

Empirical Analysis of Commodity Trade on Economic Well-Being: Evidence from Nigeria

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Abstract: Examined in this study is how commodity trade influenced economic well-being of Nigerians over the sampled period, 1988 to 2022. Commodity trade is employed as the independent variable and measured as net agriculture exports, net manufacturing exports, net mining and quarrying exports and net service exports while economic well-being, indicated as Human Development Index is the regressand. The study utilized annual time series data sourced from the Central Bank of Nigeria (CBN) statistical bulletin and the World Bank's World Development Indicators. The data analyses conducted comprise the short-run and long-run Autoregressive Distributed Lag (ARDL) estimation processes. The empirical outputs established that net agriculture exports and net manufacturing exports exerted favourable and substantial effects on Human Development Index in Nigeria in both short-run and long-run while net mining and quarrying exports exerted favourable but insignificant effects in the long-run, its one year lagged result had favourably substantial impact on Human Development Index; and net service exports had favourable but insignificant effects in the long-run but had favourable and substantial effects on the regressand in the short-run in Nigeria. The study concluded that net commodity trades are important contributors to improved economic well-being in Nigeria over the sampled period. It is therefore suggested that government should implement policies that promote diversification of Nigeria's export base by encouraging multi-sectorial real investments for expanded value chain exploration to improve trade balance.

Keywords: Commodity Trade, Net Exports, Economic Well-being, Human Development Index and Autoregressive Distributed Lag (ARDL), Nigeria.

INTRODUCTION

Given the interconnected nature of countries of the world, it is clear that no nation can function alone. Consistent with Yusuff, Adekanye, and Babalola (2020), the level of economic integration with other global economies dictates the rate of economic growth and development. Given this, trade's role in promoting global prosperity is crucial. Both domestic and international trade are feasible. Cross border trade is the buying and selling of products and services between nations. Economic and financial interactions between nations are the focus of external trade, which helps less developed nations succeed socially and economically and opens doors for more developed ones (Adeleye, Adeteye & Adewuyi, 2015). Trade between nations, regardless of their economic status, facilitates the flow of commodities and services and helps to build friendly relations between nations. Since it is a two-way street, nations that trade with each other do not have to worry about dominance or losing control of their own destiny. Because no nation has access to all the resources required for its long-term economic growth, and nations that choose not to engage in transnational trade run the danger of seeing their economies grow at a snail's pace (Azeez, Dada & Aluko, 2014).

Many prominent trade theorists like ‘Adam Smith, David Ricardo, Ali Hechscher, Bethel Ohlin’, among others, postulate that nations should for trading produce in sectors of their optimum advantages in terms of ‘comparative cost, factor endowment, or absolute’ in effort to nurture desired healthy economy. Since various nations have differing amounts of natural resources, human capital, financial capital, and technological capability endowments, the theory of comparative advantage explains why nations trade commodities and services with one another. Even though some economies are more endowed than others, many more have the resources but lack the management and channeling skills to put them to effective and optimum use, meaning their citizens have limited opportunities for grow, capacity development, and quality of live (Ayanda, 2021).

The exchange of basic commodities as, raw materials, primary products, and natural resources, from one nation or area to another is known as commodity trade, and it is an essential part of global commodity transaction. Agricultural goods, minerals, energy resources, and other raw materials are the main items in such cross-border trading (Krugman, Obstfeld & Melitz, 2015). Stiglitz and Greenwald (2014) state that when nations or regions purchase and sell primary products, raw materials, and natural resources, it is known as commodity trade. Commodities comprise a wide range of goods and services, comprising food and drink (grains, cattle, coffee), building materials (wood, metals, cotton), energy inputs as fossils, and minerals inputs (gold, silver, copper). Facilitating economic progress, industrial development, and international commerce, commodity trade is crucial for addressing the demands of both producing and consuming nations.

The volume of commodities traded between nations has grown substantially over the last few decades. Specifically, commodities trade with other nations has seen a noteworthy growth in volume and value for Nigeria. Nigeria is the world's 41st biggest export economy and the 119th most complicated economy, as opined by the 2020 International Trade Statistics compiled by the Economic Complexity Index (ECI). Among the many commodities that Nigeria brings into the nation, the most important ones are refined petroleum, cocoa beans, crude petroleum, petroleum gas, and special purpose ships. On the other hand, wheat, rolled tobacco, refined petroleum, automobiles, and special purpose ships are among the most important imports. Crude petroleum accounts for 79.4% of Nigeria's total exports, followed by petroleum petrol at 10.9%, while refined petroleum makes up 17.9% of imports, and cars make up 3.51% of exports.

Consequently, commodity trade is critically important to Nigeria's economic development and general welfare. Nigeria is rich in oil, gas, minerals, and agricultural goods; hence commodity trade has always played a crucial role in the nation's economy. Implications for the nation's economic structure, performance in the external sector, and chances for growth stem from its dependence on commodity exports. Particularly important to Nigeria's export and import revenues is the commodities trade. Foreign currency profits, government income, and economic performance enhancement are all greatly aided by revenues from commodities exports. Agricultural products, minerals, oil and gas, and other exports can bring in a lot foreign exchange. That earned foreign currencies are invested towards building up the nation's infrastructure, funding

social programs, and funding development projects (Makanjuola, Ekperiware, Oyetade, Adewusi & Lester, 2022).

Furthermore, commodities trade may help developing nations escape poverty by increasing their GDP, their disposable income, and the number of jobs available to their citizens (Simon and Pingfang, 2021). Governments may use earnings from commodity exports to fund initiatives to alleviate poverty, expand social services, and build infrastructure, all of which contribute to economic prosperity. More so, commodity trade has the potential to impact income distribution, general wellbeing, and accessibility to basic necessities, all of which are components of social welfare. More availability, decreased costs, and more competition in domestic markets are all ways in which commodity trade may improve people's access to essentials like food, energy, and healthcare (Falaye & Babatunde, 2021). This is in line with the study by Shido-Ikwu, Dankumo, Pius and Fazing (2023), who confirmed that commodity trade, especially for resource-rich nations, may greatly boost economic development. Improving economic wellbeing is possible via the reinvestment of huge sums of money and foreign currency gains from the export of commodities like metals, oil, minerals, agricultural goods, and agricultural products.

In addition, commodities trade between nations has grown substantially in recent decades. In particular, commodity trade with other nations has grown in value and volume in Nigeria. Having said that, the trade relations have not helped the economy expand or improve in recent times. For one thing, local businesses take a hit when consumers see low-quality imports and assume the worst about their locally made goods. Production growth in these sectors and the economy overall has therefore slowed. There are several Nigerian goods that just simply not hold their own in the global marketplace, comprising footwear, clothing, metal, etc. The plainly unfavourable atmosphere of production has led to the closure of several firms across various industries. As a result, economic prosperity declined, poverty levels rose, and unemployment rates spiked.

Moreover, the "resource curse" effect has set in because of Nigeria's reliance on earnings from commodity exports, particularly oil. It has been difficult for Nigeria, one of Africa's leading oil exporters, to use its oil riches to create long-term economic growth and raise people's living standards. On the contrary, the nation has faced problems comprising social unrest, environmental degradation, corruption, and misuse of resources, all of which have hampered inclusive progress and weakened the economy.

This has led to persistent economic maladies in Nigeria, such as, high unemployment rate, widespread poverty (in both urban and rural regions), a high prevalence of illiteracy, and a lack of capital creation. In terms of human development, Nigeria rated 161st out of 189 nations in a study by the United Nations Development Programme in 2022. With a Human Development Index (HDI) of 0.539, Nigeria falls short of the set benchmark. Moreover, data also shows that 7.2% of Nigerians were living in poverty and 7.8% were unemployed in 2014. The unemployment rate is at 33.3% in 2022 while the poverty rate is at 40.1% (National Bureau of Statistics, 2022). In light of these issues, the current study aims to analyse the impact of commodity trade on Nigeria's

economy. Specifically, it looked at the effects of net exports from agriculture, manufacturing, mining and quarrying, and services on the nation's HDI from 1988 to 2022. The outcomes of this research will be extremely useful for federal agencies, policymakers, intellectuals, and trade thinkers who sometimes advise the government on trade policy.

LITERATURE REVIEW

Conceptual Clarifications

Commodity Trade

Trade is the buying and selling of products and services between nations or between private entities with the purpose of exchanging money or other valuables. It entails the exchange of goods and services to meet the requirements and desires of buyers and sellers (Gbanador, 2005). Trade in commodity is defined by Azeez, Dada, and Aluko (2014) as the cross-border exchange of goods and services between several countries. Products like cotton, coffee, metal, gold, iron ore, energy resources like oil and natural gas, cattle, and other intermediary items are all part of what is known as commodity trade. Influencing macroeconomic indicators and offering chances for investments and speculations, commodity trading is crucial to individual, national and global economies. If exports are higher than imports, then commodity trading is profitable. Net commodity trade, therefore, is the sum of a nation's exports minus its imports of goods from all economic sectors put together. An important indicator of economic progress, stability, and well-being is a favourable net commodity trade, which means that a nation sells more goods than it buys. In particular, it shows how much of an impact a nation has on the global commodities market and the economy as a whole. Natural gas and crude oil are two of the many commodities traded by Nigeria. Other important commodities comprise agricultural goods like cocoa and rubber, solid minerals like coal, limestone and gold, and processed foods like sesame oil and cocoa butter. Trading in these commodities is crucial to Nigeria's economy since it helps bring in foreign currency, creates jobs, improve sectors, and boosts overall economic health.

Economic Well-Being

When people, families, or communities are economically well-off, they are able to meet their material needs and feel content with their lives. Economic well-being is multi-faceted and comprises a person's capacity to satisfy short-term financial responsibilities and long-term objectives, likewise their income, job prospects, quality of life, and access to essential goods and services. Consistent with Stiglitz, Sen, and Fitoussi (2010), economic well-being is the sum of people's material welfare and life satisfaction, which comprises their access to resources, income levels, and quality of life. Coyle (2014) utilised a similar definition, stating that economic well-being is "the overall level of material welfare and life satisfaction experienced by individuals and households, which reflect the ability to harness technological innovation, adapt to changing economic conditions, and achieve sustainable development goals as key component of economic well-being, in congruent with Brynjolfsson and McAfee (2014). They highlight the impact of innovation and technology drivers of economic well-being in the digital age. Numerous things impact this idea, comprising as national and global policies and economic situations, societal institutions, and personal experiences.

Theoretical Review

This research is predicated on the Heckscher-Ohlin theory, which is one of several that link international commerce to a nation's economic prosperity. Developed in the early 20th century, this theory goes under many names, one of which is Factor Proportion theory. It is also known as the Modern Theory of International Trade. In the early 1900s, two Swedish economists named Heckscher and Ohlin developed a theory of international commerce that became later known as the Heckscher-Ohlin model. This model postulates that differences in endowed factors underpin patterns of cross-border trading and opines that, nations should manufacture and export commodities that make extensive use of their abundant endowed elements while importing goods that make extensive use of their limited factors. The theory takes into consideration the need for trading across international frontiers and places emphasis on the relative quantity of resources across nations. All of the above points to the fact that a nation's comparative advantage is a result of its resource abundance and the technology it has developed to make the most of those resources (Tebekew, 2014). The Heckscher-Ohlin-Samuelson (H-O-S) model, an extension of the H-O principle, also elicits trade openness, which is what this theory proposes. The H-O-S model illustrates how the most heavily utilised production elements might see a rise in revenue as a result of a commodity's price rise. Free movement of factors, in line with this concept, may cause national resources to shift from nations with plenty to nations with relative shortage, likewise transfer welfare from one nation to another (Ude & Agodi, 2015).

The theory's core principles state that nations should manufacture and sell commodities that need factor inputs they have in abundance while importing items that require resources, they have in relatively less quantities. When it comes to arguing that a nation should focus on manufacturing and exporting commodities for which it has an abundance of productive inputs, this idea differs from absolute and proportionate advantages. Assumptions underlying this concept comprise: (i) Unrestricted mobility of capital and labour among industries, likewise equal factor prices within these industries worldwide. (ii) Human resources and financial resources vary from nation to nation; (iii) Technological capabilities are comparable across nations; and (iv) Personal preference is not nation specific. Nigeria, like many other developing nations, has a large pool of potential workers but a severe lack of financial resources. On the other hand, there is an abundance of people, but they do not have the training or experience to work in factories. Unemployment is at a record high, productivity is poor, and economic growth is slow as a consequence of this dreadful situation.

Empirical Literature

To garner background knowledge of the directions of existing empirical literature, the current study reviewed studies that are either nation-specific or focused on Nigeria. These reviews provided crucial empirical insight into the topic at hand. While trade exports directly and considerably influenced growth over the sampled period, trade in imports, direct cross-border investments, and the currency rate of exchange all had unfavourable but insignificant impacts on growth in the long and short runs, as conducted in Nigeria by employing the ARDL method (Shido-

Ikwu, Dankumo, Pius, & Fazing, 2023). International trade did not substantially affect Nigeria's economic development throughout the research period. Similarly, Kehinde, Jubril, and Felix (2012) found that the import quantities and exchange rate had unfavourable effects on economic development in Nigeria, although trade openness and aggregate 'capital formation' were favourably effective. The implication of exports on growth is substantial, whereas that of import trade is negligible, as opined by Falaye and Babatunde (2021). From 1981 to 2020, Makanjuola, Ekperiware, Oyetade, Adewusi, and Tenny (2022) utilised the ARDL method to examine the effects of imports, exports, currency rate, and inflation on economic growth in Nigeria. The outcomes showed that exports had a beneficial effect on growth in Nigeria, but inflation and the currency rate had unfavourable effects. There is a favourable correlation between augmented trades between nations as reported.

In addition, Yusuff, Adekanye, and Babalola (2020) investigated the years 1986–2017 to ascertain how international trade influenced expansion of Nigeria's GDP. They came to the conclusion that there is an inverse relationship between worldwide commerce and GDP per capita. Duru, Bartholomew, Okafor, Adikwu, and Njoku (2020) conducted research on the impact that foreign trade had on the growth of Nigeria's GDP between the years 1981 and 2018. The research established, via the use of an ARDL analytical technique, that exports do, in fact, contribute to the growth of GDP, and that a single direction of link from exports to real GDP was established. In their findings, Agbo, Agu, and Eze (2018) ascertained growth of Nigeria's economy as substantially influenced by the activities of operations involving import and export. In addition, the findings of the research suggested that the increase of Nigeria's gross domestic product was not substantially influenced by the country's import trade. In 2018, Adebisi, Eko, Nya, Arikpo, and Mbotor employed the ARDL approach to investigate the long-term and short-term causal link that exists between Nigerian economy's growth and its commerce cross-border trading with other nations. They came to the conclusion that boosting Nigeria's gross domestic product is not dependent on the country's levels of trading activities. There is no direct connection between the pace of increase in Nigeria's GDP and the country's exchange rate and its level of trade openness. In conclusion, it is clear that there is a causal connection at the short-term level between the rate of growth in Nigeria's GDP, total exports, total imports, and the trade balance. Further, using GDP as an indicator for growth in an economy, Ejike, Anah, and Onwuchekwa (2018) conducted an empirical examination of how international commerce has impacted on spurring GDP in Nigeria. According to the findings of their investigation, there was evidence of a favourable and strong connection between Nigeria's international trade and the growth of the country's gross domestic product over the long term. Despite this, there was a huge body of information that supported the decision to implement free trade policy in 1986, which was a pivotal moment in the history of the country. Employing degree of openness as a measure for the examination of external trade, Muhammad and Benedict (2018) conducted an empirical investigation into the impact that trade across international frontiers had on growth of the Nigeria's economy over the sampled period, 1981-2012. They discovered that every component, with the exception of the interest rate, had statistically substantial results.

Furthermore, Afolabi, Danladi, and Azeez (2017) evaluated the impact of foreign trade on Nigeria's economic growth using OLS. Although, interest rates, government expenditure, imports, and exports all played favourable and substantial roles in Nigeria's economic development, the findings showed that the exchange rate and FDI had moderate negative effects. Lawal and Ezeuchenne (2017) looked at how trade affected real GDP, an indicator of economic growth, and they discovered that import and trade openness were not short-run issues, but they were long-run issues; these they concluded reliant on their inquiry. The trade balance and exports, however, were noteworthy in both the short and long terms. Imports, exports, and the trade balance have zero effects on GDP growth, according to the Granger causality test. Although, trade openness only affects economic growth in one direction. Thus, investigating the relationship trade-growth nexus, Abiodun (2017) came to the conclusion that increased international trade drives economic development. Comparative research by Ezeuchenne (2017) on the effects of international trade on Nigeria's economic growth found that trade openness correlates positively with GDP growth, but imports have a weak and unsustainable relationship with GDP growth over the long run. Nteegah, Nelson, and Owede (2017) discovered in their study titled "the impacts of trade liberalization on Nigeria's economic development" that oil exports and non-oil imports substantially impacted growth over medium and long timeframes. Nevertheless, the import of oil considerably stunted expansion. By conducting an empirical analysis, Babatunde, Jonathan, and Muhyideen (2017) identified the most influential determinants on economic development from 1981 to 2014. From what they reported, interest rates, government spending, imports, and exports are the four main factors that drive economic development in Nigeria. Meanwhile, FDI and Naira-Dollar rate of exchange are insignificantly effective to growth of the economy.

Arodoye and Iyoha (2014) utilised quarterly data from 1981Q1 to 2010Q4 to study the empirical implications of international trade on Nigeria's growth in economy. They established that innovations in overseas trade and internal shocks accounted for most of the Nigeria's economic growth variations. The research concluded that Nigeria should promote exchange rate policies that encourage export development while also taking into account the nation's modest open economy position. Ayanda (2021) conducted a study in South Africa to determine the effect of international trade on economic growth. The study utilised a now-casting approach to the multiple linear regression model and looked at the top ten imported and exported commodities from 2010 to 2019. The outcomes of the analysis showed that certain groups of imported commodities had no effect on quarterly economic growth, while the export of cars, car parts, and plastic goods had favourable and substantial influence. On the other hand, the unfavourable export commodities exported in big quantities added little to no value to the economy. Another factor that reduces the effect of certain commodities on GDP is the makeup of the HS code grouping. Employing data from 53 nations between 2000 and 2018, Simon and Pingfang (2021) looked at how the internet economy plays out in international commerce on economic development in Africa. We utilised the GMM, POLS, and random and fixed effects models to estimate the implications after further subdividing the sample into five areas. First, the POLS estimates showed that trade only had favourable effects on economic growth when it interacted with the digital economy. Second, the RE, FE, and sys-GMM estimations all found that trade substantially boosts progress in the economy with and without

interactive term. Third, capital and labour output elasticities had favourable and unfavourable effects on growth, respectively. Fourth, there were statistically substantial differences in the indicator output elasticities for the sub-sample regressions.

Research gap

Predicated on the empirical excursions related to commodity trade on Nigeria's economic wellbeing. It is reassuring to know that many researchers undertook to ascertaining the effect of international/foreign trade on economic growth or development but there seems hardly any well-established study compatible with the present one in terms of context, direction and variables composition about the effect of commodity trade on economic wellbeing in Nigeria, as most of the related studies paid less attention to economic well-being as the regressand, and commodity trade as causal variable which is here indexed as nets of agriculture, manufacturing, mining and quarrying, and service exports. This revealed notable gap in literature, which this present study is set out to address.

METHODOLOGY

Research Design

The subsection constitutes the study design stating the framework for how the study shall be conducted. This research is quantitative in nature and would employ already existing data for which quantitative econometric method of analysis will be applied to unravel the cause and effects relationships between the dependent and independent variables (Nachmias & Nachmias, 1976). Put differently, this study utilised the ex-post-facto research methods to look at how different commodities trade measures affected the dependent variable, which is indexed as economic wellbeing because the events in focus had already happened. Employing secondary data that the researchers cannot intentionally alter is one element of the ex-post-facto approach. World's Development Indicators' data from the World Bank's source and the CBN Statistical Bulletin were instrumental for gathering the 1988 to 2022 yearly time series data utilised for this analysis.

Model Specification

This section contains the model for determining how commodities trade impact on Nigeria's economic wellbeing employing empirical processes. The model is underpinned on the Heckscher-Ohlin theory of international trade, which proposes that nations should import goods for which they lack productive factors and produce and export goods for which they have an advantage in resource endowment in an effort to improve trade benefit, economic growth, and overall wellbeing. This provides further evidence that a nation's economy may benefit from balanced trade. Also, Agbo, Agu, and Eze (2018) looked at how foreign trade affected the Nigerian economy from 1980 to 2012, and their model is adopted for adaptation in the current study, with few tweaks to reflect this study's objectives. Thus following, is the functional specification of the model:

$$\text{HDI} = f(\text{NAE}, \text{NME}, \text{NMQ}, \text{NSE}) \quad (3.1)$$

$$\text{HDI}_t = \alpha_0 + \alpha_1 \text{NAE}_t + \alpha_2 \text{NME}_t + \alpha_3 \text{NMQ}_t + \alpha_4 \text{NSE}_t + U_{it} \quad (3.2)$$

Where: f is functional sign, α_0 is constant term, HDI stands for human development index, NAE is net agriculture exports, NME is net manufacturing exports, NMQ is net mining and quarrying

exports, NSE is net service exports, $\alpha_1 - \alpha_4$ are coefficients of the selected independent variables in the model and U_{it} is error term within the sampled period t .

Apriori Expectations

Following understandings from economic theory, the a priori expectations of this investigation are as follows:

Table 3.1: Apriori Expectations

Variable	Notation	Expected Relationship
Human Development Index	HDI	Dependent variable
Net Agriculture Exports	NAE	+
Net Manufacturing Exports	NME	+
Net Mining and Quarrying Exports	NMQ	+
Net Service Exports	NSE	+

Source: Researcher's Idea, 2024.

Description and Measurement of Variables

The utilised variables in the model for this investigation are divided into two categories: the dependent variables and the independent variables as described below.

Dependent Variable

Human Development Index will serve as the proxy for the dependent variable, which is **economic wellbeing**. **Human Development Index** serves as a composite index measure of life expectancy, education (the average number of years of schooling completed and the anticipated number of years of schooling upon entering the education system), and per capita income. These indicators constitute the nation's aggregate index for human development.

Independent Variable

Commodity trade will serve as the independent variable, and the following exports balances from different sectors such as net agricultural, net manufacturing, net mining and quarrying, and net services will serve as the indicators.

Net Agriculture Exports: The variable refers to the difference between the value of a nation's exported agricultural goods and the value of its imported agricultural products. After deducting the cost of imported agricultural items, it shows the remaining earnings from exporting agricultural commodities, measured in billion Naira.

Net Manufacturing Exports: In this context, "net manufacturing exports" refers to the value of a nation's exported manufactured products less the value of its imported manufactured goods. It shows the amount of money that comes in from selling produced items after deducting the cost of imported manufactured goods. This is as well measured in billion Naira.

Net Mining and Quarrying Exports: The value of a nation's exports less the value of its imports of energy and other mineral goods (i.e., coal, metals, oil, gas, and coal) is the trade balance. After deducting the cost of imported energy and mineral items, it shows the remaining earnings from exporting quarrying and mining goods. This is measured in billion Naira as well.

Net Service Exports: The variable is operationalized as the value of a nation's exports of services minus the value of its imports of services. After deducting the cost of imported services, it shows

the remaining earnings from service exports. Many other kinds of endeavours fall under the umbrella term "services," comprising travel, transportation, banking, phone, and consulting. Its value is measured in billion Naira too.

Techniques of Analyses

Summary statistics analysis is conducted to verify the normality characters of the variables by utilising Jarque-Bera statistics in an effort to empirically test the specified model. The unit root tests of the individual variables are conducted in accordingly, employing the Augmented Dickey Fuller (ADF) test at 5% to determine their orders of integration (Dickey & Fuller, 1981). The following is the general ADF model for unit root estimation:

$$\Delta Y_t = \lambda_0 + \lambda_1 + \delta Y_{t-1} + \sum_{i=1}^n \lambda_i \Delta Y_{t-i} + \mu_t \quad (3.3)$$

Where, Δ = first difference operator, Y = the time series variables under consideration, t = Linear time trend, n = optimum number of lags on the dependent variables, λ_0 = constant term, and μ_t = the stochastic error term.

In addition, following Pesaran, Shin, and Smith (2001), the ARDL Bounds co-integration test is applied to determine whether the variables in question are cointegrated. This approach is utilised when mixed orders of integration I(0) and I(1) are established from the unit root analysis. When the computed F-statistic value is above the upper limit I(1), below the lower bound I(0), or in between the lower I(0) and the higher I(1) bounds, three possible outcomes are considered by this method: the presence of cointegrating relationships, the absence of cointegrating connections, and inconclusive relationships. Equation for the generalized ARDL bounds co-integration is thus:

$$Y_t = \Delta_t Y_{t-1} + \dots \Delta_p Y_{t-p} + \delta R_t + U_t \quad (3.5)$$

Where Y_t = the time series variables under consideration in time t , Δ = first difference operator, Y_{t-1} and Y_{t-p} = cointegrating equations estimates, and U_t = stochastic error term.

The model's dependent and independent variables were theoretically and statistically examined employing ARDL long and short runs dynamic estimates after an ARDL bounds test for co-integration. Hence, the following is the construct of the ARDL long-run model.

$$\begin{aligned} \Delta(HDI_t) = & \alpha_1 + \alpha_{1i} \Delta(HDI_{t-1}) + \alpha_{2i} \Delta(NAE_{t-1}) + \alpha_{3i} \Delta(NME_{t-1}) + \alpha_{4i} \Delta(NMQ_{t-1}) \\ & + \alpha_{5i} \Delta(NSE_{t-1}) + \sum_{t=1}^p \delta_{1i} \Delta(HDI_{t-1}) + \sum_{t=1}^q \delta_{2i} \Delta(NAE_{t-1}) + \sum_{t=1}^q \delta_{3i} \Delta(NME_{t-1}) \\ & + \sum_{t=1}^p \delta_{4i} \Delta(NMQ_{t-1}) + \sum_{t=1}^p \delta_{5i} \Delta(NSE_{t-1}) + U_{1i} \end{aligned} \quad (3.6)$$

Also, to establish the short-run dynamic parameters which includes the Error Correction Term estimate, the model is expressed below.

$$\Delta(HDI_t) = \delta_0 + \sum_{t=1}^p \delta_{1i}\Delta(HDI_{t-1}) + \sum_{t=1}^q \delta_{2i}\Delta(NAE_{t-1}) + \sum_{t=1}^q \delta_{3i}\Delta(NME_{t-1}) + \sum_{t=1}^P \delta_{4i}\Delta(NMQ_{t-1}) + \sum_{t=1}^P \delta_{5i}\Delta(NSE_{t-1}) + \Omega ECT_{t-1} + \varepsilon_{1i} \quad (3.7)$$

In which Δ represents the difference operator; $\alpha_1-\alpha_5$ are the long-run co-efficient, while $\delta_1-\delta_5$ are the short-run dynamic co-efficient. The term ε_{1i} refers to a serially uncorrelated stochastic component with a zero mean and constant variance. Additionally, ECT_{t-1} represents the error correction term derived from the short-run analysis, with Ω indicating the co-efficient of the error correction term. This co-efficient reflects the annual rate of adjustment from the previous period's disequilibrium to restore long-run equilibrium. The ECT co-efficient is expected to appear inversely and significantly. However, a key limitation of this approach is its inapplicability when all variables are stationary at their first differences.

In addition, there are a number of post-diagnostic tests that need to be conducted. These comprise the Ramsey RESET test to ensure the model is correct, the Jarque-Bera normality statistic test to look for jointly normally distributed variables, the serial correlation test to determine if the residuals are serially independent, the heteroscedasticity test to look for homoscedasticity, and the CUSUM stability test to see if the estimated regression result is stable.

RESULTS AND DISCUSSIONS

Data Characteristics

The estimated outcomes of the characteristic behaviours of the data sets for the variables are presented in this section. Tabulated in Table 4.1 below are estimates from the descriptive statistics analysis.

Table 4.1: Descriptive Statistics

	HDI	NAE	NME	NMQ	NSE
Mean	14.62114	317.3729	26.62229	45.00943	-1.757429
Median	11.55000	168.9100	21.85000	12.55000	-4.920000
Maximum	37.18000	1342.430	220.3200	318.8300	351.0500
Minimum	5.300000	2.070000	-69.87000	-189.2300	-495.1700
Std. Dev.	9.005413	364.9255	61.13246	125.5183	136.5430
Skewness	1.022196	1.241018	1.507480	0.626688	-0.633178
Kurtosis	2.968840	3.682961	5.300043	2.889169	7.447723
Jarque-Bera	6.096576	9.664280	20.97110	2.308886	31.18777
Probability	0.047440	0.007969	0.000028	0.315233	0.000000
Sum	511.7400	11108.05	931.7800	1575.330	-61.51000
Sum Sq. Dev.	2757.314	4527800.	127064.0	535664.3	633895.5
Observations	35	35	35	35	35

Source: Computation by author (2024), E-views 12.0

Table 4.1 above displays the descriptive statistics of the study variables. The table indicates that the HDI averaged 14.62 from 1988 to 2022, with a high of 37.18 and a minimum of 15.3 annually. The standard deviation of 9.01 indicates a minimal departure from the mean. Net agricultural exports (NAE) exhibited an average value of 317.37, with a high of 1342.43 and a low of 2.07 per year over the period analysed. The standard deviation is 364.93, indicating substantial variability from the mean. Net manufacturing exports (NME) had an average value of 26.62, with a high of 220.32 and a low of -69.87 per year over the period. The standard deviation is 61.13, indicating a substantial dispersion from the mean. Net mining and quarrying exports (NMQ) had an average value of 45.01, with a high of 318.83 and a low of -189.23 year. The standard deviation is 125.52, indicating a substantial variation from the mean. Net service exports (NSE) had a mean value of -1.76, with a maximum of 351.05, a low of -495.17 per year, and a standard deviation of 136.54, indicating substantial variability from the mean. The estimated outcomes indicate that only net mining and quarrying export (NMQ) had a normal distribution, as seen by its Jarque-Bera probability value of 0.315233, which is not statistically substantial.

Data Analyses Outcomes

In this section, the pre-diagnostic analysis of unit root, optimal lag selection, and ARDL bounds co-integration were performed, followed by the implementation of ARDL long-run and short-run ECM models, as well as post-diagnostic testing for the model.

Unit Root Test

In efforts to determine whether or not a co-integration exists, it is necessary to first determine whether or not the series has unit roots. Therefore, to explore the integration levels of the variables that were used, this research utilised the well-known ADF unit root testing approach. Following the outcomes detailed in Table 4.2, below, it was apparent that net agricultural exports (NAE), net manufacturing exports (NME), and net mining and quarrying exports (NMQ) got integrated at level, which is denoted by the symbol I(0). On the other hand, following the first difference analysis [i.e., I(1)], both the HDI and the net service exports (NSE) showed became integrated.

Table 4.2: Augmented Dickey-Fuller (ADF) Test upshots

Variables	At Levels		At 1 st Difference		Decision
	ADF	Mackinnon Critical Value @ 5%	ADF	Mackinnon Critical Value @ 5%	
HDI	0.006539	-2.951125	-5.113022	-2.954021	I(1) Stationary
NAE	13.10479	-2.951125	-	-	I(0) Stationary
NME	-3.168519	-2.951125	-	-	I(0) Stationary
NMQ	-4.633428	-2.951125	-	-	I(0) Stationary
NSE	-2.445781	-2.951125	-6.839076	-2.954021	I(1) Stationary

Source: Computation by author (2024), E-views 12.0

Sequel to the stationarity estimates, the ARDL bounds testing approach is necessary to estimate the long-term relationship between the variables and the ECM due to the attained mixed stationarity in the variables (i.e., stationary at order zero and one).

Lag Order Selection Criteria

The optimal lag order selection result is presented in Table 4.3 below. Four criteria as the sequential modified LR test, the Final Predictor Error (FPE), the Akaike Information Criterion (AIC), and the Hannan-Quinn (HQ) selected lag two as the ideal lag length. However, out of all the criteria, only the Schwarz Criterion (SC) chose the underperforming lag one. Therefore, the ideal lag duration for the following studies is lag two.

Table 4.3: Lag Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-915.4343	NA	1.16e+18	55.78390	56.01064	55.86019
1	-775.6412	228.7522	1.13e+15	48.82674	50.18720*	49.28450
2	-742.2160	44.56700*	7.56e+14*	48.31612*	50.81030	49.15534*

Source: Computation by author (2024), E-views 12.0

ARDL Bound Co-integration Test

Table 4.4 below displays the outcomes of the ARDL Bounds long-run test. Evidence of co-integration between commodity trade indicators (net exports from agriculture, net exports from manufacturing, net exports from mining and quarrying, and net exports from services) and economic well-being (Human Development Index) in Nigeria is established, showing that at 5% significance level, the computed F-statistic of 8.960089 is above the crucial upper limit of 4.57. Therefore, we can conclude that the variables do in fact exhibited long-run association, thus, we reject the null hypothesis that there is no co-integration. That led to the next step: estimating the theoretical and significance links between the ARDL model's dependent and independent variables.

Table 4.4: ARDL Bounds Co-integration Test

Significance	I(0) Bound	I(1) Bound
10%	3.03	4.06
5%	3.47	4.57
2.5%	3.89	5.07
1%	4.4	5.72

Computed F-statistic: $F_{HDI}(NAE, NME, NMQ, NSE) = 8.960089$
Unrestricted intercept and no trend for $K = 4$.

Source: Computation by author (2024), E-views 12.0

Discussion of Short-Run and Long-Run ARDL Model Analysis upshots

Utilising the ARDL approach, we assessed the short-term dynamic and long-term impacts of commodities trade on Nigeria's economic well-being (the Human Development Index). Table 4.5 below displays the outcomes that Net agricultural exports substantially boosted Nigeria's HDI in

the short- and long-term estimations. The favourable co-efficient and substantial values for the short-run (0.015489 and $0.0007 < 0.05$) and long-run (1.171861 and $0.0003 < 0.05$) models indicate that one billion Naira growth in net agricultural exports contributed 0.015489 percent and 1.17186 percent to the HDI, respectively. However, the long-run effect has a more noticeable impact on human development in Nigeria. Empirical evidence from Ayanda (2021) corroborated this conclusion, showing that South Africa's GDP grows substantially when net agricultural exports, a measure of international trade of commodities improves.

There was also a favourable and statistically substantial relationship between Nigeria's HDI and the nation's net manufacturing exports, both in the short and long terms. The favourable co-efficient and significant values for the short-run (0.009093 and $0.0356 < 0.05$) and long-run (0.037199 and $0.0144 < 0.05$) indicated that one billion Naira rise in net manufacturing exports improved the HDI by 0.009093 percent and 0.037199 percent, respectively. But the outcome in the long term is better for propelling HDI in Nigeria. Consistent with previous research, this study confirms that net manufacturing export, a measure of export commerce, substantially affects economic growth in Nigeria (Shido-Ikwu, Dankumo, Pius and Fazing, 2023).

Table 4.5: Short-run and Long-run Analyses Outcomes

Dependent Variable = LOG(CPI)				
Long-Run upshots				
Variable	Co-efficient	Std. Error	t-Statistic	Prob.*
NAE	1.171861	0.206554	5.673394	0.0003
NME	0.037199	0.012299	3.024525	0.0144
NMQ	0.266241	0.412693	0.645130	0.5252
NSE	0.190619	0.297547	0.640636	0.5281
C	-2.559491	16.18704	-0.158120	0.8757
Short-Run upshots				
D(HDI(-1))	-0.373669	0.138639	-2.695263	0.0143
D(NAE)	0.015489	0.003965	3.906371	0.0007
D(NAE (-1))	-0.004603	0.003270	-1.407305	0.1727
D(NME)	0.009093	0.004074	2.231991	0.0356
D(NME(-1))	-0.029147	0.008890	-3.278525	0.0040
D(NMQ)	-0.008665	0.003340	-2.594725	0.0178
D(NMQ(-1))	0.017714	0.003987	4.443345	0.0003
D(NSE)	0.008911	0.003709	2.402750	0.0267
CointEq(-1)	-0.141470	0.0009457	-7.267167	0.000019467
R ² = 0.788979; Adjusted R ² = 0.706405; Durbin-Watson stat = 1.845420				

Source: Researcher's EViews Computation, 2024

Furthermore, the long-term estimates suggested that the HDI was not substantially favourably influenced by net mining and quarrying exports ($0.5252 > 0.05$ and 0.266241). It suggests that one billion Naira rise in net exports from mining and quarrying would have a long-term favourable effect on the HDI, increasing it by 0.266241 percent. Nevertheless, in the short-term, this predictor

had an unfavourable and statistically substantial impact on the dependent variable, indicating that a one billion Naira rise in net exports of mining and quarrying slowed the HDI by 0.008665 percent. The widespread unlawful production operations in the industry can be to blame for this result. However, the HDI in Nigeria was favourably and substantially affected by the one-year lagged improvement of net mining and quarrying exports (0.017714 and $0.0003 < 0.05$). Mekanjuola, Ekperiware, Oyetade, Adewusi, and Tenny (2022) shown that exports had a favourable effect on GDP growth, and this empirical outcome is in line with their submission.

Further palpable from the empirical analysis is that, net service exports had favourable impacts on the HDI in Nigeria in both the short- and long-terms (0.008911 and 0.190619), but only significantly in the short-term ($0.0267 < 0.05$). From what is clear, one billion Naira boost to this sector's net exports improved the HDI by 0.008911% in the short run and 0.190619 % in the long run. However, the long run impact is more beneficial in improving Nigeria's human development index. This finding is in line with the submission of Simon and Pingfang (2021), who also discovered that export-based international commerce had favourable effect on economic development in Africa.

Table 4.5 also displays the estimated short-run dynamic co-efficient, which the analysis confirmed to be statistically substantial and appeared inversely sign. In other words, the predicted error correction co-efficient of -0.141470 (with a p-value of 0.0000) is substantial, appropriately signed, but suggests a rather sluggish rate of adjustment to long-run equilibrium after shock. In other words, this year's shock returned approximately 14% of last year's disequilibria to long-run equilibrium. The short-run estimates in table 4.5 showed an Adjusted R-squared value of 0.706405, which means that the model fits the data adequately. This is because the employed explanatory variables systematically explained about 71% (Adj. R-squared) of the variance in the HDI, while other variables or factors outside the model accounted for the remaining 29%. Finally, there is no serial autocorrelation since 1.845420 is greater than 2 in the Durbin-Watson statistic.

Post-Estimation Tests

The estimated outcomes of the post estimation tests are presented and discussed in Table 4.6 below:

Table 4.6: Post-Estimation Test upshots

Test	Null Hypothesis	Test Type	F-stat.	Prob.
Normality Test	Normal distribution exists	Jarque-Bera Test	1.069979	0.585675
Serial Correlation Test	Serial correlation does not exist	Breusch-Godfrey LM Test	0.218211	0.8062
Heteroscedasticity Test	Homoscedasticity exists	Breusch-Pagan-Godfrey	1.673877	0.1494
Functional Form Test	Model is stable	Ramsey RESET	2.183317	0.1537

Source: Computation by author (2024), E-views 12.0

Table 4.6 as displayed, indicated that the Jarque Bera (Normality) test, which show the null hypothesis of normal distribution cannot be rejected since the probability value (0.585675) is more than the 0.05 threshold of significance. So, we may say that the model follows a normal distribution. Further, null hypothesis of no serial correlation was tested using the Breusch-Godfrey Serial Correlation LM method and it found a probability value of 0.8065, which is higher than 0.05, suggesting that the model is free of serial correlation issues. Additionally, the probability values (0.1494) from the Breusch-Pagan-Godfrey heteroskedasticity test is more than 0.05, indicating that the null hypothesis of homoscedasticity cannot be discarded. Consequently, inferring that the model is homoscedastic. Meaning that relevant variables were not left out(omitted) from the model. Lastly, the model is adequately specified as certified by the Ramsey RESET test as it produced a p-value of 0.1537, which is more than the 0.05 level of significance. Therefore, it is reasonable to conclude that the model's functional form is correct.

Figure 4.1 shows the cumulative sum (CUSUM) graph; the CUSUM line remained within the 5% critical bounds and did not cross the critical lines. The research variables' long-run co-efficients are stable as observable in figure below.

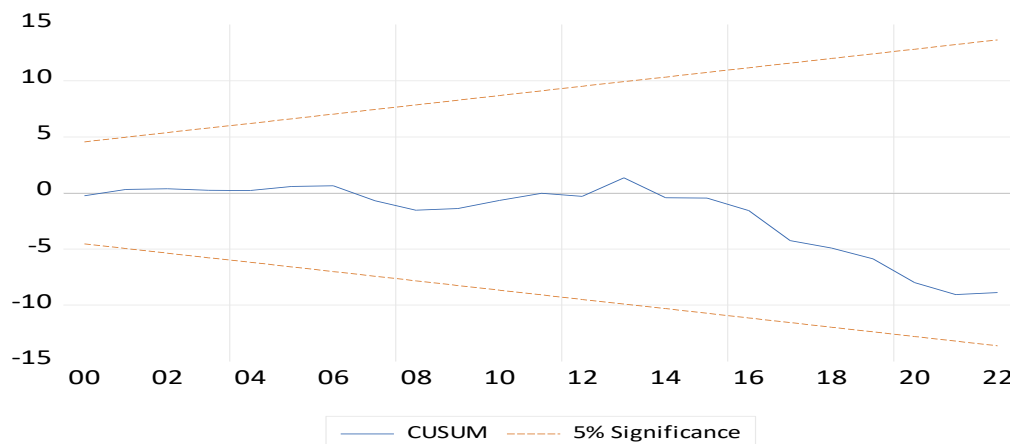


Figure 4.1: Stability Cusum Test

CONCLUSION AND RECOMMENDATIONS

Conclusion

This research empirically investigated the theoretical and significance impacts of commodities trade on Nigeria's economic well-being for the 1988–2022 sample period. The researchers utilised the ARDL method to estimate the model. Based on the study's outcomes, commodity trade indicators employed as net exports from agriculture, net exports from manufacturing, net exports from mining and quarrying, and net exports from services had improvement impacts on Nigeria's HDI over the time under consideration. In concordance with the findings, the study concluded that commodity trade contributes positively to economic well-being in Nigeria.

Recommendations

Founded on objectives and estimates of this investigation, the researchers suggested the following way forward:

- i. The government should put in place policies that would boost the exports of higher-value crops and processed agricultural items from Nigeria to sustainably diversify the nation's agricultural export base which will transmit to enhance human development index in Nigeria.
- ii. The government should support domestic manufacturers through grants, subsidies, and tax incentives so that they can become more globally competitive. This would help boost exports in sectors like textiles, electronics, and agro-processing, which in turn would help Nigeria's HDI.
- iii. To boost its net exports, the government should allocate significant amount of her budget to improving infrastructure development and enhance word best practices in the mining and quarrying regions of these activities, while also implementing policies that encourage local content in the extraction industries as this will induce its outputs and net exports to grow HDI.
- iv. To strengthen the nation's impact on human development, the government should improve digital infrastructure and fund skill development programs targeted at firms into information technology (IT), finance, and professional services. This would support Nigeria raise its service exports, which in the long-run would improve the HDI of the country.

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