Causal analysis of trade openness, government expenditures and economic growth in Nigeria (1980-2020): Recalling economic policy corrective actions

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Research Article

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Abstract

This research investigates the causality relationship between trade openness, government expenditures and investment in infrastructure's relative advantage of economic growth for recalling economic policy corrective actions. Based on the theory of comparative advantage and elementary neoclassical trade model that concentrating on different productivity would improve trade and development potentials of the country. It employs Johansen cointegration and Granger causality techniques to examine the comparative advantage theory and assess the short-run and long-run relationship. Annual time-series data from 1980 to 2020 shows the relationship between trade openness, government expenditures on education and investment in infrastructure are statistically significant for economic growth in Nigeria. There is a cointegration relationship among the indicators with relative advantage, and Granger causality reveals short-run. There is a bidirectional relationship between trade openness and economic growth. While a unidirectional relationship between trade openness and infrastructural development on economic growth. Hence, this research realize that human capital development does not affect economic growth. The policy recommendations imply that all the indicators are solid macroeconomic factors following the empirical analysis for emphasizing the relative advantage of trade openness in Nigeria. The policymakers should consider trade diversification through development of infrastructure, human capital development to increase productivity toward economic growth.

Introduction

A relative advantage for trade openness is an indispensable enabler for promoting internal manufacturing, exportation and economic development. On the other hand, public expenditure and infrastructural development spur employment opportunities and economic growth. Trade also provides new market opportunities for developing domestic firms' more vital productivity, innovation and competition. This central question of open economics has received attention in the theoretical literature for relative advantage. Previous studies on infrastructure, trade, and development have mainly adopted the elementary neoclassical economy to focus on factor accumulation or endowment. (Ahmad et al., 2015; Arnaud Costinot, 2009; Hooi Lean et al., 2014; Liu et al., 2020; O'Connor et al., 2020).

Nigeria being a developing country that is in need of economic development policy corrective actions provide justification on the need of this research. The proportion of Nigerian economic growth is concentrated primarily in agriculture and trade, which suggests a significant need for the government to provide more human resources in human capital development, including infrastructural development to advance the productivity sector.

Nigeria has experienced low performance because of a budget deficit to increase human capital and other factors in infrastructure development (Aworinde & Akintoye, 2019; Chinwendu & Ph, 2019). These improve the living standard, human development, economic growth and development of a nation. Trade openness is an engine of growth that leads to steady improvement and stimulates productivity. Human capital development is essential because it is the main factor that coordinates all other aspects of

production for increasing productivity and economic growth. In addition, infrastructure serves as a catalyst for economic development by enhancing access to capital and engaging the production sectors.

Nigeria must integrate the significance of government expenditure to improve labor intensive and trade openness leading to productivity with infrastructure to cause economic growth. Thus, the fundamental role of trade openness or relative advantage has been controversial, including an unfavorable environment, since not much research concentrated on the open economy causality. Nigerian economic performance has not been encouraging because the growth data containing trade openness in Fig. 1 showed an inclination for potential trade openness or comparative advantage. The annual economic growth rate indicated a shortfall between 2015 with a miniature rise and a negative from 2018 to 2020. It shows that the economy of Nigeria is not supporting trade openness. Although the trade openness indicator rose in 2016 and 2019 (3.83%, 9.74%) suddenly declined in 2020 by 5.51%, respectively. Other factors, government expenditure, declined by 2% from 1991 to 2020 and infrastructure development by negative 5% in 2020.

The key determinants of trade openness are government expenditure and infrastructure development in Nigeria. A significant decrease in government expenditure and infrastructural development has affected Nigerian trade openness or productivity, which has affected economic growth in recent years. Nigeria's trade performance has been redundant since the discovery of crude oil in the 70s, which causes a lack of economic diversification for the export-base. This dominance of fuel export has made the economy highly susceptible to developments in the world oil market and prevented the country from taking advantage of dynamic opportunities in other sectors of the economy. Sectors like services, manufacturing, construction, building and many others. As a result, several policies have been directed toward diversification of the economy to increase productivity and revenue but failed to yield tangible outcomes (Arawomo and Apanisile, 2018; Onakoya et al., 2019).

Elijah et al. (2019) opined that the government needs to have all that it takes to sustain the diversification of the economy to achieve economic growth led by exports since the imports of the country are more than the exports. It matters when the productivity of a country increases, particularly in Nigeria, which faces low economic growth due to the challenges of human capital and infrastructure development. The government increased spending to reduce apparent unemployment. Nigeria needs to spend more to boost trade openness and economic growth, which is mainly dependent on government expenditure to influence either education or a rise in school attainment that can define skills acquisition as a mechanism to improve productivity (Awogbenle and Iwuamadi, 2010; Kizito, 2013; Maku et al., 2021; Sule, 2020; Wilkinson, 1998).

In Nigeria, the number of studies conducted so far on the Granger causality between trade openness, government expenditure and infrastructure development on economic growth is limited in number, in which further studies are required. Therefore, this research will help fill the knowledge gap in trade openness, relative advantage, economic development and improving policy design and implementation for inclusive infrastructural development and government expenditure to increase human capital in

developing countries, especially Nigeria. Despite this paradoxical scenario, this study intends to capture the interconnection and effectiveness of government expenditure and infrastructure development and whether they could be trade-openness-economic-growth-dependent in Nigeria. Therefore, the general objective of the research is to examine the cointegration and causality of trade openness on the economic growth of Nigeria.

Theory and Evidence

Trade openness and relative advantage led growth theory

According to the trade openness and comparative advantage led growth theory based on Richardian and the elementary neoclassical trade model, a region or country concentrating on different productivity would improve trade and development potential. Thus, the relative advantage is at the core of the neoclassical trade model, whether driven by technology or factor endowment, in the Ricardian model developed by Banerjee et al. (1998) and (Abhijit et al. (1993) that, supposing there is a variety of distinct factors in the economy, then assumption 0 is generally valid. Therefore, this research maintains the assumption 0, which allows expressing aggregate output under an efficient allocation. Supposing that assumption 0 holds C = 1, …C (growth) and S = 1. …, S (trade openness), aggregate output under an efficient allocation is given by exogenous vectors,

$$\vartheta\left(\sigma^{s}\gamma^{c}\right) = \int \Pi(\sigma^{s},\ \gamma^{c})\,\delta\left(\omega,\ \sigma^{s},\ \gamma^{c}\right)f\left(\omega,\ \gamma^{c}\right)\mathrm{d}\mu(\omega)(1)$$

Where $\Pi(\sigma^{s},\ \gamma^{c})$ is the set of factors allocated to sectors in the economy (c).

$$\Pi\left(\sigma^{s},\ \gamma^{c}\right) = \left\{\frac{\omega\epsilon\,\Pi}{\tau\left(\omega,\ \sigma^{s},\ \gamma^{c}\right)} > {}_{s^{'}\neq s}{}^{max}\tau\left(\omega,\ \sigma^{s},\ \gamma^{c}\right)\right\}(2)$$

This research essentially refers to an economy where equations (1) and (2) hold as an elementary neoclassical economy. Therefore, in a developed form after modifications, the factor productivity or relative advantage lead growth is as follows;

$$\alpha = f(\sigma,\ \gamma) = h(\omega)\,\alpha(\sigma,\ \gamma)(3)$$

Where $h(\omega) > 0\mathrm{and}\alpha(\sigma,\ \gamma) \geq 0(\mathrm{exogenousvectors}).$ α is a function of $\sigma\mathrm{and}\,\gamma,$ trade openness, government expenditure and investment infrastructure may be relatively more productive for economic growth. If a factor ω becomes effective as an element ω in a given sector, then (trade openness, government expenditure and investment infrastructure) has relative advantage in the country's economic growth.

Causal relationship between trade openness, government expenditures, investment infrastructure and economic

growth

Most established theoretical literature from developed and developing countries is scant on trade openness, focusing on the relative advantage of inclusive infrastructural development and government expenditure on economic growth. Likewise, this study will review the assumption that; trade openness, government expenditure and infrastructure investment influences economic growth.

Many developing and developed countries now have a relative advantage to spike development and contribute to economic growth. It can generate employment, productivity, and domestic trade, increase government revenue or income and enhance infrastructural development. In Nigeria, Wafure et al. (2010) detected the role of foreign trade and skills acquisition on economic growth based on provision of developmental capital and relative market size advantage. Policy implied that expansion of GDP through infrastructure drives productivity due to relative market size opportunity. Gohou et al. (2012), in Africa, examined the relationship between foreign trade and poverty reduction as the human development confirmed mixed results among the developing countries. Although, foreign trade exerted positive and strongly significant relationships on the economy particularly welfare or relative advantage of human capital development. The policy suggested that international development priorities encourage labour-intensive and pro-poor sectors such as human capital and infrastructural development. Onifade et al. (2020) that government expenditure impacts economic growth applied the ARDL approach and data from 1981 to 2017. The empirical results revealed a significant relationship between government spending and economic development. Further, the result of Granger causality indicated public expenditure Granger caused real growth in the economy. The policy implied that the government should ensure that the share of public expenditure (fiscal) is kept within the reasonable budget proposal earmarked.

Osakwe et al. (2018) explored the relationship between trade libralization and export diversification in developing countries. The results indicated that developing countries trade is related to diversification in the short term and leads to economic growth. The policy implication encouraged human capital development, and institutions (infrastructure) may play a vital role in export diversification. Dudzevičiūtė et al. (2018) estimated the relationship between government spending and economic growth of European Union Countries (EU) by employing correlation and Granger causality test data from 1995 to 2015. The results showed that government spending has a significant relationship with economic growth. Unidirectional causality running from government spending to economic growth explains the role of relative human capital development in accelerating the GDP to economic growth. The policy suggested government expenditure as a growth factor should be adequately managed and efficiently allocated for development reasons. Mazorodze (2018) assessed the impact of government expenditure on economic growth from 1994 to 2016 by employing a cointegration test, VAR model estimation and Granger causality in Bangladesh. The results revealed a unidirectional causality from economic development to expenditure. The policy suggested that a rigorous strategy for monitoring the implementation of the budget would enhance human capital development relative to a change in the economy.

Ngouhouo et al. (2021) examined trade openness, and economic growth in Sub-Sahara African countries focused on the role played by domestic institutions from 1996–2017. The Generalized Method of Moments (GMM) results revealed that domestic institutions as a composite index determined trade openness significantly impacts on economic growth. The policy implications suggested that different states of sub-Sahara Africa should improve the quality of domestic institutions in elaborating their international trade policies. Chen et al. (2022) study that foreign trade, energy and economic growth have multiplied and are extraordinary in china. The results from 2005 to 2018 in panel data revealed that foreign trade affects energy through the export route, while the effect of the import route is not significant on growth. The policy suggested that the government should play an active role in opening trade and economic growth due to the control over energy intensity flow. Trade openness, capital formation and export are key elements to bring sustainable economic growth in a country (Zaman et al., 2021). They employed annual data to estimate the impact of IT exports, gross capital formation, FDI and trade openness on sustainable growth from 2013 to 2018. The two-step GMM technique and the results show that FDI and gross capital formation substantially positively impact economic growth. In contrast, IT exports and trade openness have a negative, insignificant impact. The policy implies that most developing countries need to invest in industrialization and encourage export-based growth.

Roşoiu (2015) used quarterly data from 1998 to 2014 to analyze the impact of government expenditures, revenues and economic growth. The results indicated granger causality through cointegration between the variables. The policy suggested using government expenditure as a means to control economic growth. government expenditure as an essential instrument for achieving full employment and improved living standard and economic growth (Ugochukwu & Oruta, 2021). Employed data from 1981 to 2020 using error correction and the Granger causality model. The results revealed government expenditures have an insignificant negative impact on economic growth. The policy suggested that the government increase and improve internally generated revenue to supplement government spending and strict monitoring of government projects. Arvin et al. (2021) measured government expenditure, tax revenue and economic growth from 2005 to 2015 using primary data in low-income and lower-middle-income countries. The short-run and long-run results show government expenditure and tax revenue have an endogenous link in the short-run. At the same time, policy implies that more vital institutions and more effective fiscal policies can sustain long-run economic growth. Nayak et al. (2021) explored the relationship between government expenditure and economic growth. The results show no relationship among the variables indicating negative impact. The policy suggested that the government should invest in the development of infrastructure to increase internal revenue generation. In Romania Popescu et al. (2021) examined government spending and economic growth by employing quarterly data from 1995 to 2020 to measure the relationship and Granger causality. The results indicated long-run relationships among the variables, and the Granger causality runs between the variables in the short run. The policy suggested that the government should concentrate on the macroeconomic inflationary factors to enhance the sector's economic development.

Infrastructure development is essential for productivity and comparative advantage (Park, 2020). The study suggested that improved quality of infrastructure fosters comparative advantage. Ke et al. (2020)

investigated infrastructure development and economic growth in China by employing the Generalized Method of Moments (GMM) during the period 2007 to 2015. The results showed that infrastructure significantly contributes to growth. The policy implied that the government should support local production through infrastructural strategies to benefit from comparative advantage. In China Chin et al. (2021) measured the role of infrastructure on economic growth employed panel cointegration, Granger causality and the findings indicated long run and short run relationship, Granger causality running from infrastructure to economic growth. The policy implied that infrastructure is a worthy huge investment that enhances development. Chu et al. (2020) used panel data and examined government expenditure, and economic growth data from 1993 to 2012 based on the effects of OLS fixed and GMM techniques. The results revealed that a shift in government expenditure toward effective spending forms is associated with a high level of growth. The policy implied that spending more on welfare and human capital development would improve the relative advantage of the economy. David (2019) examined causal-effect relationships employing panel data from 2000 to 2015 in African countries. The results show a bidirectional long-run relationship between infrastructures and economic growth. The causality tests indicated a feedback causal relationship. The policy implied that African countries need to include digital communication in their infrastructure to promote economic growth.

Magazzino et al. (2021) explored the impact of infrastructure on economic growth in China, employing aggregated data from 1990 to 2017. The findings from a machine learning technique for verifying causality approach revealed that infrastructure affects economic growth. The policy implication suggested that lack of infrastructure maintenance eliminates the positive effects of investments and comparative advantage over time in the medium term. Sofuoğlu et al. (2022) explored the relationship between infrastructure (high technology) on economic growth employed the modified ordinary least square and canonical cointegration regression data from 1990 to 2019. The results indicated that infrastructure (high technology) positively impacts economic growth. The policy recommended that increasing investment on infrastructure will boost exports and development. Furthermore, the users need to be educated by the government or firm. In the study of Anakpo et al. (2022) that infrastructure (technological innovation) effect on economic growth has received significant attention for development and employs panel dynamic ordinary least square regression with annual data from 2004 to 2017 for accessing relationships. The results show infrastructure has a significant positive relationship with economic growth in the long run. The policy suggested timely intervention in infrastructure can promote economic growth. Additionally, this research explores whether the theoretical interaction (assumption) of trade openness, government expenditure and inclusive infrastructural development has a relative advantage on economic growth. Ensuring the government should implement a better trade openness and high labor-intensive policy, further enhancing economic growth.

Dudzevičiūtė et al. (2018) that many scholars have debated in theoretical and empirical relevancy of government expenditure arising for structural change in growth that government expenditures stimulated economic growth. Chin et al. (2021) that trade openness promotes economic growth, which encouraged Belt and Road initiative in China to improve investment and trade acceleration through infrastructural development that plays a focal role in sustaining comparative advantage on economic growth. Also, in

China, Zhang et al. (2021) the transport infrastructure effectively influences economic growth and is essential for the government to formulate growth policies. Therefore, the relationship between trade openness, government expenditures and investment in infrastructure and economic growth have become, in recent years, the most important economic topics in both academic and policy circles from developed countries.

Further empirical studies in developing countries especially Nigeria sufficed the fact that trade openness does not determine economic growth, which indicated the absence of relative advantage due to lack of good environment and policies (Shayanewako, 2018). According to some scholars Babatunde (2018); Okolo et al. (2018) and Fauzel et al. (2015) that government expenditure and investment in infrastructure seems a waste of scarce resources. Ugochukwu et al. (2021) observed that government failure to efficiently and equitably allocate resources for social and infrastructural development are most of the reasons for government to be fully involved in the economy. Moreover, one of the instruments the government uses in regulating the economy is increasing spending to achieve macroeconomic objectives like infrastructure, employment, productivity and sustained economic development. Thus, following these empirical studies in Nigeria that uses theoretical analysis based on Heckscher-Ohlin theory, Cobb-Douglass production function, Adolf Wagner's law and Keynesian growth model (Babatunde, 2018; Okolo et al., 2018; Omoke & Opuala–Charles, 2021; Shayanewako, 2018).

Some argued that government expenditure determined economic growth, and some supported that trade openness was an essential instrument for achieving sustainable economic development. In contrast, others refuted the assertions that infrastructure development causes economic development. In addition, there is the possibility that Nigeria, with a good and efficient policy environment, will grow faster, regardless of the changes in factors of production (government expenditure and investment in infrastructure). Second, there is another possibility that in a suitable policy environment, trade openness will translate into a relative advantage. This research has revealed the relationship between trade openness, government expenditures, and infrastructure investment on economic growth in most cases. On some occasions, increasing government expenditures on human capital development will impact economic development, while in other cases, investment in infrastructure has affected trade openness. However, sometimes both government expenditures and investment in infrastructure have caused each other and support the bidirectional approach for trade openness.

Data And Methodology

Data description

The indicators of variables used in this research are GDP, TROP, GEEX and INIF. Details of their measurements and source are as tabulated in the following Table 1. The time period is from 1980–2020 (40 years). All data are on an annual basis and per cent.

Table 1
variables description

Data	construct	Measurement/proxy	source
Gross Domestic Product	GDP	Gross National Income per capita growth (% annual)	World Development Indicator
Trade Openness	TROP	Trade in services (%GDP) the sum of service exports and imports divided by the value of GDP	World Development Indicator
Government Education Expenditure	GEEX	Adjusted savings: education expenditure (% GNI)	World Development Indicator
Infrastructure Investment	INIF	Gross fix capital formation (% GDP)	World Development Indicator

Econometric methods

In an econometric analysis, the basic procedure ensures that all-time series data must be stationary. Accordingly, this research uses the Augmented Dickey-Fuller – ADF test, Phillips-Perron – PP test (Phillips & Perron, 1988) to check the stationarity of the data. The basic equation above, the ϵ_t assumes independently and identically distributed with zero mean and equal variance. If − 1 < β < 1, the process is stationary. While, if β =1, the equation represents a process that is a random walk with a drift. This process characterized the most economical time series data (Gebre-Mariam, 2011).

The ADF test should be on the following equation. The null hypothesis of the ADF test is H_0: θ = 0 (i.e. the data needs to be differenced to make it stationary) against the alternative hypothesis of H_1: θ < 0 (i.e. the data is stationary and doesn't need to be differenced).

$$\Delta \vartheta_t = \theta \vartheta_{t-1} + \alpha_1 \Delta \vartheta_{t-1} + \alpha_2 \Delta \vartheta_{t-2} + \cdots + \alpha_n \Delta \vartheta_{t-n} + \alpha_1 (4)$$

The PP test where Δ is the first difference operator, C is constant, ϵ_t a time trend and n_t is a stationary time series (Phillips & Perron, 1988). The null hypothesis is H_0: $k = 0$ (i.e. stationary) and the alternative hypothesis is $H_1 : k < 0$ (i.e. non-stationary). The test equation is as follows:

$$\Delta \phi_t = C + \epsilon_t + k\phi_{t-1} + n_t (5)$$

The Granger causality test developed by Engle et al. (1987) to examine the bivariate causal relationship, which indicates the short-run co-movements between GDP,TROP, GEEX and INIF as follows;

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + \ldots \alpha_n Y_{t-n} + \beta_1 X_{t-1} + \beta_2 X_{t-2} + \ldots \alpha_n X_{t-n} + \epsilon_t (6)$$

$$X_t = \alpha_0 + \alpha_1 X_{t-1} + \alpha_2 X_{t-2} + \cdots + \alpha_n X_{t-1} + \beta_1 Y_{t-2} + \cdots + \alpha_n Y_{t-n} + \epsilon_t (7)$$

$$t = 1,2..., m$$

In equations (6) and (7), *Y* represents GDP, and *X* represents TROP, GEEX and INIF respectively. $\alpha \text{and} \beta$ denotes the intercept and unknown parameters respectively. While, ϵ_t is an error term. The *F-statistics* (Wald statistics) test the joint hypothesis of $\beta_1 = \beta_2 = \cdots = \beta_n = 0$. This is performed in both equations (6) and (7).

The cointegration test assesses the evidence of the existence of the long-term relationship between GDP, TROP, GEEX and INIF. This research used the Engle-Granger cointegration test (Engle & Granger, 1987). The static model used to estimate the long-run relationship between GDP, TROP, GEEX and INIF is as follow;

$$Y_t = \alpha_0 + \beta X_t + \epsilon_t (8)$$

This research uses the diagnostic test for time series data stationary status. Secondly, bivariate cointegration and Granger-causality tests were employed to examine the variables' short- run and long-run relationships. Thus, the basic autoregressive process of order 1 (AR (1)) equation is written as;

$$\Delta GDP_t = \beta_0 + \beta_1 \Delta TROP_t + \beta_2 \Delta GEEX_t + \beta_3 \Delta INIF_t + \epsilon_t (9)$$

Where, ΔGDP_t is annual changes in per capita growth, β_0, β_1, $\beta_2 \text{and} \beta_3$ are the parameters, $\Delta TROP_t$ is the annual change in trade in services or sum of service exports and imports, $\Delta GEEX_t$ is the annual change in government education expenditure, $\Delta INIF_t$ is the annual change in gross fix capital formation and ϵ_t denotes error terms.

Findings

Stationary analysis

The summary for GDP, TROP, GEEX, and INIF in Table 2 reveals the calculated variables, it demonstrating that government education expenditure positively and significantly correlated with infrastructural development. Table 2 summarize the various statistics methods for stationary test based on ADF and PP tests, both data are stationary at level (i.e. GDP, TROP, GEEX and INIF). Thus, further analysis will be addressed on the level data.

Table 2
Unit root tests (ADF and PP)

At level	AIC	intercept	Trend & intercept	At first difference	AIC	intercept	Trend & intercept	Decision
GDP	1*	-2.697845	-2.203615		1***	-11.64287	-11.81330	I(1)
TROP	1***	-3.551838	-4.025956		1***	-6.537824	-6.340448	I(0) I(1)
GEEX	1***	-12.69190	-7.643991		1*	-2.154643	-2.163449	I(1)
INIF	1***	-3.026283	-1.458181		1***	-4.576338	-5.633611	I(0) I(1)
Unit root tests (PP)								
Bandwidth Bandwidth								
GDP	**2***	**-3.590266**	**-3.937709**		**5***	**-12.41355**	**-27.25797**	**I(0) I(1)**
TROP	1***	-3.698988	-4.025956		8***	-9.092670	-8.915600	I(0) I(1)
GEEX	2*	-1.427290	-1.256462		5***	-6.925321	-9.222012	I(1)
INIF	5***	-3.288743	-1.299594		2***	-4.522414	-5.407517	I(0) I(1)
Note: *** denotes significant at 95% confidence level								
Parenthesis indicates: lags. I(0) = at level, I(1) = first difference.								
Optimum lag selection is 1 (AIC) and Bandwidth automatically selected								

After the unit root test under Augmented Dickey-Puller (ADF) and the Philips Perron (PP) result estimates indicated variables are stationary at a level and first difference. Hence, under both unit root tests, variables are integrated of I(0) and I(1) with intercept and trend. This mixed and particular order of integrating the variables justifies applying the Johansen cointegration and Granger approach. However, as required by the technique developed by Pesaran et al. (1999); Pesaran (2008) and Im Pesaran et al. (2011) that, the results of the ADF and PP unit root tests should confirm no variable is I(2). The Akaike Information Criterion (AIC) has been used to determine the optimum lag length of the model. Therefore, the selected model is Johansen Cointegration, and the Granger causality model is one (1).

Johansen’s cointegration test

The Johansen cointegration existence offers a pathway to analyze the directional cause correlation between the estimated variables/indicators. The obtainable results of Table 3 presents Johansen cointegration test for possible long-run co-movement of GDP, TROP, GEEX, INIF as summarized.

Table 3: Johansen’s cointegration test

Unrestricted cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace statistic	0.05 Critical value	Prob.
None*	0.756753	90.63343	47.85613	0.0000
Almost 1*	0.441360	38.32731	29.79707	0.0041
Almost 2*	0.267228	16.78407	15.49471	0.0318
Almost 3*	0.132988	5.280012	3.841466	0.0216
Trace test indicates 4 cointegration eqn (s) at 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 No. of CE(s)	Eigenvalue	Max-Eigen statistics	0.05 Critical value	Prob.
None*	0.756753	52.30611	27.58434	0.0000
Almost 1*	0.441360	21.54325	21.13162	0.0438
Almost 2	0.267228	11.50406	14.26460	0.1307
Almost 3*	0.132988	5.280012	3.841466	0.0216
Max-eigenvalue test indicates 3 cointegration eqn (s) at 0.05 level. * denotes rejection of the hypothesis at the 0.05 level. **Mackinnon-Haug-Michelis (1999) p-values.				

The trace tests are more significant than the critical values, with p-values of 0.05%, . Statistically, this indicates that GDP, TROP, GEEX and INIF demonstrated a statistically significant long-run relationship. While, the max-eigenvalue tests revealed that GDP, TROP and INIF are more effective than the critical value with a p-value of 0.05%, . Consequently, the GEEX show a substantial value of greater than 0.05%, signifying an enormous relationship between the other variables/indicators. These significant results accept the null hypothesis, which indicates a cointegration association between variables/indicators at a 0.05% critical value.

Granger causality test

Table 4 summarizes the Granger causality test for observing the potential short-run relationship between GDP, TROP, GEEX and INIF. Therefore, it could be a unidirectional or bidirectional relationship. Since the probability is more significant than 0.05% for both causality tests, we cannot reject null hypotheses. First, the Granger causality test shows a short-run causality relationship between GDP, TROP and GEEX. In addition, the nature of the indicators/variables relationship is bidirectional and unidirectional. It means both cause each other in the short run. Further, the Granger causality indicated a significant unidirectional

causality between INIF and GDP. Secondly, the bidirectional relationship between TROP and GEEX moves together in the short run.

Table 4
Granger causality test

Null Hypothesis:	Obs	Lags	F-Statistic	Prob.	Causality direction
GDP does not Granger cause TROP	40	1	3.09810	0.0866	Unidirectional
TROP does not Granger cause GDP	40	1	0.21689	0.6441	Unidirectional
GDP does not Granger cause GEEX	40	1	0.03141	0.8603	Unidirectional
GEEX does not Granger cause GDP	40	1	3.71841	0.0615	Unidirectional
GDP does not Granger cause INIF	40	1	3.12394	0.0854	Unidirectional
INIF does not Granger cause GDP	40	1	7.91615	0.0078	Unidirectional
TROP does not Granger cause GEEX	40	1	10.5675	0.0025	Bidirectional
GEEX does not Granger cause TROP	40	1	8.34696	0.0064	Bidirectional
TROP does not Granger cause INIF	40	1	0.01023	0.9200	Unidirectional
INIF does not Granger cause TROP	40	1	4.61777	0.0383	Unidirectional
GEEX does not Granger cause INIF	40	1	0.32682	0.5710	Unidirectional
INIF does not Granger cause GEEX	40	1	4.52455	0.0401	Unidirectional
Source: compiled by author					

Discussion

Synthesis of the research findings to the referred theory and existing empirical evidence

The research employed annual time series data from 1980 to 2020 and a 40 total number of observations. This study investigated the significant influence of relative advantage of trade openness, inclusive infrastructural development and government expenditure or improving human capital development on economic growth in Nigeria both in the short-run and long-run perspectives. Thus, the results revealed a statistically significant relationship between the variables in the short-run and long-run, emphasizing the lack of relative advantage of the infrastructure and human capital development.

Moreover, according to the trade openness based on the comparative advantage led-growth theory, Richard emphasized the trade model driven by factor endowment. The Johansen cointegration tests correlated among the indicators/variables as factors endowment to drive productivity and economic development. Therefore, the country can benefit from trade openness when resources such as

government expenditures and infrastructure investment increase to affect the human effect on productivity. Secondly, the Granger causality advances the comparative advantage led-growth theory on factor endowment. It revealed a unidirectional relationship between trade openness, government expenditures and investment in infrastructure on economic growth. Also, as observed in the causality results, a bidirectional relationship between trade openness and government expenditures effectively influences comparative advantage in the sense of productivity and development in the country.

In addition, the findings are online with Wafure (2010) and Ngouhouo et al. (2021) that foreign or domestic trade significantly influences economic growth. Nevertheless, human capital development that Gohou (2012) found ambiguous in some African countries became significant in the developing region and became impactful on Nigerian economic growth. According to Osakwe's (2018) findings and Magazzino et al. (2021), there is a relationship between infrastructure and trade openness on economic growth, unidirectional even in Nigeria. More so, government expenditure has a significant effect, and Granger causes economic growth that coincides with the present study finding in Nigeria as unidirectional.

On the other hand, the results also support the relationship between trade openness, government expenditure and investment infrastructure on economic growth for relative advantage. The trace cointegration between trade openness, government expenditure, investment infrastructure and economic development. While the maximum eigenvalue has a cointegration between trade openness and investment infrastructure on economic growth. There is a unidirectional Granger causality between investment infrastructure and economic growth in Nigeria. Moreover, these two variables are cointegrated in the long run. The results of this research are comparable to the earlier findings of Babatunde (2018) and Okolo et al. (2018) that spending on human capital development and infrastructure enhances growth with relative advantage.

Conclusion And Policy Implications

This research analyzes the Granger causality relationship between trade openness, government expenditure, and investment infrastructure on economic growth for Nigeria. The study also aims to test the views of Ricardo’s theory for comparative advantage and put it into practice. The investigation concluded that infrastructure and government education expenditure or human capital development has a relative advantage in supporting trade openness in the economic growth of Nigeria. Meanwhile, trade openness is strategically dynamic for economic diversification. It supports the neoclassical elementary theory regarding the impact of trade openness as an exogenous factor of economic growth. It improves skills acquisition to ensure a sustainable flow of trade and productivity on economic growth in Nigeria. Hence, the novelty of this research finding that government expenditure does not affect economic growth in the short-run, but trade openness and government expenditure do so. The policy implication concerning trade openness, human capital, and infrastructural development are necessary macroeconomic tools to boost and ensure sustainable economic growth in Nigeria. The government should consider trade

diversification inclusive of infrastructure based on the relative advantage or government education expenditure towards and beyond 2030.

Declarations

Conflicts of interest

Authors mention that there is no conflict of interest in this study.

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Figures

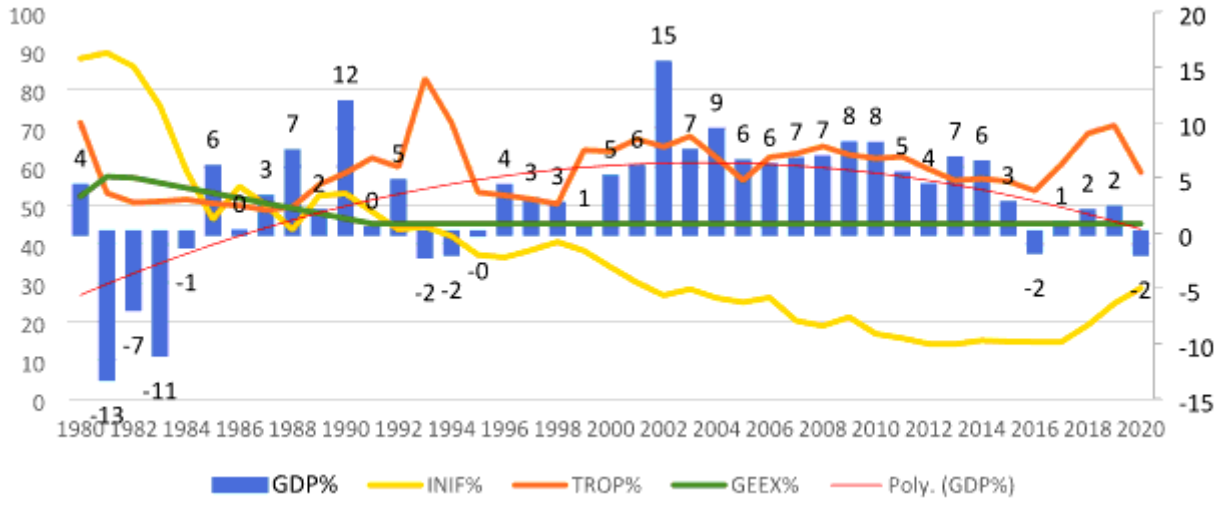

Figure 1

Relationship between trade openness, government expenditure, infrastructure development and economic growth: 1980-2020. Left scale is for INIF%, and the right scale is for GDP%, TROP% and GREEX%.

Source: World Development Indicator (2020)