

The role of investment and trade in promoting economic growth in Ghana

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Abstract. *This study examines the effects of investment, exports, and imports on Ghana's economic growth from 1980 to 2025 using ADF, Johansen cointegration, Granger causality, and CUSUM tests. The results indicate that investment and exports are positively associated with GDP, while imports are negatively associated with GDP in the long run. Short-run causality runs from investment to GDP, while exports and GDP exhibit bidirectional causality. Long-run bidirectional causality exists among investment, exports, imports, and GDP, with evidence of structural changes in the model. The study recommends promoting investment, exports, infrastructure, innovation, and FDI while managing import dependence to support sustainable growth.*

Keywords: Ghana, investment, GDP, exports, imports.

JEL Classification: O11, E20, G15.

1. Introduction

Ghana's economy has undergone substantial structural and institutional transformation since the implementation of the Economic Recovery Programme (ERP) in 1983. The programme marked a major shift from extensive government controls toward a more market-oriented economic system and was supported by the International Monetary Fund (IMF), the World Bank, and other development partners. Its main objectives included restoring macroeconomic stability, improving economic incentives, strengthening fiscal management, promoting exports, and encouraging private investment (Kapur et al., 1991). Over the following decades, these reforms contributed to greater private-sector participation, increased integration into international markets, and significant changes in the structure of economic activity. Nevertheless, Ghana's transformation remains incomplete, as the economy continues to depend considerably on primary commodities, particularly gold, crude oil, and cocoa, while manufacturing remains relatively less developed (World Bank Group, 2015).

The structure of Ghana's economy is now dominated by services, while agriculture and industry continue to play important roles in output, employment, exports, and investment. According to the Ghana Statistical Service (GSS), in the third quarter of 2024, services accounted for 42.9% of GDP at basic prices, compared with 32.6% for industry and 24.5% for agriculture (GSS, 2024). The increasing contribution of services reflects Ghana's long-term structural shift away from its historical dependence on agriculture. However, the expansion of services has occurred alongside persistent weaknesses in manufacturing and a large informal sector, limiting the extent to which structural transformation has generated broad-based productivity and employment gains (Baah-Boateng, 2015; World Bank Group, 2015).

Agriculture remains an essential component of the Ghanaian economy because of its contribution to food security, rural livelihoods, employment, and export earnings. Major agricultural products include cocoa, maize, cassava, yam, and rice. Ghanaian agriculture remains predominantly rain-fed, making agricultural production vulnerable to rainfall variability and climate change. Limited irrigation, restricted access to finance and technology, and productivity constraints continue to affect the sector's performance (World Bank, 2024). Cocoa is particularly important because Ghana is one of the world's leading cocoa producers and has historically ranked second globally after Côte d'Ivoire. The sector involves approximately 800,000 farming families and constitutes an important source of rural income and foreign-exchange earnings (FAO, 2019). However, the cocoa industry faces challenges associated with climate change, environmental degradation, productivity, and limited domestic value addition, highlighting the importance of investment in agricultural technology, processing, infrastructure, and sustainable production systems (FAO, 2019; World Bank, 2024).

Industry is another major component of Ghana's economy and includes mining, oil and gas, construction, and manufacturing. Extractive activities, particularly gold and petroleum production, have made substantial contributions to export earnings, government revenues,

and foreign investment. At the same time, the relatively limited development of manufacturing has constrained the depth of Ghana's structural transformation. Manufacturing firms continue to face challenges related to energy costs, infrastructure, access to long-term finance, technology, and productivity. The concentration of industrial activity in extractive industries also exposes the economy to fluctuations in international commodity prices and limits the potential for broader domestic production linkages (World Bank Group, 2015). Strengthening manufacturing and agro-processing could therefore increase domestic value addition, employment, technological upgrading, and linkages between agriculture and industry.

The services sector has become the largest contributor to Ghana's GDP and includes trade, transport, financial services, information and communication activities, education, health, hospitality, and public administration. Its expansion has been supported by urbanization, increasing domestic demand, financial-sector development, and technological change. Digitalization has also created new opportunities for financial inclusion, entrepreneurship, and service delivery. According to the International Telecommunication Union (ITU), 72.2% of Ghana's population used the Internet in 2024, demonstrating the increasing importance of digital connectivity to economic activity (ITU, 2025). Nevertheless, a substantial proportion of service-sector employment remains concentrated in informal and relatively low-productivity activities. Consequently, increasing the productivity and technological intensity of services remains important for achieving sustainable economic growth.

Investment represents an important channel through which Ghana can expand productive capacity, create employment, facilitate technology transfer, and promote structural transformation. Foreign direct investment (FDI) can provide financial capital, managerial expertise, technological knowledge, and access to international markets. Its developmental contribution, however, depends on the extent to which foreign-invested firms create domestic linkages and generate productivity and knowledge spillovers. Ghana registered 140 investment projects in 2024, representing an estimated total investment of US\$651.72 million. Of this amount, US\$617.61 million was the foreign component and US\$34.11 million was domestic investment (GIPC, 2025a). During the first half of 2025, 76 projects were registered with estimated FDI of US\$862.96 million, a 381.91% increase compared with the corresponding period of 2024. These projects were expected to generate approximately 4,707 jobs when fully operational (GIPC, 2025b). While these figures indicate continued investor interest, registered investment commitments should be distinguished from realized investment and actual employment creation.

International trade is similarly important to Ghana's economic performance. World Bank World Integrated Trade Solution (WITS) data indicate that Ghana's merchandise exports amounted to approximately US\$16.88 billion in 2023, while merchandise imports reached approximately US\$16.39 billion, implying a merchandise trade surplus of about US\$0.48 billion (World Bank, 2025). Total trade in goods and services was equivalent to approximately 64.39% of GDP, indicating a substantial degree of integration with

international markets (World Bank, 2025). Ghana's exports are highly concentrated in gold, petroleum products, cocoa, and other primary commodities, while imports include fuel, machinery, transport equipment, chemicals, and other intermediate and consumer goods. This trade structure provides important foreign-exchange earnings and access to capital and intermediate goods, but it also exposes the economy to international commodity-price fluctuations and external demand conditions.

Ghana's trade relationships are geographically broad, with major export destinations including Switzerland, the United Arab Emirates, South Africa, China, and India, while China, the Netherlands, India, the Russian Federation, and the United States were among the leading sources of imports in 2023 (World Bank, 2025). However, geographical diversification does not necessarily imply diversification of the export base. Ghana remains heavily dependent on a relatively small number of commodities, particularly gold, petroleum, and cocoa. Greater investment in manufacturing, agro-processing, and higher-value services is therefore necessary to increase domestic value addition and reduce the vulnerability associated with commodity dependence.

The relationship between investment, trade, and economic growth is consequently central to Ghana's development process. Investment can increase productive capacity, introduce new technologies, improve infrastructure, and support firms' participation in domestic and international markets. Trade can expand market opportunities, encourage specialization and competition, and provide access to imported capital and intermediate goods. However, these benefits are not automatic. When investment is concentrated in extractive activities and exports remain dominated by unprocessed commodities, the contribution of investment and trade to structural transformation may be limited. Conversely, investment directed toward manufacturing, agro-processing, infrastructure, technology, and productive services can strengthen domestic linkages, employment, productivity, and value addition.

These issues have become particularly important following Ghana's recent macroeconomic difficulties. The country experienced severe macroeconomic pressures in 2022, including high inflation, substantial exchange-rate depreciation, elevated public debt, and restricted access to international capital markets. Ghana subsequently implemented fiscal and monetary adjustment measures and entered an IMF-supported programme while undertaking a comprehensive debt-restructuring process. Economic activity subsequently recovered, with real GDP growth reaching approximately 5.8% in 2024, according to the World Bank (World Bank, 2026). This recent experience demonstrates the importance of understanding the factors that can support sustainable economic recovery and long-term growth.

Despite significant economic progress, Ghana therefore continues to face structural challenges, including limited manufacturing capacity, dependence on primary commodities, agricultural productivity constraints, inadequate intersectoral linkages, infrastructure and energy challenges, restricted access to long-term finance, and widespread informality. Addressing these constraints requires policies that improve the quality and composition of investment and trade rather than focusing solely on their volume. Strengthening productive investment, encouraging agro-processing and

manufacturing, improving digital and physical infrastructure, promoting technological upgrading, and increasing the domestic value added of exports can contribute to a more diversified and resilient economy. Such measures are also important for generating productive employment, improving living standards, and supporting inclusive and sustainable development.

Against this background, this study examines the relationship between investment, exports, imports, and economic growth in Ghana over the period 1980 - 2025. By investigating these relationships over an extended period, the study seeks to provide empirical evidence on the contribution of investment and international trade to Ghana's economic growth and to identify implications for policies aimed at strengthening productive capacity, diversification, and sustainable development. The remainder of the paper is organized as follows. Section Two reviews the relevant theoretical and empirical literature. Section Three presents the methodological framework, data, and variables used in the analysis. Section Four presents and discusses the empirical findings. The final section summarizes the main conclusions and discusses their policy implications.

2. Literature Review

A substantial body of theoretical and empirical literature has examined the determinants of economic growth, with investment and international trade occupying a central position in this debate. Investment contributes to economic growth through capital accumulation, expansion of productive capacity, and improvements in productivity. In the neoclassical growth framework, Solow (1956) established the importance of capital accumulation while showing that sustained growth in output per worker ultimately requires technological progress. Subsequent empirical studies provided evidence that both physical and human capital are associated with differences in economic performance across countries. Barro (1991), using data for 98 countries over 1960–1985, found that economic growth was positively associated with initial human capital and that countries with higher human capital also tended to have higher physical investment ratios. Similarly, Mankiw et al. (1992) demonstrated that an augmented Solow model incorporating human as well as physical capital provided a substantially better explanation of cross-country differences in income than the basic Solow model.

The composition and productivity of investment are also important. De Long and Summers (1991), using international data, found a particularly strong association between investment in machinery and equipment and subsequent economic growth, suggesting that the type of capital investment may matter considerably for economic performance. Levine and Renelt (1992) subsequently identified the investment share of GDP as one of the more robust variables associated with economic growth in cross-country regressions, while also demonstrating that many other reported relationships were sensitive to model specification. These findings suggest that investment can contribute to economic growth, but that its effectiveness should not be interpreted independently of the type of capital accumulated and the broader economic environment.

The broader institutional and policy environment provides an additional qualification to the investment–growth relationship. Easterly and Levine (2001) argued, on the basis of cross-country growth evidence, that factor accumulation alone does not adequately explain differences in long-run economic performance and emphasized the importance of productivity and national policies. Their findings therefore suggest that investment should not be regarded as an automatic source of sustained growth. The productivity gains associated with investment may depend on technological capabilities, institutional conditions, policy quality, financial development, and the capacity of domestic firms and workers to use new technologies effectively.

International trade represents a second major channel through which economies can influence their growth performance. Trade can contribute to growth by allowing specialization according to comparative advantage, expanding market opportunities, increasing competitive pressure, improving resource allocation, and facilitating technological and knowledge diffusion. Feder (1983), examining semi-industrialized developing countries, found that marginal factor productivity was higher in the export sector and argued that beneficial externalities from exporting could extend to other sectors of the economy. Balassa (1978), examining eleven developing countries with established industrial bases, also investigated the relationship between exports and economic growth, while Balassa (1985), using data for 43 developing countries, found that outward-oriented policies and export promotion were associated with stronger growth performance.

The export–growth relationship has also been examined using broader cross-country evidence. Ram (1987), using time-series and cross-sectional evidence from developing countries, reported a positive relationship between export growth and economic growth. Edwards (1998), using nine measures of openness for 93 countries, found that more open economies tended to experience faster total factor productivity growth, although he emphasized that methodological issues concerning causality remained. Frankel and Romer (1999) addressed the endogeneity of trade by using geographical characteristics as instruments for trade and provided instrumental-variable evidence consistent with a positive causal effect of trade on income. Nevertheless, Rodriguez and Rodrik (2001) subsequently questioned the strength of some earlier cross-country evidence, emphasizing problems with the measurement of trade policy and the identification of causal relationships. Thus, the literature provides substantial evidence of a potential growth-enhancing role for trade, but does not justify assuming that trade openness automatically generates higher growth in every country.

The role of imports deserves particular attention because their effects on economic performance can depend on their composition and productive use. Imports of machinery, equipment, intermediate inputs, and technologically advanced goods can expand productive capacity and facilitate access to foreign technology. At the same time, rapid growth in imports does not necessarily generate equivalent productivity benefits when imports are concentrated in final consumption goods. Consequently, distinguishing between productive imports and consumption-oriented imports is particularly relevant when evaluating the trade–growth relationship in developing economies.

Awokuse (2007) provided evidence that the trade–growth relationship cannot be understood solely through the export-led growth hypothesis. Examining three transition economies, the study investigated the causal relationships among exports, imports, and economic growth and concluded that trade stimulated economic growth. Awokuse (2008) subsequently examined Argentina, Colombia, and Peru and found that the exclusive focus on exports could be misleading: although some evidence supported export-led growth, the empirical support for import-led growth was relatively stronger in the countries examined, while reverse causality from economic growth to trade was also evident in some cases. These findings suggest that imports can contribute to growth when they provide productive inputs or technologies, while also illustrating that causality between trade and growth can operate in both directions.

The balance-of-payments perspective provides an additional explanation for differences in the relationship between trade and long-run growth. Thirlwall (1979) argued that, when long-run balance-of-payments equilibrium is required, a country's sustainable growth rate can be constrained by its ability to generate the foreign exchange necessary to finance imports. In the original formulation, the balance-of-payments-constrained growth rate is related to the growth of exports and the income elasticity of demand for imports. This perspective is particularly relevant to developing economies that depend heavily on imported capital goods, intermediate inputs, fuel, or other goods, because the growth benefits associated with access to international markets may ultimately be constrained if export earnings do not expand sufficiently to finance import requirements.

The preceding literature provides a broad framework for understanding the relationship between investment, trade, and economic growth. To assess how these relationships apply in Ghana, the following section reviews relevant empirical evidence, with particular attention to the roles of investment, exports, and imports.

Sakyi et al. (2015) examined the long-run relationship between foreign direct investment (FDI), trade openness, and economic growth in Ghana over 1970–2011 using an autoregressive distributed lag (ARDL) bounds-testing approach. Their results suggested that the interaction between FDI and exports was important for Ghana's growth performance and led the authors to recommend directing FDI toward export-oriented activities. The study therefore provides evidence that the growth effects of foreign investment may depend partly on its interaction with the country's export sector rather than on FDI inflows considered in isolation.

The institutional environment provides a further qualification to the FDI–growth relationship. Kulu et al. (2021) examined Ghana using annual data for 1995–2019 and an ARDL framework. Their results indicated that FDI and institutional quality considered jointly had a significantly positive effect on economic growth in both the short and long run, compared with their individual effects. This finding suggests that the capacity of Ghana to translate foreign investment into higher output may depend partly on the institutional environment in which investment takes place.

More recent Ghanaian evidence does not, however, establish a uniformly positive effect of FDI. Obeng-Amponsah and Owusu (2025) examined Ghana using ARDL bounds testing and Granger-causality techniques with data for 1995–2017. They found that FDI did not significantly affect economic growth or employment, while technology moderated the relationship between FDI and growth in the short run. They also found that technology had a positive effect on economic growth in both the short and long run. The study therefore reinforces the view that the benefits of FDI may depend on technological transfer and absorptive capacity rather than simply on the volume of foreign investment.

Evidence concerning trade openness in Ghana is similarly mixed. Duodu et al. (2020) investigated the relationship between trade openness, institutional quality, and economic growth in Ghana over 1984–2018 using an ARDL model. They found that both trade openness and institutional quality had significant positive effects on economic growth in the short and long run. However, the interaction between trade openness and institutional quality was not statistically significant. The findings therefore support a positive association between trade openness and Ghanaian economic growth, while providing no evidence that institutional quality significantly amplified the effect of openness in the interaction term.

Other Ghanaian evidence provides a more cautious assessment of trade liberalization. Darku (2012), applying a balance-of-payments-constrained growth framework and ARDL techniques to Ghana, found that increases in export growth, capital inflows, and relative prices were associated with higher income growth. However, the study concluded that external-sector liberalization had not improved Ghana's income-growth performance. This finding is consistent with the argument that greater openness alone does not necessarily raise the sustainable growth rate when the structure of exports, imports, and external financing remains restrictive.

Enu et al. (2013), using Johansen cointegration techniques and Ghanaian data for 1980–2012, also found a long-run relationship among real GDP, exports, imports, and FDI. Their estimates indicated a positive long-run effect of exports on real GDP, while imports and FDI were negatively associated with GDP in the long run. Although the study differs from more recent research in its sample period and econometric specification, its findings further illustrate that the individual components of international trade and investment may have different effects on Ghana's economic performance.

The importance of distinguishing among the components of international trade is further illustrated by Mawutor et al. (2023). Using annual Ghanaian data for 1980–2018 and an ARDL framework, the study found long-run relationships among economic growth, FDI, imports, remittances, the real exchange rate, and gross capital formation. FDI, imports, and the real exchange rate were found to have significant negative effects on economic growth, while remittances had a positive and significant effect. The study therefore provides evidence that an increase in imports does not necessarily translate into higher economic growth. Its findings are particularly relevant to Ghana because they indicate that the growth implications of imports need to be considered in relation to their broader macroeconomic context and the country's domestic productive capacity.

Evidence from West Africa also indicates substantial heterogeneity across countries. Guei and Le Roux (2019) examined all 15 ECOWAS countries over 1990–2016 using ARDL and pooled mean group estimation. Their regional PMG estimates indicated a negative long-run effect of trade openness on GDP per capita. However, importantly, the country-level analysis did not identify a long-run cointegrating relationship for Ghana, Guinea-Bissau, Mali, Senegal, and Togo. Consequently, the regional negative coefficient should not be interpreted as evidence of a negative long-run effect of trade openness specifically in Ghana. Rather, the study demonstrates that the relationship between trade openness and economic performance differs substantially across ECOWAS economies and should not be assumed to be uniform.

More recent regional evidence is provided by Yeboah and Adamec (2025), who examined twelve ECOWAS countries over 1993–2022 using pooled mean group and nonlinear ARDL approaches. In the PMG estimates, gross capital formation and trade openness had positive long-run effects on GDP per capita, whereas FDI and merchandise trade were negatively associated with economic performance. The study also identified bidirectional causality between GDP per capita and both merchandise trade and gross capital formation. These results are important because they demonstrate that the effects of investment and trade are heterogeneous and that the relationship between these variables and economic performance cannot necessarily be interpreted as a simple one-way causal process.

Taken together, the evidence from Ghana and West Africa does not establish a single, universally valid relationship between investment, trade, and economic growth. Some studies report positive effects of trade openness, exports, investment, or the interaction between FDI and exports, whereas others identify negative or statistically insignificant effects for FDI, imports, or trade openness. These differences may reflect variations in the composition of trade, the sectoral destination of investment, institutional quality, technological capacity, exchange-rate conditions, sample periods, and econometric methodologies. The available evidence therefore supports a conditional interpretation in which investment and trade are more likely to contribute to economic growth when their composition and domestic economic environment allow their productivity-enhancing effects to materialize.

Previous studies show that investment and international trade can contribute to economic growth, although their effects vary across countries and depend on institutional and macroeconomic conditions. Evidence from Ghana is mixed, with studies reporting positive, negative, or insignificant effects of FDI, exports, imports, and trade openness. These differences highlight the need for further country-specific evidence. Accordingly, this study examines the effects of investment, exports, and imports on economic growth in Ghana.

3. Data and Methodology

This study adopts the Vector Autoregression (VAR) model as its primary econometric framework to analyze the dynamic interactions among key macroeconomic variables. The VAR methodology is particularly well suited for examining multivariate time series

systems, as it treats all variables as endogenous and captures their mutual interdependencies over time. Unlike structural models that impose strong a priori theoretical restrictions, the VAR approach allows the data to reveal the underlying dynamic relationships, thereby providing a flexible and empirically driven representation of economic behavior.

The economic growth model specified in this study is designed to empirically assess the impact of investment, exports, and imports on the performance of the Ghanaian economy. This specification is consistent with both endogenous growth theory and open-economy macroeconomic frameworks, which emphasize the complementary roles of capital formation and trade integration in shaping growth dynamics. The empirical analysis relies on annual time series data covering the period 1980 - 2025, sourced from the World Bank (WB) database. This extended time horizon allows for a comprehensive assessment of long-term growth dynamics, structural changes, and policy shifts affecting the Ghanaian economy. The economic growth model is presented as follows:

$$\ln GDP = \beta_0 + \beta_1 \ln GFCF + \beta_2 \ln EXP + \beta_3 \ln IMP + \epsilon_t \quad (1)$$

where β_0 is the intercept, β_1 , β_2 and β_3 are the slope coefficients, $\ln GDP$ represents the natural logarithm of gross domestic product (USD), $\ln GFCF$ denotes the natural logarithm of gross fixed capital formation, used as a proxy for investment (USD), $\ln EXP$ is the natural logarithm of exports (USD), $\ln IMP$ is the natural logarithm of imports (USD), and ϵ_t is the error term. Based on theoretical expectations, the slope coefficients in the economic growth model specified in equation (1) are expected to be positive, i.e., $\beta_1 > 0$, $\beta_2 > 0$ and $\beta_3 > 0$.

Given the time series nature of the data, the empirical analysis begins with testing the stationarity properties of the variables to avoid spurious regression results. To this end, the Augmented Dickey–Fuller (ADF) unit root test is applied to each series to determine whether the variables are stationary in levels or become stationary after first differencing, thereby establishing their respective orders of integration. Once the stationarity properties and integration orders of the variables are identified, the Johansen cointegration test is employed to examine the existence of a long-run equilibrium relationship among the variables, provided that they are integrated of the same order. The Johansen methodology is particularly suitable in a multivariate framework, as it allows for the identification of one or more cointegrating vectors within the system.

In the presence of cointegration, the analysis proceeds by estimating a Vector Error Correction Model (VECM), which incorporates both short-run dynamics and long-run equilibrium adjustments. Within the VECM framework, Granger causality tests are conducted to distinguish between short-run and long-run causal relationships among the variables, with the error correction term capturing the speed at which deviations from the long-run equilibrium are corrected over time. In contrast, if the Johansen cointegration test fails to confirm the existence of a long-run relationship, Granger causality analysis is carried out using an unrestricted Vector Autoregression (VAR) model. This approach allows for the examination of short-run causal interactions among the variables without imposing long-run equilibrium constraints. Finally, the stability of the estimated model parameters is evaluated using the cumulative sum (CUSUM) test.

4. Empirical Results and Discussion

This section presents and discusses the empirical results of the study. It reports the findings obtained from the econometric analyses conducted to examine the dynamic relationships among the variables. Specifically, the section presents the results of the Augmented Dickey–Fuller (ADF) unit root test used to assess the stationarity properties of the time series data, followed by the Johansen cointegration test employed to investigate the existence of long-run equilibrium relationships among the variables. Furthermore, the section reports the results of the Granger causality tests, which are used to identify the direction and nature of causal linkages among the variables within the appropriate econometric framework. Finally, the results of the model stability test are presented to evaluate the robustness and reliability of the estimated parameters over the study period.

4.1. The ADF Unit Root Test Results

As an initial step in the empirical analysis, the Augmented Dickey–Fuller (ADF) unit root test is employed to assess the stationarity properties of the variables included in the model. The test is first applied to the variables in their level form, and for those found to be non-stationary, it is subsequently conducted on their first-differenced series. As reported in Table 1, the results indicate that all variables are non-stationary at levels but achieve stationarity after first differencing at the 1% or 5% significance level. These findings confirm that all variables are integrated of order one, $I(1)$, thereby satisfying the necessary condition for conducting cointegration analysis.

Table 1. ADF unit root test results

	Level			First difference		
	Intercept	Trend and intercept	No trend & no intercept	Intercept	Trend and intercept	No trend & no intercept
lnGDP	-0.44253	-2.95475	4.27445	-4.34839***	-4.32718***	-1.97839**
lnGFCF	-0.83196	-2.95550	2.87532	-6.67957**	-6.56533**	-4.54944**
lnEXP	-1.25802	-2.82757	4.17631	-8.64402***	-8.27309***	-4.44180**
lnIMP	-1.68037	-3.08419	0.17521	-7.04633***	-7.09572***	-7.22810***

Note: *** denotes significance at the 1 percent level, and ** at the 5 percent level.

4.2. Johansen Cointegration Test Results

Given that all variables are stationary after first differencing, the Johansen multivariate cointegration test is employed to investigate the existence of a long-run equilibrium relationship among the variables in the model. Prior to conducting the cointegration analysis, a Vector Autoregression (VAR) model is estimated to determine the optimal lag length, which is a crucial step to accurately capture the dynamic structure of the system. Based on the minimum value of the Akaike Information Criterion (AIC), the optimal lag length is identified as two, ensuring that the model adequately represents the temporal dependencies among the variables while avoiding over-parameterization.

After identifying the optimal lag length, the Johansen cointegration test is applied to the model to examine the presence of long-run equilibrium relationships among the variables. As shown in Table 2, the results of both the trace test and the maximum eigenvalue test indicate the existence of up to two cointegrating equations. This finding provides evidence

of multiple long-run equilibrium relationships within the system, involving the logarithm of GDP (lnGDP), gross fixed capital formation (lnGFCF), exports (lnEXP), and imports (lnIMP). The presence of these cointegrating vectors implies that, despite short-term fluctuations, the variables exhibit a stable long-term association, consistent with theoretical expectations from growth and open-economy trade models.

Table 2. *Johansen cointegration test results*

No. of CE(s)	Trace Statistic	0.05 Critical Value	Max-Eigen Statistic	0.05 Critical Value
$r = 0$	110.5004**	0.0000	60.41617**	0.0000
$r \leq 1$	50.08423**	0.0007	31.36522**	0.0021
$r \leq 2$	18.71901	0.0804	12.97599	0.1362
$r \leq 3$	5.743025	0.2115	5.743025	0.2115

Note: ** denotes significance at the 1 percent level, and * at the 5 percent level.

Upon confirming the existence of cointegration among the variables lnGDP, lnGFCF, lnEXP, and lnIMP, the cointegrating equation was normalized with respect to the real GDP variable (lnGDP). Normalization on lnGDP allows the long-run coefficients of the explanatory variables—gross fixed capital formation, exports, and imports—to be interpreted in terms of their long-term elasticities with respect to economic growth, thereby facilitating an economically meaningful assessment of the equilibrium relationships within the system.

Table 3. *Cointegration equation normalized with respect to lnGDP*

lnGDP	lnGFCF	lnEXP	lnIMP	C
1.000000	-0.518490	-1.223480	0.257853	10.27935
	(0.15629)	(0.21360)	(0.05773)	(2.14686)

From Table 3, the long-run lnGDP equation can be written as:

$$\ln \text{GDP} = -10.279 + 0.518 \ln \text{GFCF} + 1.223 \ln \text{EXP} - 0.258 \ln \text{IMP} \quad (2)$$

The cointegration equation presented in Equation (2) indicates that GDP is positively associated with investment and exports, while it exhibits a negative relationship with imports. The estimated coefficient of gross fixed capital formation (GFCF) indicates that a 1% increase in investment is associated with an approximate 0.518% increase in Ghana's GDP, underscoring the important role of investment in promoting overall economic performance. This positive relationship between investment and economic growth can be understood through several interrelated mechanisms. Investment increases the stock of productive physical capital, including factories, machinery, infrastructure, and other productive assets. This expansion of capital resources improves the economy's capacity to produce goods and services more efficiently, thereby increasing output and GDP. Additionally, investment is closely linked to the adoption of modern technologies and the development of innovative products and production processes, which can contribute to higher total factor productivity and support long-term economic growth. Investment can also stimulate aggregate demand, as the establishment of new projects and the expansion of existing operations increase demand for goods, services, and labor, generating employment opportunities and increasing income levels. Moreover, investment facilitates the development of essential infrastructure, including roads, ports, electricity networks, and telecommunications, which can lower production and transportation costs, improve market

efficiency, and create a conducive environment for attracting additional domestic and foreign investment. Foreign direct investment (FDI) can play a particularly important role because it not only provides capital inflows but may also introduce modern technologies, managerial expertise, and organizational knowledge that enhance productivity and strengthen the competitiveness of the national economy. Consequently, the observed positive relationship between investment and economic growth in Ghana reflects the central role of investment in expanding productive capacity, improving infrastructure, fostering technological progress, stimulating economic activity, and facilitating technology transfer. This finding is consistent with the neoclassical growth framework and with empirical evidence emphasizing the importance of capital accumulation and investment for economic growth. It is also broadly consistent with the findings of Barro (1991), Mankiw et al. (1992), De Long and Summers (1991), and Sakyi et al. (2015).

The estimated coefficient for exports (EXP) indicates that a 1% increase in export volumes is associated with an approximate 1.223% increase in Ghana's GDP, emphasizing the important role of exports in shaping the country's economic performance. Exports can positively influence economic growth through several interrelated mechanisms. By generating foreign exchange earnings, exports strengthen the economy's capacity to finance imports of technology, machinery, intermediate inputs, and other goods essential for domestic production. Moreover, expanding exports stimulates domestic production, as meeting external demand requires increased output from industrial and agricultural sectors, which can create employment opportunities and raise national income levels. Exposure to international markets can also foster competition, encouraging local producers to enhance product quality, improve efficiency, and adopt technological innovations, thereby increasing productivity. Additionally, exporting allows firms to access larger markets and potentially achieve economies of scale, reducing average production costs and enhancing competitiveness in both domestic and international markets. Greater participation in international markets may also encourage foreign direct investment, which can contribute capital, managerial expertise, technological knowledge, and improvements in production capacity. Consequently, the positive relationship between exports and economic growth in Ghana reflects the role of exports in generating foreign exchange earnings, expanding domestic production, fostering productivity improvements, and integrating the economy into international markets. This finding is broadly consistent with empirical evidence reported by Feder (1983), Balassa (1985), Ram (1987), and Enu et al. (2013). Evidence from developing countries has generally identified a positive association between export performance and growth, while the Ghanaian evidence also reports a positive long-run effect of exports on GDP.

The estimated coefficient for imports (IMP) indicates that a 1% increase in imports is associated with an approximate 0.258% decrease in Ghana's GDP, highlighting a negative long-run relationship between imports and economic growth. This relationship can be explained through several interconnected mechanisms. High levels of imports, particularly when concentrated in consumption goods, may increase reliance on foreign production and place competitive pressure on domestic industries. Large import requirements can also

contribute to external imbalances and increase demand for foreign exchange, potentially placing pressure on the domestic currency and raising the domestic cost of imported goods. Furthermore, excessive dependence on imported consumer goods may reduce incentives for domestic production and investment, while substantial import requirements can increase the economy's vulnerability to external shocks, including exchange-rate volatility and global supply disruptions. However, the economic effect of imports depends importantly on their composition: imports of machinery, equipment, intermediate inputs, and advanced technologies can support productive capacity and may therefore have different effects from imports of final consumption goods. In the Ghanaian context, the negative coefficient obtained in this study is consistent with empirical evidence reported by Enu et al. (2013) and Mawutor et al. (2023), both of which examined Ghana and reported negative effects of imports on economic growth in their respective long-run specifications.

4.3. Granger Causality Test Results

Given the presence of cointegration among the variables, Granger causality tests are conducted within a Vector Error Correction Model (VECM) framework to examine both short-run and long-run causal relationships. In this context, the significance of the joint F-statistics for the lagged differenced variables indicates the presence of short-run Granger causality, while a statistically significant and appropriately signed coefficient of the lagged error correction term [ECT(-1)] provides evidence of long-run causality. This approach allows for a comprehensive assessment of the dynamic interactions within the system by capturing both short-run causal effects and the adjustment of the variables toward their long-run equilibrium relationship.

The results of the Granger causality tests based on the VECM are reported in Table 4. The findings reveal the existence of unidirectional short-run causality running from $\ln\text{GFCF}$ to $\ln\text{GDP}$, while a bidirectional short-run causal relationship is observed between $\ln\text{EXP}$ and $\ln\text{GDP}$. However, no short-run causal relationship is found between $\ln\text{IMP}$ and $\ln\text{GDP}$. In contrast, the results indicate bidirectional long-run causality between the variables, with the error correction mechanism indicating significant long-run causal interactions among $\ln\text{GFCF}$, $\ln\text{EXP}$, $\ln\text{IMP}$, and $\ln\text{GDP}$ in Ghana.

Table 4. *Granger causality test results*

Dependent Variables	Independent Variables				
	$\sum \Delta \ln\text{GDP}$	$\sum \Delta \ln\text{GFCF}$	$\sum \Delta \ln\text{EXP}$	$\sum \Delta \ln\text{IMP}$	ect(-1)
$\Delta \ln\text{GDP}$	-	0.012537**	0.043527*	0.360531	0.011258**
$\Delta \ln\text{GFCF}$	-0.753825	-	-0.021637**	0.462314	0.034206**
$\Delta \ln\text{EXP}$	-0.103587*	-0.172671	-	0.135602	0.103726*
$\Delta \ln\text{IMP}$	-1.583024	-0.080647*	-0.046314**	-	0.112732**

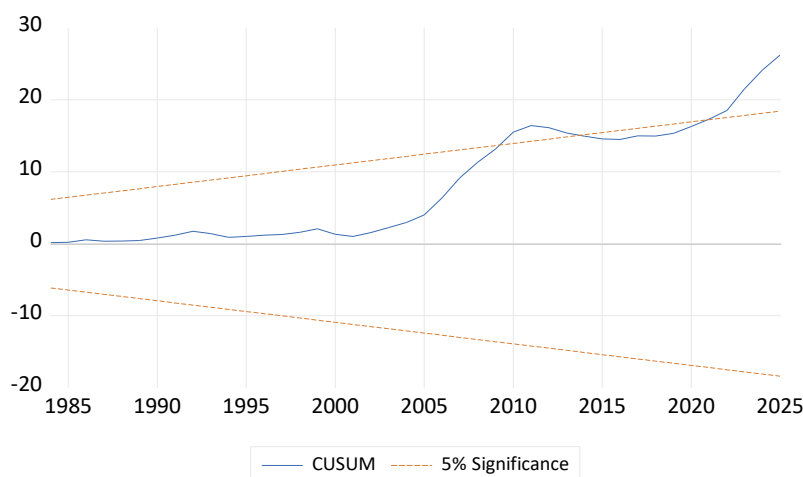
Note: ** denotes significance at the 5 percent level, and * at the 10 percent level.

4.4. Stability Test Result

In this study, the CUSUM test is applied to evaluate the stability of the model's parameters over the study period. Parameter stability is assessed by examining the position of the CUSUM plots relative to the 5% significance critical bounds. If the plots remain within the area defined by the upper and lower critical lines, the model parameters are deemed stable.

Figure 1 indicates that the CUSUM plot does not remain within the 5% critical bounds, suggesting the presence of structural changes in the model.

Figure 1. *CUSUM test results*



5. Conclusions

This study investigated the impact of investment and international trade on Ghana's economic growth over the period 1980–2025. The empirical model incorporated four variables, with GDP serving as the dependent variable and gross fixed capital formation, exports, and imports as the independent variables. The analysis employed several econometric techniques, including the Augmented Dickey-Fuller (ADF) unit root test, the Johansen cointegration test, the Granger causality test, and a stability test, to examine the relationships among these variables.

The results of the ADF unit root test indicated that all variables are integrated of order one, $I(1)$. The Johansen cointegration test revealed a long-run relationship in which GDP is positively associated with investment and exports, while it is negatively associated with imports. Granger causality analysis showed unidirectional short-run causality running from gross fixed capital formation to GDP, a bidirectional short-run causal relationship between exports and GDP, and no significant short-run causal relationship between imports and GDP. Furthermore, the findings indicated bidirectional long-run causality among gross fixed capital formation, exports, imports, and GDP. Finally, the stability test suggested the presence of structural changes within the model, highlighting changes in the underlying economic relationships over time.

Hence, investment and international trade play important roles in Ghana's economic growth. Investment contributes to the expansion of productive capital through the development of infrastructure, equipment, and factories. It also encourages the adoption of modern technologies and innovation, while stimulating economic activity through the

establishment of new projects and the expansion of existing operations, thereby generating employment and increasing income. Investment further supports the development of essential infrastructure such as roads, ports, electricity networks, and telecommunications, reducing production and transportation costs and creating conditions for additional domestic and foreign investment. Foreign direct investment can play a particularly important role by facilitating capital inflows, technology transfer, and the introduction of managerial expertise. Exports, on the other hand, strengthen the economy by generating foreign exchange and supporting domestic production. They can stimulate output in both industrial and agricultural sectors, create employment opportunities, encourage improvements in product quality and productivity, and enhance competitiveness in domestic and international markets. In contrast, the negative long-run association between imports and GDP suggests that high dependence on imports, particularly when concentrated in consumption goods, may constrain domestic productive capacity and increase external vulnerabilities. Therefore, investment and international trade, combined with appropriate management of import dependence, are important factors for supporting productivity, infrastructure development, innovation, and Ghana's integration into global markets.

To strengthen Ghana's economic growth, a comprehensive set of policies and strategies should focus on investment, international trade, and sustainable import management. Firstly, both domestic and foreign investment should be encouraged through appropriate investment incentives and streamlined administrative procedures, with emphasis on productive sectors such as manufacturing, infrastructure, and energy. Such measures can expand productive capacity and create employment opportunities. Infrastructure development, including roads, ports, electricity, and telecommunications, should also remain a priority because efficient infrastructure can reduce production and transportation costs, improve market efficiency, and attract additional investment. In terms of innovation and productivity, policies should support the adoption of modern technologies and the development of human capital through education and vocational training. Export promotion should also be prioritized by supporting productive industries capable of competing in international markets and by encouraging agricultural and industrial producers to increase output, efficiency, and product quality. At the same time, import management should focus on reducing excessive dependence on imported consumption goods while facilitating access to machinery, intermediate inputs, raw materials, and technologies that support domestic production. Finally, Ghana should strengthen its integration into the global economy by attracting foreign direct investment that contributes not only capital but also technology, managerial expertise, and productive capabilities. These measures can support innovation, productivity, employment, and the long-term competitiveness of the Ghanaian economy.

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