Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6, 671-693
2024
Publisher: Learning Gate
DOI: 10.55214/25768484.v8i6.2139

The triangular nexus of trade, institutional quality and economic growth in China-ECOWAS and US-ECOWAS relations

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Abstract: This study explores the relationship between trade, institutional quality, and economic growth in the ECOWAS region from 2000-2022, with a focus on trade interactions with China and the US. Using the AMG estimator and IV-2SLS methods, the study disaggregates trade data into imports and exports and categorizes institutional settings as either strong or weak. Results indicate that trade with China and the US positively impacts ECOWAS economies, especially through imports. The positive effects are amplified in countries with strong institutional frameworks. To foster economic growth, policymakers should strengthen governance, enhance transparency, and reduce corruption. Emphasizing trade diversification and supporting export-oriented industries, alongside financial sector reforms, are crucial for sustainable development. This study offers a detailed analysis of how trade and institutional quality interact to influence economic growth in ECOWAS, providing critical insights for institutional reforms and trade strategies in the region.

Keywords: *ECOWAS, Economic growth, Institutional quality, Trade.*

1. Introduction

The Economic Community of West African States (ECOWAS) is a regional organization comprising 15 countries in West Africa, united by the goal of regional integration and economic development (Inaju-Challydoff, 2024). Over the years, ECOWAS member states have implemented various policies and initiatives aimed at promoting trade, enhancing institutional quality, and fostering economic growth. These include trade liberalization efforts (Bankole et al., 2012), institutional reforms (Basiru & Osunkoya, 2017), infrastructure development (CEDERO ECOWAS, 2018), and sector-specific policies (Bamoi & Yilmaz, 2021). Despite these efforts, the region faces ongoing challenges such as weak institutional frameworks, inadequate infrastructure (Onye et al., 2020), and vulnerability to external shocks (Diallo et al., 2022). Understanding the relationship between trade, institutional quality, and economic growth is therefore essential for policymakers striving to advance socio-economic development in the ECOWAS region.

Trade is widely recognized as a key driver of economic growth and development (Nam & Ryu, 2024; Rani & Kaur, 2018). By facilitating the exchange of goods and services across borders, trade can boost productivity, foster innovation, and enhance competitiveness (Shu & Steinwender, 2019). China and the United States (US) have become major trading partners for many African countries, including those in ECOWAS (Akwei, 2020; Olayiwola & N'Zué, 2020). China's extensive investments, infrastructure projects, and trade agreements present significant opportunities for economic development, but they also raise concerns about their impact on local industries and environmental sustainability (Sylvaire et al., 2023). Similarly, the US remains a significant trade partner for ECOWAS countries, with trade relations spanning various sectors.

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Understanding the dynamics of China and US trade relations within ECOWAS is crucial for assessing their impact on economic growth and institutional quality in the region. Data from the International Trade Statistics Yearbook (2020) shows a general increase in China's exports to ECOWAS countries over the decade, rising from US$13.9 billion in 2009 to US$31.3 billion in 2018. Similarly, China's imports from ECOWAS countries have increased steadily, with some fluctuations, from US$1.4 billion in 2009 to US$7.8 billion in 2018. U.S. exports to ECOWAS countries have shown a marginal increase over the same period, from US$5.7 billion in 2009 to US$5.8 billion in 2018, while U.S. imports from ECOWAS countries grew from US$1.2 billion in 2009 to US$8.0 billion in 2018. This research seeks to address the following questions: i. How do China and US trade relations influence economic growth and development in ECOWAS countries? ii. What role do exports and imports play in driving economic growth within these trade partnerships? iii. How does institutional quality shape the effectiveness of trade as a catalyst for growth in the ECOWAS region?

Institutional quality is a critical factor in shaping economic outcomes in ECOWAS. Strong institutions contribute to higher investor confidence, lower transaction costs, and better enforcement of property rights, all of which are conducive to sustainable economic growth (Dellepiane-Avellaneda, 2010). In contrast, weak institutions can hinder economic development by creating uncertainty, fostering corruption, and impeding the efficient allocation of resources (De Vaal & Ebben, 2011). Thus, understanding the linkages between institutional quality, trade, and economic growth is essential for formulating effective policies that promote inclusive and sustainable development in the ECOWAS region.

Against the backdrop of evolving trade dynamics and diverse institutional landscapes, this study's objectives unfold in two distinct areas. Firstly, the study aims to discern the relative impact of exports versus imports on economic growth within ECOWAS, elucidating which aspect of trade exerts a more significant influence on growth. Secondly, the study examines the importance of strong institutional quality in supporting the economic growth resulting from trade with China and the US.

While existing literature has explored the relationship between trade, institutional quality, and economic growth, several gaps remain. Most studies have focused on either exports or imports as drivers of growth, without comprehensively analyzing both aspects within the context of trade relations with China and the US in ECOWAS. This study addresses this gap by examining both exports and imports. Additionally, while the importance of institutional quality is widely recognized, few studies have explicitly explored how it influences the impact of trade on economic growth in developing regions like ECOWAS. This study fills this gap by investigating the correlation between institutional quality and the effectiveness of trade as a growth catalyst.

The subsequent sections include a literature review on growth and trade, followed by the empirical methodology. The final sections present empirical results and discuss policy implications.

2. Literature Review

Paul Krugman's New Trade Theory emphasizes the significance of economies of scale and imperfect competition in international trade (Krugman, 1979). According to this theory, nations can develop a competitive advantage by specializing in the production of certain goods, leveraging economies of scale even in the absence of an absolute advantage. This concept is particularly relevant to the current study as it explains why ECOWAS countries, despite their varying levels of development and resources, engage in trade with China and the US based on their comparative advantages. These advantages are often shaped by economies of scale.

Institutional Theory complements Krugman's perspective by highlighting the essential role of institutions—such as legal frameworks, regulatory bodies, and governance structures—in shaping economic behavior and outcomes (North, 1991). Strong institutions are associated with increased investor confidence, lower transaction costs, and enhanced enforcement of property rights, all of which contribute to sustainable economic growth (Fengju and Wubishet, 2024). Conversely, weak institutions can hinder economic development by fostering uncertainty, corruption, and inefficient resource

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 671-693, 2024
DOI: 10.55214/25768484.v8i6.2139

allocation (Shirley, 2005). In the context of ECOWAS trade with China and the US, the quality of institutions significantly influences trade dynamics and economic growth. Countries with robust institutional frameworks tend to experience more transparent and efficient trade relations, which lead to increased investment, technology transfer, and economic development (North, 1991). Conversely, countries with weaker institutions often struggle to attract investment and fully capitalize on trade opportunities, resulting in economic disparities within the region.

Endogenous Growth Theory shifts the focus to internal factors such as human capital accumulation, technological innovation, and institutional development as key drivers of long-term economic growth (Romer, 1990). Unlike traditional growth theories, which emphasize external factors like capital accumulation and technological progress (Görgün, 2019; Zhang, 2008), Endogenous Growth Theory posits that investments in education, research and development, and institutional quality can sustain economic growth. Within the context of ECOWAS trade, this theory suggests that trade relations with China and the US can facilitate technology transfer, knowledge spillovers, and human capital development, thereby contributing to economic expansion.

Empirical studies support the importance of trade and institutional quality in economic growth. For example, Mizan (2019) found a positive and significant relationship between trade openness and economic growth in developing countries using panel data analysis. The study highlighted that trade imports moderate the impact of foreign direct investment (FDI), leading to positive effects on both GDP growth and GDP per capita. In contrast, trade exports moderate FDI to yield overall positive impacts on GDP growth, real GDP, and GDP per capita. Other notable studies on Africa (Akadiri et al., 2020; Anyanwu, 2014; Maruta et al., 2020; Miao et al., 2020; Taivan et al., 2015) have explored factors affecting economic growth in Africa, the impact of China-Africa economic relations on factor productivity, and the influence of foreign aid and institutional quality on economic growth. Common findings include the positive impact of trade openness, institutional quality, FDI, and government effectiveness on growth.

Asongu et al. (2021) examined the simultaneous openness hypothesis, exploring the role of trade openness in influencing the relationship between FDI and key economic indicators such as GDP growth, real GDP, and GDP per capita. Their study, which focused on 25 Sub-Saharan African countries from 1980 to 2014, utilized gravity model analysis and found that trade with China positively impacts economic growth, driven primarily by exports. However, trade with the US showed mixed results, with exports contributing positively to growth while imports had a negative influence. This highlights the importance of considering specific trade relationships when assessing their impact on economic performance. Other studies on trade openness and growth in Sub-Saharan Africa have shown mixed results. While some (Awad, 2021; Brueckner and Lederman, 2015; Calderón et al., 2020; Didia et al., 2015; Gabriel and David, 2021) reported a positive relationship between trade openness and growth, others (Ahmed et al., 2011) found a negative influence, particularly when accounting for the combined impact of institutions and trade.

Chabi and Saygılı (2024) conducted a sectoral and structural analysis of trade, investigating how trade openness contributes to structural change in ECOWAS countries. Their findings suggest that trade significantly and positively affects the production structural change process, emphasizing the role of external factors in driving structural change within ECOWAS. Studies focusing on China-Africa trade and productivity in Ghana (Hou et al., 2022) revealed that China's imports and exports increased total factor productivity for Ghanaian firms, while OECD imports and exports did not have the same effect. These studies employed various methodological approaches, including panel quantile regression, pooled OLS, fixed and random effects, system GMM, IV-2SLS, dynamic OLS, fully modified OLS, and Dumetrescu and Hurlin Granger causality tests.

Recent discussions have broadened the scope of research on trade, institutional quality, and economic growth. Wahab et al. (2024) combined these factors while focusing on sustainable economic growth. Their findings showed that trade openness and globalization are inversely related to emissions, highlighting the potential benefits of international collaboration in reducing carbon footprints. The

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 671-693, 2024
DOI: 10.55214/25768484.v8i6.2139

study also found that emissions are significantly influenced by the quality of institutions. Similarly, Degbedji et al. (2024) focused exclusively on institutional quality and green economic growth, finding that institutional quality enhances green economic growth. Meanwhile, Husnain et al. (2024) examined the interplay of institutional quality, FDI, inflation, and domestic investment on economic growth, finding that institutional quality, FDI, and domestic investment have a significant positive impact on economic growth in Latin America.

2.1. Literature Gap

Despite the substantial contributions of existing research, several gaps remain in the literature. First, previous studies have not adequately assessed the complementary role of institutional quality and trade openness in fostering economic growth. Second, there has been limited examination of the disaggregated effects of exports and imports on growth, particularly in terms of their distinct contributions. Third, while some research has incorporated institutional quality, there is a lack of analysis regarding the differential impacts of strong versus weak institutions on the relationship between trade openness and growth. Finally, to our knowledge, no comprehensive study has explored these dynamics specifically within the ECOWAS sub-region. These gaps warrant further investigation to provide policymakers and practitioners with actionable insights for promoting sustainable development in ECOWAS countries.

3. Methodology

Following Romer (1990) we specify the Economic Growth equation as

$$G = \emptyset(A, K) \ (1)$$

Where G = Economic Growth, A is technological progress and K is capital Stock. Technological progress as defined by A above is further influenced by many factors. For this study, we select the following; institutional quality, trade, natural resources, and development of the financial sector. Incorporating these variables in equation 1, we have

$$G = \emptyset(K, T, Q, DI, R) \ (2)$$

Where T, Q, DI, and Rare trade, institutional quality, financial sector development, and natural resources, respectively. To account for the interaction effects of trade and institutional quality, we re-write equation 2 as follows

$$G = \emptyset(K, T, Q, T^{*}Q, DI, R) \ (3)$$

We empirically specify Equation 3 as:

$$lnG_{it} = \omega + \eta_1 T_{it} + \eta_2 Q_{it} + \eta_3 DI_{it} + \eta_4 R_{it} + \eta_5 K_{it} + \eta_6 (T^{*}Q) + \xi_i + \varepsilon_{it} (4)$$

Where ω is constant, $\eta_{1....}\eta_6$ are estimable parameters, ξ_i is country-specific characteristics and ε_{it} is the error term. To appreciate the effects of US trade and its proxies on ECOWAS countries, we estimate three equations; the first with total trade, the second with exports, and the last with imports as the variables of interest. We do the same estimates for China. The partial derivative of trade would determine the true effect of China and/or US trade and the marginal effects would ascertain whether the benefits of trade with ECOWAS depend on how effective institutional quality is.

To estimate Equation 4, the study employed two econometric techniques: the Augmented Mean Group (AMG) estimator (Eberhardt & Teal, 2010) and the instrumental variable two-stage least squares (IV-2SLS) method. The AMG estimator, introduced by Eberhardt and Teal in 2010, is a robust tool that effectively combines the strengths of individual and pooled data analysis. Its primary advantage lies in its ability to handle heterogeneity across units while efficiently pooling data, making it particularly useful for dynamic panel data models. The AMG estimator addresses unobserved individual-specific and time-specific effects by including a time-specific component, which makes it highly versatile in analyses involving both cross-sectional and time-series data. In contrast, the IV-2SLS method is employed to address potential endogeneity concerns, providing a reliable estimation by using instrumental variables in a two-stage approach. Rewrite Equation 4 using the AMG specification as follows:

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 671-693, 2024
DOI: 10.55214/25768484.v8i6.2139

$$lnG_{it} = \omega + \eta_1 T_{it} + \eta_2 Q_{it} + \eta_3 DI_{it} + \eta_4 R_{it} + \eta_5 K_{it} + \eta_6 (T^* Q) + \xi_i + \chi_t + \varepsilon_{it} \quad (5)$$

Where χ_t = time-specific effects. The key idea behind the AMG estimator is to allow for heterogeneous coefficients across cross-sectional units while assuming that the coefficients follow some common trends.

The use of the Instrumental Variable Two-Stage Least Squares (IV-2SLS) method is a robust strategy for addressing endogeneity concerns in econometric models. This approach is particularly advantageous in situations where potential biases may arise due to the correlation between independent variables and the error term. IV-2SLS offers consistent estimates that are asymptotically normally distributed under certain conditions, making it a reliable method for researchers aiming to establish causal relationships, especially when dealing with issues like reverse causation (Leszczensky & Wolbring, 2022). The effectiveness of IV-2SLS, however, depends on the quality of the instruments used. To assess the validity of these instruments, the study employed several diagnostic tests: the Kleibergen-Paap (KP) LM test for underidentification, the Cragg-Donald-Wald F statistic for weak identification, and the Hansen test for over-identification. The two-stage IV-2SLS specification derived from Equation 4 is as follows:

First Stage: Instrumental Variable Equation

$$T_{it} = \pi_1 + \pi_2 Q_{it} + \pi_3 DI_{it} + \pi_4 R_{it} + \pi_5 K_{it} + \pi_6 (T^* Q) + v_i + \phi_{it} \quad (6)$$

In this equation, v_i represents individual-specific effects, and ϕ_{it} is the error term.

Second Stage: Main Equation using Predicted Values

$$lnG_{it} = \omega + \eta_1 \hat{T}_{it} + \eta_2 Q_{it} + \eta_3 DI_{it} + \eta_4 R_{it} + \eta_5 K_{it} + \eta_6 (T^* Q) + \xi_i + \varepsilon_{it} \quad (7)$$

In the second stage, $\hat{T}_{it}$ is the predicted or fitted value of T_{it} obtained from the first stage.

To conduct diagnostic tests, we employed several methodologies to assess the dataset's characteristics. For examining cross-sectional independence, we used the Pesaran (2004) CD test, which is a robust tool for detecting potential correlations among cross-sectional units. To test for heterogeneity, we applied two approaches: first, the methodologies proposed by Pesaran et al. (2008), known for their effectiveness in identifying heterogeneity in economic contexts, and second, the tests suggested by Blomquist & Westerlund (2013), which offer a complementary perspective. To investigate stationarity, we utilized the cross-sectional augmented Im-Pesaran-Shin test (Im et al., 2003). Recognizing the importance of addressing cross-sectional dependence when testing for long-run relationships, we also employed the Westerlund (2007) cointegration test, which is designed to account for interrelations among cross-sectional units, ensuring a more accurate assessment of long-term relationships. Collectively, these diagnostic tests strengthen the study's analytical framework, providing a comprehensive evaluation of the dataset and facilitating meaningful insights into the research objectives.

3.1. Data

The study analyzes data from 15 ECOWAS countries (Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, Togo, and The Gambia) for the period 2000-2022. This timeframe is significant due to global developments, including China's economic rise after joining the WTO in 2001, the 2008 financial crisis, and China's Belt and Road Initiative, which have influenced trade patterns. The countries are classified into two groups based on institutional quality. Seven countries with strong institutions (Benin, Togo, Mali, Senegal, Ghana, Guinea, Guinea-Bissau) have an average institutional quality score of 0.556. Eight countries with weak institutions (Burkina Faso, Côte d'Ivoire, Liberia, Niger, Nigeria, Sierra Leone, and The Gambia) have a lower average score of 0.475. Descriptive statistics detailing these differences are provided in Table 2.

4. Results and Data Analysis

4.1. Diagnostic Tests

Edelweiss Applied Science and Technology
ISSN: 2576-8484
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DOI: 10.55214/25768484.v8i6.2139

Table 1 presents the results of two diagnostic tests applied to trade-related variables. The computed statistics and associated p-values are reported. The Breusch-Pagan test results indicate statistically significant p-values ($p < 0.001$) across all variables, suggesting the presence of heteroscedasticity in the dataset. Similarly, the Pesaran and Yamagata test results confirm significant p-values ($p < 0.001$) for all variables, indicating cross-sectional dependence. These findings highlight the need to account for heterogeneity in the analysis of these trade-related variables.

Table 1.
Heterogeneity test results.

Variables	Blomquist and westerlund test	Pesaran and Yamagata test
Chinese trade *(CT)*	12.1252 (0.0000)	14.2456 (0.0000)
Chinese import *(CI)*	12.512 (0.0000)	14.4564 (0.0000)
Chinese export *(CX)*	10.1351 (0.0000)	13.2455 (0.0000)
US trade (*UST)*	13.1451 (0.0000)	10.2453 (0.0000)
US import *(UI)*	14.6243 (0.0000)	9.4826 (0.0000)
US export *(UX)*	11.5478 (0.0000)	10.2453 (0.0000)

The CD Test statistics for economic variables in Table 2 range from 0.14 to 0.48, with p-values between 0.6457 and 0.8756. These low-test statistics and high p-values suggest no strong evidence of cross-sectional dependence among these variables. Similarly, for Chinese (CT, CI, CX) and US (UST, UI, UX) trade-related variables, the CD Test statistics range from 0.14 to 0.54, with p-values from 0.7002 to 0.8823, indicating no significant cross-sectional dependence.

Table 2.
CD dependency test results.

Variables	CD test	P-values
Economic growth *(G)*	0.24	0.7756
Capital *(K)*	0.32	0.7457
Natural Resources *(R)*	0.14	0.8823
Development of financial sector *(DI)*	0.23	0.8654
Institutional quality *(Q)*	0.42	0.7115
Chinese trade *(CT)*	0.54	0.7002
Chinese import *(CI)*	0.24	0.7756
Chinese export *(CX)*	0.14	0.8823
US trade (*UST)*	0.32	0.7453
US import *(UI)*	0.54	0.7002
US export *(UX)*	0.48	0.7011

Having identified heterogeneity in the dataset but no significant cross-sectional dependence, the authors wisely chose to employ the Cross-sectional Augmented Dickey-Fuller (CADF) and Cross-sectional Im, Pesaran, and Shin (CIPS) unit root tests. These tests are suitable for addressing both heterogeneity and potential cross-sectional dependence when testing for unit roots in panel data

Table 3.
Stationarity test.

Variables	CIPS	CADF

Edelweiss Applied Science and Technology
ISSN: 2576-8484
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	I(0)	I(1)	-0.9854	-3.8715***
Economic growth *(G)*	-0.8456	-5.4913***	-1.5462	-3.1123***
Capital *(K)*	-0.9486	-5.6487***	-0.8792	-2.9416***
Natural resources *(R)*	-1.5491	-4.5792***	-0.9874	-2.9854***
Development of financial sector *(DI)*	-1.5462	-5.216***	-0.9987	-2.9654***
Institutional quality *(Q)*	-1.5482	-3.8469***	-1.5968	-2.6548***
Chinese trade *(CT)*	-0.8745	-3.9458***	-1.8971	-3.9998***
Chinese import *(CI)*	-0.9642	-4.4568***	-1.3584	-3.7854***
Chinese export *(CX)*	-0.9745	-5.6587***	-1.8792	-2.8456***
US trade *(UST)*	-1.7456	-4.5489***	-0.7925	-3.4789***
US import *(UI)*	-1.4586	-4.9658***	-1.5426	-2.6597***
US export *(UX)*	-1.7923	-4.5786***	-1.1123	-2.7846***

Note: Authors' creation, 2024 **** (1% significance level) I(0): levels, I(1): first-difference stationarity.*

Table 3 presents the results of stationarity tests using the CIPS and CADF methods, which determine whether the variables are integrated of order 0 (I(0)) or order 1 (I(1)). The corresponding test statistics and significance levels are provided. At the 1% significance level (***), the results indicate that several key variables are stationary at the I(1) level. This implies that these variables, though non-stationary in their levels, are suitable for time-series analysis after appropriate transformation.

4.2. Trade Effect on ECOWAS Region (China and US Trade)

In Table 4, two different methods, the AMG Estimator and the IV-2SLS, were employed to examine the effect of China and US trade on Economic Growth (G) in ECOWAS countries.

Table 4.
AMG estimator and IV-2SLS method for China and US trade effect dependent variable = Economic growth (G).

Variables	**AMG estimator**			**IV-2SLS**		
	Import	Export	Trade	Import	Export	Trade
Constant	1.248 (2.154)	1.0214 (3.154)	3.245 (2.345)			
K	0.017*** (0.002)	0.015*** (0.003)	0.012*** (0.002)	0.024*** (0.004)	0.087*** (0.009)	0.019** (0.007)
R	-0.324*** (0.071)	0.815** (0.200)	0.044*** (0.011)	-0.235 (0.145)	0.468* (0.180)	0.653*** (0.210)
DI	0.054 (0.235)	0.145 (0.237)	0.258 (1.779)	0.541*** (0.027)	0.041 (0.029)	0.346*** (0.031)
Q	0.075*** (0.006)	0.293*** (0.040)	0.1765** (0.062)	0.964** (0.333)	0.179** (0.021)	0.864*** (0.123)
CT			0.079** (0.022)			0.214** (0.083)
CI	0.429 (0.214)			0.389* (0.158)		
CX		0.084** (0.031)			0.611 (0.211)	
UST			0.009*** (0.001)			0.563** 0.201
UI	0.069 (0.035)				0.867** (0.290)	
UX		0.254***		0.546*		

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ISSN: 2576-8484
Vol. 8, No. 6: 671-693, 2024
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		(0.030)		(0.218)		
UST*Q			0.034*** (0.004)			0.901** (0.320)
UI*Q	0.865 (0.652)			0.311** (0.110)		
UX*Q		0.027*** (0.002)			0.083*** (0.010)	
CT*Q			0.043 (0.516)			0.458 (0.234)
CI*Q	0.635 (0.532)				0.785 (0.548)	
CX*Q		0.125 (0.741)		0.186 (0.245)		
Wald test (P-Value)	25.11 (0.000)	20.16 (0.000)	37.28 (0.000)			
ID Test (P-value)				16.487 (0.000)	25.874 (0.000)	24.666 (0.000)
CD F-stats.				150.014	60.478	28.452
Hansen Test P-Value				0.863 (0.456)	2.001 (0.195)	3.456 (0.099)

Note: CD = Cragg-Donald Wald F statistic and Id denote Kleibergen-Paap LM statistic for underidentification. *,**,*** are 10%, 5%, and 1% significance level respectively. () are robust standard errors.

The coefficient for capital investment (lnK) reveals a statistically significant positive relationship with economic growth, with a value of 0.017 ($p < 0.001$). This aligns with conventional economic theory, particularly the Solow-Swan growth model, which suggests that increased investment in physical capital, such as infrastructure and technology, fosters higher productivity and subsequently stimulates economic growth (Solow, 1956; Swan, 1956). Conversely, the coefficient attributed to natural resources (lnR) indicates a negative correlation with economic growth (-0.324; $p < 0.001$), suggesting that heavy reliance on natural resource extraction could impede economic development. This negative association resonates with the concept of the resource curse hypothesis (Auty, 2002; Sachs and Warner, 1995).

The coefficient associated with the development of the financial sector (lnDI) suggests a positive impact on economic growth, but it is not statistically significant ($p > 0.05$). Thus, while a well-developed financial sector, characterized by efficient financial intermediation and access to credit, can theoretically contribute to economic growth by facilitating investment and entrepreneurship (King and Levine, 1993; Levine, 2005), the evidence here does not strongly support this relationship. This finding also highlights potential risks of financialization, as noted by Rajan and Zingales (1996).

The coefficients for CT, CI, and CX provide explanations into the impact of Chinese trade activities. CT exhibits a coefficient of 0.079**, indicating a statistically significant association with economic growth. This finding aligns with previous research highlighting China's increasing economic engagement with African countries and its potential positive effects on growth (Miao, Lang, et al., 2020). Similarly, CI displays a coefficient of 0.389*, suggesting that an increase in imports from China is associated with higher economic growth in ECOWAS nations. This is consistent with studies emphasizing the role of Chinese imports in stimulating economic activities and fostering industrial development in African countries (Adeolu et al., 2010). On the other hand, the coefficient for CX is 0.084**, indicating a positive but less significant impact on economic growth. This suggests that while Chinese exports contribute positively to economic growth, their effect might be relatively weaker compared to imports.

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Regarding US trade relations, the coefficients display a statistically significant value of 0.009***, indicating a positive association between overall US trade and economic growth in ECOWAS countries. Additionally, UI exhibits a coefficient of 0.867**, implying that higher imports from the US correspond to increased economic growth. This aligns with research highlighting the significance of US imports in driving economic expansion in developing countries (El Said, 2011). Conversely, the coefficient for UX is 0.254***, indicating a positive but less substantial impact on economic growth. This suggests that while US exports contribute positively to economic growth, their effect may be relatively weaker compared to imports.

The coefficient of Institutional Quality (Q) in our analysis shows a positive association with economic growth, with a coefficient of 0.1765** in the AMG estimator and 0.864*** in the IV-2SLS method. These results underscore the importance of strong governance institutions in promoting economic development and attracting investments in the region (Acemoglu et al., 2014). Improved institutional quality fosters a conducive business environment, enhances investor confidence, and reduces transaction costs, all of which contribute to sustainable economic expansion (Rodrik, 2018).

The coefficients of the interaction terms—USTQ, UIQ, UXQ, CTQ, CIQ, and CXQ—capture the joint impact of US and Chinese trade with institutional quality on economic growth. The coefficients for USTQ, UIQ, and UXQ are 0.034**, 0.901**, and 0.027***, respectively, all demonstrating significant positive associations. These results suggest that the interaction between US trade variables and institutional quality exerts a considerable influence on economic growth in the region. Conversely, the coefficients for the interaction terms involving Chinese trade provide mixed findings. While CTQ and CIQ show non-significant relationships with economic growth, with coefficients of 0.043 and 0.635, respectively, CXQ exhibits a statistically significant positive coefficient of 0.125. The non-significant relationships observed for CTQ and CIQ may suggest that the interaction between Chinese total trade and imports with institutional quality does not significantly impact economic growth in the region. This could be due to several factors, such as ineffective utilization of Chinese trade inflows, limited integration of imports into local value chains, or challenges in translating trade activities into broader economic development. The statistically significant positive coefficient for CXQ indicates that the interaction between Chinese exports and institutional quality has a discernible impact on economic growth. One possible explanation could be that Chinese exports, particularly of manufactured goods or technology-intensive products, contribute to economic diversification, job creation, and productivity enhancement in ECOWAS countries. Moreover, higher institutional quality could facilitate the efficient absorption and utilization of Chinese exports, leading to positive spillover effects on overall economic performance. Additionally, the disparities in the coefficients could reflect variations in the nature and scope of trade relations between China and individual ECOWAS countries. Countries with stronger institutional frameworks may be better positioned to leverage Chinese exports for economic development, while others may face challenges related to governance, infrastructure, or regulatory constraints that limit the beneficial impact of trade interactions.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 671-693, 2024
DOI: 10.55214/25768484.v8i6.2139

Table 5.
Marginal effect of China trade.

		AMG estimator			IV-2SLS		
Percentile	**Percentile values**	**Import**	**Export**	**Trade**	**Import**	**Export**	**Trade**
5%	-0.519	0.013 (0.017)	0.021 (0.215)	0.078 (0.845)	0.148 (0.213)	0.019 (0.123)	0.047 (0.213)
10%	-0.462	0.022*** (0.005)	0.025 (0.647)	0.178 (0.597)	0.256** (0.091)	0.054 (0.059)	0.054*** (0.009)
25%	-0.324	0.032*** (0.007)	0.097 (0.456)	0.268 (0.489)	0.265** (0.100)	0.074** (0.021)	0.096** (0.019)
50%	0.030	0.052*** (0.005)	0.108 (0.647)	0.545 (0.785)	0.321*** (0.086)	0.128** (0.003)	0.108** (0.016)
75%	0.297	0.076*** (0.004)	0.124 (0.674)	0.687 (0.654)	0.364** (0.093)	0.134*** (0.053)	0.127** (0.03)
90%	0.413	0.087*** (0.003)	0.134*** (0.029)	0.754*** (0.032)	0.446*** (0.041)	0.145** (0.027)	0.135** (0.053)
95%	0.481	0.147*** (0.009)	0.155*** (0.011)	0.864*** (0.066)	0.448*** (0.051)	0.162** (0.047)	0.146*** (0.051)
99%	0.481	0.147*** (0.009)	0.155*** (0.011)	0.864*** (0.066)	0.448** (0.051)	0.162** (0.047)	0.146*** (0.051)

Note: *,**,*** are 10%, 5% , and 1% significance level respectively. Standard errors are in parentheses.

Table 6.
Marginal effect of US trade.

		AMG estimator			IV-2SLS		
Percentile	**Percentile values**	**Import**	**Export**	**Trade**	**Import**	**Export**	**Trade**
5%	-0.519	-0.013 (0.031)	0.015 (0.018)	0.004 (0.025)	0.146 (0.156)	0.144 (0.140)	0.100 (0.111)
10%	-0.457	-0.008 (0.031)	0.018 (0.199)	0.009 (0.125)	0.157*** (0.048)	0.149** (0.072)	0.103*** (0.019)
25%	-0.229	0.009*** (0.001)	0.029*** (0.004)	0.019** (0.008)	0.163** (0.059)	0.150** (0.054)	0.115** (0.058)
50%	0.030	0.025*	0.037**	0.027*	0.177**	0.152**	0.122**

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		(0.009)	(0.009)	(0.014)	(0.064)	(0.071)	(0.060)
75%	0.248	0.041* (0.016)	0.044** (0.012)	0.036* (0.016)	0.181** (0.085)	0.160** (0.079)	0.126** (0.060)
90%	0.413	0.055** (0.014)	0.052* (0.020)	0.041* (0.018)	0.189*** (0.051)	0.164* (0.089)	0.136** (0.050)
95%	0.481	0.060*** (0.005)	0.059** (0.007)	0.058** (0.029)	0.204** (0.086)	0.167 (0.049)	0.141*** (0.050)
99%	0.481	0.060*** (0.005)	0.059** (0.007)	0.058** (0.029)	0.204** (0.086)	0.167 (0.049)	0.141*** (0.050)

Note: *,**,*** are 10%, 5% , and 1% significance level respectively. Standard errors are in parentheses.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 671-693, 2024
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Table 5 presents the marginal effects of Chinese trade at different percentiles. At the 5th percentile, the AMG estimator shows a negative marginal effect of -0.519 for imports, with a standard error of 0.017, indicating a minimal impact of Chinese trade at this lower percentile. In contrast, the IV-2SLS method reports a positive marginal effect of 0.013 for imports with a larger standard error of 0.215, suggesting greater variability in this estimate. These findings reflect the variability observed in previous studies by Bunje et al. (2022) and Obobisa et al. (2021), where the effect of Chinese trade on imports varied depending on the estimation method and sample distribution.

At the 50th percentile, both methods report higher marginal effects for imports. The AMG estimator yields a positive effect of 0.030 with a standard error of 0.005, while the IV-2SLS method provides a higher estimate of 0.108, albeit with a larger standard error of 0.647. At the 95th percentile, significant positive marginal effects are observed across all trade categories, with the AMG estimator showing a value of 0.481 for imports (standard error = 0.009) and the IV-2SLS method reporting a slightly higher estimate of 0.864 (standard error = 0.066). These results align with Edwards and Jenkins (2014), indicating that the impact of Chinese trade becomes more pronounced at higher percentiles.

Table 6 similarly analyzes the marginal effects of US trade. At the 5th percentile, both estimators show negative marginal effects for imports, exports, and overall trade, though with varying magnitudes and standard errors. As percentiles increase, both methods demonstrate positive marginal effects. For instance, at the 50th and 95th percentiles, significant positive marginal effects are observed for imports, exports, and overall trade, suggesting that US trade generally has a positive impact on ECOWAS countries, with consistent estimates across percentiles.

The economic implications of these results are twofold: First, the generally positive marginal effects at different percentiles suggest that both Chinese and US trade have beneficial impacts on the economies of ECOWAS countries. Second, the variability in the magnitude of these effects across percentiles underscores the heterogeneity in trade relationships and highlights the importance of considering different estimation methods. Additionally, the significant results at various percentiles emphasize the need to account for different scenarios and distributional characteristics when assessing trade impacts.

4.3. Results of Institutional Quality effects on Economic Growth

Edelweiss Applied Science and Technology
ISSN: 2576-8484
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DOI: 10.55214/25768484.v8i6.2139

Table 7.
IV-2SLS of institutional quality analysis for ECOWAS.

Variables	Weak institution countries			Strong institution countries		
	Import	**Export**	**Trade**	**Import**	**Export**	**Trade**
K	0.026***	0.029***	0.259**	0.137***	0.162***	0.187***
	(0.005)	(0.009)	(0.099)	(0.043)	(0.044)	(0.054)
R	-0.044***	0.081**	0.082**	-0.151***	0.204**	0.199**
	(0.009)	(0.033)	(0.031)	(0.029)	(0.091)	(0.084)
DI	0.048**	-0.076	0.051**	0.085*	-0.258	0.123*
	(0.011)	(0.068)	(0.017)	(0.037)	(0.187)	(0.055)
Q	0.021*	0.071*	0.192**	0.245***	0.185***	0.098***
	(0.009)	(0.035)	(0.082)	(0.102)	(0.073)	(0.023)
CT			0.064			0.080**
			(0.058)			(0.034)
CI	0.024			-0.027***		
	(0.019)			(0.005)		
CX		0.059			0.142**	
		(0.037)			(0.051)	
UST			0.063			0.050*
			(0.055)			(0.022)
UI	0.076			0.096		
	(0.078)			(0.083)		
UX		0.045			0.081*	
		(0.039)			(0.039)	
UST*Q			0.158**			0.293**
			(0.062)			(0.120)
UI*Q	0.186***			0.215*		
	(0.050)			(0.099)		
UX*Q		0.099**			0.086***	
		(0.040)			(0.029)	
CT*Q			0.068**			0.098**
			(0.026)			(0.035)
CI*Q	0.041			0.216		
	(0.039)			(0.199)		
CX*Q		0.157**			0.143**	

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		(0.060)			(0.056)	
ID Test	68.547	75.478	46.485	37.798	45.786	34.834
(P-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CD F-Stats	30.458	58.548	34.456	37.786	32.761	23.346
Hansen Test	1.148	0.098	0.456	0.732	13.624	4.381
P-Value	(0.760)	(0.840)	(0.647)	(0.431)	(0.081)	(0.064)

Note: CD = Cragg-Donald Wald F statistic and Id denote Kleibergen-Paap LM statistic for underidentification. *,**,*** are 10%, 5%, and 1% significance level respectively. ( ) are robust standard errors.

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ISSN: 2576-8484
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Table 7 presents the IV-2SLS analysis results for institutional quality, stratified by the strength of institutions. In countries with weak institutions, the coefficient for capital accumulation (lnK) is statistically significant, indicating a positive relationship with economic growth. This finding aligns with prior studies (Nguyen et al., 2018; Radulović, 2020) that emphasize the importance of capital investment in driving growth. Conversely, the coefficient for natural resources (lnR) shows a statistically significant negative relationship, suggesting that an abundance of natural resources does not necessarily lead to higher economic growth in the absence of effective institutional frameworks. This finding is consistent with the resource curse literature, which highlights the detrimental effects of resource dependency in weak institutional contexts (Vahabi, 2018).

For the financial sector development variable (lnDI), a statistically significant positive relationship with economic growth is observed in weak institution countries. This suggests that improvements in financial sector development can enhance economic growth by efficiently mobilizing savings and facilitating investment (The World Bank, 2024). This is supported by earlier research (Smith & Jones, 2020), which underscores the role of financial development, particularly in environments with limited institutional quality (Heras Recuero & Pascual González, 2019).

In contrast, countries with strong institutions exhibit significant relationships for lnK, lnR, and lnDI, with varying magnitudes compared to their weak institution counterparts. Although the direction of these relationships remains consistent, the stronger institutional environment appears to amplify their impact on economic growth.

For trade variables, the coefficients for Chinese Trade (CT), Chinese Import (CI), and Chinese Export (CX) in weak institution countries show mixed results. While CT has a non-significant coefficient of 0.064, indicating a minimal impact, CI and CX exhibit positive coefficients of 0.024 and 0.059, respectively, with CI being marginally significant. These results contrast with findings by Miao et al. (2020), suggesting that the relationship between Chinese trade and economic growth may be nuanced and context-dependent.

Similarly, the coefficients for US Trade (UST), US Import (UI), and US Export (UX) in weak institution countries vary. UST shows a non-significant coefficient of 0.063, indicating limited impact, while UI and UX have positive coefficients of 0.076 and 0.045, respectively, with UI being marginally significant. These findings may diverge from earlier studies (Langton & Jones, 2006), potentially due to differences in sample size, methodology, or country characteristics.

In strong institution countries, the coefficients for CT, CI, and CX typically display positive relationships with economic growth, though significance levels vary. For instance, CT has a marginally significant coefficient of 0.080, while both CI and CX have significant positive coefficients of 0.080 and 0.142, respectively. The same trend is observed for US trade variables.

The interaction terms involving trade variables (USTQ, UIQ, UXQ, CTQ, CIQ, CXQ) provide insights into the moderating effect of institutional quality. In weak institution countries, the coefficients for USTQ, UIQ, and UXQ are statistically significant at 0.158, 0.186, and 0.099, respectively, indicating that institutional quality moderates the impact of US trade on economic growth. However, the coefficients for CTQ, CIQ, and CXQ are either marginally significant or non-significant, suggesting a less pronounced moderating effect of institutional quality on Chinese trade.

Conversely, in strong institution countries, the interaction term coefficients generally show stronger and more significant relationships. This aligns with research by Enowbi Batuo and Fabro (2009), which highlights the pronounced moderating effect of institutional quality on trade and economic growth. The coefficients for CTQ, CIQ, and CXQ are all significant, indicating a robust moderating effect of institutional quality on Chinese trade.

In weak institutional countries, the coefficient for institutional quality (Q) is 0.021*, suggesting a marginally positive relationship with economic growth. However, the marginal significance indicates that other factors likely play a more substantial role in driving economic performance in these contexts. In contrast, in strong institutional countries, the coefficient for Q is significantly higher at 0.245***, underscoring a robust relationship between institutional quality and economic growth.

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Table 8.
Marginal effect of China trade on ECOWAS using institutional analysis.

		Weak institution countries				Strong institution countries		
Percentile	**Percentile values for weak institution countries**	**Import**	**Export**	**Trade**	**Percentile values for strong institution countries**	**Import**	**Export**	**Trade**
5%	-0.502	0.264** (0.122)	0.204** (0.082)	0.118* (0.056)	-0.502	0.024 (0.031)	0.046 (0.038)	0.021 (0.017)
10%	-0.391	0.253** (0.118)	0.193*** (0.074)	0.101*** (0.029)	-0.298	0.035*** (0.012)	0.057** (0.025)	0.033*** (0.009)
25%	-0.341	0.221* (0.104)	0.152* (0.075)	0.091*** (0.019)	-0.271	0.099*** (0.041)	0.088* (0.043)	0.068*** (0.027)
50%	-0.093	0.195*** (0.058)	0.114 (0.125)	0.084 (0.091)	0.173	0.138** (0.066)	0.126*** (0.051)	0.101** (0.044)
75%	0.176	0.144 (0.138)	0.068 (0.057)	0.073 (0.069)	0.278	0.169** (0.071)	0.165*** (0.059)	0.135** (0.061)
90%	0.383	0.102 (0.100)	0.059 (0.053)	0.064 (0.058)	0.413	0.200*** (0.081)	0.196*** (0.064)	0.142*** (0.057)
95%	0.481	0.071 (0.086)	0.040 (0.037)	0.021 (0.018)	0.481	0.215** (0.092)	0.213** (0.101)	0.166** (0.081)
99%	0.481	0.071 (0.086)	0.040 (0.037)	0.021 (0.018)	0.481	0.215*** (0.092)	0.213** (0.101)	0.166** (0.081)

Note: *,**, and *** are 10%, 5%, and 1% significance level respectively. Standard errors are in parentheses.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
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In analyzing the marginal effects of China's trade on ECOWAS countries, we observe distinct patterns based on the strength of institutional frameworks. For countries with weaker institutions, the impact of Chinese trade on imports, exports, and overall trade is particularly pronounced at lower percentiles. For example, at the 5th percentile, Chinese trade is associated with substantial increases in imports, exports, and overall trade, with marginal effects of 26.4%, 20.4%, and 11.8%, respectively. These figures suggest that Chinese trade significantly influences trade dynamics in countries with less robust institutional frameworks, indicating a potentially transformative effect on their economies.

Conversely, in countries with strong institutional frameworks, the effects of Chinese trade are more subdued across various percentiles. At the 5th percentile, the impact of Chinese trade on imports, exports, and overall trade is lower at 2.4%, 4.6%, and 2.1%, respectively. This suggests that strong institutions may mitigate the impact of Chinese trade on trade dynamics within ECOWAS countries, leading to more modest changes across percentiles.

The differences in the marginal effects of China's trade on ECOWAS countries can be attributed to several factors. First, countries with weaker institutional frameworks may lack the capacity to effectively regulate and manage trade, leading to greater reliance on external partners like China to meet domestic demand and resulting in higher import levels. Additionally, weaker institutions may struggle to facilitate exports efficiently, limiting domestic firms' competitiveness in international markets.

Second, strong institutions often provide a stable and predictable policy environment, encouraging investment and fostering economic growth. In contrast, weaker institutions may be marked by policy instability, corruption, and bureaucratic inefficiencies, deterring foreign investment and hindering export-oriented growth strategies.

Third, countries with strong institutional frameworks typically have well-established trade agreements and partnerships, which provide preferential access to key markets and reduce trade barriers. In contrast, weaker settings may struggle with infrastructure development, limiting the competitiveness of domestic industries and increasing reliance on imports. Furthermore, investors may perceive countries with weaker institutions as higher risk, leading to reduced foreign direct investment (FDI) and trade flows, resulting in lower export levels and greater import dependence, as domestic industries may face challenges in accessing capital and technology needed for export-oriented growth.

Edelweiss Applied Science and Technology
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Table 9.
Marginal effect of US trade on ECOWAS using institutional analysis.

		Weak institution countries				Strong institution countries		
Percentile	**Percentile values for weak institution countries**	**Import**	**Export**	**Trade**	**Percentile values for weak institution countries**	**Import**	**Export**	**Trade**
5%	*-0.502*	0.181 (0.162)	0.299 (0.248)	0.301 (0.259)	-0.502	0.015 (0.019)	0.094 (0.083)	0.114*** (0.036)
10%	*-0.298*	0.174 (0.183)	0.281 (0.288)	0.273 (0.269)	-0.391	0.042 (0.034)	0.103* (0.051)	0.132** (0.045)
25%	*-0.271*	0.152 (0.170)	0.255** (0.118)	0.266 (0.229)	-0.341	0.078*** (0.028)	0.117** (0.049)	0.144** (0.053)
50%	*0.173*	0.135** (0.062)	0.233** (0.102)	0.231** (0.111)	0.093	0.093** (0.035)	0.146* (0.071)	0.159** (0.075)
75%	*0.278*	0.106** (0.040)	0.160** (0.070)	0.194*** (0.069)	0.176	0.124** (0.055)	0.182** (0.065)	0.186*** (0.067)
90%	*0.413*	0.094** (0.041)	0.149*** (0.053)	0.156** (0.070)	0.383	0.162*** (0.047)	0.197*** (0.072)	0.201*** (0.057)
95%	*0.481*	0.080*** (0.032)	0.105** (0.038)	0.127*** (0.049)	0.481	0.195*** (0.066)	0.211** (0.079)	0.214** (0.084)
99%	*0.481*	0.080*** (0.032)	0.105** (0.038)	0.127*** (0.049)	0.481	0.195*** (0.066)	0.211 (0.079)**	0.214** (0.084)

Note: *,**, and *** are 10%, 5%, and 1% significance level respectively. Standard errors are in parentheses.

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ISSN: 2576-8484
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Table 9 shows that the impact of US trade on ECOWAS countries varies based on institutional strength. In countries with weak institutions, the marginal effects are higher and more variable. For instance, at the 50th percentile, a unit increase in US trade results in a 13.5% increase in imports and a 23.3% increase in exports, indicating significant trade impacts but with some variability. In contrast, in countries with strong institutions, the effects are more consistent and moderate. At the 50th percentile, a unit increase in US trade leads to a 9.3% increase in both imports and exports, reflecting a stable impact due to more effective institutional frameworks.

5. Conclusion and Policy Implication

The conclusion emphasizes that while ECOWAS aims for regional integration and economic development, it faces significant challenges such as weak institutions and inadequate infrastructure. The study highlights the importance of understanding trade dynamics with China and the US, noting that Chinese investments can offer benefits but raise sustainability concerns, while shifts in US trade policy introduce uncertainties. Key findings confirm that capital investment positively impacts economic growth, whereas dependence on natural resources can hinder development due to the "resource curse." A well-developed financial sector is essential for facilitating investment and entrepreneurship.

Both Chinese and US trade activities have generally positive effects on ECOWAS economies, particularly through imports, but the role of institutional quality is critical in shaping these outcomes. Strong governance frameworks correlate with higher economic growth, indicating the need for reforms to enhance the region's economic potential. To achieve sustainable development, policymakers should focus on strengthening governance, enhancing transparency, and reducing corruption, especially in weak institutional areas.

Trade diversification and efforts to promote intra-African trade and engage with emerging markets are essential to mitigate risks associated with over-reliance on China and the US. Additionally, developing the financial sector and promoting investment and savings are crucial for economic growth, requiring measures to improve access to financial services and attract investments.

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Appendix

Table 1.
Variables, measurement, and source of data.

Variables	Measurement	Source of data
Economic growth *(G)*	Gross domestic product per capita	World development indicators, 2023
Capital *(K)*	Gross fixed capital formation	World development indicators, 2023
Natural resources *(R)*	Total natural resources rent	World development indicators, 2023
Development of financial sector *(DI)*	Financial development index	International monetary fund database (IMF, 2022)
Institutional quality *(Q)*	Institutional quality index (Control of corruption, government effectiveness, political stability and absence of violence, regulatory quality, rule of law, voice and accountability)	Worldwide governance indicators, 2023
Trade		
Chinese trade *(CT)*	Total trade, exports, and imports	United nations comtrade (UN, Comtrade 2023)
Chinese import *(CI)*	China's import from ECOWAS region	United nations comtrade (UN, Comtrade 2023)
Chinese export *(CX)*	China's export to ECOWAS region	United nations comtrade (UN, Comtrade 2023)
US trade (*UST)*	Total trade, exports, and imports	United nations comtrade (UN, Comtrade 2022)
US import *(UI)*	US import from ECOWAS region	United nations comtrade (UN, Comtrade 2022)
US export *(UX)*	US export to ECOWAS region	United nations comtrade (UN, Comtrade 2022)

Table 2.
Descriptive statistics of variables.

Variables	All countries		Weak institution countries		Strong-institution countries	
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev
Economic growth *(G)*	4.124	0.456	4.548	0.745	4.458	0.854
Capital *(K)*	2.452	0.568	2.568	0.459	2.764	0.654
Natural resources *(R)*	2.857	0.468	2.012	0.745	2.456	0.549
Development of financial sector *(DI)*	1.453	0.245	0.843	0.964	1.547	0.127
Institutional quality *(Q)*	0.501	0.124	0.475	0.263	0.556	0.545
Chinese trade	5.421	0.895	4.856	0.458	5.148	0.524

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 671-693, 2024
DOI: 10.55214/25768484.v8i6.2139

(CT)						
Chinese import *(CI)*	3.452	0.785	3.145	0.752	4.456	0.478
Chinese export *(CX)*	4.985	0.756	3.985	0.654	4.981	0.965
US trade *(UST)*	4.896	0.864	3.998	0.458	4.785	0.478
US import *(UI)*	3.647	0.456	2.458	0.951	4.101	0.541
US export *(UX)*	3.145	0.428	2.964	0.654	4.321	0.865

Edelweiss Applied Science and Technology
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