

The Dynamic Effect of Trade Openness, Debt, and Foreign Investment in Ghana's Economy: An ARDL Bound Testing Approach

EVANS YEBOAH¹, CEESAY LAMIN²

¹Mendel University in Brno, Faculty of Business and Economics. Czech Republic. yeboah.evans869@gmail.com
(corresponding author)

²University of Palermo, Department of Economics, Statistics and Business. Italy.
lamin.ceesay@community.unipa.it

Abstract. The impact of macroeconomic factors offers insight into the performance of an economy. This study investigates the dynamic short- and long-term effect of trade openness, external debt, and foreign direct investment (FDI) within Ghana's economy. Utilizing Autoregressive Distributed Lag (ARDL) bound testing and Granger causality analysis, the study examines data spanning from 1991 to 2022. The results of the ARDL cointegration test reveal a long-term relationship among the variables. However, in the short term, the findings present a mixed effect of FDI and trade openness, with both positive and negative impacts. In the long run, FDI and external debt exhibit a positive influence, whereas trade openness appears to impede economic growth. Furthermore, the Granger causality test identifies a unidirectional causality relationship between the variables and economic growth. The study suggests that the government implement investment-oriented and trade policies to stimulate economic growth.

Keywords: Economic Growth, FDI, Trade Openness, GDP per Capita, ARDL

Introduction

Like many of the least developed countries, Ghana depends on foreign investment and trade to boost its economy. Growth in the global economy is influenced by numerous factors that disrupt the smooth progression of development in individual economies. Factors such as capital formation, employment rates, exchange rates, investment, and public spending all impact economic development [1]. However, an economy aiming for sustainable growth, high employment, poverty reduction, and decreased income inequality must first identify its growth factors. This involves improving living conditions and facilitating adaptation to environmental changes. Economic growth is a significant phenomenon witnessed by economies over the long term. This implies that over time, welfare is enhanced by an increase in per capita output, which offers a broader range of goods and services for consumption and boosts public purchasing power. Most economists agree that physical capital, natural resources, technology, and human resources influence economic development [2]. However, persistent low growth in developing economies is often attributed to countries with abundant natural resources failing to promote technological innovation, skilled labor, and effective educational systems due to a lack of sound economic policies [3]. Significant issues facing developing economies, whose development primarily relies on government activities, include high poverty rates, rapid population growth, and outdated

technologies. Understanding the interconnectivity of FDI, external debt, trade openness, and economic growth is crucial for policy planning and decision-making. In recent years, the amount of external debt in developing nations has significantly increased [4], [5]. However, developing economies in Africa still face high external debt and an unemployment rate that stifles economic growth, hindering the achievement of the Sustainable Development Goals 2030 and the African Union Agenda 2063. External debt and FDI play significant roles in enhancing economic growth when managed effectively. If a country's rate of national saving is low, it will turn to loans to stabilize economic growth. Additionally, both FDI and external debt reflect capital inflows that support the creation of capital to drive economic expansion [6], [7], [8], [9]. A discussion on the most effective public policies for transforming state-owned economies of the socialist world into competitive market systems has centered on the role and importance of FDI [10]. According to UNCTAD (2008) [11], global FDI inflows surged by 30% to USD 1.979 trillion in 2007 due to developing economies identifying economic growth as a fundamental goal for improving their national economic structures. The increased interest in FDI is not solely due to globalization but also because foreign aid and development assistance from industrialized economies and foreign donors to least developed economies have been steadily declining.

Over the past years, the economy of Ghana has relied on external loans and foreign investment for its development activities. Ghana's economic recovery program was implemented in 1983, and since then, its economy has undergone one of the most extensive structural adjustment programs in Africa [12], [13]. After the successful implementation of sound macroeconomic policies, Ghana's economy, according to the World Bank, was the fastest-growing in the world in 2019; however, its development rate has recently slowed down. Challenges such as low agricultural production, high government debt, inflation, energy costs, and inefficient trade persist [12]. Based on World Development Indicators data, there has been a persistent increase in Ghana's gross domestic product, external debt, and unemployment rate. In 2021 and 2022, the country's GDP was US\$ 79 billion and US\$ 73 billion, respectively. However, before the COVID-19 outbreak, FDI inflow stood at US\$ 3.25 billion in 2018 but declined to approximately US\$ 1.88 billion and US\$ 2.6 billion in 2020 and 2022, respectively. Conversely, Ghana faced macroeconomic difficulties in 2022 due to internal imbalances and external shocks. However, recent global economic shocks from COVID-19 and the Russia-Ukraine war have presented significant development challenges to Ghana, particularly severe fiscal and budget deficit issues. At the beginning of 2022, all major credit agencies downgraded Ghana's long-term debt due to growing investor concerns. During the same period, external debt rose from 39% to 44% of GDP, while public sector debt increased from 63% in 2019 to 78% in March 2022 [14]. Nevertheless, Ghana has initiated thorough debt restructuring and obtained a three-year, approximately \$3 billion IMF Extended Credit Facility (ECF) program to support the restoration of financial stability [15]. GDP growth increased to 3.2% in the first half of 2023 due to robust growth in agriculture (6.2%) and services (6.3%). However, economic growth is forecasted to decelerate further to 1.5% in 2023 and remain subdued at 2.8% in 2024. High interest rates, corrective monetary measures, continuous fiscal contraction, high inflation, and macroeconomic uncertainty hamper private consumption and investment from rising. As Ghana continues to face setbacks in post-COVID-19 economic recovery due to high external debt, low FDI inflow, and a rising unemployment rate, questions arise about its economic performance: Is there a significant relationship between economic development, FDI, external debt, and trade? If so, is the relationship positive or negative in the short and long run? This study aims to answer these questions

using Autoregressive Distributed Lag (ARDL) bound testing to cointegration to investigate the short- and long-run effect. The findings from this study aim to contribute to existing hypotheses. The study is divided into literature reviews covering the relationship of selected variables with economic growth. The methodology involves the data and methods used in this study. The results provide the outcome and discussion of the estimated models. The conclusion summarizes the findings and offers recommendations.

Literature Review

Theoretical framework

FDI, trade openness, and external debt are critical components in the analysis of international economics and development. Theories related to these components provide details on their interconnections and impacts on economic growth, stability, and policy formulation. FDI refers to investments made by a firm or individual in one country into business interests located in another country. One prominent theory of FDI is Dunning's Eclectic Paradigm, also known as the OLI model, which suggests that firms undertake FDI when they possess Ownership (O) advantages, Location (L) advantages, and Internalization (I) advantages [16]. Ownership advantages pertain to firm-specific assets such as technology or brand reputation. Location advantages include factors like resource availability, labor costs, and market size in the host country. Internalization advantages arise when firms find it more profitable to control their foreign operations rather than licensing them out. Trade openness, the degree to which a country allows free trade with other nations, is another key factor influencing economic performance. The theory of comparative advantage, developed by David Ricardo, underpins much of the rationale for trade openness. It posits that countries benefit from specializing in the production of goods and services they can produce most efficiently and trading them for those they produce less efficiently [17]. This leads to an overall increase in global efficiency and economic welfare. Additionally, the Heckscher-Ohlin model expands on this by asserting that countries will export products that use their abundant and cheap factors of production and import products that require factors that are scarce domestically [18]. External debt, the portion of a country's debt borrowed from foreign lenders, can be analyzed through the lens of the debt overhang theory. This theory suggests that high levels of external debt can stifle economic growth because potential investors fear that the returns from their investments will be used to service existing debt rather than being reinvested in productive activities [19]. This creates a disincentive for both domestic and foreign investment, potentially leading to a vicious cycle of low growth and increasing debt. The connection between these elements is complex. For instance, high levels of FDI can positively impact trade openness by fostering technological transfer, enhancing productivity, and opening new markets for exports [20]. Conversely, trade openness can attract FDI by providing a larger market and more efficient supply chains. However, excessive external debt can undermine these benefits by creating economic instability and reducing investor confidence. Countries must carefully manage their external debt to maintain the positive impacts of FDI and trade openness on economic growth [21].

Empirical Review

Numerous studies have investigated the effects of FDI, external debt, and trade on economic growth over the years, employing various approaches and yielding different outcomes. Evans et al. [22] examined the impact of FDI on economic development using the ARDL method with data from 1995 to 2019. Their findings indicate that FDI, coupled with institutional quality, positively influences economic growth. Samuel and Xicang [23] employed the cointegration method with a sample size from 1980 to 2010 to explore the effect of FDI on economic advancement. They revealed a long-run equilibrium relationship between FDI and other control variables and established that, in the short run, the effect of GDP and GNI volatility on FDI is negligible. Conversely, Safwat et al. [24] utilized Johansen cointegration and vector error correction methods with observations from 1980 to 2018 to examine the effect of FDI on economic growth. Their results indicate a long-term linkage between FDI inflows and growth, concluding that FDI has a positive impact. Hafiz et al. [25] studied the impact of FDI and economic development using the ARDL method with data from 1980 to 2016. The outcomes of the ARDL-bound testing demonstrated correlations between economic growth, FDI, trade, physical capital, and human capital. Seiko [26] investigated how FDI affected economic expansion using a panel dataset from 1980-2013 through dynamic GMM estimators. The findings suggested a positive impact of FDI on economic growth, with a conditional convergence rate of 5%, indicating no crowding-out effect when FDI shifts to domestic investment. Alina [27] examined the impact of FDI on GDP growth and the causal relations between economic growth, finding a long-run relationship between FDI, trade, labor, and economic growth using the ARDL bound testing approach. Adeleke et al. [28] analyzed the effects of FDI on Nigerian economic growth from 1999 to 2013 using the OLS estimation method, revealing a positive relationship between FDI and economic growth. Malik [29] investigated the significance of FDI on Pakistan's economic expansion from 2008-2013, concluding that FDI has a positive impact on economic growth. Conversely, Bouchoucha and Ali [30] examined how FDI influenced Tunisia's economic growth from 1980 to 2015, finding a positive effect of FDI on economic development in both the short and long terms.

Faraji and Said [31] explored the effect of Tanzania's external debt on economic growth from 1990 to 2010 through linear regression, finding that external debt and debt service affected GDP growth. Khaled and Mohammad [32] studied the relationship between external debt and economic growth in Jordan from 2010-2017, concluding that external debt negatively influences economic growth. Paul [33] analyzed the effect of Nigeria's external debt on the country's economic growth from 1985 to 2015, finding a favorable impact of external debt on Nigeria's growth index. Elwasila [34] studied the impact of external debt on Sudan's economic growth from 1969 to 2015, concluding that external debt contributes positively to economic growth. Conversely, Mbah et al. [35] examined how Nigeria's external debt affected economic expansion from 1970 to 2013, finding significant adverse effects from external debt. Yaya [36] explored the effects of trade openness on Cote d'Ivoire's economic growth from 1965 to 2014, finding favorable long- and short-term benefits of trade openness on economic growth. Chandrashekar [37] focused on a panel of five developing economies from 1993 to 2016, finding a positive association between trade openness and economic growth. However, Qazi and Lau [38] analyzed the relationship between India's economic growth and trade openness, concluding that trade openness harms economic growth in the long run. Ijirshar [39] evaluated the effect of trade openness

on economic growth among ECOWAS members from 1975 to 2017, finding a favorable long-term effect on growth. Conversely, Khalid [40] studied how Turkey's economic growth is affected by trade openness from 1960 to 2014, finding a short-term positive impact but no long-term relationship. Markus and Daniel [41] estimated the connection between trade openness and economic growth in Sub-Saharan Africa, finding a significant positive effect of trade openness on economic growth. Similarly, Kwame et al. [42] examined the impact of trade openness on Ghana's economic development from 1970 to 2013, finding positive influences on both long- and short-term economic growth. Akutson et al. [43] studied the connection between Nigeria's economic expansion and unemployment, finding no long-term correlation between Nigeria's unemployment rate and economic growth. Muhammad [44] investigated the impact of unemployment and inflation on economic growth in Pakistan, finding a long-term relationship between the variables. Nikolaos and Pavlos [45] analyzed the relationship between Greece's unemployment rate, economic growth, and inflation rate, and found short and long-term unidirectional relationship between unemployment and economic growth. Salyha et al. [46] studied Pakistan's growth rate changes from 1974 to 2020 regarding unemployment, finding a statistically significant negative association between unemployment, inflation rates, and economic growth. The reviewed studies examining FDI, external debt, and trade openness have not been sufficiently assessed using current data capturing recent developments. Most of the literature on the correlation between these variables is overlooked, and some outcomes remain inconclusive. The dynamic relationship between these variables is significant as they directly or indirectly influence each other. The comparative study of Ghana using these variables has not been explored to the best of researchers' understanding. Therefore, this study aims to fill this gap by testing the relationship between economic development, FDI, external debt, trade openness, and the unemployment rate in the Ghanaian economy to understand their dynamic influence.

Materials and Methods

Data source and econometric approach

The study utilized the autoregressive distributed lag (ARDL) bound testing method developed by Pesaran et al. [47], which aids in determining the presence of a long-run relationship in the series. The ARDL approach has been widely adopted by researchers in a single-equation total growth model, as evidenced by studies conducted by Thobekile et al. [48], Rathnayaka et al. [49], Hao [50], Khalid [51], and Ari et al. [52], among others, to explore the relationship between FDI, trade openness, and other variables' impact on economic growth. Building upon existing literature, this current study utilized data from the World Development Indicators (WDI) on gross domestic product per capita (GDPpc) measured in thousands of United States dollars (USD) using 2015 as the based year, net foreign direct investment inflows (% share of GDP), external debt representing foreign loans measured in billions USD, trade openness (exports plus imports ratio to GDP), and unemployment rate measured in percentage. The study employed World Bank data spanning from 1991 to 2022. This sample range was selected to investigate the effects of these variables following Ghana's economic recovery program initiated in 1983. The selection of these variables stems from the recent trends observed, including an increase in FDI inflows, high government external debt, trade deficits, and rising unemployment, prompting

inquiries into Ghana's economic performance. The variables were transformed into natural logarithms to ensure uniformity in measurement units in Equation 1.

$$\ln GDPpc_t = \beta_0 + \beta_1 \ln FDI_t + \beta_2 \ln Exd_t + \beta_3 \ln Top_t + \beta_4 \ln Unemp_t + \varepsilon_t \quad (1)$$

In this context, GDPpc represents gross domestic product per capita, FDI denotes net foreign direct investment inflow, Top signifies trade openness, Exd indicates external debt, and Unemp represents the unemployment rate.

Estimation approach

To examine the long-run and short-run relationships between the variables, this study employed the ARDL-bound testing approach as outlined by Pesaran et al. [47]. In this investigation, FDI inflows and external debt are regarded as crucial components of the economic factors influencing Ghana's gross domestic product. The ARDL model has been widely adopted in recent research studies due to its advantages over other econometric models. One primary advantage of the ARDL is its ability to accommodate variables with differing orders of integration I (0) and I (1) and limited sample sizes [53], [54], [55], [56]. The ARDL model specification used in this study is presented in Equation 2.

$$\begin{aligned} \Delta \ln GDPpc_t = a + \sum_{i=1}^k \delta_i \Delta \ln GDPpc_{t-i} + \sum_{i=1}^{\rho} \phi_i \Delta \ln FDI_{t-i} + \sum_{i=1}^{\tau} \varrho_i \Delta \ln Exd_{t-i} + \sum_{i=1}^{\varsigma} \varphi_i \Delta \ln Top_{t-i} \\ + \sum_{i=1}^{\sigma} \theta_i \Delta \ln Unemp_{t-i} + \varepsilon_t \end{aligned} \quad (2)$$

However, to implement the ARDL bound testing for cointegration, the theory proposed by Pesaran and Shin [57] regarding ARDL bound testing is utilized. This theory primarily utilizes Wald statistics within the model to evaluate the significance of the lag coefficients of the variables. The F-statistic resulting from the correlation coefficient in the F-test is compared to the critical value of the ARDL cointegration coefficient, representing the maximum asymptotic spread of the F-statistic, to determine whether to accept or reject the null hypothesis [47]. However, due to the smaller sample size selected, it is necessary to contrast the model's F-statistic value with the threshold value for the asymptotic distribution of the F-statistic as suggested by Narayan [58]. The ARDL bound testing for cointegration is presented in Equation 3.

$$\begin{aligned} \Delta \ln GDPpc_t = a + \sum_{i=1}^k \delta_i \Delta \ln GDPpc_{t-i} + \sum_{i=1}^{\rho} \phi_i \Delta \ln FDI_{t-i} + \sum_{i=1}^{\tau} \varrho_i \Delta \ln Exd_{t-i} + \sum_{i=1}^{\varsigma} \varphi_i \Delta \ln Top_{t-i} \\ + \sum_{i=1}^{\sigma} \theta_i \Delta \ln Unemp_{t-i} + \lambda_1 \ln GDPpc_{t-1} + \lambda_2 \ln FDI_{t-1} + \lambda_3 \ln Exd_{t-1} + \lambda_4 \ln Top_{t-1} \\ + \lambda_5 \ln Unemp_{t-1} + \varepsilon_t \end{aligned} \quad (3)$$

Where δ , ϕ , ϱ , φ , and θ represent the short-term parameters to be estimated, while $\lambda_1, \lambda_2, \lambda_3, \lambda_4$, and λ_5 indicate the long-run relationship. Cointegration is identified when the null hypothesis ($\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0$) is rejected in favor of the alternative hypothesis ($\lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq 0$). Here, Δ signifies the difference operator. The conclusions are based on the test's upper and lower critical bounds. The lower critical bound presumes all series are integrated of order zero, I (0), while the upper

critical bound presumes they are integrated of order one, $I(1)$. If the F-statistic exceeds the upper critical bound, it indicates that the series are cointegrated. If the F-statistic is below the lower critical bound, it implies no cointegration. When the F-statistic falls between the two bounds, the cointegration status remains uncertain. However, it is essential to estimate the error correction model (ECM) because there is at least one causal relationship between the variables in the direction defined by the F-statistic of the long-run estimation and the lag of the ECM. The short-run economic activity parameters are derived by estimating an error-correction model with respect to the long-run estimation. The model's variables are reconfigured into an ARDL-ECM model, and the combination of causality and ECM is utilized to examine the short-run dynamics between the variables in the model [59]. The ARDL-ECM to be estimated is presented in Equation 4.

$$\begin{aligned} \Delta \ln GDPpc_t = a + \sum_{i=1}^k \delta_i \Delta \ln GDPpc_{t-i} + \sum_{i=1}^{\rho} \phi_i \Delta \ln FDI_{t-i} + \sum_{i=1}^{\tau} \varrho_i \Delta \ln Exd_{t-i} + \sum_{i=1}^{\zeta} \varphi_i \Delta \ln Top_{t-i} \\ + \sum_{i=1}^{\sigma} \theta_i \Delta \ln Unemp_{t-i} + \psi ECT_{t-1} + \varepsilon_t \end{aligned} \quad (4)$$

Where ψECT_{t-1} represents the error correction term to be determined. The sign of ψ indicates the speed of adjustment dynamics from the short run to the long run equilibrium. However, according to the ARDL-ECM condition, the error correction coefficient should be negative and statistically significant for a long-run relationship to be established. Conversely, following Granger [60], a causal model between the dependent variable and the regressors is expressed in Equation 5.

$$\begin{aligned} \ln GDPpc_t = \alpha_1 + \sum_{i=1}^{\rho} \delta_i \ln GDPpc_{t-i} + \sum_{i=1}^{\rho} \phi_i \ln FDI_{t-i} + \sum_{i=1}^{\rho} \varrho_i \ln Exd_{t-i} + \sum_{i=1}^{\rho} \varphi_i \ln Top_{t-i} \\ + \sum_{i=1}^{\rho} \theta_i \ln Unemp_{t-i} + \varepsilon_{1t} \end{aligned} \quad (5)$$

$$\begin{aligned} \ln FDI_t = a_2 + \sum_{i=1}^{\rho} \exists_i \ln GDPpc_{t-i} + \sum_{i=1}^{\rho} \omega_i \ln FDI_{t-i} + \sum_{i=1}^{\rho} \tau_i \ln Exd_{t-i} + \sum_{i=1}^{\rho} \eta_i \ln Top_{t-i} \\ + \sum_{i=1}^{\rho} \pi_i \ln Unemp_{t-i} + \varepsilon_{2t} \end{aligned} \quad (5)$$

Results and discussions

The descriptive statistics in Table 1 provide valuable insights into the distribution and characteristics of the variables under consideration. The mean GDP per capita (GDPpc) indicates the average economic output per person over the observed period, which is approximately 6.664. This suggests the average level of economic prosperity within the studied context. The median GDPpc, slightly higher at 6.785, implies that the distribution of GDPpc values might be slightly skewed towards higher values, as the median is greater than the mean. The maximum and minimum GDPpc values, 7.767 and 5.533 respectively, showcase the range of economic performance observed within the dataset, indicating variations in economic development across different periods or regions. Similarly, examining the mean and median values for other variables such as foreign direct investment inflow, external debt, trade

openness, and unemployment rate provides insights into their central tendencies and distributions. The standard deviation for each variable quantifies the degree of dispersion around the mean, highlighting the variability in their values. For instance, the relatively high standard deviation for FDI suggests considerable variability in foreign direct investment inflows over the observed period. Skewness and kurtosis measures offer additional information about the shape and distribution of the data. A skewness close to zero for most variables indicates a relatively symmetrical distribution, while positive skewness for GDPpc suggests a slightly longer tail on the right side of the distribution, implying a few instances of high GDPpc values. Kurtosis values, especially for GDPpc and FDI, indicate the shape of their distributions. Higher kurtosis values suggest a more peaked distribution with heavier tails, implying the presence of extreme values or outliers in the dataset.

	lnGDPpc	lnFDI	lnExd	lnTop	lnUnemp
Mean	6.664	-0.619	2.222	4.297	1.780
Median	6.785	-0.452	1.978	4.271	1.726
Maximum	7.767	1.355	3.444	4.753	2.347
Minimum	5.533	-3.912	1.305	3.749	1.249
Std.Dev	0.806	1.742	0.641	0.235	0.271
Skewness	0.078	-0.263	0.576	-0.135	0.391
Kurtosis	1.317	1.581	1.994	2.833	2.528
Jarque-Bera	3.687	2.957	3.022	0.131	1.077
Probability	0.158	0.227	0.220	0.936	0.583
Sum	206.587	-19.202	68.823	133.228	55.186
Sum Sq. Dev	19.502	91.077	12.363	1.669	2.216
Observations	31	31	31	31	31
Correlation matrix					
lnGDPpc	1.000				
lnFDI	0.919	1.000			
lnExd	0.757	0.670	1.000		
lnTop	-0.244	-0.004	0.040	1.000	
lnUnemp	-0.556	-0.336	-0.196	0.679	1.000

Table 1. Descriptive statistics and correlations matrix

Source: Authors calculation

Moreover, the Jarque-Bera test and associated probabilities assess the normality of the data distribution. In this context, the relatively low probabilities suggest deviations from a normal distribution for GDP per capita, FDI, external debt, and unemployment, implying that their distributions may not be entirely symmetric or may contain outliers. The correlation matrix, the coefficients provide insights into the relationships between variables. Strong positive correlations between GDP per capita and FDI, as well as between GDP per capita and external debt, suggest that higher levels of foreign direct investment and external debt are associated with higher GDP per capita. Conversely, the negative correlation between GDP per capita and unemployment indicates that higher levels of GDP per capita are generally associated with lower unemployment rates.

ADF and PP stationarity test

The Dickey and Fuller [61] as well as the Phillips and Perron [62] unit root tests were utilized to assess the properties of the selected variables prior to conducting the ARDL bound test for cointegration. These

tests aid in determining the order of integration of the series. According to the restrictions outlined by Dickey and Fuller [61] and Phillips and Perron [62], a unit root exists when the asymptotic p-value exceeds the 5% critical value. The option including an intercept was employed to examine the dynamics within the series. The results indicate that, at a 5% significance level, all variables were found to be non-stationary and integrated at the first difference. Table 2 displays the results of the stationarity test.

Variable	Level	ADF	PP
lnGDPpc	0	-0.092	-0.171
lnGDPpc	1	-4.540***	-4.540***
lnFDI	0	-1.742	-1.742
lnFDI	1	-4.612***	-4.571***
lnExd	0	-0.122	-0.204
lnExd	1	-4.540***	-4.540***
lnTop	0	-2.736*	-2.744*
lnTop	1	-5.124***	-5.238***
lnUnemp	0	-1.999	-2.280
lnUnemp	1	-3.304**	-3.305**

Table 2. Unit root test

Source: Authors calculation

*** 1%, ** 5%, and *10% significance level;

ARDL Bound test cointegration

The ARDL bound testing is employed to determine whether there exists long-term cointegration among the variables. In this study, the Akaike information criterion (AIC) is utilized due to its optimization potential in achieving reliable outcomes. The AIC is known for its consistency and effectiveness in capturing changes in the relationships between variables. The AIC automatic lag length selection is used in this study. Table 3 presents the outcome of the bound testing cointegration. The null hypothesis of no long-run cointegration is rejected when the F-statistic coefficient exceeds the upper and lower critical value. As depicted in Table 3, the ARDL bound test for cointegration reveals a significant F-statistic value of 7.165. This statistic indicates strong evidence of cointegration between the variables. Hence, the results indicate the existence of a long-term relationship among the variables. This suggests that GDP per capita, FDI inflows, external debt, trade openness, and unemployment rate exhibit long-term interdependency within the Ghanaian economy.

TestStatistic	Value	Significance	I (0)	I (1)
F-statistic	7.165***	10%	2.2	3.09
		5%	2.56	3.49
		1%	3.29	4.37

Table 3. ARDL Bound test cointegration results

Source: Authors calculation

The AIC selection criterion (3,3,2,2,0) is applied in determining the optimal lag structure

ARDL estimated results

The ARDL results in Table 4 depict both the long-run and short-run coefficients of the explanatory variables. These findings underscore the substantial influence of the independent variables on Ghana's economy. Notably, the long-run coefficient for FDI stands at (0.369), signifying statistical significance at the 1% level. This robust figure indicates a positive correlation between FDI inflows and economic

growth, suggesting that a one percentage point increase in FDI would spur approximately a 0.37% expansion in Ghana's economy. FDI plays a pivotal role as an engine for economic growth, fostering capital investment, technology transfer, job creation, and infrastructure development. Moreover, it bolsters productivity, competitiveness, and generates positive spillover effects, facilitating economic diversification and sustainable development. In the short run, the FDI coefficient is (0.204), indicating statistical significance at the 1% level and implying a positive impact on Ghana's economy. This suggests that an increase in FDI inflow propels the country's growth by 0.20%. Conversely, the one-year coefficient for FDI stands at (-0.194), also significant at the 1% level, indicating a contraction in economic development by 0.19% in Ghana due to FDI fluctuations. Similarly, the two-year coefficient for FDI records a negative impact, decreasing economic development by 0.10%. These outcomes suggest a positive short-term impact of FDI, attributed to immediate investment inflows boosting economic activity. However, in the medium to longer term, this impact may diminish or even turn negative, potentially due to saturation effects or adjustments in the economy to the initial shock of FDI inflows. The diversification of FDI into sectors beyond mining further supports its positive and statistically significant long-run influence on Ghana's economic growth [63].

Long Run	Coefficient	Std.Error	t-statistic	Prob.
lnFDI	0.369***	0.016	22.025	0.000
lnEXD	0.239***	0.055	4.310	0.001
lnTOP	-0.473***	0.099	-4.777	0.004
lnUNEMP	-0.268**	0.111	-2.401	0.032
Constant	8.871***	0.477	18.584	0.000
Short Run				
$\Delta \ln \text{GDPpc} (-1)$	0.651***	0.106	6.135	0.000
$\Delta \ln \text{GDPpc} (-2)$	0.399***	0.090	4.424	0.001
$\Delta \ln \text{FDI}$	0.204***	0.031	6.655	0.000
$\Delta \ln \text{FDI} (-1)$	-0.194***	0.028	-6.717	0.000
$\Delta \ln \text{FDI} (-2)$	-0.100***	0.029	-3.414	0.005
$\Delta \ln \text{EXD}$	0.073	0.072	1.027	0.323
$\Delta \ln \text{EXD} (-1)$	-0.127*	0.071	-1.788	0.097
$\Delta \ln \text{TOP}$	-0.938***	0.077	-12.053	0.000
$\Delta \ln \text{TOP} (-1)$	0.228*	0.117	1.944	0.073
ECT (-1)	-1.161***	0.150	-7.715	0.000
Diagnostic test				
χ^2 Normality			1.846	0.397
χ^2 Serial			1.384	0.262
χ^2 ARCH			0.081	0.777
χ^2 Reset			1.776	0.100
Adjusted R ² =0.89	Durbin-Watson stat =2.396			

Table 4. ARDL results

Source: Authors calculation

*** 1%, ** 5%, *10, significance level. The AIC selection criterion (3,3,2,2,0). χ^2 Normality, normality test for residuals, χ^2 Serial, LM serial correlation test, χ^2 Arch, autoregressive conditional heteroscedasticity, χ^2 Reset, Ramsey reset test. The probability values are provided in parentheses.

Similarly, the long-term coefficient for external debt is (0.239), signifying statistical significance at the 1% level, indicating a positive relationship between government external borrowing and economic

growth in Ghana. Specifically, a one percentage point increase in government external borrowing would elevate economic development by 0.24%, fostering infrastructure projects and developmental initiatives, thus enhancing productivity, connectivity, and living standards. Nevertheless, the short-term first difference coefficient for external debt is (0.073) and insignificant, suggesting no significant impact on Ghana's advancement in the short term. However, the negative one-year coefficient for external debt (-0.127), statistically significant at the 10% level, implies a 0.13% decrease in economic growth due to changes in external loans. These results suggest that while short-term changes in external debt may not significantly affect economic growth, long-term accumulations of external debt could impede Ghana's economic development by crowding out private investment and undermining fiscal sustainability. Conversely, it is argued that government borrowing from abroad can incentivize domestic banks to engage in financial innovation, resulting in the creation of new products and relatively riskier lending to the private sector [64]. The positive impact of external debt can be attributed to the sectors where these foreign loans are invested, thereby contributing to economic growth.

The long-run coefficient for trade openness is (-0.473), indicating a statistically significant negative impact at the 1% level. This suggests that a one percentage point change in the trade-GDP ratio will lead to a 0.47% decrease in economic growth. This negative long-run relationship implies that increased trade openness is associated with a reduction in long-term economic growth in Ghana. The negative effect could be attributed to various economic mechanisms, such as structural adjustments required for international competition, dependency on external markets leading to volatility, deteriorating terms of trade, and potential resource reallocation away from sectors with comparative disadvantages. While trade openness offers benefits like market access and technology transfer, it appears to come with trade-offs that may hamper long-term economic growth. The short-run coefficient for trade openness (-0.938) is significant and indicates a negative impact, implying that a change in trade openness reduces economic growth in the Ghanaian economy by 0.94%. However, the previous one-year coefficient for trade openness (0.228) is statistically significant at the 10% level, suggesting it expands economic development by 0.23%. These results reveal the dynamic nature of the relationship between trade openness and economic growth in Ghana. In the short run, an increase in trade openness appears to have a detrimental effect on economic growth, potentially due to increased exposure to international competition or vulnerability to external shocks. However, the positive one-year lag effect suggests that the initial negative impact may be offset by benefits such as increased access to foreign markets, technology transfer, and specialization advantages. The long-run coefficient for unemployment is (-0.268) and significant at the 5% level, indicating a negative effect on economic development. This implies that an increase in unemployment reduces the growth rate by 0.27%. This negative relationship suggests that higher levels of unemployment are associated with lower long-term economic development in the Ghanaian economy. The negative effect of unemployment on economic development could be explained by various economic mechanisms, such as underutilization of labor resources, reduced consumer spending, and dampened investor confidence. Additionally, long spells of unemployment can lead to skills depreciation and labor market scarring effects, further exacerbating the negative impact on economic development. In the short run, the coefficient for GDP per capita in the previous one-year period (0.651) is significant, suggesting that it influences current growth by 0.65%. Similarly, the coefficient for GDP per capita in the previous two-year period (0.399) indicates a positive relationship, increasing present development by 0.40%. These findings suggest that past levels of GDP

per capita have a substantial impact on current economic growth in Ghana. The positive coefficients imply that higher levels of GDP per capita in the recent past are associated with increased economic growth in the short term. This could be due to factors such as momentum effects, where positive economic performance tends to persist over time, or the cumulative impact of past investments and policy measures. In explaining short-term dynamics, the hypothesis states that the error correction coefficient should be negative and statistically significant. According to the results, the error correction term coefficient (-1.161) has the expected sign and is significant at 1%. This indicates that when there is a deviation, the target variable needs an adjustment of 116.1% to equilibrium, indicating an oscillatory convergence. This means that when disequilibrium occurs, the recovery process will take more than one year. The stability of the ARDL model estimated in this study was examined using recursive CUSUM and recursive CUSUMSQ tests. The results indicate that the estimated model is stable and consistent, as the lines generated by these tests remain within the 5% significance bounds. This suggests that the coefficients estimated in the model are reliable and that the model provides a consistent representation of the relationship between the variables over time.

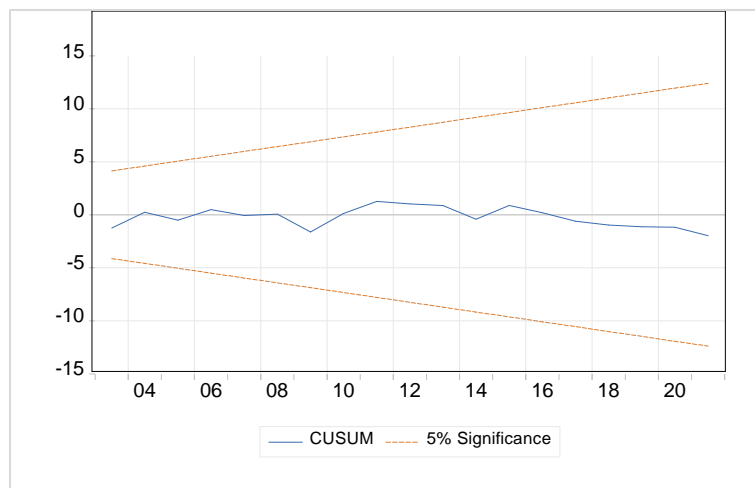


Figure 1: Cumulative sum of recursive residuals

Source: Authors calculation

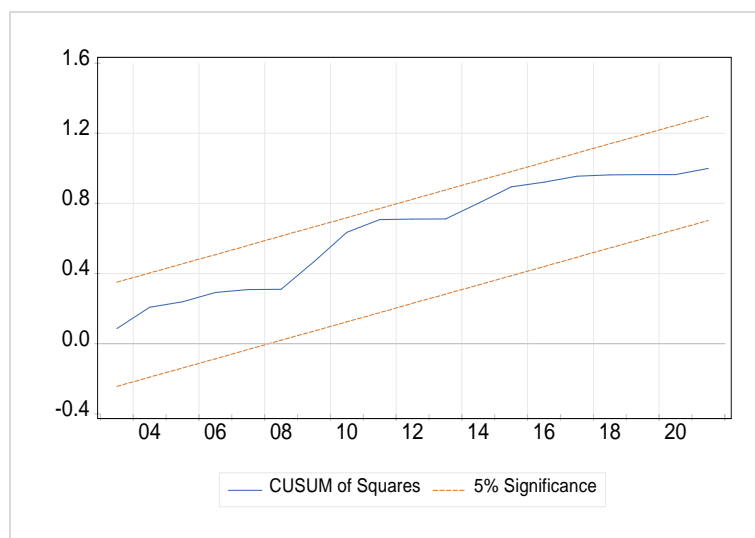


Figure 2: Cumulative sum of squares of recursive residuals

Source: Authors calculation

Granger causality test

The results from the Granger causality test, presented in Table 5, are crucial for understanding the causal relationships among variables, which are essential for informing future decisions and policies, as emphasized by Granger [60]. The null hypothesis of the Granger causality test states no causality, and it is rejected when the F-statistic p-value is statistically significance level. Analyzing the corresponding p-values of the F-statistic coefficient, a unidirectional causal relationship from GDP per capita to FDI is confirmed. Similarly, a unidirectional causality from GDP per capita to external debt is established. Additionally, a unidirectional causality from trade openness to GDP per capita is confirmed. This suggests that an expansion in the trade ratio to gross domestic product leads to increased economic growth in the Ghanaian economy. Conversely, a unidirectional causality from the unemployment rate to GDP per capita is accepted. This implies that an increase in the unemployment rate leads to a decline in economic development in Ghana.

Null Hypothesis	F-Statistic	Prob.	Decision
FDI does not Granger cause GDP per capita	0.882	0.426	Fail to reject
GDP per capita does not Granger cause FDI	9.951	0.000	Rejected
External debt does not Granger cause GDP per capita	0.040	0.960	Fail to reject
GDPpc does not Granger cause external debt	4.128	0.028	Rejected
Trade openness does not Granger cause GDP per capita	2.660	0.091	Rejected
GDP per capita does not Granger cause trade openness	1.187	0.322	Fail to reject
Unemployment does not Granger cause GDP per capita	5.797	0.008	Rejected
GDP per capita does not Granger cause unemployment	1.378	0.271	Fail to reject

Table 5. Granger causality test results

Source: Authors calculation

Conclusion and policy implication

Foreign direct investment (FDI) and external debt represent significant sources of capital formation in many developing economies across the African continent. However, the mismanagement of external loans, often associated with high interest rates, leads many countries to incur substantial debt servicing costs. Developing nations have recognized the importance of FDI as a means through which their economies can benefit from technology and knowledge transfer. Numerous researchers have investigated the relationship between these variables and their impact on economic growth. Building

upon existing literature, this study explores the effect of trade openness, FDI, and debt, along with other supporting variables such as trade openness and unemployment, on the economy of Ghana, using GDP per capita as a proxy. The study utilizes data from the World Bank spanning from 1991 to 2022. Employing the ARDL bound testing and the Granger causality test, the research investigates the short-run and long-run linkages among the variables. The cointegration results reveal a long-term connection between GDP per capita, FDI, external debt, trade openness, and the unemployment rate in Ghana's economy. However, the short-run estimated results indicate a mixed positive and negative effect of FDI and trade openness on economic growth. In contrast, the long-run findings demonstrate a positive impact from FDI and external debt, while showing a negative effect from the unemployment rate and trade openness on economic development in Ghana. Regarding policy implications, prudent debt management practices are essential given the negative impact of external debt on economic growth in the long run. Policymakers in Ghana should carefully assess borrowing needs, negotiate favorable lending terms, and diversify funding sources to minimize reliance on external loans with high interest rates. Additionally, promoting foreign direct investment through incentives such as tax breaks, streamlined regulatory processes, and investment-friendly business environments can stimulate long-term economic development. To address the negative effects of unemployment and trade openness, the government could support domestic industries through targeted policies, including access to credit facilities for small and medium-sized enterprises (SMEs) and investments in skills development programs. Moreover, infrastructure investment should be prioritized to stimulate economic growth and create employment opportunities, particularly in transportation networks, energy facilities, and social infrastructure. By adopting these policy measures, Ghana can foster sustainable economic development and job creation, ultimately improving the well-being of its citizens. While this study contributes valuable insights into the determinants of economic growth in Ghana, it is not without limitations. One limitation is the reliance on secondary data from the World Bank, which may be subject to measurement error or inconsistencies. Additionally, the study's findings are based on econometric modeling techniques, which are subject to assumptions and limitations inherent in the methodology. Future research could address these limitations by incorporating alternative data sources and methodologies to further validate and extend the findings of this study.

References

- [1] S. Jiahao, R. L. Ibrahim, K. A. Bello, and D. M. Oke, "Trade facilitation, institutions, and sustainable economic growth: Empirical evidence from Sub-Saharan Africa," *African Development Review*, vol. 34, pp. 201–214, 2022. <https://doi.org/10.1111/1467-8268.12630>.
- [2] E. Tee, F. Larbi, and R. Johnson, "The Effect of foreign direct investment (FDI) on the Ghanaian economic growth," *Journal of Business and Economic Development*, vol. 2, pp. 240-246, 2017. doi: 10.11648/j.jbed.20170205.11.
- [3] H. F. KanKou, X. Enjun, and B. T. Mamadou, "The Causal Linkage between Foreign Direct Investment, Trade and Economic Growth in Mali: An Application of the ARDL bound Testing Approach," *International Journal of e-Education, e-Business, e-Management and e-Learning*, vol. 9, pp. 296-305, 2019. doi: 10.17706/ijejee.2019.9.4.296-305.

- [4] M. Safdari and A. M. Masoud, "External debt and economic growth in Iran," *Journal of Economics and International Finance*, pp. 322-327, 2011.
- [5] O. O. Olaoye, "Sub-Saharan Africa's debt-financed growth: How sustainable and inclusive?," *African Development Review*, vol. 34, pp. 443-458, 2022. <https://doi.org/10.1111/1467-8268.12670>.
- [6] A. Bolanle, O. Fapetu, and A. A. Olufemi, "External Debt or Foreign Direct Investment: Which Has Greater Significant Economic Impact on Nigeria?" *European Scientific Journal*, vol. 11, pp. 185-195, 2015.
- [7] S. C. Imran, I. Shumaila, and F. Fatima, "Foreign Direct Investment, External Debt and Economic Growth: Evidence from Some Selected Developing Countries," *Review of Economics and Development Studies*, vol. 3, pp. 111-123, 2017. <https://doi.org/10.26710/reads.v3i2.170>.
- [8] Z. Hadhek and F. Mrad, "Debt and Economic Growth," *International Journal of Economics and Financial Issues*, vol. 4, pp. 440-448, 2014.
- [9] B. Mehdi, "Foreign Direct Investment and Economic Growth: Evidence from Southern Asia," *Atlantic Review of Economics*, vol. 2, pp. 1-14, 2012.
- [10] P. Romer, "Increasing Returns and Long Run Growth," *Journal of Political Economy*, vol. 94, pp. 1002-1037, 1986.
- [11] UNCTAD, *World Investment Report: Transnational Corporations and the Infrastructure Challenge*. New York: United Nations Conference on Trade and Development, 2008.
- [12] E. O. Addo, "An Assessment of the Impact of Foreign Direct Investment on Employment: The Case of Ghana's Economy," *International Journal of Economics and Financial Research*, vol. 5, pp. 143-158, 2019. <https://doi.org/10.32861/ijefr.56.143.158>.
- [13] K. Appiah-Adu, "The Impact of Economic Reform on Business Performance: A Study of Foreign and Domestic Firms in Ghana," *International Business Review*, vol. 8, pp. 463-486, 1999. <https://doi.org/10.1016/j.enpol.2007.03.032>.
- [14] MOF, *Annual Public Debt Report for the 2022 Financial Year*. Accra: Minister for Finance, 2023.
- [15] IMF, *IMF Executive Board Approves US\$3 Billion Extended Credit Facility Arrangement for Ghana*. Washington, DC: International Monetary Fund, 2023.
- [16] J. Dunning, "Toward an Eclectic Theory of International Production: Some Empirical Tests," *Journal of International Business Studies*, vol. 11, pp. 9-31, 1980. <https://doi.org/10.1057/palgrave.jibs.8490593>.
- [17] D. Ricardo, *On the Principles of Political Economy and Taxation*. London: John Murray, 1817.
- [18] E. Heckscher and B. Ohlin, *Interregional and international trade*. Cambridge, MA: Harvard University Press, 1933.
- [19] P. Krugman, "Financing vs. forgiving a debt overhang," *Journal of Development Economics*, vol. 29, no. 3, pp. 253-268, 1988. [https://doi.org/10.1016/0304-3878\(88\)90044-2](https://doi.org/10.1016/0304-3878(88)90044-2).

- [20] L. Alfaro, A. Chanda, S. Kalemli-Ozcan, and S. Sayek, "FDI and economic growth: the role of local financial markets," *Journal of International Economics*, vol. 64, no. 1, pp. 89-112, 2004. [https://doi.org/10.1016/S0022-1996\(03\)00081-3](https://doi.org/10.1016/S0022-1996(03)00081-3).
- [21] M. A. Kose, E. Prasad, and M. E. Terrones, "How do trade and financial integration affect the relationship between growth and volatility?," *Journal of International Economics*, vol. 69, no. 1, pp. 176-202, 2006. <https://doi.org/10.1016/j.jinteco.2005.05.009>.
- [22] K. Evans, M. Samuel, and M. S. Prince, "Effects of foreign direct investment on economic growth in Ghana: the role of institutions," *Economics of Development*, vol. 20, pp. 23-34, 2021. doi:10.21511/ed.20(1).2021.03.
- [23] A. Samuel and Z. Xicang, "Impact of Foreign Direct Investment and Economic Growth in Ghana: A Cointegration Analysis," *International Journal of Business and Social Research*, vol. 3, pp. 64-74, 2013.
- [24] A. Safwat, A. Salah, and M. Elsherif, "The Impact of Foreign Direct Investment on the Economic Growth of Egypt (1980-2018)," *International Journal of Economics and Financial Issues*, pp. 74-85, 2021. <https://doi.org/10.32479/ijefi.11762>.
- [25] M. A. Hafiz, A. Romana, M. N. Muhammad, and Y. Sajid, "Impact of FDI on Economic Growth: Evidence from Pakistan," *Bulletin of Business and Economics*, vol. 6, pp. 111-116, 2017.
- [26] M. Z. Seiko, "The Impact of Foreign Direct Investment (FDI) on Economic Growth in Eastern Africa: Evidence from Panel Data Analysis," *Applied Economics and Finance*, vol. 3, pp. 146-161, 2016. <http://dx.doi.org/10.11114/aef.v3i1.1317>.
- [27] M. C. Alina, "The Impact of FDI on Economic Growth in Case of Romania," *International Journal of Economics and Finance*, vol. 12, pp. 81-88, 2020. DOI:10.5539/ijef.v12n12p81.
- [28] K. M. Adeleke, S. Olowe, and O. O. Fasesin, "Impact of Foreign Direct Investment on Nigeria Economic Growth," *International Journal of Academic Research in Business and Social Sciences*, vol. 4, pp. 234-242, 2014. <http://dx.doi.org/10.6007/IJARBS/v4-i8/1092>.
- [29] K. Malik, "Impact of Foreign Direct Investment on Economic Growth of Pakistan," *American Journal of Business and Management*, vol. 2, pp. 190-202, 2015. <https://doi.org/10.11634/216796061706624>.
- [30] N. Bouchoucha and W. Ali, "The impact of FDI on economic growth in Tunisia: An estimate by the ARDL approach," *Journal of Smart Economic Growth*, vol. 4, pp. 23-46, 2019.
- [31] K. Faraji and M. A. Said, "Impact of External Debt on Economic Growth: A Case Study of Tanzania," *Advances in Management & Applied Economics*, vol. 3, pp. 59-82, 2013.
- [32] A. M.-T. Khaled and S. J. Mohammad, "Impact of External Debt on Economic Growth in Jordan for the Period (2010-2017)," *International Journal of Economics and Finance*, vol. 11, pp. 114-118, 2019. DOI:10.5539/ijef.v11n4p114.
- [33] N. Paul, "Analysis of the Impact of External Debt on Economic Growth in an Emerging Economy: Evidence from Nigeria," *AFRREV*, vol. 11, pp. 156-173, 2017. DOI:10.4314/afrrrev.v11i4.13.

- [34] S. M. Elwasila, "Effect of External Debt on Economic Growth of Sudan: Empirical Analysis (1969-2015)," *Journal of Economic Cooperation and Development*, vol. 39, pp. 39-62, 2018.
- [35] S. A. Mbah, O. C. Agu, and G. Umunna, "Impact of External Debt on Economic Growth in Nigeria: An ARDL Bound Testing Approach," *Journal of Economics and Sustainable Development*, vol. 10, pp. 16-26, 2016.
- [36] K. Yaya, "The impact of trade openness on economic growth: The case of Cote d'Ivoire," *Cogent Economics & Finance*, vol. 5, pp. 1-14, 2017. <https://doi.org/10.1080/23322039.2017.1332820>.
- [37] R. Chandrashekar, "The effect of trade openness on economic growth: Some empirical evidence from emerging market economies," *Journal of Public Affairs*, pp. 1-18, 2020. DOI: 10.1002/pa.2081.
- [38] M. A. Qazi and W.-Y. Lau, "Trade openness and economic growth: empirical evidence from India," *Journal of Business Economics and Management*, vol. 16, pp. 188-205, 2015.
- [39] V. U. Ijirshar, "Impact of Trade Openness on Economic Growth among ECOWAS Countries," *CBN Journal of Applied Statistics*, vol. 10, pp. 75-96, 2019.
- [40] A. M. Khalid, "The Impact of Trade Openness on Economic Growth in the Case of Turkey," *Research Journal of Finance and Accounting*, vol. 7, pp. 51-61, 2016.
- [41] B. Markus and L. Daniel, "Trade Openness and Economic Growth: Panel Data Evidence from Sub-Saharan Africa," *Economica*, vol. 82, pp. 1302-1323, 2015. <https://doi.org/10.1111/ecca.12160>.
- [42] M. Kwame, A. A. Ellen, and D. Daniel, "Trade openness and economic growth volatility: An empirical investigation," *Cogent Economics & Finance*, vol. 5, pp. 1-11, 2017. DOI: 10.1080/23322039.2017.1385438.
- [43] S. Akutson, A. J. Messiah, and Y. D. Araf, "The Impact of Unemployment on Economic Growth in Nigeria: An Application of Autoregressive Distributed Lag (ARDL) Bound Testing," *Sumerianz Journal of Business Management and Marketing*, vol. 1, pp. 37-46, 2018.
- [44] S. Muhammad, "Effect of Inflation and Unemployment on Economic Growth in Pakistan," *Journal of Economics and Sustainable Development*, vol. 5, pp. 103-106, 2014.
- [45] N. Nikolaos and S. Pavlos, "The Effects of Unemployment on Economic Growth in Greece. An ARDL Bound Test Approach," *The Romanian Economic Journal*, pp. 53-72, 2015.
- [46] Z. A. Salyha, R. S. Mah, and P. Sabiha, "The Impact of Unemployment on Economic Growth in Pakistan: An Empirical Investigation," *iRASD Journal of Economics*, vol. 4, pp. 78-87, 2022. <https://doi.org/10.52131/joe.2022.0401.0062>.
- [47] M. H. Pesaran, Y. Shin, and R. Smith, "Bounds testing approaches to the analysis of level relationships," *Journal of Applied Econometrics*, vol. 16, no. 3, pp. 289-326, 2001. <https://doi.org/10.1002/jae.616>.
- [48] Q. Thobekile, V. N. Edmund, and D. Isaac, "Linkages between foreign direct investment, trade openness and economic growth in South Africa: Does exchange rate regime choice matter?" *Latin*

American Journal of Trade Policy, vol. 13, pp. 59-86, 2022. <https://doi.org/10.5354/0719-9368.2022.66007>

- [49] M. M. Rathnayaka, G. Epuran, and B. Tescaşiu, "Causal Links between Trade Openness and Foreign Direct Investment in Romania," *Journal of Risk and Financial Management*, vol. 14, no. 3, pp. 1-18, 2021. <https://doi.org/10.3390/jrfm14030090>.
- [50] Y. Hao, "The dynamic relationship between trade openness, foreign direct investment, capital formation, and industrial economic growth in China: new evidence from ARDL
- [51] M. Z. Khalid, "The Impact of Trade Openness on Economic Growth in Pakistan; ARDL Bounds Testing Approach to Co-integration," *Iran. Econ. Rev.*, vol. 24, no. 3, pp. 675-705, 2020. DOI: 10.22059/IER.2020.77643
- [52] Y. O. Ari, A. Jibir, and A. A. Hassan, "The Impact of Trade Openness and FDI on Nigeria's Economic Growth: Revisiting the Unsettled Debate," *Review of Market Integration*, vol. 14, pp. 133-163, 2022. DOI: 10.1177/09749292221135326
- [53] B. Mohammed and N. Ruslee, "Foreign direct investment, trade openness and economic growth," *Foreign Trade Rev.*, vol. 50, pp. 73-84, 2015. DOI: 10.1177/0015732515572055
- [54] J. Ang, "CO2 emissions, energy consumption, and output in France," *Energy Policy*, vol. 35, pp. 4772-4778, 2007.
- [55] T. Tong, J. Ortiz, C. Xu, and F. Li, "Economic growth, energy consumption, and carbon dioxide emissions in the E7 countries: a bootstrap ARDL bound test," *Energy Sustain Soc*, vol. 10, pp. 1-17, 2020. DOI: 10.1186/s13705-020-00253-6
- [56] Y. C. Akinyemi, "Short- and long-run impacts of gasoline price and macroeconomic factors on road traffic safety in Nigeria," *African Development Review*, vol. 35, pp. 308-319, 2023. DOI: 10.1111/1467-8268.12710
- [57] M. Pesaran and Y. Shin, "An autoregressive distributed lag modelling approach to cointegration analysis," in *Econometrics and economic theory in 20th century: the Ragnar Frisch centennial symposium*, Cambridge, Cambridge University Press, 1999.
- [58] P. Narayan, "The saving and investment nexus for China: evidence from cointegration tests," *Appl Econ*, vol. 37, pp. 1979-1990, 2005. DOI: 10.1080/00036840500278103
- [59] R. Engle and C. Granger, "Cointegration and error correction: representation, estimation and testing," *Econometrica*, vol. 55, pp. 251-276, 1987.
- [60] C. Granger, "Investigating causal relations by econometric models and cross spectral methods," *Econometrica*, vol. 37, pp. 424-438, 1969.
- [61] D. Dickey and W. Fuller, "Likelihood ratio statistics for autoregressive time series with a unit root," *Econometrica*, vol. 49, pp. 1057-1072, 1981.
- [62] P. Phillips and P. Perron, "Testing for a unit root in time series regression," *Biometrika*, vol. 75, pp. 335-346, 1988. DOI: 10.1093/biomet/75.2.335

- [63] S. Daniel, C. Richmond, and E. Eric, "Foreign Direct Investment, Trade Openness and Economic Growth in Ghana: An Empirical Investigation," *Journal of African Business*, vol. 16, pp. 1-15, 2015. DOI: 10.1080/15228916.2015.1061283
- [64] D. Agyapong and K. Bediabeng, "External Debt Stock, Foreign Direct Investment and Financial Development: Evidence from African Economies," *Journal of Asian Business and Economic Studies*, pp. 81-98, 2019. DOI: 10.1108/JABES-11-2018-0087



© 2024 by the authors. Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).