"The Impact of Trade Openness on Sectoral Performance in Nigeria: Insights for Sustainable Economic Growth"

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ABSTRACT

Understanding the relationship between trade openness and economic performance is crucial, particularly for emerging economies like Nigeria. This study examines the sector-specific impacts of trade openness on Nigeria's economic output using quarterly data from 1981 to 2022. Employing the Autoregressive Distributed Lag (ARDL) bounds co-integration approach and Granger causality tests, the analysis reveals that trade openness significantly enhances output performance in the industrial and service sectors, while its impact on the agricultural sector is negligible. These findings highlight the varying effects of trade openness across sectors and underscore the need for tailored economic strategies. To maximize the benefits of trade openness, policymakers are encouraged to adopt sector-specific interventions, such as fostering industrial growth and enhancing service sector competitiveness. Concurrently, addressing structural challenges in agriculture and promoting investment in this sector are essential to boost its productivity and contribution to economic performance. This study enriches the existing literature by providing empirical evidence on the differentiated impacts of trade openness across sectors in Nigeria, offering actionable insights for sustainable development strategies in emerging economies.

Keywords: Agricultural sector, Industrial Sector, Service Sector, Economic performance, Emerging economies, Output performance, Trade openness.

INTRODUCTION

In the ever-evolving world of global economics, the distinction between developed and developing nations is often drawn along the lines of their Gross National Income (GNI). According to the World Bank (2019), nations with a GNI per capita exceeding US$12,535 are classified as affluent, while those falling below this benchmark grapple with developmental challenges that shape their economic trajectories. For emerging economies like Nigeria, this classification belies the vital role of key sectors such as agriculture, industry, and services, which not only sustain livelihoods but also drive international trade and economic growth.

The Central Bank of Nigeria (CBN, 2021) classifies the nation’s economic activities into three primary sectors: agriculture, industry, and services. This classification reflects the diverse nature of Nigeria’s economy, where agriculture remains essential, the industrial sector contributes approximately 22% to GDP, and the service sector exhibits steady growth. However, despite the recognized potential of these sectors, the complexities of trade liberalization and its sector-specific impacts remain underexplored.

Trade openness, measured by the ratio of exports and imports to GDP, is widely regarded as a catalyst for economic growth. It facilitates the cross-border exchange of goods and services, drives technological spillovers, and promotes competitiveness (Keho, 2019). "Despite the recognized potential of trade openness to foster economic growth, its effects on sector-specific performance, especially in developing economies like Nigeria,

remain inadequately explored. While industrial and service sectors are seen to benefit from trade liberalization, the agricultural sector often faces challenges, including high trade costs and inadequate technological integration. Furthermore, conflicting evidence in the literature necessitates a comprehensive investigation to guide sector-specific policy formulation."

Theoretical frameworks, such as the Export-Led Growth Hypothesis and Import-Led Growth Hypothesis, emphasize the significant role of trade in fostering economic development (Hye & Lau, 2019). Yet, the precise mechanisms through which trade openness affects individual sectors of Nigeria's economy, particularly agriculture, industry, and services, are insufficiently examined, leaving a critical gap in understanding the nuances of these relationships.

Nigeria's economic landscape presents unique challenges that complicate the evaluation of trade openness' impact. These include fluctuating exchange rates, high shipping costs, and inadequate infrastructure—all of which influence trade costs and sectoral performance. Current research offers mixed findings: some studies highlight the benefits of trade liberalization, while others reveal adverse effects on specific industries. This divergence of views necessitates a deeper investigation into the interplay between trade openness and sectoral outcomes.

This study aims to bridge this gap by conducting a comprehensive analysis of the relationship between trade openness and the performance of Nigeria's agricultural, industrial, and service sectors. By integrating theoretical perspectives and empirical evidence, the research seeks to unravel the complexities of these interactions and provide actionable insights for policymakers. The ultimate objective is to inform trade policies that enhance sustainable development and drive sectoral growth in Nigeria’s dynamic economic environment.

Problem statement

Trade openness is widely acknowledged as a cornerstone of economic progress, enabling countries to harness global markets for growth. However, the specific sectoral effects of trade openness, particularly in developing economies like Nigeria, remain underexplored. While existing literature underscores the general advantages of trade liberalization, there is a dearth of empirical studies that dissect its varying impacts on agriculture, industry, and services. This gap is especially pronounced in the context of Nigeria’s evolving economic and trade dynamics.

Nigeria’s economy is uniquely characterized by challenges such as volatile shipping costs, fluctuating exchange rates, and insufficient infrastructure. These factors significantly influence the cost of trade and the efficiency of sectoral operations. Despite the critical role of trade openness in driving growth, its interactions with these challenges have not been comprehensively analyzed. Furthermore, the literature presents conflicting evidence, with some studies demonstrating positive effects of trade liberalization, while others highlight its adverse impacts on specific sectors. These contradictions point to a need for further inquiry to unravel the complexities of trade policy and its implications for sustainable economic growth.

This study addresses this gap by investigating the sector-specific effects of trade openness on Nigeria’s economy. Utilizing the Central Bank of Nigeria’s classification of economic activities, the research aims to provide nuanced insights that can guide policymakers in optimizing trade policies for enhanced sectoral performance and sustainable development.

Aims of the study

The main objective of this study is to investigate the sectoral impacts of trade openness in Nigeria. Specifically, the study aims to:

1. Evaluate the influence of trade openness on agricultural productivity and identify barriers to maximizing benefits.
2. Examine how trade openness supports industrial growth amid infrastructural deficits.
3. Analyze the role of trade openness in driving service sector advancements through globalization.

"**Hypotheses Generation**

Hypothesis one

H_0: There is no significant relationship between trade openness (TOP) and the performance of the agricultural sector (AGDP).

The study investigated the relationship between trade openness and the performance of the agricultural sector in Nigeria. Trade openness was measured by the ratio of total exports and imports to GDP, while agricultural sector performance was captured through its contribution to GDP (AGDP). The agricultural sector, being a key component of Nigeria's economy, has traditionally played a crucial role in employment generation and foreign exchange earnings. However, the sector's reliance on primary commodity exports and limited access to modern farming technologies presented challenges in fully leveraging trade liberalization. The research assessed whether trade openness positively or negatively influenced agricultural output, particularly in light of recent policies and economic reforms.

Hypothesis Two

H_0: There is no significant relationship between trade openness (TOP) and the performance of the industrial sector (IGDP).

The study analyzed the impact of trade openness on the industrial sector, with a focus on its contribution to GDP (IGDP). The industrial sector, which includes manufacturing, mining, and construction, has been a cornerstone of Nigeria's diversification efforts. Despite persistent infrastructural deficits and high operational costs, the sector has shown resilience, contributing to exports through products like cement and processed foods. Trade openness was evaluated as a potential driver of industrial growth, particularly through the importation of machinery and technology. The study explored whether the liberalization of trade facilitated increased industrial output or exacerbated existing challenges, such as competition from imported goods.

Hypothesis Three:

H_0There is no significant relationship between trade openness (TOP) and the performance of the service sector (SGDP).

The research examined the influence of trade openness on the performance of the service sector, which has become an increasingly significant contributor to Nigeria's GDP (SGDP). The service sector encompasses finance, telecommunications, and other professional services, which have benefited from globalization and advancements in technology. The study assessed whether trade openness enhanced the sector’s growth by promoting foreign investment and technological spillovers or whether it exposed the sector to vulnerabilities such as over-reliance on external inputs. The analysis considered how Nigeria's policies and global trade trends shaped the performance of this dynamic and fast-evolving sector.

Concept Review

Trade Openness:

Trade openness, quantified by the ratio of exports plus imports to GDP, is a pivotal metric facilitating economic growth by enabling the movement of goods and services across borders (Keho, 2019). It is a fundamental aspect of global economics, influencing the development trajectories of nations. Import and export rates, as integral components of trade openness, directly reflect a country's engagement in international trade activities. However, their precise impact on agricultural economies like Nigeria remains underexplored, particularly concerning recent economic dynamics and statistical trends.

Economic Performance in Nigeria:

Nigeria's economic performance is multifaceted, encompassing various sectors such as agriculture, industry, and

services. Each sector plays a distinct role in the country's GDP composition and employment generation. Import and export rates directly influence the performance of these sectors by affecting trade volumes, revenue generation, and competitiveness in international markets (World Bank, 2019). The Central Bank of Nigeria (CBN) further classifies economic activities into three primary sectors: agricultural, industrial, and service (CBN, 2021). Understanding the interplay between trade openness, shipping rates, import/export rates, and economic performance across these sectors is crucial for formulating effective policy interventions aimed at fostering sustainable development.

Theoretical Review

This study utilizes three principal theoretical frameworks to support its investigation of the correlation between trade openness and sectoral performance in Nigeria:

Export-Led Growth (ELG) Theory

The Export-Led Growth (ELG) theory, which emerged in the 1970s, asserts that economic growth can be expedited by enhancing exports. Accessing broader markets enables governments to leverage economies of scale and attract foreign investments, hence promoting industrialization and technical progress. This theory is pertinent to the current study as it elucidates the manner in which trade openness might stimulate growth in Nigeria's industrial and service sectors. Nonetheless, its constraints such as excessive dependence on external markets may elucidate the reasons behind the agriculture sector's ongoing difficulties under liberalized trade policy.

Endogenous Growth Theory

Endogenous Growth Theory, proposed in the 1980s by economists like Paul Romer and Robert Lucas, highlights the significance of internal variables such as innovation, human capital development, and technology transfer in stimulating economic growth. Trade openness promotes the transfer of technology and information internationally, improving industry efficiency and production. This thesis posits that Nigeria's industrial and service sectors gain from trade liberalization, whilst its agriculture sector suffers from insufficient human capital and innovation.

Theory of Comparative Advantage

The Comparative Advantage Theory as formulated by David Ricardo in 1817, posits that nations ought to specialize in the production of products in which they possess a relative efficiency advantage. Trade openness allows Nigeria to concentrate on industrial commodities and services that possess greater global competitiveness. Nonetheless, the theory underscores structural obstacles, like Nigeria’s agriculture sector's ineffectiveness in competing in global markets owing to infrastructural inadequacies and elevated trade expenses. This study employs this theory to examine the differential effects of Nigeria's trade policy on its diverse industries.

These theories collectively offer a framework for comprehending the dynamics of trade openness in Nigeria. The ELG hypothesis corresponds with the study's aim of investigating the effects of export-driven growth on the industrial and service sectors. Endogenous Growth Theory elucidates the significance of technology transfer and human capital in enhancing sectoral performance. Simultaneously, Comparative Advantage Theory underscores the structural difficulties in agriculture, stressing the necessity for specialized strategies to improve competitiveness. By grounding the analysis in these theoretical frameworks, the study offers a detailed comprehension of the disparate impacts of trade openness on Nigeria's economic sectors.

Empirical Review

The relationship between trade openness and economic growth has been a subject of extensive investigation across various regions and economic contexts. Existing literature emphasizes the multifaceted impacts of trade openness, influenced by factors such as sectoral composition, human capital, technological adoption, and foreign direct investment (FDI). This review synthesizes notable studies, highlighting their methodologies, findings, and implications, with a particular focus on Nigeria.

Several studies underscore the positive relationship between trade openness and economic growth. For instance, Sghaier (2021) analyzed North African countries, revealing that trade openness complements financial development, fostering sustainable economic growth through technology transfer. Similarly, Dahmani, Mabrouki, and Youssef (2022) emphasized the role of information and communication technologies (ICT) and trade openness as drivers of long-term growth in Tunisia, with significant contributions from gross fixed capital formation.

Conversely, trade openness does not always yield uniform benefits. Fatima et al. (2020) demonstrated that in economies with low human capital, trade openness could negatively affect GDP growth. This finding aligns with Hussein et al. (2023), who observed that trade openness had adverse long-term effects on Somalia's economic growth, suggesting the need for policy interventions to mitigate these impacts.

In the Nigerian context, trade openness exhibits complex dynamics. Abdulkarim (2023) identified a negative impact of oil exports and imports on economic growth, while non-oil imports supported long-term inclusive growth by facilitating access to foreign innovations. The findings also highlighted causal relationships between trade measures, domestic capital formation, and economic growth. Onifade et al. (2020) further explored trade's impact on Nigeria's unemployment, finding significant yet contrasting effects of trade openness and domestic investment on unemployment, stressing the importance of stimulating investment to mitigate the unemployment crisis.

Adewuyi and Oye (2022) examined the asymmetric effects of trade openness on sectoral growth in Nigeria using non-linear autoregressive distributed lag (NARDL) models. Their findings revealed that while trade openness positively impacts the service and industrial sectors in the long term, its effect on agriculture remains minimal, exacerbated by infrastructural deficiencies and low technological adoption in the sector.

Babatunde and Oyewole (2021) analyzed the relationship between trade openness, exchange rate volatility, and economic growth in Nigeria. Employing a vector error correction model (VECM), the study identified exchange rate volatility as a significant impediment to the growth benefits of trade openness, particularly for non-oil exports. The study recommended stabilizing exchange rates and diversifying export structures to maximize trade benefits.

Oluwaseun et al. (2022) explored the impact of trade liberalization on manufacturing performance in Nigeria, utilizing panel data regression techniques. The study revealed a positive relationship between trade liberalization and manufacturing output, driven primarily by improved access to imported intermediate goods. However, it cautioned against the over-dependence on imports, emphasizing the need for local industrial development policies.

Adebayo et al. (2023) investigated the relationship between trade openness and foreign direct investment (FDI) inflows in Nigeria, focusing on sectoral variations. The findings showed that trade openness significantly attracted FDI into the service and industrial sectors while having a negligible impact on agriculture. The study highlighted the importance of creating enabling environments for agricultural investments to balance sectoral growth.

Bello and Afolabi (2023) assessed the impact of trade openness on employment generation in Nigeria, using time-series data from 1985 to 2020. The results indicated that while trade openness contributed to job creation in the industrial and service sectors, it led to job losses in agriculture due to increased competition from imported agricultural products. The study emphasized the need for protective measures to safeguard local farmers and promote agricultural productivity.

Ogundipe et al. (2022) employed a dynamic stochastic general equilibrium (DSGE) model to investigate the macroeconomic effects of trade openness in Nigeria. Their findings showed that trade openness, coupled with fiscal discipline, enhances economic stability and long-term growth. However, the study cautioned that excessive reliance on oil exports exposes the economy to external shocks.

Regional studies reinforce these complexities. Sunde et al. (2023) found that in Namibia, imports negatively affected growth, whereas exports and trade openness had positive impacts. These findings support the

mercantilist perspective, emphasizing the role of export-led growth in economic development.

Moreover, trade openness often interacts with broader structural reforms. Rehman and Islam (2022) demonstrated that financial market reforms, alongside trade openness, significantly drive productivity growth in BRICS countries. Their findings emphasize the importance of financial infrastructure and innovation as complementary factors in achieving sustainable economic progress.

This synthesis highlights the varying outcomes of trade openness on economic growth, shaped by factors such as financial development, human capital, sectoral dynamics, and regional contexts. In the Nigerian context, the interplay between trade openness, sectoral performance, and macroeconomic stability underscores the need for targeted policies to optimize its benefits and mitigate associated challenges.

METHOD

Data, source sample, and justification.

The study utilized quarterly time series data spanning from 1981 to 2022, totaling 42 years, to conduct its empirical analysis. These datasets encompassed the contributions of the agricultural, industrial, and service sectors to GDP, serving as measures for output performance, as well as data on trade openness, exchange rates, and inflation rates. The data for these variables were extracted from the online Central Bank of Nigeria (CBN) Statistical Bulletin (2022) and the World Development Indicators (WDI, 2022). In summary, the study's empirical analysis relied on secondary data from reputable sources to investigate the relationships between various economic indicators.

Variables Measurement and Definition

In examining the nexus between trade openness and the output performance of the activity sectors in Nigeria, the response variables include the output performances of agricultural, industrial and service sectors (measured by their contributions to real GDP). Meanwhile, the core independent variable includes “trade openness”. Moreover, the inflation rate and exchange rate were employed as a control variable to prevent any possible estimation and specification biases.

Table 1 - Variable Description Summary

Dependent Variable:	Proxy/Measure	Definition	Source
Output performance			
(a)Agricultural sector performance	Contribution to Real GDP (*AGDP*)	Measure the aggregate value market of agricultural produce at constant prices involving crop production, forestry, livestock and fishing.	CBN Statistical Bulletin (2023)
(b) Industrial sector performance	Contribution to Real GDP (*IGDP*)	Measure the aggregate value market of industrial products at constant prices involving mining, manufacturing, energy and construction.	CBN Statistical Bulletin (2023)
(c) Service sector performance	Contribution to Real GDP (*SGDP*)	Measure the aggregate value market of services at constant prices involving financial institution, trade, information and communication, real estate, entertainment and education, among others.	CBN Statistical Bulletin (2023)
Independent Variable:	Proxy/Measure	Definition	

Trade openness (*TOP*)	Proportion of the sum of import and export to GDP	Measures the extent of an economy's engagement in cross-border trading.	CBN Statistical Bulletin (2023)
Control Variable	Proxy/Measure	Definition	
Inflation Rate (*INF*)	Consumer price index (CPI)	Measure the proportionate changes in general level of price.	WDI (2022)
Exchange rate	Naira/US Dollar exchange rate	The part of government revenue realized from the sales of crude oil based on the prevailing international market price.	CBN Statistical Bulletin (2023)

Source: Researcher's compilation (2024)

Data Analysis Techniques

Following the study's empirical data structure, the study employs the time series data methodology. Thus, empirical data analysis phases sequentially include preliminary analysis, model estimation stage and post diagnostic tests.

Preliminary Analysis

Descriptive analysis, tests for unit roots, and co-integration tests are all included in the preliminary study. The summary statistics of the variables under investigation, such as mean, skewness, kurtosis, and Jarque-Bera statistic, are provided by the descriptive analysis. The pre-estimation tests needed to check for stationarity and linear combinations of the variables under investigation, respectively, are the unit root test and the cointegration test. The "Augmented Dickey Fuller (ADF)" test is used in the unit root test to evaluate the order in which the variables are integrated. Following the findings of the unit root test, the single-equation testing methods of Engle-Granger (EG) cointegration tests were used to determine whether or not the long-run relationships among the variables existed. The Engle-Granger (EG) is a parametric version of the augmented Dickey-Fuller (ADF) methodology.

Estimation Methods

Following the pre-estimation tests, the study employed time series long-run or cointegrating fully efficient estimation methods. The cointegrating estimation methods include: "Fully Modified Ordinary Least Squares, FMOLS (Phillips & Hansen, 1992), Dynamic Ordinary Least Squares, DOLS (Saikkonen 1992; Stock & Watson 1993) and Canonical Cointegrating Regression, CCR (Park 1992)". The aforementioned estimation methods are fully efficient estimation procedure applicable to models with $I(1)$ series as well as having the existence of linear combination among the variables. Meanwhile, the choice among the three competing estimation methods is based on their adjusted R-squared values. Thus, method with largest R-squared value is selected in conducting the inferential analysis.

Post Estimation Diagnostics

To evaluate the validity of the given model, post estimation tests, such as the serial correlation test (using the Ljung-Box Q-statistic) and normality test (using the Jarque-Bera statistic), were carried out.

Model Specification

By the study's objectives, output performances of agricultural, industrial and service sectors (measured by their contributions to real GDP) are the response variables for each of the models while the core explanatory variable is trade openness. Meanwhile, inflation rate and exchange rate are taken as control variables. Thus, the model's functional form is defined as follows:

Agricultural Sector (GDPA) Model

$$AGDP_t = f(TOP_t, INF_t, EXCR_t) \quad (3.1)$$

Industrial Sector (GDPS) Model

$$IGDP_t = f(TOP_t, INF_t, EXCR_t) \quad (3.2)$$

Service Sector (SGDP) Model

$$SGDP_t = f(TOP_t, INF_t, EXCR_t) \quad (3.3)$$

Where

GDPA = contribution of agricultural sector to real GDP
GDPI = contribution of industrial sector to real GDP
GDPS = contribution of service sector to real GDP
GDP = contribution of overall sector to real GDP
INF = inflation rate
EXCR = exchange rate

The long-run relationships are specified as follows

Agricultural Sector (GDPA) Model

$$GDPA_t = \lambda_0 + \lambda_1 TOP_t + \lambda_2 INF_t + \lambda_3 EXCR_t + \varepsilon_{t1} \quad (3.4)$$

Industrial Sector (IGDP) Model

$$GDPI_t = \beta_0 + \beta_1 TOP_t + \beta_2 INF_t + \beta_3 EXCR_t + \varepsilon_{t2} \quad (3.5)$$

Service Sector (SGDP) Model

$$GDPI_t = \delta_0 + \delta_1 TOP_t + \delta_2 INF_t + \delta_3 EXCR_t + \varepsilon_{t3} \quad (3.6)$$

The *a priori* expectation

The *a priori* expectations are defined as follows:

$$\lambda_1 > 0, \lambda_3 >< 0, \lambda_2 >< 0$$

$$\beta_1 > 0, \beta_3 >< 0, \beta_2 >< 0$$

$$\delta_1 > 0, \delta_3 >< 0, \delta_2 >< 0$$

The above statements suggest that trade openness is expected have positive effect on the activity sectors' output performance. Meanwhile, inflation may exact positive or negative impact on performance depending on the prevailing market or economic conditions.

Estimation and Results

Descriptive Statistics

The empirical data for the study are statistically summarised and presented in this section. The variables under investigation include contribution of agricultural sector to GDP (*GDPA*), contribution of industrial sector to GDP (*GDPI*), contribution of service sector to real GDP (*GDPS*), trade openness index (*TOP*), exchange rate (*EXCR*) and inflation (*INF*).

Table 2-: Summary Statistics

Realization-: 1981 – 2022

Statistics	**Variable**					
	GDPA	**GDPI**	**GDPS**	**TOP**	**EXCR**	**INF**
Obs.	48	48	48	48	48	48
Mean	8725.96	12263.74	17600.05	0.198	115.74	18.948
Maximum	19091.07	16742.15	41352.81	0.728	425.98	72.840
Minimum	2303.51	8255.760	5352.556	0.0009	0.610	5.390
Std. Dev.	5866.176	2491.224	12736.29	0.198	119.141	16.455
Skewness	0.4603	0.0868	0.6270	0.7636	1.0214	1.8772
Kurtosis	1.6462	1.7966	1.7145	2.6265	3.2213	5.4377
Jarque-Bera	4.6904	2.5871	5.6434	4.3253	7.3879	35.067
p-value	0.0958	0.2743	0.0595	0.1150	0.0249	0.0000

Source: Research's computation (2024)

The statistical description of the variables under investigation are shown in Table 2 With the exception of *EXCR*, it could be observed that the standard deviations (which indicate the variability measure) of other variables are less than the respective averages. The foregoing implies that there is moderate variability in the variables for the chosen realization, and thus, the variables are likely to demonstrate high predictive power. However, *EXCR* may have low predictive power having its standard deviation above the mean value. Meanwhile, *GDPS* (contribution of the service sector to GDP) appears to have the largest average contribution to GDP among the three sectors while the least contribution arose from the agricultural sector. Following the skewness coefficients, all the variables appear to be positively skewed (large right-tail). The foregoing suggests that the clusters of large observations are wider the clusters of small observations. *GDPA*, *GDPI*, *GDPS* and *TOP* "appear to have flat-topped distributions (platykurtic) relative to the normal distribution with kurtosis coefficients" below the moment distribution's threshold of 3. However, *EXCR* and *INF* appear to peaked having kurtosis coefficients above the threshold of 3 for normality. More importantly, all the core variables appear to have normality having insignificant Jarque-Bera statistics with the respective *p*-values above to 0.05 level of significance. Thus, all the output performance variables as well as trade openness meet the normality assumption.

Pre-Estimation Tests

Unit Root Tests

The unit root test was carried out before the model estimation to determine the stationarity status of the variables under study. Thus, the Augmented Dickey-Fuller (ADF) test was employed to examine the stationarity conditions of the variables.

Table 3-: Unit Root Test Results

Realization: 1981 – 2022

Level Form							
Specification		**TOP**	**GDPA**	**GDPI**	**GDPS**	**EXCR**	**INF**
Constant	t-Stat.	1.2220	1.8740	-0.7985	1.0036	2.8640	-1.0505

	p-value	**0.9978**	**0.9997**	**0.8090**	**0.9959**	**1.0000**	**0.0385**
Constant & Trend	t-Stat.	-1.3912	-2.0240	-1.5182	-1.7189	0.0981	-1.1299
	p-value	**0.8488**	**0.5712**	**0.0506**	**0.7242**	**0.9962**	**0.0121**
Constant & Trend	t-Stat.	2.4645	5.7920	0.3367	2.1366	4.7193	-1.3184
	p-value	**0.9960**	**1.0000**	**0.7779**	**0.9911**	**1.0000**	**0.0534**
First Difference Form							
		Δ(TOP)	Δ(GDPA)	Δ(GDPI)	Δ(GDPS)	Δ(EXCR)	Δ(INF)
Constant	t-Stat.	-5.1927***	-5.0289***	-5.3570***	-2.6339*	-4.2120***	-6.6370***
	p-value	**0.0001**	**0.0002**	**0.0001**	**0.0948**	**0.0019**	**0.0000**
Constant & Trend	t-Stat.	-5.5596***	-5.5972***	-5.2134***	-6.0000***	-4.9358***	-6.5376***
	p-value	**0.0002**	**0.0002**	**0.0007**	**0.0001**	**0.0014**	**0.0000**
Constant & Trend	t-Stat.	-4.6670***	-1.9187*	-5.3367***	-1.6307***	-3.4674***	-6.7278***
	p-value	**0.0000**	**0.0534**	**0.0000**	**0.0964**	**0.0010**	**0.0000**
I(d)		I (1)	I(1)	I (1)	I (1)	I(1)	I (1)

Source: Research's computation (2024)

*Note: ***, ** & * denote statistical significance at 1%, 5% and 10% respectively.* Δ = first difference operator.

Employing ADF unit root testing approach, the results of the unit root test are shown in Table 3. It could be witnessed that all the variables in question appear to be integrated of order one *i.e.* they follow *I(1)* processes. This shows that first differencing technique was utilized in order for the series to become stationary. As a result, the variables' consistent orders of integration, of I(1), attracts the use of a co-integration test to determine whether or not there is a long-term relationship among the variables. Thus, each model being investigated incorporate non-stationary variables. Besides, impulses to the variables may be perpetual having non-stationary conditions.

Cointegration Test

It is essential to test for the possibility of the existence of linear combinations or long-term relationships among the variables following the unit root test results. Thus, a single-equation co-integration test method such as the "Engle-Granger (EG) co-integration testing methods" was employed since the variables in question have the same I (1) order of integration. The EG cointegration test was applied to each of the four competing models.

Table 4-: Engle-Granger (EG) Co-Integration Test Results

Realization-: 1981 – 2022

Model	**Test Type**	**tau-Stat.**	**p-value**	**z-stat.**	**p-value**
GDPA	Engle-Granger	-4.2170	0.0695	-35.9999	0.0021
GDPI	Engle-Granger	-4.1315	0.0888	-504.991	0.0038
GDPS	Engle-Granger	-4.1630	0.0837	-35.7920	0.0026

Source: Research's computation (2024)

The results of the co-integration test conducted using the Engle-Granger (EG) co-integration testing techniques

are shown in Table 4. Thus, significant test results are shown by both the tau-statistics and the z-statistics for all the competing models, with the corresponding *p*-values below 0.01 level of significance. The foregoing implies that the variables in each of the models appear to have linear combinations or long-run relationships. In other words, each model does not incorporate spurious relationships.

Model Estimation

Having attained the long-run relationship among the variables being investigated, the study utilizes the cointegrating regression estimation methods which include: canonical cointegrating regression (CCR), fully-modified ordinary least squares (FMOLS), and dynamic ordinary least squares (DOLS). The choice of among the above-mentioned competing estimation methods depends on the adjusted R-squared values. The estimator with the highest adjusted R-squared value is taken as the most efficient estimation method. Besides, the double-log specification was adopted in the model estimation process such that natural log transformation was applied to both the dependent and independent variables in each of the three competing models such as GDPA (agricultural-sector) model, GDPI (industrial-sector) model and GDPS (service-sector) model. Therefore, the coefficients obtained are elasticity. The model estimation demonstrates the long-run relationships among the variables. The estimation results of the three competing models are shown in Tables 5.

Following the results displayed in Table 4, it could be observed that among the competing estimation methods, the dynamic ordinary least squares (DOLS) estimator is considered most acceptable method having the highest adjusted R-squared values for each of the competing models. Thus, the dynamic ordinary least squares (DOLS) estimation method is selected for each of the models.

Table 5-: Cointegration Regression Estimation Results

Sample Period: 1981 – 2022Q4

Estimation Method	**DOLS**	**DOLS**	**DOLS**
Response Variable	**GDP-A**	**GDP-I**	**AGD-S**
Independent Variable			
C	8.5443***(0.0005)	7.1841***(0.0000)	6.2126***(0.0000)
Ln (TOP)	-0.0233(0.9357)	0.2108***(0.0000)	0.2373***(0.0014)
Ln (INF)	-0.2887(0.3099)	0.0574**(0.0342)	-0.0162(0.7485)
Ln (EXR)	0.3142(0.3265)	0.0219(0.5427)	-0.4023***(0.0000)
Further Statistics:			
Explanatory Power			
R-squared	0.8984	0.9560	0.9925
Adj. R-squared	0.8516	0.9304	0.9882
Overall Test			
F-statistics	12.1720***(0.0000)	14514.2***(0.0000)	12.9102***(0.0000)
Post Diagnostics Tests			
Serial Correlation Test:			
Q-Statistic (Ljung-Box)	13.499	4.4968	2.8873

	(0.1970)	(0.9220)	(0.7170)
Normality Test:			
Jarque-Bera Stat.	5.5945(0.0610)	2.0260(0.3632)	0.6184(0.7340)

Source: Researcher's computation (2024).

*Note: ***, & ** denote statistical significance at 0.01 and 0.*1 at levels. Meanwhile, values in parentheses are *p-values* of the respective coefficients and statistics. Ln = natural logarithm.

Individual Significance Tests

As shown in table 4.4, it could be observed that changes in trade openness index (*TOP*) exert negative and insignificant effect (λ_1 = -0.0233, p = 0.9357 > 0.1) on the output performance or contribution of agricultural sector to GDP (*GDPA*) in Nigeria. The numerical impact suggests that GDPA is TOP-inelastic having an elasticity coefficient below one. However, changes in trade openness index (*TOP*) exert positive and statistically significant effect on the output performance or contribution of industrial sector to GDP (*GDPI*, β_1 = 0.2108, p = 0.0000 < 0.01) and the output performance or contribution of service sector to GDP (*GDPS*, δ_1 = 0.2373, p = 0.0014 < 0.01). Evidently, the numerical impact suggests that GDPA GDPS are individually TOP-inelastic having elasticity coefficients less than one.

Meanwhile, changes in inflation rate (*INF*) impact negative and statistically insignificant effects on agricultural sector output performance (λ_2 = -0.2887, p = 0.3099 > 0.1) and the service sector output performance (δ_2 = -0.0162, p = 0.7485 > 0.1) while a positive and significant effect was witnessed in industrial sector (β_2 = 0.0574, p = 0.0342 < 0.05). Changes in exchange rate (*EXCR*) exert positive but statistically insignificant effects on agricultural sector output performance (λ_3 = 0.3142, p = 0.3265 > 0.1) and the industrial sector output performance (β_3 = 0.0219, p = 0.5427 > 0.1) while having a negative and significant effect on service sector output performance (δ_3 = 0.0574, p = 0.0342 < 0.05). Nevertheless, all sectors' output performances appear to be inelastic with respect to *INF* and *EXCR* having elasticity coefficients less than one.

Post Diagnostic Tests

The model diagnostic tests include serial correlation test and normality test. As revealed in Table 5, the insignificant results of the serial correlation test (using the Ljung-Box Q-statistic) and normality test (using Jarque-Bera statistic) of the selected DOLS estimation method for the estimation of three competing models (GDPA, GDPI and GDPS) suggest that the estimates obtained are efficient and valid for inferences and policy making.

Summary of Hypotheses Testing Results

A summary of the tests of significance of the estimated model is presented in Table 5 to reveal the tests of hypotheses result of the study.

Table 6-: Summary of Tests of Hypotheses Results

Trade openness and output performance in Nigeria			
	Null Hypothesis (H_0)	**Method**	**Stat. Sign.**
1	There is no significant effect of trade openness on the agricultural sector's output performance in Nigeria	DOLS	- Insignificant (p > 0.1)
2	There is no significant effect of trade openness on the industrial sector's output performance in Nigeria	DOLS	+ Significant (p < 0.01)
3	There is no significant effect of trade openness on the service sector's output performance in Nigeria	DOLS	+ Significant (p < 0.01)

Source: Researcher's compilation (2024).

DISCUSSION OF FINDINGS

This study investigates the nexus between trade openness and output performance of the Nigerian economy employing annual time series between 1981 and 2022. Considering the CBN's classification of activity sector, output performances (using contribution to GDP) of the agricultural, industrial and service sectors. Following the study's empirical analysis, it was observed output performance (contribution to GDP) of the industrial and service sectors responded positively and significantly to trade openness in Nigeria. that trade openness. The foregoing suggests that the extent of engagement of the Nigerian economy in a global or cross-border trading system tends to enhance the activities of the industrial and service sectors. However, trade openness appears to impact adversely but insignificantly on the agricultural sector output performance in Nigeria. Based on the foregoing, it appears that trade openness does not significantly promote the agricultural system in Nigeria. In other words, value trade openness is not an output performance-driven source or catalyst for the Nigerian agricultural sector.

CONCLUSION

This study investigated the relationship between trade openness and output performance of the Nigerian economy using annual time series data from 1981 to 2022. Analyzing the output performances of the agricultural, industrial, and service sectors based on the CBN's classification, it was found that trade openness had a significant positive effect on the industrial and service sectors' output performance in Nigeria. However, the study also revealed an adverse but insignificant impact of trade openness on the agricultural sector's output performance. These findings contribute to our understanding of the differential impacts of trade openness on various sectors of the economy.

RECOMMENDATIONS

For the agricultural sector, it is recommended that policymakers invest significantly in improving infrastructure, such as rural roads, irrigation systems, and storage facilities, to enhance market access and reduce trade costs. Introducing modern farming technologies and providing farmers with training and access to affordable credit will boost productivity and competitiveness. Government initiatives should also focus on creating subsidies for essential agricultural inputs and fostering value chain development to ensure that the sector benefits from trade openness.

In the industrial sector, the government should prioritize policies that promote export-oriented industrial growth and facilitate access to international markets through trade agreements and export incentives. Addressing infrastructural challenges, particularly in power supply and transportation, is critical to enhancing industrial productivity. Investments in research and development (R&D) and encouraging technology transfer through foreign direct investment (FDI) will further bolster industrial growth and diversify the sector's output, reducing dependency on specific industries.

For the service sector, strategies should focus on further liberalizing the sector to attract foreign investment and enhance technological innovation. Strengthening the regulatory framework will improve investor confidence and ensure fair competition within the sector. Capacity-building programs to train and upskill the workforce are essential for maintaining global standards in service delivery. Additionally, encouraging digital transformation and fostering partnerships with international organizations will create new opportunities for export-oriented service industries and enhance the sector's global integration.

CONTRIBUTION TO KNOWLEDGE

This study contributes to the existing body of knowledge by providing empirical evidence on the differential impacts of trade openness on Nigeria's economic sectors. It demonstrates that while trade openness significantly enhances the performance of the industrial and service sectors, its impact on the agricultural sector is negligible. This sector-specific analysis offers valuable insights into the nuanced relationship between trade liberalization and economic performance in emerging economies.

The research provides critical policy insights for emerging economies, emphasizing the importance of adopting tailored strategies to address sectoral disparities in the benefits of trade openness. By highlighting the need for targeted interventions, the study challenges the one-size-fits-all approach to trade policy and advocates for more context-specific solutions.

Integrating theoretical frameworks such as Export-Led Growth and Comparative Advantage with empirical evidence, the study offers a comprehensive understanding of trade openness in a developing country context. It underscores the structural barriers that impede the agricultural sector's ability to benefit from liberalized trade, contributing to the discourse on sustainable development strategies.

By employing a longitudinal analysis covering over four decades, this study provides a detailed temporal perspective on the effects of trade openness in Nigeria. This approach enriches the literature by offering insights into the long-term dynamics of trade policies and their sectoral impacts.

Finally, the study addresses critical structural challenges such as poor infrastructure and low technological adoption in agriculture, offering a roadmap for future research and policy development. It contributes to the ongoing dialogue on optimizing trade benefits while mitigating its challenges in emerging economies.

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APPENDIX I

A. All Unit Root Test Outputs

UNIT ROOT TEST RESULTS TABLE (ADF)							
Null Hypothesis: the variable has a unit root							
	At Level						
		TOP	GDPA	GDPI	GDPS	EXCR	INF
With Constant	t-Statistic	1.2220	1.8740	-0.7985	1.0036	2.8640	-1.0505
	Prob.	**0.9978**	**0.9997**	**0.8090**	**0.9959**	**1.0000**	**0.0385**
		n0	n0	n0	n0	n0	no
With Constant & Trend	t-Statistic	-1.3912	-2.0240	-1.5182	-1.7189	0.0981	-1.1299
	Prob.	**0.8488**	**0.5712**	**0.0506**	**0.7242**	**0.9962**	**0.0121**
		n0	n0	no	n0	n0	no
Without Constant & Trend	t-Statistic	2.4645	5.7920	0.3367	2.1366	4.7193	-1.3184

	Prob.	**0.9960**	**1.0000**	**0.7779**	**0.9911**	**1.0000**	**0.0534**
		n0	n0	n0	n0	n0	no
	At First Difference						
		d(TOP)	d(GDPA)	d(GDPI)	d(GDPS)	d(EXCR)	d(INF)
With Constant	t-Statistic	-5.1927	-5.0289	-5.3570	-2.6339	-4.2120	-6.6370
	Prob.	**0.0001**	**0.0002**	**0.0001**	**0.0948**	**0.0019**	**0.0000**
		***	***	***	*	***	***
With Constant & Trend	t-Statistic	-5.5596	-5.5972	-5.2134	-6.0000	-4.9358	-6.5376
	Prob.	**0.0002**	**0.0002**	**0.0007**	**0.0001**	**0.0014**	**0.0000**
		***	***	***	***	***	***
Without Constant & Trend	t-Statistic	-4.6670	-1.9187	-5.3367	-1.6307	-3.4674	-6.7278
	Prob.	**0.0000**	**0.0534**	**0.0000**	**0.0964**	**0.0010**	**0.0000**
		***	*	***	*	***	***
Notes:							
a: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1% and (no) Not Significant							
b: Lag Length based on SIC							
c: Probability based on MacKinnon (1996) one-sided p-values.							
This Result is The Out-Put of Program Has Developed By: **Dr. Imadeddin AlMosabbeh** **College of Business and Economics** **Qassim University-KSA**							

B. Single Equation Cointegration Test Outputs

1. GDPA Model

Date: 06/07/24 Time: 11:27				
Series: GDPA TOP EXCR INF				
Sample: 1981 2022				
Included observations: 42				
Null hypothesis: Series are not cointegrated				
Cointegrating equation deterministic: C				
Automatic lags specification based on Hannan-Quinn criterion (maxlag=2)				
Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
GDPA	-4.217013	0.0695	-35.99986	0.0021
TOP	-2.873115	0.5056	-17.14573	0.3096

EXCR	-1.492276	0.9610	-5.623065	0.9485	
INF	-1.805247	0.9161	-13.13254	0.5463	
*MacKinnon (1996) p-values.					

2. GDPI Model

Date: 06/07/24 Time: 11:37					
Series: GDPI TOP EXCR INF					
Sample: 1981 2022					
Included observations: 42					
Null hypothesis: Series are not cointegrated					
Cointegrating equation deterministic: C					
Additional regressor deterministic: @TREND					
Automatic lags specification based on t-statistic criterion (maxlag=5)					
Dependent	tau-statistic	Prob.*	z-statistic	Prob.*	
GDPI	-4.131501	0.0888	-34.68588	0.0038	
TOP	-3.668818	0.1988	-504.9907	0.0000	
EXCR	-2.590702	0.6712	-11.91360	0.6603	
INF	-1.971717	0.8986	-15.05824	0.4516	
*MacKinnon (1996) p-values.					

3. GDPS Model

Date: 06/07/24 Time: 11:39					
Series: GDPS TOP EXCR INF					
Sample: 1981 2022					
Included observations: 42					
Null hypothesis: Series are not cointegrated					
Cointegrating equation deterministic: C					
Additional regressor deterministic: @TREND					
Automatic lags specification based on t-statistic criterion (maxlag=3)					
Dependent	tau-statistic	Prob.*	z-statistic	Prob.*	
GDPS	-4.163009	0.0837	-35.79196	0.0026	
TOP	-3.185159	0.3847	-83.62207	0.0000	
EXCR	-2.363500	0.7724	-26.51287	0.0418	

INF	-1.991420	0.8938	-12.43132	0.6240	
*MacKinnon (1996) p-values.					

C. Estimation Outputs

1. Cointegrating Estimation Outputs for GDPA Model

Fully-modified Ordinary Least Squares (FMOLS) Estimation Outputs

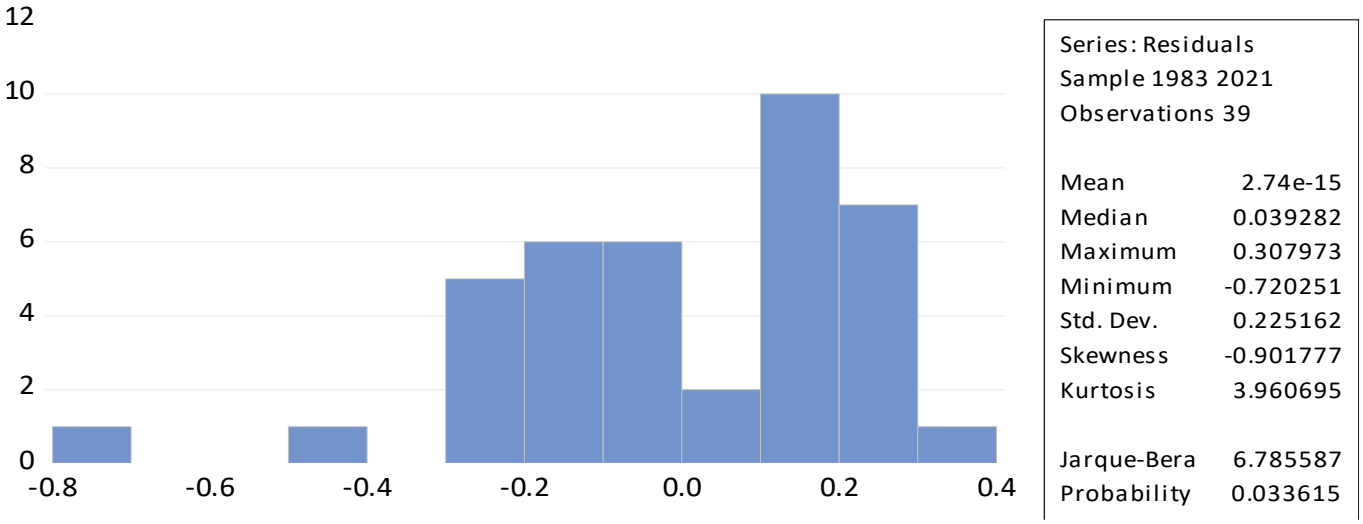
Dependent Variable: LOG(GDPA)				
Method: Fully Modified Least Squares (FMOLS)				
Date: 06/06/24 Time: 20:06				
Sample (adjusted): 1982 2022				
Included observations: 41 after adjustments				
Cointegrating equation deterministic: C				
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TOP)	0.107792	0.158895	0.678385	0.5017
LOG(INF)	-0.164088	0.121145	-1.354472	0.1838
LOG(EXCR)	0.206256	0.177931	1.159189	0.2538
C	8.879437	1.114351	7.968259	0.0000
R-squared	0.836913	Mean dependent var		8.849842
Adjusted R-squared	0.823690	S.D. dependent var		0.726294
S.E. of regression	0.304965	Sum squared resid		3.441146
Long-run variance	0.256927			

Serial Correlation Test Output

Date: 06/06/24 Time: 20:07						
Sample (adjusted): 1982 2022						
Included observations: 41 after adjustments						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |***** |	. |***** |	1	0.755	0.755	25.108	0.000
. |*** |	**| . |	2	0.461	-0.252	34.720	0.000
. |** |	. | . |	3	0.222	-0.058	37.005	0.000
. | . |	. | . |	4	0.069	-0.007	37.230	0.000

.*| . |	.*| . |	5	-0.087	-0.194	37.603	0.000
.*| . |	. |*. |	6	-0.140	0.110	38.584	0.000
.*| . |	.*| . |	7	-0.154	-0.067	39.811	0.000
.*| . |	.*| . |	8	-0.180	-0.124	41.552	0.000
.*| . |	. |*. |	9	-0.162	0.102	43.002	0.000
.*| . |	**| . |	10	-0.188	-0.244	45.022	0.000
*Probabilities may not be valid for this equation specification.						

Normality Test Output



Canonical Cointegrating Regression (CCR) Estimation Outputs

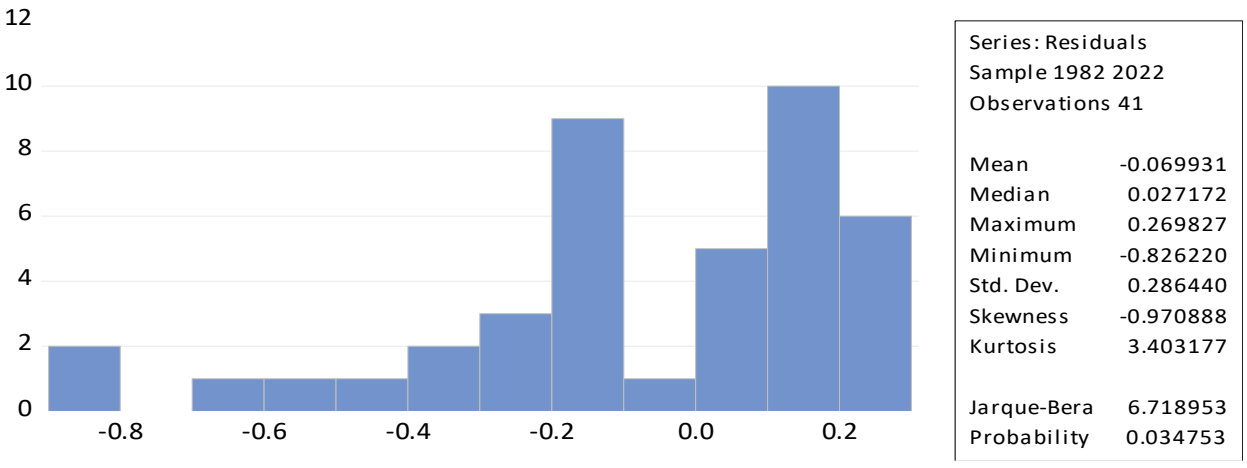
Dependent Variable: LOG(GDPA)				
Method: Canonical Cointegrating Regression (CCR)				
Date: 06/06/24 Time: 20:10				
Sample (adjusted): 1982 2022				
Included observations: 41 after adjustments				
Cointegrating equation deterministic: C				
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TOP)	0.074153	0.177011	0.418917	0.6777
LOG(INF)	-0.180415	0.140318	-1.285760	0.2065
LOG(EXCR)	0.244095	0.192277	1.269500	0.2122
C	8.690620	1.189097	7.308586	0.0000
R-squared	0.834958	Mean dependent var		8.849842

Adjusted R-squared	0.821576	S.D. dependent var	0.726294
S.E. of regression	0.306788	Sum squared resid	3.482409
Long-run variance	0.256927		

Serial Correlation Test Output

Date: 06/06/24 Time: 20:11						
Sample (adjusted): 1982 2022						
Included observations: 41 after adjustments						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |***** |	. |***** |	1	0.738	0.738	24.018	0.000
. |*** |	**| . |	2	0.427	-0.260	32.242	0.000
. |*. |	. | . |	3	0.179	-0.061	33.729	0.000
. | . |	. | . |	4	0.025	-0.017	33.758	0.000
.*| . |	.*| . |	5	-0.109	-0.149	34.341	0.000
.*| . |	. |*. |	6	-0.138	0.096	35.297	0.000
.*| . |	.*| . |	7	-0.136	-0.066	36.263	0.000
.*| . |	.*| . |	8	-0.158	-0.117	37.601	0.000
.*| . |	. |*. |	9	-0.130	0.103	38.532	0.000
.*| . |	**| . |	10	-0.154	-0.223	39.883	0.000
*Probabilities may not be valid for this equation specification.						

Normality Test Output

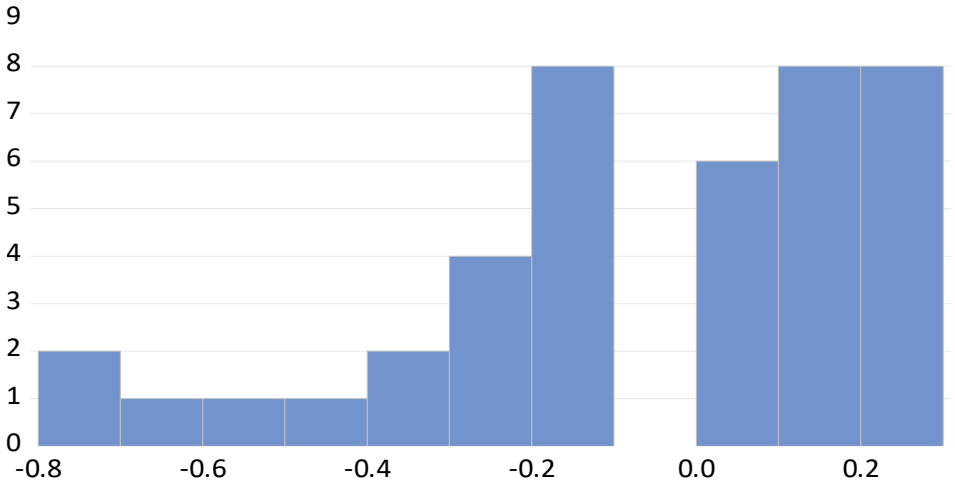


Dynamic Ordinary Least Squares (DOLS) Estimation Outputs

Dependent Variable: LOG(GDPA)		
Method: Dynamic Least Squares (DOLS)		
Date: 06/06/24 Time: 20:12		

Sample (adjusted): 1983 2021				
Included observations: 39 after adjustments				
Cointegrating equation deterministic: C				
Fixed leads and lags specification (lead=1, lag=1)				
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TOP)	-0.023345	0.286474	-0.081492	0.9357
LOG(INF)	-0.288679	0.278761	-1.035581	0.3099
LOG(EXCR)	0.314166	0.314162	1.000014	0.3265
C	8.544313	2.128368	4.014491	0.0005
R-squared	0.898449	Mean dependent var		8.851092
Adjusted R-squared	0.851579	S.D. dependent var		0.706565
S.E. of regression	0.272208	Sum squared resid		1.926522
Long-run variance	0.228306			

Normality Test Output



Series: Residuals
Sample 1982 2022
Observations 41

Mean	-0.066949
Median	0.022451
Maximum	0.289597
Minimum	-0.799262
Std. Dev.	0.285367
Skewness	-0.900836
Kurtosis	3.169803
Jarque-Bera	5.594545
Probability	0.060976

Serial Correlation Test Output

Date: 06/06/24 Time: 20:15						
Sample (adjusted): 1983 2021						
Included observations: 39 after adjustments						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |*** |	. |*** |	1	0.376	0.376	5.9390	0.015
. |*. |	. |. |	2	0.103	-0.045	6.3956	0.041
. |. |	. |. |	3	0.068	0.052	6.6010	0.086

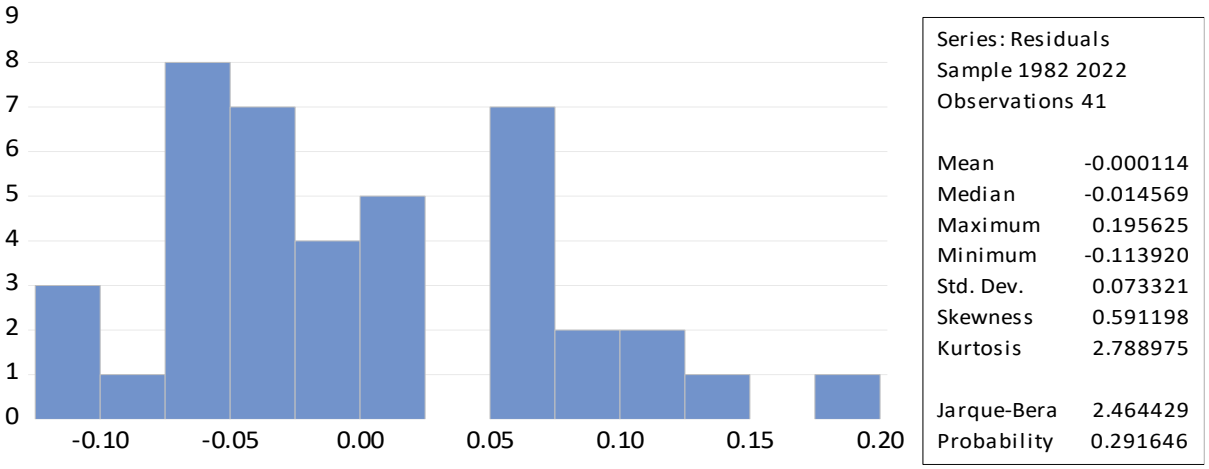
. | . |	.*| . |	4	-0.033	-0.086	6.6522	0.155
.*| . |	.*| . |	5	-0.101	-0.070	7.1312	0.211
.*| . |	.*| . |	6	-0.132	-0.081	7.9791	0.240
.*| . |	.*| . |	7	-0.157	-0.085	9.2105	0.238
.*| . |	.*| . |	8	-0.186	-0.107	10.988	0.202
.*| . |	. | . |	9	-0.151	-0.052	12.199	0.202
.*| . |	.*| . |	10	-0.154	-0.102	13.499	0.197
*Probabilities may not be valid for this equation specification.						

2. Cointegrating Estimation Outputs for GDPI Model

Fully-modified Ordinary Least Squares (FMOLS) Estimation Outputs

Dependent Variable: LOG(GDPI)				
Method: Fully Modified Least Squares (FMOLS)				
Date: 06/07/24 Time: 10:06				
Sample (adjusted): 1982 2022				
Included observations: 41 after adjustments				
Cointegrating equation deterministic: C @TREND @TREND^2				
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth				
= 4.0000)				
No def. adjustment for standard errors & covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TOP)	-0.011628	0.051021	-0.227910	0.8210
LOG(INF)	-0.008261	0.028855	-0.286296	0.7763
LOG(EXCR)	-0.040544	0.054638	-0.742036	0.4630
C	8.914979	0.435098	20.48958	0.0000
@TREND	0.039784	0.028383	1.401671	0.1698
@TREND^2	-0.000368	0.000403	-0.912437	0.3678
R-squared	0.877930	Mean dependent var		9.394272
Adjusted R-squared	0.860491	S.D. dependent var		0.209857
S.E. of regression	0.078384	Sum squared resid		0.215040
Long-run variance	0.012913			

Normality Test Output



Serial Correlation Test Output

Date: 06/07/24 Time: 10:08						
Sample (adjusted): 1982 2022						
Included observations: 41 after adjustments						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. | . |	. | . |	1	0.034	0.034	0.0502	0.823
. | . |	. | . |	2	0.000	-0.001	0.0502	0.975
.*| . |	.*| . |	3	-0.135	-0.135	0.8953	0.827
. |*. |	. |*. |	4	0.093	0.104	1.3033	0.861
. | . |	. | . |	5	-0.042	-0.051	1.3882	0.926
. | . |	. | . |	6	0.047	0.034	1.4990	0.960
. | . |	. | . |	7	-0.028	-0.006	1.5407	0.981
. |*. |	. |*. |	8	0.178	0.163	3.2336	0.919
. | . |	. | . |	9	0.025	0.028	3.2675	0.953
. |** |	. |** |	10	0.236	0.236	6.4405	0.777
*Probabilities may not be valid for this equation specification.						

Canonical Cointegrating Regression (CCR) Estimation Outputs

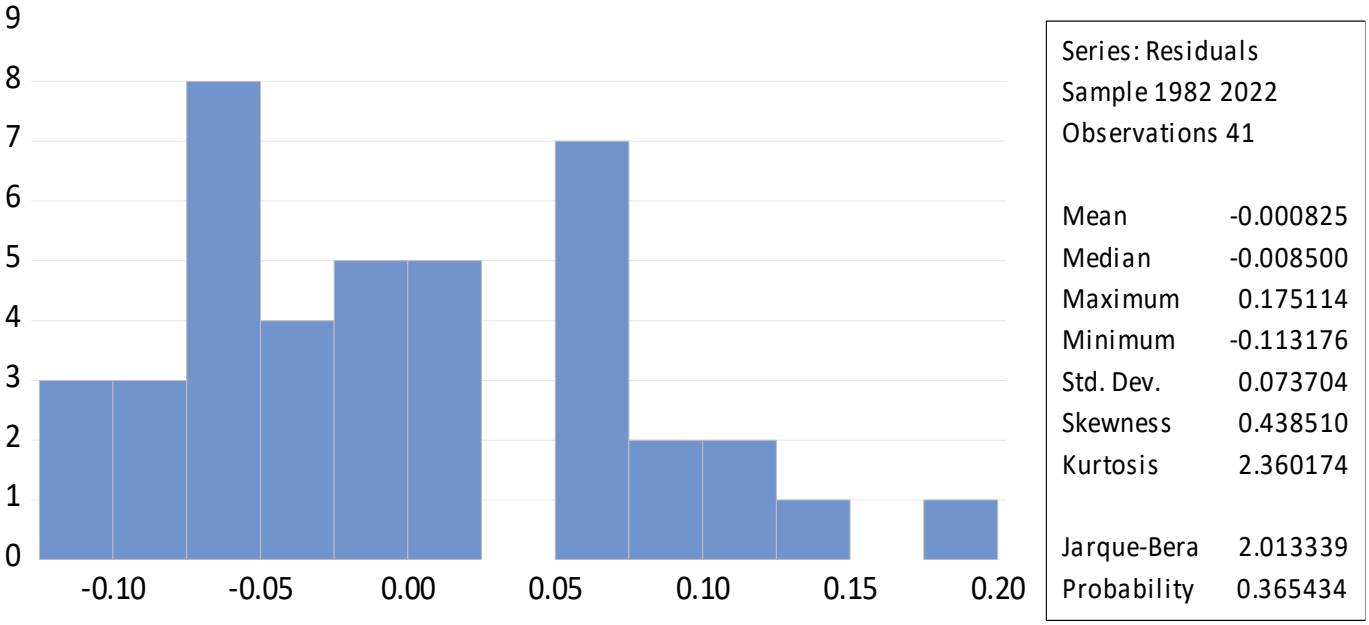
Dependent Variable: LOG(GDPI)		
Method: Canonical Cointegrating Regression (CCR)		
Date: 06/07/24 Time: 10:10		
Sample (adjusted): 1982 2022		
Included observations: 41 after adjustments		

Cointegrating equation deterministic: C @TREND @TREND^2				
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth				
= 4.0000)				
No d.f. adjustment for standard errors & covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TOP)	0.003388	0.049760	0.068085	0.9461
LOG(INF)	-0.007900	0.034165	-0.231220	0.8185
LOG(EXCR)	-0.037902	0.059989	-0.631814	0.5316
C	9.046638	0.413436	21.88160	0.0000
@TREND	0.031952	0.027453	1.163872	0.2523
@TREND^2	-0.000257	0.000390	-0.660339	0.5134
R-squared	0.876635	Mean dependent var		9.394272
Adjusted R-squared	0.859011	S.D. dependent var		0.209857
S.E. of regression	0.078798	Sum squared resid		0.217321
Long-run variance	0.012913			

Serial Correlation Test Output

Date: 06/07/24 Time: 10:11						
Sample (adjusted): 1982 2022						
Included observations: 41 after adjustments						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |*. |	. |*. |	1	0.083	0.083	0.3012	0.583
. | . |	. | . |	2	0.004	-0.003	0.3019	0.860
.*| . |	.*| . |	3	-0.137	-0.138	1.1773	0.758
. | . |	. | . |	4	0.034	0.058	1.2331	0.873
. | . |	. | . |	5	-0.053	-0.061	1.3700	0.928
. | . |	. | . |	6	0.014	0.004	1.3795	0.967
. | . |	. | . |	7	-0.022	-0.011	1.4055	0.985
. |*. |	. |*. |	8	0.188	0.179	3.2897	0.915
. | . |	. | . |	9	0.035	0.010	3.3583	0.948
. |*. |	. |*. |	10	0.192	0.190	5.4555	0.859
*Probabilities may not be valid for this equation specification.						

Normality Test Output



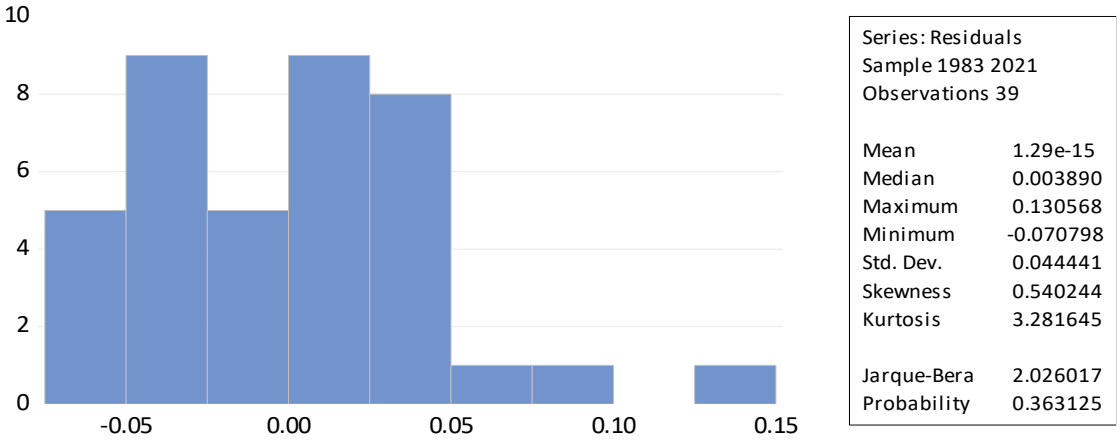
Dynamic Ordinary Least Squares (DOLS) Estimation Outputs

Dependent Variable: LOG(GDPI)				
Method: Dynamic Least Squares (DOLS)				
Date: 06/07/24 Time: 10:14				
Sample (adjusted): 1983 2021				
Included observations: 39 after adjustments				
Cointegrating equation deterministic: C @TREND @TREND^2				
Fixed leads and lags specification (lead=1, lag=1)				
White heteroskedasticity-consistent standard errors & covariance				
No d.f. adjustment for standard errors & covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TOP)	0.210755	0.034929	6.033764	0.0000
LOG(INF)	0.057406	0.025557	2.246229	0.0342
LOG(EXCR)	0.021901	0.035466	0.617533	0.5427
C	7.184083	0.289680	24.80010	0.0000
@TREND	0.103288	0.016357	6.314428	0.0000
@TREND^2	-0.001290	0.000222	-5.803107	0.0000
R-squared	0.956025	Mean dependent var		9.394241
Adjusted R-squared	0.930372	S.D. dependent var		0.211922
S.E. of regression	0.055920	Sum squared resid		0.075049

Serial Correlation Test Output

Date: 06/07/24 Time: 10:15						
Sample (adjusted): 1983 2021						
Included observations: 39 after adjustments						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
.*| . |	.*| . |	1	-0.125	-0.125	0.6540	0.419
. |*. |	. |*. |	2	0.103	0.089	1.1139	0.573
. | . |	. | . |	3	-0.057	-0.035	1.2602	0.739
.*| . |	.*| . |	4	-0.101	-0.124	1.7277	0.786
. |*. |	. |*. |	5	0.118	0.105	2.3791	0.795
.*| . |	. | . |	6	-0.082	-0.041	2.7059	0.845
. | . |	. | . |	7	0.014	-0.035	2.7155	0.910
.*| . |	.*| . |	8	-0.174	-0.171	4.2805	0.831
. | . |	. | . |	9	0.063	0.050	4.4900	0.876
. | . |	. | . |	10	-0.011	0.008	4.4968	0.922
*Probabilities may not be valid for this equation specification.						

Normality Test Output



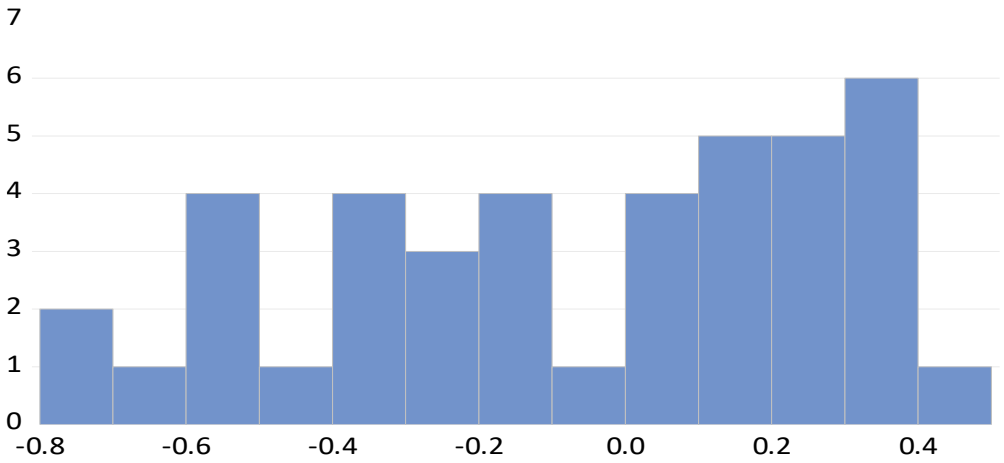
3. Cointegrating Estimation Outputs for GDPS Model

Fully-modified Ordinary Least Squares (FMOLS) Estimation Outputs

Dependent Variable: LOG(GDPS)		
Method: Fully Modified Least Squares (FMOLS)		
Date: 06/07/24 Time: 10:20		
Sample (adjusted): 1982 2022		

Included observations: 41 after adjustments				
Cointegrating equation deterministic: C				
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)				
No d.f. adjustment for standard errors & covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TOP)	0.175895	0.191299	0.919478	0.3638
LOG(INF)	-0.149910	0.145851	-1.027826	0.3107
LOG(EXCR)	0.120940	0.214217	0.564569	0.5758
C	10.04251	1.341605	7.485442	0.0000
R-squared	0.760243	Mean dependent var		9.530714
Adjusted R-squared	0.740803	S.D. dependent var		0.738001
S.E. of regression	0.375726	Sum squared resid		5.223296
Long-run variance	0.372405			

Normality Test Output



Series: Residuals
Sample 1982 2022
Observations 41

Mean	-0.077547
Median	0.015667
Maximum	0.433877
Minimum	-0.788724
Std. Dev.	0.352730
Skewness	-0.368662
Kurtosis	1.922270
Jarque-Bera	2.912964
Probability	0.233055

Serial Correlation Test Output

Date: 06/07/24 Time: 10:21						
Sample (adjusted): 1982 2022						
Included observations: 41 after adjustments						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |****** |	. |****** |	1	0.809	0.809	28.840	0.000

. |***** |	. | . |	2	0.645	-0.026	47.662	0.000
. |**** |	. | . |	3	0.525	0.032	60.472	0.000
. |** |	***| . |	4	0.302	-0.366	64.817	0.000
. | . |	**| . |	5	0.059	-0.261	64.990	0.000
.*| . |	. |*. |	6	-0.067	0.082	65.214	0.000
.*| . |	. | . |	7	-0.178	0.009	66.861	0.000
**| . |	.*| . |	8	-0.300	-0.072	71.684	0.000
***| . |	. | . |	9	-0.347	-0.053	78.305	0.000
***| . |	.*| . |	10	-0.386	-0.193	86.769	0.000

*Probabilities may not be valid for this equation specification.

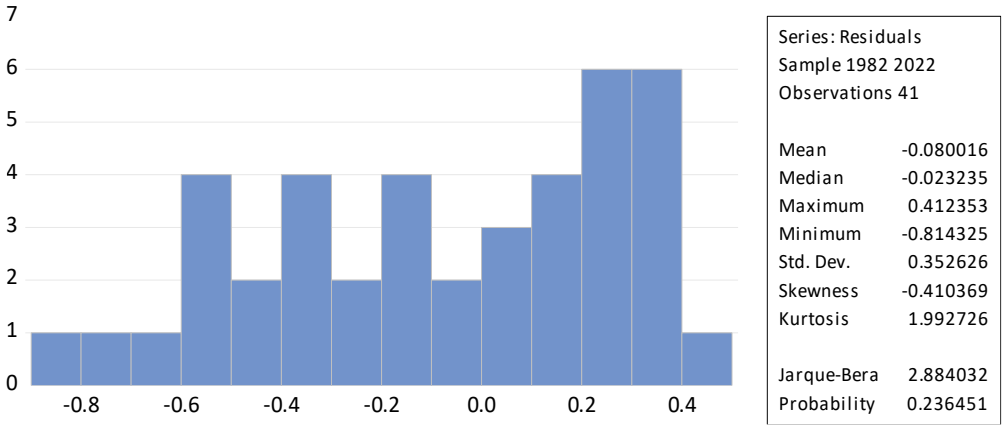
Canonical Cointegrating Regression (CCR) Estimation Outputs

Dependent Variable: LOG(GDPS)				
Method: Canonical Cointegrating Regression (CCR)				
Date: 06/07/24 Time: 10:25				
Sample (adjusted): 1982 2022				
Included observations: 41 after adjustments				
Cointegrating equation deterministic: C				
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TOP)	0.142741	0.224238	0.636561	0.5283
LOG(INF)	-0.163791	0.180487	-0.907499	0.3700
LOG(EXCR)	0.159554	0.243478	0.655310	0.5163
C	9.845066	1.495389	6.583614	0.0000
R-squared	0.759646	Mean dependent var		9.530714
Adjusted R-squared	0.740158	S.D. dependent var		0.738001
S.E. of regression	0.376194	Sum squared resid		5.236304
Long-run variance	0.412665			

Serial Correlation Test Output

Date: 06/07/24 Time: 10:26						
Sample (adjusted): 1982 2022						
Included observations: 41 after adjustments						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |****** |	. |****** |	1	0.794	0.794	27.762	0.000
. |**** |	. | . |	2	0.619	-0.030	45.072	0.000
. |**** |	. | . |	3	0.503	0.056	56.802	0.000
. |** |	***| . |	4	0.271	-0.376	60.301	0.000
. | . |	**| . |	5	0.030	-0.227	60.346	0.000
.*| . |	. |*. |	6	-0.079	0.091	60.664	0.000
.*| . |	. | . |	7	-0.174	0.023	62.232	0.000
**| . |	.*| . |	8	-0.287	-0.085	66.638	0.000
**| . |	. | . |	9	-0.317	-0.052	72.182	0.000
***| . |	.*| . |	10	-0.350	-0.203	79.142	0.000
*Probabilities may not be valid for this equation specification.						

Normality Test Output



Dynamics Ordinary Least Squares (DOLS) Estimation Outputs

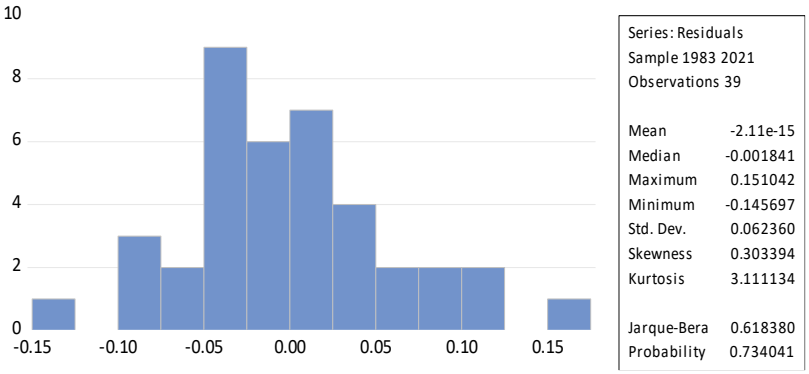
Dependent Variable: LOG(GDPS)		
Method: Dynamic Least Squares (DOLS)		
Date: 06/07/24 Time: 10:29		
Sample (adjusted): 1983 2021		
Included observations: 39 after adjustments		

Cointegrating equation deterministic: C @TREND @TREND^2				
Fixed leads and lags specification (lead=1, lag=1)				
White heteroskedasticity-consistent standard errors & covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TOP)	0.237293	0.065623	3.616008	0.0014
LOG(INF)	-0.016159	0.049826	-0.324314	0.7485
LOG(EXCR)	-0.402303	0.069353	-5.800802	0.0000
C	6.212641	0.552150	11.25174	0.0000
@TREND	0.278034	0.024626	11.29025	0.0000
@TREND^2	-0.002791	0.000357	-7.813292	0.0000
R-squared	0.992524	Mean dependent var		9.525592
Adjusted R-squared	0.988164	S.D. dependent var		0.721249
S.E. of regression	0.078469	Sum squared resid		0.147776

Serial Correlation Test Output

Date: 06/07/24 Time: 10:54						
Sample (adjusted): 1983 2021						
Included observations: 39 after adjustments						
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |*. |	. |*. |	1	0.139	0.139	0.8156	0.366
.*| . |	.*| . |	2	-0.107	-0.129	1.3130	0.519
.*| . |	. | . |	3	-0.094	-0.061	1.7045	0.636
.*| . |	. | . |	4	-0.069	-0.061	1.9203	0.750
.*| . |	.*| . |	5	-0.143	-0.149	2.8873	0.717
*Probabilities may not be valid for this equation specification.						

Normality Test Output



APPENDIX II

Datasets: 1981 – 2022

Year	AGDP (₦' Billions)	IGDP (₦' Billions)	SGDP (₦' Billions)	TOP	EXCR (₦/$)	INF (%)
1981	2364.37	11753.40	5431.79	0.0012	0.61	20.81
1982	2425.96	10189.10	5604.21	0.0010	0.67	7.70
1983	2409.08	8255.76	5563.96	0.0010	0.72	23.21
1984	2303.51	8392.25	5352.56	0.0010	0.76	17.82
1985	2731.06	8768.30	5498.16	0.0011	0.89	7.44
1986	2986.84	8347.53	5673.41	0.0009	2.02	5.72
1987	2891.67	8799.38	5861.06	0.0027	4.02	11.29
1988	3174.57	9514.81	6150.18	0.0028	4.54	54.51
1989	3325.95	9442.83	6432.39	0.0046	7.39	50.47
1990	3464.72	11148.10	6849.92	0.0072	8.04	7.36
1991	3590.84	10910.56	7038.21	0.0098	9.91	13.01
1992	3674.79	11578.98	7283.32	0.0155	17.30	44.59
1993	3743.67	10790.31	7544.10	0.0174	22.05	57.17
1994	3839.68	10151.70	7685.48	0.0170	21.89	57.03
1995	3977.38	9845.97	7837.13	0.0788	21.89	72.84
1996	4133.55	10402.19	8033.13	0.0830	21.89	29.27
1997	4305.68	10599.70	8325.74	0.0899	21.89	8.53
1998	4475.24	10641.26	8713.25	0.0667	21.89	10.00
1999	4703.64	10201.81	9062.14	0.0856	92.69	6.62
2000	4840.97	10962.84	9365.72	0.1164	102.11	6.93
2001	5024.54	11576.32	10057.76	0.1210	111.94	18.87
2002	7817.08	11725.42	11202.68	0.1059	120.97	12.88
2003	8364.83	13151.23	11488.74	0.1566	129.36	14.03
2004	8888.57	13382.86	13786.30	0.1828	133.50	15.00
2005	9516.99	13609.76	15252.04	0.2618	132.15	17.86

2006	10222.47	13342.47	17138.74	0.2563	128.65	8.23
2007	10958.47	13085.27	19342.14	0.2817	125.83	5.39
2008	11645.37	12817.79	21856.86	0.3450	118.57	11.58
2009	12330.33	13138.95	24573.09	0.2815	148.88	12.54
2010	13048.89	13826.43	27736.94	0.3694	150.30	13.74
2011	13429.38	14986.62	29095.04	0.4561	153.86	10.83
2012	14329.71	15350.45	30249.74	0.4156	157.50	12.22
2013	14750.52	15682.46	32785.73	0.3907	157.31	8.50
2014	15380.39	16742.15	35030.24	0.3500	158.55	8.05
2015	15952.22	16366.66	36705.05	0.2886	193.28	9.01
2016	16607.34	14918.15	36405.75	0.2696	253.49	15.70
2017	17179.50	15238.28	36073.21	0.3620	305.79	16.50
2018	17544.15	15523.43	36732.37	0.4606	306.08	12.10
2019	17958.58	15882.35	37546.90	0.5654	306.92	11.40
2020	18348.18	14953.72	36712.48	0.4732	358.81	13.25
2021	18738.41	14883.77	38771.49	0.5824	400.24	16.95
2022	19091.07	14195.58	41352.81	0.7284	425.98	18.85

Sources:

- Central Bank of Nigeria (CBN) Statistical Bulletin (2023)
- World Development Indicators (WDI)

GDPA: Contribution of Agricultural Sector to GDP

GDPI: Contribution of Industrial Sector to GDP

GDPS: Contribution of Service Sector to GDP

TOP: Trade openness

EXCR: Exchange rate