4i} = \delta_{40i} + \delta_{41i} / (1 - \lambda_i)$
 $\phi_i = - (1 - \lambda_i)$.

Trade openness is measured by the ratio of imports and exports to GDP. It is expected to be positively correlated with GDP per capita.

Labour force comprises people aged 15 years and above who supply labour for the production of goods and services. It is important to note that the study uses the log of labour force in the model estimation. Labour force is expected to be positively correlated with GDP per capita. It is an important contributor to economic growth through domestic technology capability building and foreign technology spillover (Banerjee & Roy 2014; Pelinescu 2015). This variable is added to the model for two reasons: one is the size of the informal sector in ECOWAS. The second reason is that low level of education does not prevent farmers and the youth from actively participating in the economy.

In many empirical studies, investment has been used as a contribution to capital accumulation. In this study, it is measured as gross capital formation as a percentage of GDP. It is an indicator of basic economic infrastructure, such as machinery, roads and land improvement (World Bank 2018). Blanchard and Johnson (2014) also note that greater investments have a positive impact on economic growth. This coefficient, therefore, is expected to be positively correlated with GDP per capita.

Financial development is measured by the domestic credit offered by financial institutions as a percentage of GDP.

The lack of a well-developed financial system and a dependence on primary products do not encourage sustainable growth in developing countries. Instead, the latter results in low real income and a tendency for borrowers to default. Hence, financial development is expected to be negatively correlated with GDP per capita.

Exchange rate refers to the price of South African currency (Rand) value against the US dollar. Hence, it measures the competitiveness of a currency. The exchange rate is expected to be negatively correlated with economic growth as suggested by the literature (Yan, Lin & Li 2016).

This article also captures the effects of debt on GDP per capita. Debt is the total external debt stock. The study uses the log of total external debt stock. Debt is expected to be inimical to economic growth.

The ARDL model is used to derive the long-run relationship in each of the 15 ECOWAS countries. The long-run relationship of the underlying variables was observed through the F-statistic or the Wald coefficient. The ARDL model used an OLS to evaluate the long-run relationship between trade openness and other controlled variables.

The ARDL bounds approach can be used irrespective of whether the underlying variables are $I(0)$, $I(1)$ or mutually cointegrated. This implies that the bound testing cointegration procedure does not require classification of the variables into $I(0)$ and $I(1)$ and is robust when there is a long-run relationship between the underlying variables. The representation of ARDL error correction becomes relatively more efficient when the F-statistic establishes a single long-run relationship between the underlying variables (Pesaran et al. 1999).

Once the long-run relationship had been established, the article used the PMG model. The latter is a cointegration technique that deals with variables that are integrated of different orders such as $I(0)$ and $I(1)$ (Pesaran et al. 1999). This is a better cointegration technique than that of Engle and Granger, and the Johansen test because they cannot be used in cases where variables are integrated of different orders (Nkoro & Uko 2016). Another advantage of the PMG is that unlike the Johansen technique it uses a reduced form equation.

The PMG model estimates a dynamic heterogeneous panel by looking at the long-run equilibrium relations between the underlying variables.

The null hypothesis of no cointegration is given as:

$\phi_1 = \phi_2 = \phi_3 = \phi_4 = \phi_5 = \phi_6 = 0$ against the alternative hypothesis $\phi_1 \neq \phi_2 \neq \phi_3 \neq \phi_4 \neq \phi_5 \neq \phi_6 \neq 0$.

Some stylised facts on trade openness and gross domestic product per capita in Economic Community of Western African States

Figure 1 shows the distribution of GDP per capita growth rate and trade openness (imports plus exports as a share

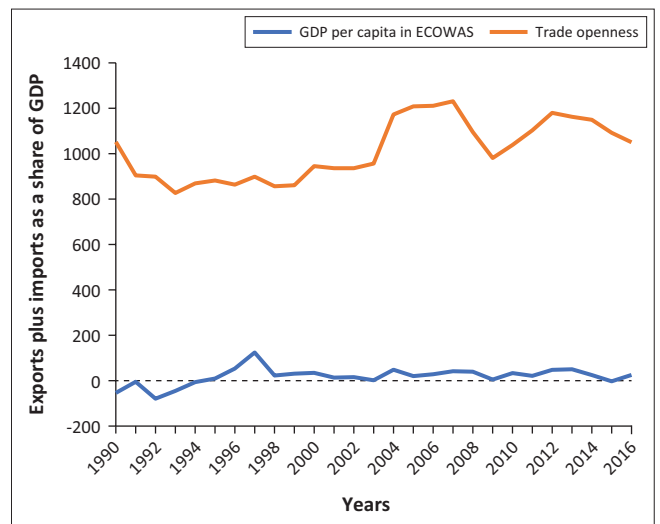


FIGURE 1: Gross domestic product (GDP) per capita and trade openness across the 15 Economic Community of Western African States countries, 1990–2016.

of GDP) during the observed period. The variables tend to follow a similar trend. The graph shows that the two variables present a downward trend from 1990 to 1992. GDP per capita growth in ECOWAS countries reached a peak in 1997 when trade openness was also at a peak level. Trade openness exhibits a downward trend from 2007 to 2009, which could be attributed to the global financial crisis. The growth rate of GDP per capita also declined during this period.

Model estimation results and discussion

The descriptive statistics and correlation matrix are shown in Table 1.

Table 1 shows that the average level of GDP per capita growth is 1.24%. Trade openness has an average of 67.56 and reached its maximum at 311.35. Debt, financial development, investment, labour force, and exchange rate have a respective mean value of 4.72, 35.31, 19.05, 14.74 and 715.08.

The correlation analysis was conducted using the Spearman's rank-order test. The correlation matrix shows a positively significant relationship between investment and GDP per capita, which follows *a priori* expectation. However, a negative and statistically insignificant relationship between trade openness and GDP per capita growth is observed. Based on the correlation results reported in Table 1, there is no problem of multi-collinearity among the explanatory variables as only a small correlation between them is observed.

Unit root tests

Several unit root tests were performed to test the order of integration of the series (see Table 2). The Phillips-Perron (PP) Fisher chi-square test, the Augmented Dickey-Fuller (ADF) Fisher chi-square test developed by Maddala and Wu (1999), Im, Pesaran and Shin test (2003) and Levin, Lin and Chu test (2002) were used. Using the PP Fisher chi-square

TABLE 1: Descriptive statistics and correlation matrix.

Variables	GDP per capita	Debt	FD	INV	LB	ER	OPENN
Panel A: Summary statistics							
Mean	1.247	4.72	35.312	19.050	14.74	715.08	67.56
Median	1.343	1.85	19.838	19.454	14.92	994.41	62.33
Maximum	91.648	3.99	2066.180	49.780	17.86	8959.71	311.35
Minimum	-50.230	1.34	-0.001	-2.420	11.64	7.87	21.12
SD	7.800	7.30	107.750	9.260	1.32	1208.55	32.21
Panel B: Correlation matrix							
GDP per capita	1	-	-	-	-	-	-
Debt	-0.040	1	-	-	-	-	-
FD	0.080	0.10**	1	-	-	-	-
INV	0.250*	-0.11**	0.15*	1	-	-	-
LB	0.050	0.77*	-0.11**	0.0090	1	-	-
ER	0.025	-0.16*	-0.29*	0.0269	0.268*	1	-
OPENN	-0.090	0.05	0.59*	0.2560*	-0.130*	-0.22*	1

GDP, gross domestic product; FD, financial development; INV, investment; LB, labour force; ER, official exchange rate; OPENN, trade openness; SD, standard deviation.

* and ** indicate 1% and 5% significance level, respectively.

TABLE 2: Unit root tests.

Variables	Levels		First difference	
	Intercept	Trend and intercept	Intercept	Trend and intercept
PP Fisher chi-square				
GDP per capita	219.79*	205.68*	377.93*	2162.95*
Debt	15.17	11.04	187.55*	150.68*
FD	58.69*	87.37*	250.52*	795.90*
INV	43.80**	45.75**	317.00*	472.84*
LB	40.89***	24.27	34.90	28.05***
ER	27.85	10.90	163.46**	130.53*
OPENN	72.40**	86.90	324.85*	625.67*
ADF Fisher chi-square				
GDP per capita	101.45*	84.44*	255.67*	200.15*
Debt	21.87	15.50	100.97*	72.63*
FD	23.27	36.10**	139.71*	127.86*
INV	29.09	31.65	177.24*	142.96*
LB	15.48	225.85*	86.63*	42.35
ER	46.93**	29.67	171.37*	138.46*
OPENN	77.36*	106.25*	266.98*	200.01*
IPS				
GDP per capita	-13.44*	-12.61*	-23.20*	-20.81*
Debt	1.91	1.26	-11.70*	-9.92*
FD	-1.92**	-6.11*	-19.55*	-19.32*
INV	-2.5*	-3.14*	-16.35*	-13.38*
LB	4.88	-7.18*	-5.21*	-0.37
ER	0.45	0.27	-11.42*	-9.97*
OPENN	-3.87*	-6.09*	-17.19*	-12.88*
LLC				
GDP per capita	-13.15*	-11.79*	-21.69*	-16.75*
Debt	1.78	0.43	-11.03*	-9.44*
FD	-1.80**	-5.27*	-20.26*	-16.68*
INV	-2.63*	-3.12*	-18.43*	-13.70*
LB	0.73	-10.04*	-7.05*	1.70
ER	1.65	-1.23	-12.36*	-10.09*
OPENN	-2.74*	-3.58*	-15.83*	-9.69*

GDP, gross domestic product; FD, financial development; INV, investment; LB, labour force; ER, official exchange rate; OPENN, trade openness.

*, ** and *** indicate 1%, 5% and 10% significance level, respectively.

methods, the results show that only labour force is stationary at the 10% level. All other methods showed a stationarity of 1% or 5% at either levels or at first difference for all the variables. This implies the possible existence of a long-run relationship between the variables.

TABLE 3: Bounds tests.

Country	F-statistic
Benin	3.66
Burkina Faso	5.98
Cape Verde	16.63
Cote d'Ivoire	6.65
Gambia	14.19
Ghana	2.42
Guinea-Bissau	2.70
Guinea	9.84
Liberia	32.21
Mali	2.73
Niger	4.71
Nigeria	7.34
Senegal	1.09
Sierra Leone	5.94
Togo	1.80

TABLE 4: Critical value bounds.

Significance (%)	I0 bound	I1 bound
10	2.12	3.23
5	2.45	3.61
1	3.15	4.43

The bounds test results are shown in Tables 3 and 4, which reveal that there is a cointegration between the variables at 1% level in most countries. However, we failed to reject the null hypothesis of no cointegration for Ghana, Guinea-Bissau, Mali, Senegal and Togo.

A diagnostic test is also conducted for each of the ECOWAS member countries using the ARDL models. The results are shown in Table 5. The 1% significance level is chosen for the analysis. The residual diagnostic tests show that of the 15 countries observed, only Benin and Liberia show serial correlation. No other country shows evidence of heteroscedasticity, serial correlation and residual non-normality. Model misspecification is only found in Ghana. Cointegration is found in most of the countries studied and the ARDL models pass the diagnostic tests. Hence, there is evidence of a long-run relationship between the variables. In this case, there is a long-run relationship between GDP per

TABLE 5: Diagnostic tests.

Country	Heteroscedasticity		Serial correlation		Normality		Ramsey test	
	F-stat	Prob.	F-stat	Prob.	JB.	Prob.	F-stat	Prob.
Benin	0.57	0.83	10.97	0.0090	1.290	0.52	0.570	0.4700
Burkina Faso	0.28	0.97	1.71	0.3100	2.270	0.32	0.270	0.6300
Cape Verde	0.37	0.94	5.46	0.0700	1.760	0.41	1.460	0.2700
Cote d'Ivoire	0.74	0.68	2.20	0.1500	0.250	0.87	0.330	0.5700
Gambia	0.26	0.98	1.16	0.4600	4.120	0.12	0.030	0.8600
Ghana	1.71	0.20	3.28	0.0900	0.900	0.63	48.570	0.0001
Guinea-Bissau	1.10	0.51	0.57	0.6300	0.160	0.91	5.510	0.1000
Guinea	0.81	0.66	15.03	0.0200	0.270	0.86	0.001	0.9700
Liberia	1.95	0.18	34.54	0.0012	0.003	0.99	1.700	0.2300
Mali	0.30	0.97	1.58	0.2500	1.790	0.40	3.900	0.0700
Niger	0.36	0.95	3.74	0.0700	0.030	0.78	0.870	0.3700
Nigeria	1.19	0.42	4.77	0.0600	0.450	0.79	3.880	0.0900
Senegal	1.58	0.27	8.25	0.0200	0.010	0.99	0.005	0.9400
Sierra Leone	2.42	0.11	6.79	0.0300	0.790	0.67	1.830	0.2200
Togo	3.35	0.01	0.01	0.9800	0.680	0.71	0.810	0.3800

JB, Jarque-Bera.

TABLE 6: Pool mean group results.

Variables	Coefficient	SE	T-statistic	Prob.
Debt	-1.87	0.105	17.70	0.000
FD	-0.12	0.004	-25.41	0.000
INV	-0.11	0.018	-6.35	0.000
LF	6.60	0.634	10.40	0.000
ER	-0.90	0.185	-4.87	0.000
OPENN	-0.03	0.001	-19.51	0.000
Short run				
COINTEQ01	-0.89	0.300	-2.94	0.004
D(GDP per capita(-1))	-0.12	0.270	-0.44	0.650
D(GDP per capita(-2))	-0.02	0.160	-0.14	0.880
D(Debt)	3.46	3.470	0.99	0.320
D(Debt(-1))	1.93	3.000	0.64	0.520
D(Debt(-2))	-2.68	4.160	-0.64	0.520
D(FD)	0.19	0.230	0.81	0.410
D(FD(-1))	0.01	0.110	0.14	0.880
D(FD(-2))	-0.02	0.080	-0.24	0.800
D(INV)	0.38	0.160	2.35	0.020
D(INV(-1))	0.36	0.260	1.38	0.160
D(INV(-2))	0.09	0.150	0.60	0.540
D(LF)	-390.00	362.740	-1.07	0.280
D(LF(-1))	254.00	377.130	0.67	0.500
D(LF(-2))	171.00	321.320	0.54	0.580
D(ER)	-13.92	12.830	-1.08	0.280
D(ER(-1))	-9.81	12.390	-0.79	0.430
D(ER(-2))	-0.04	4.120	-0.01	0.990
D(OPENN)	-0.03	0.060	-0.49	0.620
C	-102.52	40.010	-2.56	0.010

GDP, gross domestic product; FD, financial development; INV, investment; LF, labour force; ER, official exchange rate; OPENN, trade openness; LF, Labour Force; SE, standard error.

capita and trade openness. This implies that the PMG is an appropriate model for the analysis.

The PMG results are shown in Table 6. The *a priori* expectation is that openness and GDP per capita have a positive relationship. However, the results of the study show that trade openness and GDP per capita have a negative relationship in the long run. This finding is supported by Vlastou (2010), who, using a sample of 34 African countries, found that trade openness has a negative impact on economic growth. Meierrieks and Kraft (2009) also showed that trade

openness and growth in ECOWAS countries (Senegal, Togo and Cote d'Ivoire) are not significant.

A possible explanation for the negative impact of trade openness on GDP per capita is that ECOWAS countries are not able to take full advantage of exports diversification, which is a necessary condition to support economic growth.

From Table 6, debt, exchange rate and financial development are negatively correlated with GDP per capita. This is in line with the *a priori* expectation. Labour force is positively correlated with GDP per capita, which also satisfies the expectation of this study.

Surprisingly, investment has a negative relationship on economic growth, which is against the *a priori* expectation. Investment includes construction of roads, railways, schools, hospitals and land improvement. The economic costs of poor road maintenance, rehabilitation projects and the degradation of the environment could be the reasons why investment has a negative effect on GDP per capita.

The error correction term is significant and negative, indicating that there is a stable long-run relationship between the variables. The coefficient suggests that 89% of the disequilibrium level of output in the short run is corrected in the long run. In the short run, trade openness has a negative relationship with GDP per capita; however, it is not statistically significant.

The heterogeneous PMG results are presented in Table 7. The impact of trade openness on economic growth is negative and significant in eight countries. This suggests that trade openness is detrimental to economic growth in the short run. Most of the adjustment coefficients are negative and significant. Only Guinea-Bissau shows a positive adjustment coefficient, which is an indication of model instability.

TABLE 7: Pool mean group short-run coefficients.

Country	D (GDP(-1))	Debt	FD	INV	LF	ER	OPENN	Adjust
Benin	0.53	0.00	-0.11	-0.20	-0.00003*	0.06000	0.37	-1.14*
Burkina Faso	-0.44***	-0.00**	0.32	-0.07	0.00000**	-0.01000	-0.260	-0.85***
Cape Verde	0.89**	-0.00	-0.11	-0.03	-0.02000*	0.45000***	-0.570**	-1.17*
Côte d'Ivoire	0.56**	0.00*	0.62*	1.29*	0.00001	0.00001	-0.050**	-1.79*
Gambia	0.37	-0.00*	-1.65*	0.10	0.00050	1.82000**	-0.120**	-2.41*
Ghana	0.49	-0.00	-0.33**	0.09	-0.00000	-0.03000*	0.050	-1.24*
Guinea-Bissau	0.30	-0.00	0.97	0.96***	-0.00000	0.04000	-0.440***	-0.51
Guinea	0.86**	0.00	0.22	-0.22**	-0.00010**	-0.00100**	0.030	-1.65*
Liberia	0.08	0.00	0.008**	-0.93**	0.00000	-0.38000	0.060**	-1.19*
Mali	0.44	-0.00	0.51	0.45	-0.00000	0.00400**	-0.180**	-2.39*
Niger	0.95**	0.00	-0.91	0.50	0.00000	-0.00700	-0.380**	-3.10*
Nigeria	-0.20	0.00**	-0.15**	0.82*	-0.00000*	0.01000	-0.120**	-0.40***
Senegal	0.99*	0.00*	-1.61*	1.82*	0.00005**	0.03000*	-0.914*	-1.99*
Sierra Leone	0.46	-0.00	0.01	0.01	0.00016	-0.03000**	0.080	-2.24*
Togo	0.38	0.00	-0.45	0.33	-0.00030**	0.05000**	0.320	-0.61**

GDP, gross domestic product; FD, financial development; INV, investment; ER, official exchange rate; OPENN, trade openness.

*, ** and *** indicate 1%, 5% and 10% significance level, respectively.

Conclusion

This article presents a systematic analysis of a dynamic GDP per capita across ECOWAS countries. The analysis focuses on the 15 ECOWAS member countries over the period 1990–2016. The empirical analysis employs the ARDL bounds testing approach to cointegration to test whether there is a long-run relationship between GDP per capita, debt, financial development, investment, labour force, exchange rate and trade openness. The results validate the existence of a long-run relationship between the variables at 1% level except for Ghana, Guinea-Bissau, Mali, Senegal and Togo.

Furthermore, the results reveal that trade openness has a significantly negative impact on GDP per capita in the long run. This implies that ECOWAS economies should be careful in depending heavily on trade liberalisation as their primary source of economic growth. Countries that have signed the African Continental Free Trade Agreement should be cautious in liberalising all their sectors to trade. This is in line with the infant industry argument.

However, this does not mean that trade liberalisation is harmful; rather, it invites developing countries to take advantage of trade openness to facilitate the imports of goods in which they do not have a comparative advantage and also capital goods that will help in the transformation of their economies. Labour is positively correlated with GDP per capita. Hence, investing in human capital by supporting productivity and innovation is vital for developing countries to tackle the cycle of poverty.

A limitation of this study is that it uses an aggregate value to capture the impact of trade openness on GDP per capita. Thus, it ignores the positive impact a specific sector can have on the economy. A useful continuation of this research would be to examine the effects of agricultural liberalisation on ECOWAS countries. Also adding other important variables, such as inflation and institutional quality, would improve the estimation technique and reduce the omitted variable bias.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

K.M.G. wrote the article and performed the computations. He verified the analytical method and provided the conclusion. P.L.R. supervised the study and provided guidance throughout the completion of the research.

Ethical considerations

This article followed all ethical standards for research without direct contact with human or animal subjects.

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