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Interactive Effect of Foreign Trade and Human Capital Development on Inclusive Growth in Nigeria

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Abstract

This study was motivated by the persistent disparities in income distribution and limited access to the benefits of economic growth across different population groups in Nigeria. This study investigated the interactive effects of foreign trade and human capital development on inclusive growth. While foreign trade is often promoted as a catalyst for economic development, its ability to foster inclusive growth remains uncertain, especially in the absence of supportive human capital frameworks. This study investigated whether the synergistic combination of trade openness and human capital development could enhance growth inclusiveness. Data were collected from the World Development and the Central Bank of Nigeria Statistical Bulletin. The study adopted vector error correction modelling (VECM) to analyse both short-run and long-run dynamics. In the short run, the results showed that the interaction terms between trade openness and human capital proxies (life expectancy rate and secondary school enrolment rate) had mixed effects on inclusive growth. Meanwhile, the interactions between trade openness and life expectancy, and trade openness and secondary school enrolment were positive and significant in the long run. The study concluded that enhancing human capital, especially at the secondary education level, is crucial for maximising the inclusive potential of trade openness. Hence, the study recommended that the government should invest significantly in quality secondary education and strengthening the educational system; this will ensure that the workforce is better equipped to take advantage of the opportunities created by trade equitably distributed among the Nigerian population.

Keywords: Inclusive growth, trade openness, human capital development, education, life expectancy, Nigeria, VECM.

Introduction

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Nigeria, Africa's largest economy, regularly experiences tremendous GDP growth that does not benefit its inhabitants. Scholars observe that recent expansion has been characterised by "jobless growth" and substantial inequality (Ozughalu & Ogwumike 2015; Kumar, 2024). Ozughalu and Ogwumike (2015) specifically said that Nigeria has not attained inclusive growth owing to the continually concerns of poverty and unemployment that accompany the country's economic progress. In developmental terms, inclusive growth refers to broadly dispersed prosperity that relates to poverty reduction (World Bank, 2009). In Nigeria, structural constraints, such as a small industrial base and insufficient human capital, have hampered growth and improved living conditions throughout society. Ajayi and Oburota (2022) stressed the importance of inclusive growth by ensuring the population's access to jobs and services, as well as timely interventions in healthcare, education, and unemployment.

Foreign trade policy is critical in resolving this challenge. Nigeria's trade openness has traditionally been defined by oil exports, which limits job and revenue diversification. Recent empirical data show that trade openness has increased aggregate production, but its composition has altered distributional outcomes. For instance, Abinabo and Abubakar (2023) find that greater trade openness is associated with higher GDP in Nigeria. However, Adewuyi and Awodumi (2015) show that this growth has not been inclusive, rising exports (largely petroleum) affected income growth and widened inequality, whereas imports and foreign direct investment (FDI) promoted both average income gains and equity. Adewuyi and Awodumi (2015) further clarified that while imports (supplying less expensive goods and services) and FDI (bringing technology and jobs) helped lower poverty, an increase in exports tended to raise inequality since oil exports create limited direct employment. These results imply that trade policies matter, broadening export diversification and supporting trade (especially in manufactured goods) could help more inclusive growth, whereas a petroleum-focused trade profile without links to the domestic economy can worsen inequalities. In other words, Nigeria’s experience underscores that trade can be an engine of growth, but its social benefits depend on the sectors and partners involved.

Moreso, human capital development plays a critical role in growth inclusiveness. Education, health, and skills build the capacity for broad-based productivity, which is a prerequisite for inclusive growth. Unfortunately, Nigeria’s human capital indicators are weak (Azeez, 2024). The World Bank (2023) reports that a child born in Nigeria in 2020 is expected to realize only about 36% of his potential productivity in adulthood, due to deficiencies in schooling and health services. Such a low human capital index signals that most Nigerians lack the health and

education needed to participate fully in growth. Scholars attribute this to chronic underinvestment. Abaneme and Aworinde (2025) find that insufficient public spending on education and health compounded by weak institutions has entrenched poverty and inequality in Nigeria. By contrast, when human capital improves, growth tends to be more robust and inclusive. Keji (2021) documents that increases in educational attainment and health access had a significant long-run positive effect on Nigeria's GDP. Similarly, a study by Owopetu et al. (2024) finds that health-related human capital (such as higher life expectancy and government health spending) significantly raises an index of inclusive growth. Together, these results imply that a better-educated, healthier workforce not only raises average incomes but also helps ensure that growth is shared.

Key drivers of development are foreign trade and human capital, which interact dynamically according to theory. According to Muazu Ibrahim's 2017 research on sub-Saharan Africa, high-quality human capital accentuates the benefits of financial development. Stated differently, finance offers more benefits for growth when workers are more skilled. Therefore, one expects in Nigeria the degree of human capital will define the benefits of trade openness. Trade shocks (through exports, imports, and investment flows) may more readily translate into broad-based employment and income if the workforce is better educated and healthier. Nonetheless, a recent Wirajing et al. (2023) study indicates that the interaction between human capital and trade openness can adversely affect African economic development. Structural problems is responsible, where businesses mostly rely on importing manufactured goods and exporting raw materials, brings about this negative impact.

In breaching the gap in the literature, the interactive effect of foreign trade and human capital development on inclusive growth has not been empirically examined in Nigeria's context. Hence, this present study addresses this gap by exploring how foreign trade and human capital development jointly influence inclusive growth in Nigeria. Specifically, we investigate whether higher human capital intensifies the inclusive growth effects of trade. Understanding this complex dynamic can inform whether Nigeria's trade liberalization should be complemented by human-capital policies to achieve equitable growth. Such an integrated perspective linking trade policy with education and health outcomes aims to provide new empirical insight into policy strategies for advancing inclusive development in Nigeria.

Following this introduction, the study offers extensive literature analysis, analyzing previous studies on foreign trade, human capital development, and inclusive economic growth. The

third section describes the methodological framework, specifying the use of the Vector Error Correction Model (VECM) for analysis. Section four discusses results and interprets empirical results. The last part concludes and presents important policy implications.

Literature Review

Empirical Review

Foreign Trade, Economic Growth and Inclusive Growth

The relationship between foreign trade and economic growth has remained a widely investigated area in applied economics. The theoretical foundation established by Grossman and Helpman (1991) posits that trade openness facilitates technology spillovers, which enhances productivity, international competitiveness, and export revenues, thereby driving economic growth. However, alternative views argue that for low-income developing countries, structural deficiencies could reverse the expected benefits, leading to deteriorating terms of trade and potential growth retardation. Empirical findings on this relationship are notably mixed. Several studies such as those by Agyei-Idan (2022), Fetahi-Vehapi et al. (2015), Milton and Ajan (2017), Mugun (2021), and Oppong-Baah et al. (2022) demonstrated a positive relationship between trade openness and economic growth. In contrast, other research efforts, including Eris and Ulasan (2013), Huchet-Bourdon and Mou (2017), Mizan (2017), and Nduka et al. (2013), found no significant impact of openness on growth. The study by Arvin et al. (2021) using dynamic ordinary least squares models further highlights that trade openness, coupled with foreign direct investment (FDI) and information and communication technology (ICT), accelerates economic growth in G-20 countries.

Beyond its effects on economic growth, the structure of a nation's export and import activities further shapes the inclusiveness of its growth trajectory. Hence, foreign trade also intersects with inclusive growth, an area gaining increasing scholarly attention. In Nigeria, Oladapo and Oyaromade (2025) investigated the influence of trade openness on inclusive growth using the Vector Error Correction Model (VECM). Their findings indicated a moderate but positive long-run effect of trade openness on inclusive growth. Onyekwena and Oloko (2016) observed that the dominance of mineral fuels and related materials in exports, coupled with a reliance on manufactured goods and machinery imports, necessitates skilled technical manpower to maximize trade benefits for inclusive development. A temporal dimension to the trade-inclusive growth relationship is illuminated by Elvis et al. (2019), who found that while both oil and non-oil exports negatively impacted inclusive growth in the long term, they had positive

short-term effects. This temporal divergence suggests that policy measures targeting inclusive growth through trade must distinguish between immediate and sustained outcomes. Alekhina and Ganelli (2021) broaden the scope by emphasizing the roles of labour productivity growth, FDI inflows, fiscal redistribution, and savings in fostering inclusive growth. Their findings underscore that trade openness alone is insufficient; a multifaceted strategy incorporating broader economic and social factors is essential for true inclusivity.

Tambunan (2021), analysing the Indonesian experience, underlined in support of this point of view that unless policies supporting fair opportunities, skill development, and sectoral diversification accompany economic growth, it does not always translate into inclusive growth. This reinforces the notion that while foreign trade can be a catalyst for inclusive growth, it must be strategically harnessed within a supportive domestic framework. Thus, although empirical data generally supports a positive link between trade openness and economic and inclusive growth, the relationship is conditional, heterogeneous, and influenced by a variety of structural, temporal, and policy elements. These results demand sophisticated, context-specific policy actions to maximize the advantages of trade for inclusive society development as well as for economic growth.

Human Capital Development, Economic Growth, Inclusive Growth

The link between human capital development and economic growth has been shaped by foundational research, notably Becker's (1975) influential framework that examined investments in education, vocational training, and workplace learning. This line of inquiry gained renewed momentum with the introduction of endogenous growth theory by Mankiw, Romer, and Weil (1992), which emphasized the significance of human capital in driving economic expansion. Despite the strength of these theoretical contributions, empirical findings from sub-Saharan Africa have yet to provide consistent support for these models.

Oseni, et al., (2020) highlighted that despite annual government spending on education across sub-Saharan African countries, the impact on economic growth remains inconsistent. This observation raises critical questions about whether educational expenditures in the region are effectively translating into the human capital required for economic growth, as postulated by human capital theory. Rather than rejecting the theory, this situation calls for deeper scholarly inquiry into contextual factors that may be mediating the expected outcomes.

Empirical studies emphasize that the effectiveness of educational interventions differs across countries, suggesting that a uniform approach may not yield the same results universally.

Supporting this view, Wang, Ogunniyi, and Verter (2021) concluded that Sub-Saharan Africa must first achieve a threshold level of economic development before investments in human capital, particularly in health, yield substantial benefits. Furthermore, Angrist et al. (2021), using average learning scores across 162 countries, found that Africa had the lowest human capital formation, with a regional average score of 352 compared to higher averages in other regions, reinforcing the notion of underdeveloped human capital in Sub-Saharan Africa. Similarly, the World Bank (2021) reported a human capital index for Sub-Saharan Africa at 0.3, well below the global average of 0.4. This evidence indicates that education in the region has yet to reach the transformative threshold needed for robust economic growth, suggesting that the validity of human capital theory may be conditional rather than universal.

In a cross-country study by Oluwatobi, Dada, and Okunlola (2020) in Sub-Saharan Africa and by Abdouli and Omri (2021) in Asia found that education plays a significant role in building human capital, which positively affects growth. These findings affirm that strengthening human capital development is a viable strategy for promoting economic growth, albeit with regional variations. Fukao, Hamaguchi, and Hattori (2021) further validated the human capital theory, though cautioning against its universal application without considering contextual realities.

In Nigeria, Keji (2021) discovered that human capital has both short-term and long-term beneficial effects on economic development. He emphasized that educational and industrial structures must be aligned to optimize the returns on human capital investments. It was determined that economic growth was adversely affected by misalignment, particularly in high-tech and knowledge-intensive industries. This underscores the significance of absorptive capacity in the industrial sector. Akinlo and Oyeleke (2020) identified primary and tertiary education enrolments as important drivers of economic growth in Sub-Saharan Africa, while Adeniyi et al. (2021) underscored the significance of both the quantity and quality of education. However, Amassoma and Nwosa (2011) identified the absence of a direct causal relationship between economic growth and educational attainment, attributing this to systemic issues such as the declining budgetary allocations to the education and health sectors.

In addition, Okunade, et al (2022) conducted studies that examined the intersections of productivity, human capital, and globalization, emphasizing the intricate dynamics that are at play. Mathew (2011) proposed the prospect of a trade-off between education and health expenditures, positing that prioritizing one over the other could have developmental

repercussions. In the interim, Matashu (2022) provided evidence that the potential contribution of education to economic development in Sub-Saharan Africa may be restricted, potentially because of contextual and structural factors. This discourse was further nuanced by Ahsan and Haque (2017), who discovered that the influence of human capital on growth is more pronounced in established countries than in developing ones. This suggests that structural and institutional contexts heavily influence this relationship.

The relationship between inclusive growth and the development of human capital has also been extensively investigated. According to a variety of studies, human capital, in conjunction with financial development, is essential for the advancement of sustainable and inclusive development in Africa. Financial development enhances the influence of human capital on inclusive growth, as demonstrated by Oyinlola and Adedeji (2017). Oyinlola, Adedeji, and Oni (2021) further substantiated this relationship by identifying the substantial positive impacts of human capital measures on inclusive growth. Moreover, Tella and Alimi (2016) discovered that the inclusiveness of growth is more significantly influenced by the financing of the health sector than of other sectors. Raheem (2018) found in a separate complementary study that the inclusivity of growth in sub-Saharan Africa is considerably improved by supplementing health expenditures with natural resources.

Human capital thus consistently emerges as a crucial driver of inclusive growth, with empirical evidence from Oyinlola and Adedeji (2021) affirming the significant positive effects of human capital indicators. Adeniyi et al. (2021) emphasized not only the importance of educational access but also the critical role of education quality in enabling individuals to participate productively in economic growth. Oluwadamilola and Adediran (2018) contributed further by underscoring the long-term relationship between education indicators and inclusive growth measures. Their findings emphasize the necessity for policymakers to adopt holistic strategies that prioritize investments in both education and health while remaining sensitive to temporal variations and institutional dynamics. The impact of education on inclusive growth is also not uniform across all educational levels.

Furthermore, Babasanya, Ogunleye, and Ogunyomi (2017) and Akanbi (2023) collectively highlight the evolving nature of human capital in driving sustainable development in Nigeria. While Babasanya et al. (2017) focused on the role of human capital in promoting environmental sustainability, Akanbi (2023) shifted attention to the digital economy, finding that ICT penetration and regulatory quality significantly influence economic development, whereas

traditional human capital proxies like secondary school enrollment were not statistically significant.

Conversely, Abaneme and Aworinde (2025) investigated the influence of education and the moderating effect of institutional quality from 1990 to 2023. Autoregressive distributed lags (ARDL) analysis indicated that government investment in education exerted a negative albeit minor influence on inclusive growth in the short term, while demonstrating a substantial negative impact in the long term. Furthermore, the interaction with institutional quality indicated that education expenditure persistently detrimentally impacted inclusive development in both the short and long term. The study determined that inadequate institutional frameworks impede the beneficial effects of educational investments on economic growth and advised enhancing these frameworks to ensure that government expenditure on education results in increased GDP per capita employed. In another study conducted by Oladapo and Oyaromade (2025), the objective was to evaluate the impact of critical human capital indicators education, healthcare, and labour force participation on inclusive growth. Their study utilised the Vector Error Correction Model (VECM) to examine the short-run and long-run dynamics of human capital development on growth inclusivity. They discovered that secondary school enrolment and life expectancy exhibit negative long-term correlations, indicating structural concerns stemming from a mismatch between educational or health results and economic capabilities.

Foreign Trade, Human Capital Development, and Growth

It has been highlighted that research studying the combined effect of foreign trade and human capital development on economic growth remains relatively few. Soukiazis and Antunes (2012) conducted research on European Union member states, examining the roles of trade and human capital within a neoclassical growth framework, while integrating the balance-of-payments constraint hypothesis. The study utilized panel data methodologies to evaluate the individual and interacting effects of these factors on economic development, based on data from 14 EU nations from 1980 to 2004. Their research allegedly encompassed factors like trade openness and the income elasticity of exports and imports to assess non-price competitiveness and trade intensity. The results demonstrated that human capital, international trade, and their interplay significantly influenced growth, implying that constraints on economic progress may stem from deficiencies in any of these areas.

Ibrahim (2017) was discovered in sub-Saharan Africa to have looked at how human capital shaped the link between financial development and economic growth over the period 1980 to 2014. The study concluded that although both human capital and financial development help to promote growth in both the short and long term, financial sector development had a larger effect when backed by high-quality human capital—measured using the pupil–teacher ratio. The interacting impacts of financial development and human capital were found to be more substantial than those observed by enrolment rates alone. To fully realize the beneficial effects of financial development, the author underlined the need of increasing teacher availability and raising educational quality.

Likewise, Ayeni and Akeju (2023) were said to have looked at the relationship between human capital, capital goods imports, and economic development across 13 West African countries using the Panel ARDL cointegration technique for the period 1980 to 2018. Their results suggested that although capital goods investment usually boosted economic growth, the degree of its effect depended on the degree of human capital in every country. Reportedly, lower-middle-income nations with more human capital (average score of 1.45) benefited more from capital goods imports than low-income countries with less human capital (average index of 1.27). The authors concluded that the interaction between trade and human capital is necessary; nations with well-developed and skilled labour forces are better suited to benefit from trade and investment flows. On the other hand, people without human capital might find it difficult to fully appreciate these advantages. They therefore argued that important engines of long-term economic development in underdeveloped countries are education, skill development, and innovation, thereby stressing their importance.

In conclusion, the comprehensive study presented in the literature review underscores the complex and diverse interaction among foreign trade, human capital development, economic growth, and inclusiveness. The literature indicates that trade, when coupled with strategically focused human capital development policies, may significantly impact economic growth. The impact of trade on growth is dependent on context and influenced by several factors, including technology transfer, financial resources, market size, and spillover effects.

Achieving equitable growth necessitates a comprehensive strategy that tackles economic and structural aspects, emphasizes investments in health and education, and considers local dynamics and institutional capabilities. This study aims to analyse the effect of foreign trade and human capital development on inclusive growth in Nigeria. The studied empirical literature

unequivocally indicated that foreign trade and human capital development are pivotal to the growth process. In the area of contribution to the literature studies that examine the dynamics and interactions between foreign trade and human capital development on growth inclusiveness are relatively few in Nigeria.

Materials And Methods

Data source

The study also makes use of a secondary dataset from 1985 to 2023 in addition to data obtained from the World Development Indicators (WDI) released by World Bank and the Statistical Bulletin released by the Central Bank of Nigeria (CBN).

Theoretical Framework

The development of endogenous growth theory sparked studies on long-run influence for human capital, innovation and knowledge on growth. It is, nonetheless, normal in economic literature to get the estimating equation from a simple augmented production function in human capital (H_t) and total productivity (A〗_t) enters as constituent inputs.

Starting with the fundamental endogenous growth model based on the above assertion:

$$Y_t = 〖f(A〗_t, K_t, L_t 〖, H〗_t) \quad t = 1,2,3,\ldots N \qquad (1)$$

Where, Y_t = level of aggregate output, K_t = stock of physical capital, L_t = size of labour force

H_t = stock of human capital, A_t = total factor productivity (endogenous technological progress).

Therefore, this study implicitly assumed that foreign trade and other control variables influence growth by means of total factor productivity (A〗_t) rather than directly measuring their influence on growth. Thus, proxy variables for(A〗_t) are:

$$A_t = 〖f(FT〗_t, X_t) \qquad (2)$$

Where; A_t = total factor productivity, FTt = foreign trade measured by trade openness,

Xt = vector k (nx1) other independent variables. Hence, substituting equation 2 into 1 which gives;

$Y_t = 〖f(FT〗_t, K_t, L_t 〖, H〗_t, X_t) \quad t = 1,2,3,\ldots N$

Model specification

Hence, the functional relationship between these variables is the specify as follows;

$$〖IGRT〗_t = \beta_0 + 〖〖\beta〗_1 OPEN〗_t + 〖〖\beta〗_3 InGCF〗_t + 〖〖\beta〗_4 InSES〗_t + 〖〖\beta〗_6 LEX〗_t 〖〖+ 〖\beta〗_7 〖(InSES〗_t * 〖InOPEN〗_t)〗_ + 〖\beta〗_8 〖(LEX〗_t * 〖OPEN〗_t)〗_ + \xi_t \quad (3)$$

Where; IGRT for inclusive growth and OPEN for trade openness, GCF for gross capital formation, 〖InSES〗_t * 〖InOPEN〗_t , 〖LEX〗_t * 〖OPEN〗_t = interaction effects between human capital development (measured by secondary school en1rolment and life expectancy) and foreign trade (measured by trade openness), In denotes natural logarithms.

Measurement of Inclusive Growth

The dependent variable, an index of inclusive growth, was derived from the analytical framework developed by Anand et al. (2014) to formulate the model to be estimated. This framework combines growth in income and equity into a measured index of inclusive growth, as follows:

$$(dy^*)/(y^*) = dy/y + dw/w \quad (4)$$

$(dy^*)/(y^*)$ denotes Inclusive Growth, dy/y is the growth in income per capita and dw/w is the growth in equality (Gini coefficient).

Estimation Technique

This study employs the Vector Error Correction model estimation technique, which consists of two forms. The first model addresses the educational aspect of human capital, as defined in equation (5). It emphasises the index of inclusive growth (IGRT) and integrates the variables of secondary school enrolment rate and trade openness to analyse their interactive effect on inclusive growth. The second model, which addresses the health aspect of human capital development as outlined in equation (6), incorporates the variable of life expectancy rate (LEX) and trade openness. These models aim to clarify the relationship between human capital development and trade openness in fostering inclusive economic growth.

$$\Delta[\blacksquare(IGRT_t@OPEN_t@ \blacksquare(〖InGCF〗_t@InSES_t@〖InSES*InOPEN〗_t))] = \alpha_0+\sum_{i=1}^{K-1}\theta_i \Delta [\blacksquare(IGRT_{t-i}@OPEN_{t-i}@ \blacksquare(〖InGCF〗_{t-i}@〖InSES〗_{t-i}@〖InSES*InOPEN〗_{t-i}))] + \eta [\blacksquare(IGRT_{t-1}@OPEN_{t-1}@ \blacksquare(〖InGCF〗_{t-1}@〖InSES〗_{t-1}@〖InSES*InOPEN〗_{t-1}))] +\mu_t \quad (5)$$

Where; η captures the long-run cointegration relationships, θ captures short-run dynamics

α is a constant, μ_t = error term, all other variables remain this same as stated above

$$\Delta[\blacksquare(IGRT_t@OPEN_t@ \blacksquare(InGCF_t@LEX_t@〖LEX*OPEN〗_t))] = \alpha_0+\sum_{i=1}^{K-1}\zeta_i \Delta [\blacksquare(IGRT_{t-i}@OPEN_{t-i}@ \blacksquare(InGCF_{t-i}@LEX_{t-i}@〖LEX*OPEN〗_{t-i}))] + \Gamma [\blacksquare(IGRT_{t-1}@OPEN_{t-1}@ \blacksquare(InGCF_{t-1}@LEX_{t-1}@〖LEX*OPEN〗_{t-1}))] +\mu_t \quad (6)$$

Where; Γ captures the long-run cointegration relationships, ζ captures short-run dynamics

α is a constant, μ_t = error term, all other variables remain this same as stated above

Results and Discussion

Descriptive Statistics

The descriptive statistics presented in Table 1 provides a comprehensive overview of the key characteristics within the dataset, shedding light on the dynamics of trade openness, secondary school enrollment rate, life expectancy rate, and inclusive growth in Nigeria. The mean values of these variables offer insights into the central tendencies and significance of each factor. Gross fixed capital formation is notably high, with a mean value of N1215.5 which shows substantial proportion of capital investment, followed by trade openness with 312.21%, highlighting its substantial role in Nigeria's economy. The inclusive growth (IGRT) index, with a mean of 0.00, suggests a relatively balanced distribution around its center, indicating no significant skew in the data. The secondary school enrollment rate, at a mean of 34.31%, reflects the average level of enrollment in the country. Life expectancy, averaging 49.74 years, provides an indication of the general health and longevity of the Nigerian population.

Meanwhile, school enrollment rate, life expectancy rate and gross fixed capital formation are skewed positively to the right except the inclusive growth index and trade openness which are

negatively skewed. The Kurtosis of the variables shows that, inclusive growth, secondary school enrollment rate and trade openness are platykurtic, indicating that they are thin-tailed with few outliers. While life expectancy rate and gross fixed capital formation show that they are leptokurtic, implying that their distribution is fat-tailed as there are many outliers in the series.

Table 1: Descriptive Statistics

Variables	IGRT	SES	LEX	GFC	OPEN
Mean	0.00	34.31	49.74	12151.5	312.21
Std. Dev.	1.37	9.57	4.22	19217.6	103.27
Skewness	-0.04	0.37	1.31	2.31	-0.12
Kurtosis	2.65	1.73	4.91	7.69	2.85

Source: Authors' computation using EViews 9 (2025).

Correlation Matrix

Table 2 exhibits the functional relationship that exists among the variables. The correlation between trade openness and inclusive growth is 0.39, this is pro-intuitive as it improves inclusive growth. Moreso, secondary school enrollment also has a positive correlation but not strong, hence this calls for complementary policy to enhance education to affect inclusive growth. However, life expectancy rate has a negative relation with inclusive growth, this indicates that poor infrastructural facilities in the health sector affect shared-growth. Additionally, gross capital formation (GFC) demonstrated a notable positive correlation with secondary school enrollment (SES), which indicates that investments in capital goods may lead to improvements in educational outcomes, potentially due to greater investment in infrastructure and social services. However, GFC is negatively correlated with inclusive growth (-0.25), suggesting that there may be inefficiencies in how capital formation contributes to economic expansion in certain contexts. The overall interpretation of the matrix shows that while some variables align well with each other, others, such as trade openness and life expectancy, show more complex relationships that might require further investigation. Hence, the VECM analysis latter in this section shed more educative light on this correlation coefficient.

Table 2: Correlation Matrix

	IGRT	LEX	SES	OPEN	GFC
IGRT	1				
LEX	-0.12181	1			
SES	0.003237	0.922792	1		
OPEN	0.395473	-0.23171	-0.19934	1	
GFC	-0.24538	0.823327	0.692518	-0.17241	1

Source: Authors' computation using EViews 9 (2025).

Unit root

Table 3 displays the results of the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. The results indicate that many variables are non-stationary at their levels, with the exception of inclusive growth and life expectancy, which exhibit stationarity at level. Upon first differencing the data, inclusive growth (IGRT), secondary school enrolment (SES), and life expectancy (LEX) provide robust evidence of stationarity, as evidenced by exceedingly low p-values (0.0000) in both tests. This verifies that these variables are integrated of order one, or I (1), necessitating one level of differencing to achieve stationarity. The concordance between the ADF and PP test results bolsters the dependability of these findings.

Likewise, trade openness (OPEN) attains stationarity after the first differencing, corroborated by statistically significant p-values. Gross fixed capital (GFC), which only shows marginal stationarity in levels, becomes strongly stationary after first difference, with p-values of 0.0022 in the ADF test and 0.0019 in the PP test. The findings consistently demonstrate that all variables in the dataset are integrated of order one, I(1), requiring first differencing for time-series analysis.

Table 3: Unit root test

Variables	Level		First Difference		Integration Order
	ADF	PP	ADF	PP	
IGRT	-4.11324*	-4.03032*	-4.549185*	-24.5094*	I(1)
	0.0027	0.0033	0.0009	0.0000	
SES	-2.7092	-2.6806	-6.9086*	-6.9086*	I(1)

	0.2388	0.2498	0.0000	0.0000	
LEX	-6.4411*	-6.5493*	-6.6157*	-37.6373*	I(1)
	0.0000	0.0000	0.0000	0.0000	
GFC	-1.6856	-1.8189	-4.8112*	-4.8733*	I(1)
	0.7382	0.6758	0.0022	0.0019	
OPEN	-3.25786	-3.13296	-4.974183*	-15.4932*	I(1)
	0.0242	0.0324	0.0003	0.0000	

Notes: ***Significant at the 10%; **Significant at the 5%; * Significant at the 1%

Source: Authors' computation using EViews 9 (2025).

Lag Selection Based on AIC

Table 4 below presents the results of multiple lag selection criteria used to identify the most suitable lag length for the Vector Autoregression (VAR) model. Among the evaluated criteria, the Akaike Information Criterion (AIC) was ultimately chosen as the guiding metric for lag selection in this study. The AIC identified lag 3 as optimal, corresponding to its lowest value of 35.84. This finding is reinforced by the Final Prediction Error (FPE), which also records its minimum (3.53e+09) at the third lag, suggesting enhanced predictive performance at that point.

While the SC favored a more conservative lag length of 1, the AIC is known to prioritize capturing richer dynamics within the data, even if this occasionally comes with a trade-off in terms of model simplicity. The use of three lags reflects the possibility that key economic variables such as inclusive growth, human capital development, and trade openness interact over time in ways that extend beyond immediate effects.

Choosing the correct number of lags is crucial for the integrity of the VAR model. Too few lags can result in omitted dynamics, leading to biased estimates, while too many may introduce inefficiency and overfitting. In this analysis, the preference for three lags strikes a balance between capturing delayed interdependencies and maintaining model robustness.

Table 4: Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ

0	-843.44	NA	2.03E+14	47.14	47.36	47.21
1	-644.45	331.66	1.31E+10	37.47	38.79*	37.93
2	-602.73	57.94	5.63E+09	36.54	38.96	37.38
3	-565.16	41.74*	3.53e+09*	35.84*	39.36	37.07*

Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion

Source: Authors' computation using EViews 9 (2025).

Cointegration test

Table 5 indicates the outcomes of the Johansen cointegration test, which offer compelling statistical proof of long-term connections among the model's variables. Both the Trace and Maximum Eigenvalue tests suggest the existence of at least two distinct cointegrating vectors at the 5% significance threshold. The Trace statistic reveals that the null hypotheses of no cointegration and at most one cointegrating relationship are rejected, with p-values of 0.000 and 0.0092, respectively. Likewise, the Maximum Eigenvalue statistic also supports the rejection of these hypotheses, yielding p-values of 0.000 and 0.024. These results indicate that, while short-run deviations may occur, the variables such as inclusive growth, trade openness, and indicators of human capital tend to align in the long run, moving toward a shared equilibrium.

The presence of cointegration underscores the legitimacy of applying a Vector Error Correction Model (VECM) to capture both short-term deviations and long-run adjustments. This aligns with theoretical expectations, which propose that structural economic relationships particularly those linking trade, growth, and human development tend to be stable over extended periods. Moreover, identifying multiple cointegrating relationships suggests that several distinct long-term forces are at work, reflecting the complex, multifaceted drivers of inclusive economic development.

Table 5: Cointegration test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized	Trace	0.05

No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.785588	110.4415	69.81889	0.0000
At most 1 *	0.565424	55.00665	47.85613	0.0092
At most 2	0.308469	25.0048	29.79707	0.1613
At most 3	0.245891	11.72628	15.49471	0.1705
At most 4	0.042579	1.566425	3.841466	0.2107

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized Max-Eigen 0.05

No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.785588	55.43485	33.87687	0.0000
At most 1 *	0.565424	30.00185	27.58434	0.024
At most 2	0.308469	13.27852	21.13162	0.4269
At most 3	0.245891	10.15986	14.2646	0.2016
At most 4	0.042579	1.566425	3.841466	0.2107

Source: Authors' computation using EViews 9 (2025).

Short Run Estimate Regression Results

The findings in Table 6 offer insightful analysis of the short-run dynamics of the interplay between foreign trade and human capital development in promoting equitable growth in Nigeria. With values of -0.77 and -0.96, respectively, the error correction terms (ECT) in both models Life expectancy and Secondary School enrollment—are negative and statistically significant. This shows that, although at a modest speed, deviations from the long-run equilibrium correct back over time. The relevance of the mistake repair terms underlines the need of long-term interactions in forming short-term changes.

The coefficients of the interaction variables of Secondary school enrolment and trade openness as well as life expectancy and trade openness, imply different short-run impacts of trade openness paired with secondary school enrolment and life expectancy on inclusive growth. For example, while statistically insignificant, the initial lag of school enrollment-trade openness interaction shows a negative coefficient. Also, the initial lag of life expectancy-trade openness interaction is also unfavourable and unimportant. These results show that although the relationship between trade openness and human capital proxies matters, their direct consequences on inclusive development are constrained in the near term.

Table 6: Short-Run Effects of the Interactive Effects of Foreign Trade and Human Capital Development on Inclusive Growth in Nigeria.

Dependent Variable: IGRT				Dependent Variable: IGRT			
Life Expectancy (LEX)				Secondary School Enrollment (SES)			
Variables	Coefficient	Standard error	t-statistics	Variables	Coefficient	Standard error	t-statistics
ECT	-0.96**	(0.42)	[-2.30]	ECT	-0.77**	(0.21)	[-3.69]
ΔIGRTt-1	-0.03	(0.26)	[-0.11]	ΔIGRT t-1	-0.12	(0.19)	[-0.62]
ΔIGRTt-2	0.16	(0.21)	[0.75]	ΔIGRT t-2	0.26	(0.21)	[1.25]
ΔIGRT t-3	0.048	(0.20)	[0.24]	ΔIGRT t-3	-0.04	(0.18)	[-0.22]
ΔLEXt-1	0.76	(0.46)	[1.65]	ΔInSES t-1	30.12	(25.24)	[1.19]
ΔLEXt-2	0.27	(0.41)	[0.67]	ΔInSES t-2	-0.34	(24.5)	[-0.01]
ΔLEXt-3	-0.27	(0.25)	[-1.05]	ΔInSES t-3	-29.25	(22.22)	[-1.32]
ΔOPEN* LEXt-1	-0.001	(0.00)	[-1.33]	ΔInSES*InOPEN t-1	-5.4	(4.26)	[-1.27]
ΔOPEN*LEX t-2	0.000	(0.00)	[0.19]	ΔInSES*InOPENt-2	-0.43	(4.19)	[-0.10]
ΔOPEN*LEX t-3	0.000	(0.00)	[1.36]	ΔInSES*InOPEN t-3	3.87	(3.82)	[1.01]
ΔOPEN t-1	0.060	(0.04)	[1.47]	ΔInOPEN t-1	18.37	(14.18)	[1.30]
ΔOPEN t-2	-0.003	(0.05)	[-0.06]	ΔInOPEN t-2	1.10	(14.09)	[0.14]
ΔOPEN t-3	-0.04	(0.03)	[-1.26]	ΔInOPEN t-3	-12.08	(12.68)	[-0.95]

ΔInGFC t-1	-0.15	(1.91)	[-0.08]	ΔInGFC t-1	2.27	(1.59)	[1.43]
ΔInGFC t-2	-4.55	(1.58)	[-2.87]	ΔInGFC t-2	-3.37	(1.57)	[-2.15]
ΔInGFC t-3	-1.64	(2.07)	[-0.79]	ΔInGFC t-3	-2.37	(1.79)	[-1.32]
R-squared	0.83			R-squared	0.79		
Adj. R-squared	0.68			Adj. R-squared	0.61		
F-statistic	5.54			F-statistic	4.32		

***Significant at the 10%; **Significant at the 5%; * Significant at the 1%

Source: Authors' computation using EViews 9 (2025).

Meanwhile, the second and third lags of the interaction terms in both models yield mixed results. For example, the third lag of school enrollment-trade openness interaction has a positive effect, suggesting a delayed beneficial effect of trade openness and secondary school enrollment. Conversely, the second lag of life expectancy-trade openness interaction has a marginal but statistically insignificant positive effect. These findings highlight the time-dependent nature of trade and human capital interactions, where any meaningful contributions may take longer to materialize.

Lastly, the overall model fit, reflected in the R-squared values, is notable. For Table 4, the R-squared is 0.79, while for Table 4 it is higher at 0.83. These values suggest that the models explain a reasonable proportion of the variations in inclusive growth. However, the F-statistics indicate that the explanatory power of the models can still be improved, possibly by incorporating additional variables or refining the measurement of existing ones.

Long run results (Normalise Cointegrating equation) results

The Table 7 below shows the impact on inclusive growth of interacting effect of human capital development and trade openness, the coefficients of the first normalized cointegrating equation with the standard error in brackets and test statistics in parentheses. The preceding table shows that most of the parameters are rather important. We can now build the long run equations as follows using the normalized cointegrating coefficients and their t-values.

The estimated normalized long run relationship among the variables of interest shown in Equation (8) below. Though the interactive impact of life expectancy and trade openness has a positive and significant influence on growth inclusiveness, the life expectancy rate has a

negative influence on inclusive growth while the gross fixed capital has a positive influence on inclusive growth. This offers important insights on how these combinations affect inclusive growth in Nigeria. These findings underline the connection between human capital and international commerce in determining the inclusivity of economic growth. Equally, Equation (10) reveals the projected normalized long-term connection among the relevant variables. From the secondary school enrolment and trade openness model it was found that school enrolment has a negative impact on inclusive growth while the gross fixed capital has positive impact on inclusive growth, more so, the interactive effect of secondary school enrolment and trade openness have a positive and significant effect on growth inclusiveness. This finding underlines the importance of education in increasing the advantages of trade openness. Secondary education increases the inclusivity of growth promoted by trade openness by arming people with the tools and knowledge to participate in constructive economic activity.

However, the results reveal that the magnitude of the effects differs significantly between the two interaction terms. Where secondary school enrollment and trade openness demonstrate a far greater influence on inclusive growth than life expectancy and trade openness, highlighting education as a more potent channel for enhancing inclusiveness through trade openness. This difference suggests that while both health and education are important, education, particularly at the secondary level has a more transformative effect in ensuring that the benefits of trade reach a broader segment of the population.

This aligns with the conclusions of previous studies such as Soukiazis and Autunes (2012), and Ayeni and Akeju (2023), who emphasized the importance of the interaction between trade and human capital in driving economic advancement and contradicts Wirajing et al. (2023) that found a negative effect on the interaction of human capital and trade openness as it affects growth. Nevertheless, the observed negative standalone effects of life expectancy and school enrollment suggest that improvements in human capital, when pursued in isolation, may not be sufficient to foster broad-based growth. Rather, their full potential is realized only when complemented by a trade-friendly environment. In essence, the findings underscore that while trade liberalization has the potential to stimulate inclusive development, its effect is considerably enhanced when integrated with targeted investments in human capital.

Table 7: Long-Run Effects (Normalized Cointegrating Equation) of the Interactive Effects of Foreign Trade and Human Capital Development on Inclusive Growth in Nigeria

	Life Expectancy	Secondary School Enrollment

Variables	Coefficient	Std. Error	t-Statistic	Coefficient	Std. Error	t-Statistic
IGRT	1	—	—	1	—	—
LEX	1.31	(0.17)	[7.69]	—	—	—
OPEN*LEX	-0.003	(0.00)	[10.23]	—	—	—
OPEN	0.17	(0.02)	[1.06]	—	—	—
InSES				106.37	(18.72)	[5.68]
InSES * InOPEN	—	—	—	-16.62	(3.02)	[5.51]
InOPEN	—	—	—	55.23	(10.70)	[5.16]
InGCF	-0.62	(0.28)	[2.22]	-2.25	(0.30)	[7.46]

Note. IGRT = Inclusive Growth Rate; LEX = Life Expectancy; OPEN = Trade Openness; InSES = Secondary School Enrollment; InGFC= Gross fixed capital

Source: Author's computation based on E-view 9 (2025).

$$1*IGRT + 1.31\,(LEX) + 0.17\,(OPEN) - 0.003\,(OPEN*LEX) - 0.62\,(InGCF) = 0 \quad (7)$$

$$IGRT = -1.31\,(LEX) - 0.17\,(OPEN) + 0.003\,(OPEN*LEX) + 0.62\,(InGCF) \quad (8)$$

$$1*IGRT + 106.37\,(InSES) + 55.23\,(InOPEN) - 16.62\,(InSES * InOPEN) - 2.25\,(InGCF) = 0 \quad (9)$$

$$IGRT = -106.37\,(InSES) - 55.23\,(InOPEN) + 16.62\,(InSES * InOPEN) + 2.25\,(InGCF) = 0 \quad (10)$$

Stability and diagnostic test

The Breusch-Godfrey LM test for serial correlation shows p-values of 0.09 for InSES and 0.44 for LEX. Given that both numbers above the 5% significance level, there is no clear evidence of autocorrelation in the residuals of the model, implying that the error components are

independent over time. The Breusch-Pagan-Godfrey test for heteroskedasticity also gives InSES and LEX p-values of 0.35 and 0.37, respectively. These findings suggest that the residuals show consistent variation, hence supporting the validity of the coefficient estimations and fulfilling the homoscedasticity requirement. Regarding the assumption of normality, the residuals were evaluated using a normality test, producing p-values of 0.17 for InSES and 0.57 for LEX. As both values are above the conventional 5% level, we can conclude that the residuals follow a normal distribution. Collectively, these diagnostic tests confirm that the Vector Error Correction Model (VECM) is well-specified and free from major econometric issues such as serial correlation, heteroskedasticity, and non-normality. This enhances confidence in the model's findings about the dynamic interplay between human capital development and trade openness in promoting inclusive growth.

Table 4.22 VECM diagnostic test results

Tests	Probability values	
	InSES	LEX
Breusch-Godfrey Serial Correlation LM Tests	0.09 *	0.44 *
Breusch-Pagan-Godfrey Heteroskedasticity Tests	0.35 *	0.37*
Normality Test	0.17 *	0.57*

Source: Authors' computations

*implies acceptance of null hypothesis at 5% level of significance.

Conclusion

This study examines the interplay between human capital development and international trade in relation to economic growth in Nigeria, utilizing data from the World Development Indicators and the Central Bank of Nigeria for the period spanning 1985 to 2023. The research studies secondary school enrolment and life expectancy as indices of human capital and analyses their impact on the relationship between trade openness and inclusive economic growth. The study is based on the Vector Error Correction Model (VECM) framework.

The findings indicate a multifaceted interaction. Over the long run, isolated indices of human capital, such as education and health, seem to negatively impact inclusive growth. The relationship between human capital and commercial openness presents a contrasting

perspective. The combination of trade openness and advancements in human capital, particularly education, often fosters inclusive growth. Significantly, secondary school enrolment had a more robust correlation with trade openness than life expectancy, highlighting the essential function of education in enhancing the inclusivity of economic growth gains.

These findings underscore that for commerce to significantly contribute to equitable development, it must be bolstered by smart investments in human capital, particularly in education. This study implies a need for more government financing and policy emphasis on secondary education. By enhancing accessibility and elevating quality within the education system, Nigeria may more effectively equip its workforce to capitalise on the possibilities afforded by global commerce. This strategy promotes inclusive economic results while enhancing national productivity, innovative potential, and competitiveness in the global market.

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