**Journal of African Union Studies (JoAUS)**
**ISSN 2050-4306 (Online) ISSN 2050-4292 (Print)**

**Indexed by: SCOPUS, IBSS, JSTOR, EBSCO, COPERNICUS, ERIH PLUS, ProQuest, J-Gate and Sabinet**

**Volume 15, (Number 1), April 2026**
**pp 279-299**

# AfCFTA as a Catalyst for Intra-African Trade, Regional Integration and Economic Development: A Gravity Model Approach

DOI: https://doi.org/10.31920/2050-4306/2026/v15n1a12

**Dr. Bongumusa Prince Makhoba**
*Senior Lecturer, University of Zululand,*
*Faculty of Commerce, Administration, and Law,*
*Department of Economics, South Africa,*
*E-mail address: MakhobaB@unizulu.ac.za*

## Abstract

This study adopts a Gravity model framework to conduct an empirical analysis of the relationship between intra-African trade, regional integration, and economic development in Sub-Saharan Africa. The study employed a gravity-consistent Vector Autoregressive (VAR) methodology, using time-series data from the World Bank Development Indicators (WDI) for the period 1975-2023. The empirical findings of the study indicated that the gravity model is valid for Sub-Saharan African (SSA) countries. Consistent with the gravity model, the study's results suggest that intra-African trade increases as the size of GDP increases, and that regional free trade agreements in SSA are strengthened. Conversely, intra-African trade diminishes as distance—measured by import transportation costs—increases within the region. The study proposes that policymakers focus on prudent policies to promote intra-African trade, regional economic expansion, integration, and cooperation through the AfCFTA. The study strongly suggests that AfCFTA provides a significant opportunity and platform for cross-border infrastructure and technology investment; an integrated financial system and monetary union; economic structural reforms that boost intra-investment and regional value chain integration; and economic diversification that would ultimately unlock the optimal economic benefits of intra-African trade.

***Keywords***: *AfCFTA, Intra-Africa Trade, Gravity Model, and Free Trade Agreements (FTA)*

## 1. Introduction

The African continent, with 54 countries, remains the largest region in the world, accounting for the highest number of countries in a single continent. The continent has a population of over 1.4 billion people, heavily endowed with abundant natural resources and raw materials. Africa possesses abundant natural and human resources, making the continent one of the most resource-rich regions in the world (Ukwandu, 2015). The work of Bush (2007) asserted that Africa boasts an incredible array of natural resources, with 88% of diamonds, 42% of gold, 42% of the world's bauxite, 38% uranium, and 10% confirmed oil reserves. According to the work of Gordon and Wolpe (1998), South Africa alone produces 88% of the world's platinum, making it the largest producer of platinum in the world, whereas the African continent holds 82% chromium, 54% cobalt, and 52% of the world's manganese reserves. With all these abundant natural resources, Carmody (2011) described the African development quagmire as a "paradox of plenty," implying that despite the continent's abundance of natural resources, the vast majority of citizens still live in extreme poverty and economic deprivation.

The majority of Africa's resources are processed and refined into finished products outside the continent. Most of these scarce resources are instrumental in the production of energy, infrastructure, appliances, and the automotive industry. This effectively implies that Africa remains a recipient of value-added finished commodities that could have been produced and processed locally. Such local production would have generated employment opportunities, stimulated economic activity, and ultimately fostered a conducive environment for holistic development through intra-investment, industrialisation, localisation, and regional integration (Ukwandu, 2014). The majority of African countries need to work together to foster sustainable regional economic integration and development to improve the economic conditions of several African countries, such as addressing high income inequality, unemployment, poverty, and sluggish economic growth.

The African Continental Free Trade Area (AfCFTA), officially implemented in January 2021, was ratified by 48 African countries to promote intra-African regional trade by creating a single African market for local goods and services. This regional trade agreement provides numerous opportunities for economic development, industrialisation, and integration in African economies. A study by Virag-Neumann (2014) noted that while international trade is growing at a faster pace across

different trading partners, there are numerous challenges in the multilateral trading system linked to the size of membership and the diversity of economic conditions, trade interests, geopolitics, and other commitments between countries.

This study discovered a research gap in the literature on intra-African trade and its impact on African development and industrialisation to achieve sustainable economic integration and development in the African continent. There is a lack of empirical evidence on the relationship between intra-regional trade and economic growth and industrialisation from the African perspective. Some studies, such as Virag-Neumann (2014) and Lypko (2022), have predominantly been conducted in advanced economies, leaving a vacuum for African-specific policy analysis. The purpose of this study is to investigate the relationship between intra-African trade, economic size, and integration among the Sub-Saharan African (SSA) economies. Using the gravity model framework, the study analyses intra-African trade and its implications for the African economic development trajectory. The study adopted a VAR methodology to conduct an empirical analysis of the nexus between intra-African trade, economic size, distance as proxied by transportation costs, and free trade agreements within Africa.

## 2. Literature Review

This section provides a detailed discussion and critical analysis of the existing theoretical framework underpinning international trade as well as empirical literature on the subject matter. This study focuses on two prominent conventional trade theories, namely, mercantilist theory and the gravity model, which focus on the impact of economic size, resources, and trade to analyse the foundation and nature of international trade between trading partners to explain intra-African trade.

### *2.1 Theoretical Framework*

#### *2.1.1 The Mercantilist Theory*

The mercantilist theory is the oldest theory of international trade, which assumes that the wealth and power of the nation are directly tied to its gold and silver reserves and precious natural resources. The mercantilist principles suggest that trade policies should focus on maximising exports and minimising imports. This approach would foster a favourable balance of trade and trade pattern, where a country earns more through

exports than it spends on foreign goods. This is the most fundamental framework of international trade. African countries need to revisit their trade policies for long-term benefit and sustainable economic growth through regional economic development and integration.

Another prominent international trade theory, the Heckscher-Ohlin (1933) theory, assumes that there are winners and losers during the process of international trade. According to the Hecksher-Ohlin model, the winners of free trade are countries with relatively abundant factors of production, while the losers are countries that have relatively scarce production factors. An intra-Africa regional trade partnership similar to the intra-Europe trade agreement would most likely lead to a situation where there are more winners than losers in the African Continental Free Trade Area (AfCFTA). This would only be possible if African economies strengthen their trade ties to create a single market for the continent and trade more with each other than they do with other regions, as supported by the gravity model by Tinbergen (1962) to foster regional development and integration.

### *2.1.2 Augmented Gravity Model*

A groundbreaking work by Jan Tinbergen (1962) applied an analogy with Newton's universal law of gravity to describe the patterns of bilateral aggregate trade flows between two countries, $i$ *and* $j$, as proportional to the GDP of the two countries, $i$ *and* $j$, and inversely proportional to the distance between the two countries. The gravity model is a conventional theory of international trade that posits that the volume of trade between two countries is directly proportional to the size of their economies, as indicated by their GDP, and is inversely related to the distance separating the two nations. The theory posits that larger economies tend to trade more extensively with each other; conversely, trade volumes are expected to decline as the geographical distance between countries grows, largely owing to increased transportation costs and diverse trade impediments. The gravity model allows the study to empirically analyse regional economic development and integration with the Sub-Saharan African region through the adoption of the AfCFTA by African economies.

The logic is that larger economies spend more on imports and attract a larger share of exports from developing economies because they produce large quantities of various goods and services. On the other hand, distance tends to decrease the volume of trade between countries because of high transportation costs and other intangible barriers, such as

language, geography, and historic colonial ties. The gravity model can also incorporate other important factors such as common borders, language, cultural affinity, free trade membership, etc. This gravity theoretical framework is used to analyse trade patterns and regional integration, including the impact of regional trade agreements such as AfCFTA. The gravity model equation using logarithms can be expressed as follows:

$$In(Trade_{ij}) = In(A) + \propto In(Yi * Yj) - \beta InD_{ij} \quad (1)$$

Where $Trade_{ij}$ represents trade between South Africa (country $i$) and Sub-Saharan African (SSA) countries (country $j$), it is a function of the economic size $(Yi * Yj)$ of trading economies and the distance $(D_{ij})$ between trading countries, i.e., South Africa's trade with SSA countries, as an indirect indicator of trade expenses. Incorporating a stochastic component in the above model gives us the following equation:

$$In(Trade_{ij}) = In(A) + \propto In(Yi * Yj) - \beta InD_{ij} + \varepsilon_{ij} \quad (2)$$

Within the gravity model framework, we can incorporate the impact of other variables. In equation (2), $In(A)$ is a gravity constant, $\propto$ and $\beta$ are the regression coefficients, and $\varepsilon_{ij}$ is a stochastic error. The study incorporates the free trade agreement (FTA) dummy variable to account for the African Continental Free Trade Area (AfCFTA) to anayse the impact of regional integration. Importantly, the AfCFTA only came into effect in 2021, which represents the FTA as captured by the dummy variable. This development is relatively recent compared to other regional free trade agreements, such as intra-European trade, intra-Asian trade, etc. However, this proxy remains the most accurate measure capturing the intra-African free trade agreement among 55 African economies and eight regional economic communities to foster a free single market for the continent.

$$In(Trade_{ij}) = In(A) + \propto In(Yi * Yj) - \beta InD_{ij} + \gamma X_{ij} + \varepsilon_{ij} \quad (3)$$

Equation (3) includes the $\gamma X_{ij}$ as another explanatory variable to anayse the impact of the free trade agreement on intra-African trade. The most

recent theoretical framework of international trade, formulated by Krugman (1990) in the context of the new trade theory, attempts to analyse globalisation and international trade through the concepts of first-entry advantage, network effects, and economies of scale across nations. The new trade theory describes intra-industry trade as an important aspect of contemporary trade patterns across different economies. This theory implies that African economies need to capitalize on their regional networks and economies of scale to foster regional integration and economic development.

### *2.2 Review of Empirical Studies*

International trade and globalisation have been a key source of economic development and integration between different countries in the world. Several empirical studies have studied the relationship between trade, trade membership agreements, and economic growth across different countries. However, most previous studies have been predominantly conducted in advanced economies; consequently, there is a lack of empirical evidence from an African perspective. The findings from different studies report mixed results across different regions and trading partners. An earlier study by Sichei, Erero, & Gebreselasie (2008) applied an augmented gravity model to South Africa's bilateral exports of motor vehicles, parts, and accessories to its 71 trading partners from 1994 to 2004. Their study found that certain characteristics of the trading partners, such as GDP, government effectiveness, regulatory quality, English language, and membership in the EU, Africa, NAFTA, and Asia, enhance South Africa's exports of motor vehicles and parts and accessories. Furthermore, the study found that the negative effect of distance implies that high transport costs inhibit South Africa's exports of motor vehicles and parts and accessories.

Another study by Tansey & Touray (2010) tested the gravity model hypothesis for African economies using data from the U.S. Central Intelligence Agency. However, this paper used a simple linear regression estimation. Their study reported a disappointing trade impact of growth in the developing world on the potential development of Africa through export growth, since trade grows less than proportionately for the GDP of both the importing nation and the exporter. The results further indicated that developing countries in Africa can expect gravity effects to be at work if they are able to grow.

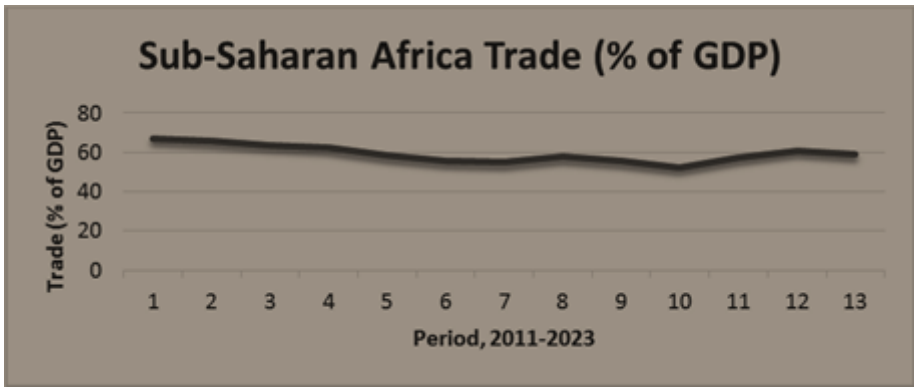
A study by Virag-Neumann (2014) applied a gravity model approach to investigate the impact of the integration on trade of EU members over the 2000-2010 period. This paper estimated a simple OLS regression model. The study found that the GDP variables exert a significantly positive impact, while EU membership also demonstrates a consistently positive effect within the model. The results indicated that the intra-EU trade volumes were positively affected by the enlargement of the European Community, e.g., with the accession of new member states. A recent study by Lypko (2022) on the patterns of international trade in the Central and Eastern European countries found that the gravity model remains a reliable and simple instrument that explains bilateral trade flows between countries. The result showed that the gross domestic product and distance are the main factors, which explain more than 90% of the variability of trade between countries.

According to Aiyar et al. (2024) and the IMF report (2023), since the Global Financial Crisis, there has been a decline in global trade and investment flows that coincide with an increase in geopolitical tensions, growing demands to de-risk supply chains by reducing reliance on geopolitical rivals, and incentives to "reshore," "friendshore," or "nearshore" investments. Importantly, this section shows that there is a lack of empirical evidence of the gravity model application on intra-African trade and economic development and integration. The findings of previous studies, as discussed in this section, show disparity in the results from one region or trade membership alliance to another. These differences in the empirical literature warrant a need for a robust empirical investigation of the relationship between intra-trade and economic expansion in the Sub-Saharan African region for specific, rigorous policy analysis and intervention in the best interest of African economies.

### *2.3 Key Commodities and Natural Resources in Africa*

Africa remains a global powerhouse of critical mineral resources and raw materials, holding the world's largest reserves in essential commodities such as crude oil, natural gas, gold, diamonds, platinum, cobalt, copper, chromium, uranium, manganese, and lithium etc. Most of these rare minerals are crucial for several industries, including electric vehicles, high-tech electronics, renewable energy, appliances, and infrastructure. The majority of African countries export unprocessed raw materials and natural resources to advanced economies. By exporting raw materials that are later re-imported as high-value finished goods, the continent

effectively exports the very jobs it needs to create locally, thereby stalling the industrialisation and manufacturing growth vital to Africa's economy. Ukwandu (2014) argued that concentrating solely on exporting raw materials inhibits the ability of developing countries to add value to their resources, which will in turn diminish the revenues accruable to the countries from exports.




The above diagram illustrates the trends in trade as a percentage of GDP in Sub-Saharan Africa from 2011 to 2023. The figures indicate that, over the last ten years, trade as a proportion of GDP in Sub-Saharan Africa has maintained an average of approximately 60%. This figure is significantly lower than that of European Union trade, which accounts for almost 100%. According to Statistica's (2025) report, the European Union trade-to-GDP ratio for 2023 was 95.69%, a 7.89% decline from 2022's 103.57%.

### *2.3.1 Crude Oil and Natural Gas*

Crude oil remains Africa's most significant export commodity by value, driven by major oil-producing countries like Nigeria, Angola, Algeria, Libya, and Egypt. Oil is Africa's top export commodity. Nigeria and Angola rank among the top oil exporters in the world. Natural gas is also a critical commodity in the world, and countries such as Algeria, Egypt, Nigeria, and Mozambique are the largest gas producers in Africa (African Commerce Bank, 2025).

### *2.3.2 Gold and Diamonds*

Africa is rich in gold resources, and gold remains one of the most sought-after commodities globally. Africa holds 40% of global gold reserves. The leading producers of gold in Africa include South Africa,

Ghana, Mali, Burkina Faso, Sudan, and Tanzania. South Africa and Ghana rank among the top ten leading global gold producers. Ghana recently overtook South Africa as Africa's top gold producer (African Commerce Bank, 2025). Diamonds are a valuable mineral commodity in Africa, with Botswana and South Africa leading in production. Leading diamond producers in Africa include Botswana, South Africa, Namibia, Angola, and the Democratic Republic of Congo (DRC).

### *2.3.3 Platinum Metals and Chromium*

South Africa holds more than 80% of global platinum reserves. Zimbabwe also holds major platinum deposits in Africa. South Africa holds approximately ”70% of global chromium reserves. Zimbabwe also has significant chromium deposits in Africa after South Africa (African Mining Week 2025).

### *2.3.4 Cobalt, Copper, and Lithium*

The DRC accounts for approximately 70% of global cobalt production. Copper, an essential metal in electronics and construction, has seen increased demand as economies digitise and electrify. The DRC is Africa's largest copper exporter, producing over half of the continent's copper, followed by Zambia and South Africa. Copper production serves as a vital economic pillar for these nations, as it attracts foreign investment and acts as a primary driver of economic growth (African Commerce Bank, 2025). Zimbabwe has the largest lithium reserves on the continent. Other African countries with large lithium deposits include Namibia, the DRC, South Africa, Mali, and Ghana.

### *2.3.5 Manganese and Uranium*

South Africa is the world's leading producer of manganese, accounting for a significant portion of global manganese production, with the largest global manganese reserves. Gabon and Ghana also have large manganese deposits in Africa (African Mining Week, 2025). Uranium is a critical commodity in the world market that is used in nuclear energy production. The DRC, Gabon, Niger, Namibia, and South Africa are the top uranium producers in Africa.

### *2.3.6 Agricultural Commodities: Cocoa, Coffee, Cotton, and Tea*

Ivory Coast and Ghana are the leading cocoa-producing countries in Africa. Africa's coffee exports are primarily driven by Ethiopia and Uganda, the leading coffee producers on the continent. Cotton is a

critical agricultural export for West African nations, with countries such as Benin, Mali, and Burkina Faso leading the continent's exports. Kenya dominates Africa's tea exports, known globally for its robust and aromatic black tea. In 2023, Kenya accounted for nearly 70% of Africa's total tea exports (African Commerce Bank, 2025).

### *2.4 Lessons from Intra-European Union and Intra-Asia Trade*

Intra-European trade refers to the flow of goods and services between the 27 European Union member states. Intra-European trade is a single market, which promotes the free movement of goods and services, people, and capital within Europe. Intra-EU trade accounted for 61.65% of the regional total trade value in 2024 (Statista, 2025). A study by Virag-Neumann (2014) noted that the enlargement of the European Union (EU) from 15 to 27 members between 2004 and 2007 was one of the defining developments in its recent economic history. The European Union members trade more with one another than they do with outside countries through intra-European Union trade, and Asian countries trade more with other Asian countries than they do with outside countries. Importantly, Africa, similar to other regional trade agreements, needs to understand that these are fundamental principles of beneficial international trade as advocated by the gravity model and mercantilist trade theory and, sooner rather than later, foster intra-African trade for the benefit of the whole of Africa.

Asia ranks as the second-most integrated trade region in the world, after the European Union. Intra-Asian trade in 2022 accounted for nearly 57% of Asia's total trade value. This implies that more than half of the goods traded in Asia are traded between Asian countries. Intra-regional trade is an important driver of regional economic development and integration. Regional development and trade integration in Asia have mainly been driven by the rapid growth of manufacturing supply chains across borders (McKinsey & Company, 2025). In 2023, intra-African trade slightly improved to approximately 15% of the continent's total trade from 13.6% in 2022. Despite these improvements, intra-African trade is still limited when compared to the European Union and Asia, both of which exhibit substantially higher levels of intra-regional commerce. Moreover, Africa trades more with Europe and China than it does within the intra-African trade. However, over the past few years, we have seen a slight increase in intra-African trade owing to the African Continental Free Trade Area (AfCFTA). Africa remains the least

economically integrated region in the world. In 2024, only 15 percent of Africa's total trade value originated within the region. This intra-African trade pattern is far below that of other larger regions such as Europe and Asia.

## 3. Data and Methodology

This section outlines data collection processes and the types of data that were employed during the estimation process. It also discusses the estimation procedure of the VAR approach as the main model and the ARDL technique as a verification method to carry out rigorous empirical analysis of intra-African trade. The specific variables employed, as supported by the gravity model and mercantilist theory, include trade as a percentage of GDP, GDP of South Africa, GDP of Sub-Saharan Africa, and the Free Trade Agreement (AfCFTA) dummy variable. This paper used annual time series data over the period 1975-2023, extracted from the World Bank Development Indicators and the South African Reserve Bank (SARB) database.

### *3.1 Model Specification*

The model specification of the study follows the assumptions of the gravity model, which suggests that trade between countries is directly influenced by the size of their economies as measured by their GDP and the distance between trading countries. A study by Virag-Neumann (2014) noted that the gravity model enables statistical analysis of flows and patterns with bilateral trade flow data. The study further argued that the gravity model is convenient for several reasons, such as simplicity, high explanatory ability, and improved econometric application. The model specification investigating intra-African trade supported by the augmented gravity model can be written in the following representation:

$$Trade_{ij} = In(A) + \propto In(Yi * Yj) - \beta InD_{ij} + \gamma X_{ij} + \varepsilon_{ij} \quad (4)$$

Equation (4) is a gravity model representation where $Trade_{ij}$ represent trade between country $i$ (SA) $and\ j$ (SSA), which is an independent variable. Explanatory variables include the GDP of South Africa, the GDP of Sub-Saharan Africa, the distance between countries $i\ and\ j$, and a free trade agreement (FTA) dummy variable to account for the African Continental Free Trade Area (AfCFTA) to anayse the impact of regional

integration. $\varepsilon_t$ represents the disturbance term. The aforementioned Gravity model is further estimated using the VAR equation within an aggregated time-series framework to empirically analyse the impact of economic size, distance (proxied by transport costs), and the FTA (represented by the AfCFTA) on trade between South Africa and other SSA countries.

### *3.2 The Vector Autoregressive (VAR) Approach*

This study adopted a VAR methodology formulated by Sims (1980) to empirically analyse intra-African trade using the augmented gravity model in the case of South Africa. The VAR approach is an advanced technique that analyses long-run relationships and short-run dynamics between variables in the system. The model captures rich dynamic analyses of macroeconomic variables, in this case, the contemporaneous analysis of the gravity model in the Sub-Saharan African settings. The VAR model allows all variables to be endogenous variables in explaining the relationship between each other, and all variables are required to be integrated in the same order. The Augmented Dicky Fuller (ADF) and Phillips-Perron (PP) tests are employed to determine the order of integration and confirm stationarity of the variables in the system. The VAR model is a systematic approach that is able to analyse the response of endogenous variables due to the shocks of other variables and its shocks in the system through the impulse response functions (IRF). By estimating the Impulse Response Function (IRF), this study tracks the reaction of each endogenous variable to innovative shocks arising from other variables and to shocks within its own series. A VAR representation to empirically analyse intra-African trade with respect to the South African economy, in line with the gravity model, can be expressed as

$$Y_t = \alpha_0 + \sum_{i=1}^{p} \Gamma_i Y_{t-i} + \varepsilon_t \quad (5)$$

The Vector Autoregressive (VAR) representation (5), consistent with the gravity model, shows that $Y_t = Trade_{ij}, GDP\_SA_t, GDP\_SSA_t, D_{ij}, FTA_t,$ which is a (5×1) column vector of five endogenous variables in the system. As mentioned earlier, $Trade_{ij}$ represents trade between countries $i$ *and* $j$, GDP of

South Africa (GDP_SA), GDP of Sub-Saharan Africa (GDP_SSA), the distance between countries $i$ *and* $j$ and a free trade agreement (FTA) dummy variable to account for the African Continental Free Trade Area (AfCFTA) to anayse the impact of regional integration. The term, $\alpha_0$ represents a (5×1) vector of the constant term, while $\Gamma_i$ represents a (5×5) matrix of autoregressive coefficients of regressors, $p$ is the lag order of the VAR, and $\varepsilon_t$ represents a vector of idiosyncratic errors in the system. Moreover, a VAR model will be subjected to the stability and post-diagnostic inspection tests, viz., autocorrelation, normality, and heteroscedasticity of the residuals to confirm the robustness and statistical reliability of the estimated model.

## 4. Results Analysis and Discussion

This section provides a detailed discussion of empiricalanalysis based on VAR estimates. As previously mentioned, the study estimated an Augmented Gravity model to empirically analyse intra-African trade and regional integration among Sub-Saharan African (SSA) economies.

### 4.1 Correlation Analysis

| | *Trade* | *GDP_SA* | *GDP_SSA* | *Distance* | *FTA* |
|---|---|---|---|---|---|
| Trade | 1 | | | | |
| GDP_SA | 0,848099 | 1 | | | |
| GDP_SSA | 0,809774 | 0,935311 | 1 | | |
| Distance | 0,071598 | 0,007057 | 0,207852 | 1 | |
| FTA | 0,426976 | 0,208079 | 0,296101 | 0,314192 | 1 |

The correlation matrix shows the estimated correlation coefficients between each of the variables included in the model. The correlation coefficient shows a strong positive correlation between trade and the GDP of South Africa and the entire GDP of SSA countries. Interestingly, there is a strong positive relationship between South African GDP and SSA GDP. These results are theoretically plausible, as supported by the gravity model. The correlation between trade and distance is positive; however, the coefficient is modest and closer to zero. Moreover, the results show a positive correlation between trade and regional free trade agreements (FTAs) in Africa. There is also a positive correlation between FTA, SA GDP, SSA GDP, and distance. This implies that there is a strong need to strengthen regional free trade agreements in Africa to foster sustainable regional integration and

economic development. Importantly, all these estimated correlation matrices are statistically aligned with the Gravity model.

### *4.2 VAR Trade-Growth Model*

As mentioned earlier, the paper estimated a VAR model based on the Gravity model. An Augmented Dicky Fuller (ADF) and Phillips-Perron (PP) test were conducted to determine the order of integration between variables. Both tests indicated that all variables are stationary at first differences, which allows for the estimation of a VAR since all variables are integrated of order one, i.e., I(1). The study further computed the lag length selection process in order to determine the most appropriate VAR lag order.

#### *4.2.1 VAR Lag Length*

VAR Lag Order Selection Criteria
Endogenous variables: TRADE LGDP SA LGDP SSA DISTANCE FTA
Exogenous variables: C
Date: 07/06/25 Time: 20:03
Sample: 1975 2023
Included observations: 47

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -121.6883 | NA | 0.000151 | 5.390993 | 5.587817 | 5.465059 |
| 1 | 59.50352 | 316.1220 | 1.97e-07 | -1.255469 | -0.074524* | -0.811071 |
| 2 | 100.9546 | 63.49951* | 1.02e-07* | -1.955515* | 0.209552 | -1.140786* |

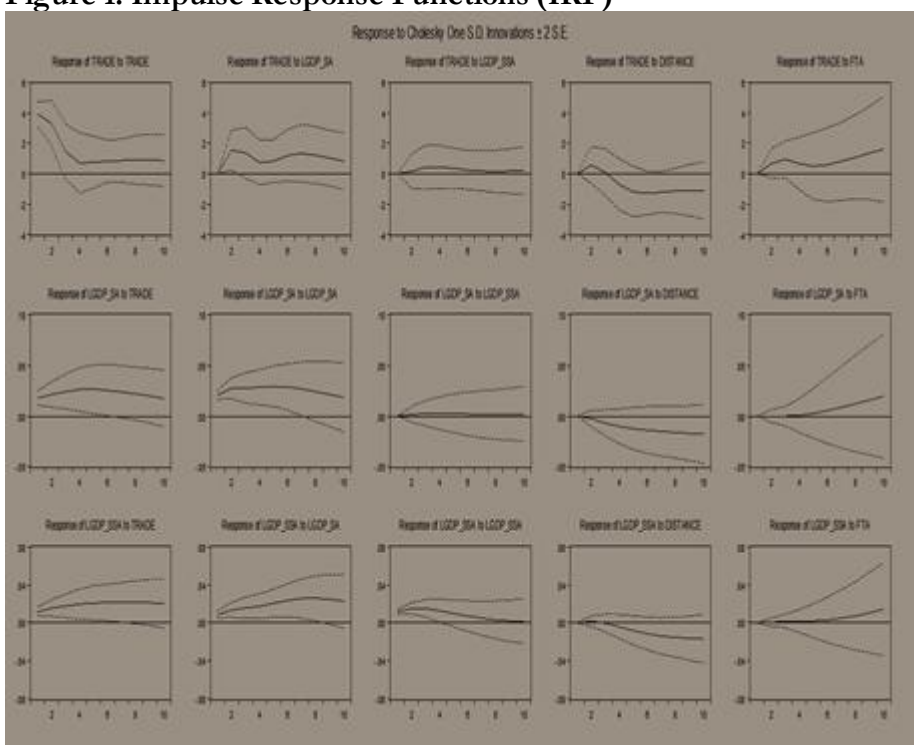
* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

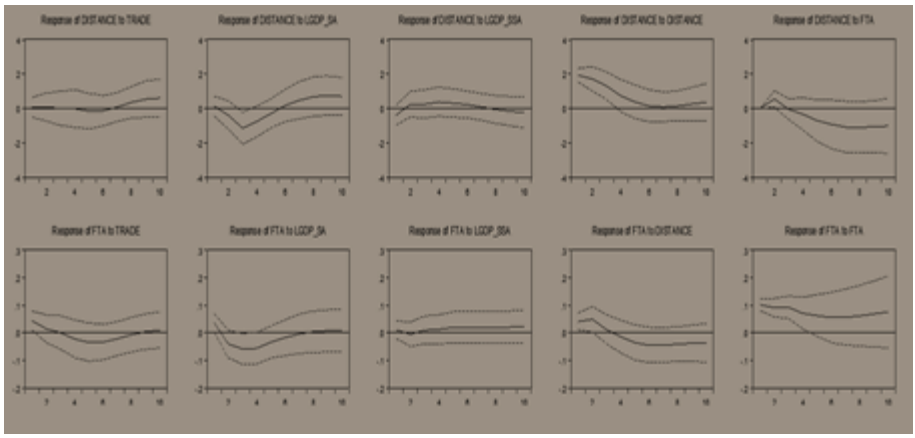
The lag length selection process, as given by the sequential modified Likelihood Ratio test, Final Prediction Error (FPE), Akaike Information Criterion (AIC), and Hannan-Quinn Information Criterion (HQ) test, indicates that the most suitable lag length is VAR lag order 2. Therefore, the paper proceeds to estimate a VAR(2) model to empirically analyse the intra-African trade based on the gravity model.

### *4.2.2 Impulse Response Functions (IRF)*

As previously mentioned, the IRF is computed to trace the response of intra-African trade due to innovative shocks of economic expansion and free trade agreements with Sub-Saharan African (SSA) countries. IRF was used analyse the degree of response of intra-African trade due to unanticipated shocks of all variables in the system over a 10-year horizon. The study assumes that innovative shocks of intra-African trade have a direct contemporaneous effect on the GDP of South Africa, the GDP of the Sub-Saharan African countries, distance, and free trade agreements (FTAs), while the shocks of all other variables only affect free trade agreements in the future. Of particular interest in the IRF analysis is the response of intra-African trade to innovative shocks in the GDP of Sub-Saharan African countries, alongside its reaction to unexpected shocks in distance and FTAs. This approach enables an empirical investigation into the dynamics between intra-African trade, GDP growth, and distance, providing evidence consistent with the Gravity model.

**Figure 1: Impulse Response Functions (IRF)**





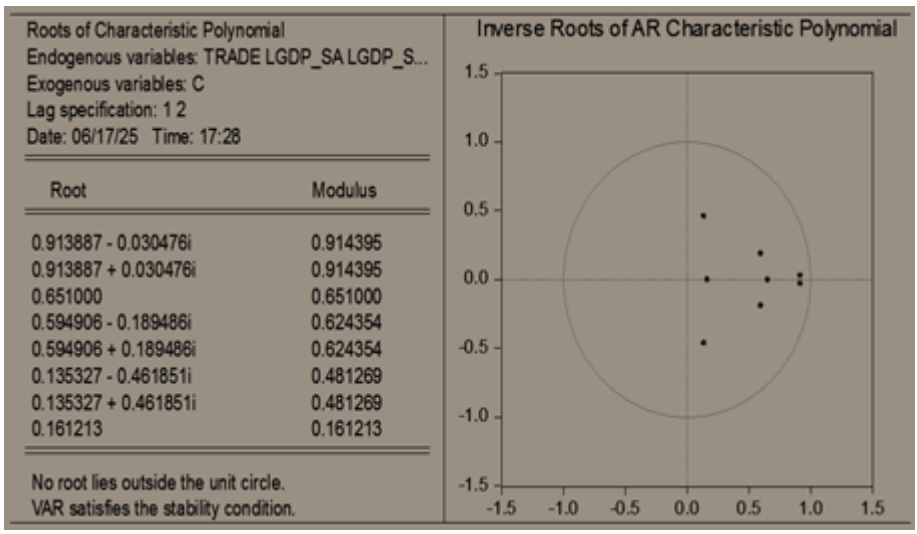
The IRF results show that intra-African trade responds positively due to an unexpected positive innovative shock of South Africa's economic growth. This positive response of trade to the shock of GDP growth in South Africa is vividly visible after two two-period lags and sustained over a 10-year horizon. The response of intra-African trade due to the innovative shocks of SSA GDP growth remains modest over time. This makes economic sense because SSA countries tend to trade more with outside countries than they trade with other African countries. This result supports the contention that Africa has remained the least economically integrated region globally over recent decades, despite the attainment of independence from colonial rule. Consistent with the gravity model, the response of trade to the innovative shocks of distance is negative after 2 lags and sustained over a longer period. This result implies that trade diminishes as the distance (transportation costs) increases between African economies. The finding of a negative relationship between distance and trade is consistent with the gravity model. Importantly, trade responds positively due to the innovative shock of the FTA within the African continent. This result suggests that FTA improves trade relations within the region, thus translating to a strong regional economic integration between SSA countries.

Furthermore, the GDP of South Africa and SSA countries responds positively to the unexpected shocks of intra-African trade. This finding indicates that enhanced intra-African trade drives economic growth, producing a significant and immediate effect that persists throughout the economic system for a prolonged period. These results are supported by the findings of previous studies reported by Virag-Neumann (2014) and Lypko (2022) for European countries. Moreover, the findings of the

study are plausible and consistent with several conventional economic theories, such as the Mercantilist theory and the Gravity model, as discussed earlier.

### *4.2.3 VAR Stability Tests*

An autoregressive (AR) root test was applied to determine the stability of the VAR model. The AR root test examines the eigenvalue roots in the unit root circle to confirm VAR model stability. The VAR would pass the AR stability testing if all eigenvalue roots lie within the unit root circle. This would imply that the VAR is a stable and appropriate estimation technique for this study.




**Source:** *Own results*

The Autoregressive (AR) root test inspected the stability condition of the VAR(2) model. The results indicate that all eigenvalue roots lie inside the unit root circle, thus implying that the estimated VAR(2) passes the stability condition. Furthermore, the highest modulus of 0.91, with the corresponding eigenvalues situated within the unit circle, indicates that the VAR model is stable with corresponding eigenvalues lying inside the unit root cycle indicates that the VAR is stable.

### *4.2.4 Post-diagnostic Inspections*

The estimated VAR was subjected to post-diagnostic inspection tests to ascertain the statistical adequacy and reliability of the results. The paper applied the Breusch-Godfrey test for autocorrelation, the Breusch-Pagan

Godfrey White test for heteroscedasticity, and the Cholesky of covariance (Lutkepohl) normality test. The results of these post-diagnostic inspection tests indicated that the estimated model passed post-diagnostic inspections, implying that the residuals were serially uncorrelated, homoscedastic, and normally distributed for the VAR estimates. The results demonstrate that the VAR model adheres to the assumptions of classical linear regression; consequently, the results are statistically robust and trustworthy, consistent with the Gauss-Markov theorem.

## 5. Conclusion and Policy Recommendations

This study sought to empirically investigate intra-African trade and its impact on GDP growth and regional economic integration among Sub-Saharan African (SSA) economies. The study estimated a VAR approach based on the Gravity model to empirically anayse interrelationships between intra-African trade, GDP growth in sub-Saharan Africa, distance, and free trade agreements. The study applied secondary time series data from the World Development Indicators (WDI) over the period 1975-2023 to analyse dynamic interrelationships. The findings of the study revealed that the volume of intra-African trade increases as the GDP size of Sub-Saharan Africa increases. This implies that there is a positive relationship between intra-African trade and the GDP size of Sub-Saharan Africa. The results also indicated that trade between African countries diminishes with an increase in the distance between African economies, as proxied by import transportation costs. The study further incorporated the impact of the African Continental Free Trade Area (AfCFTA) using the dummy variable to capture the effect of the free trade agreement (FTA). The IRF results indicated that the Free Trade Agreement (FTA) positively influences intra-African trade in the region. The findings of the study were theoretically plausible, as supported by the Gravity model. These findings suggest that African nations ought to prioritise mutual trade by reinforcing bilateral free trade agreements and removing internal barriers prior to expanding trade relations with external markets. This would ensure that Africa is ranked among the most economically integrated regions in the world, which would subsequently promote sustainable intra-African trade, regional economic development, and international competitiveness.

Harvey (2005) argued that the impact of colonialism on Africa's economic growth and development remains evident, as the continent

continues to be a primary producer of raw materials and natural resources; meanwhile, key developmental outcomes such as job creation and poverty alleviation have largely shifted to advanced economies. African countries need to effectively work together to dismantle neocolonial influence on domestic economic affairs to drive sustainable economic development programmes in the best interest of the African continent. This can be done through a clear programme of action that drives investment in regional infrastructure and technology, regional value chain integration, local processing and refining of natural resources into value-added finished products, a common monetary agreement, and boosting intra-African trade above 50% within the next decade.

On the African market, Africa, with a total of 54 countries, is the largest continent in the world, with a population of over 1.4 billion people, subsequently translating to a large market size. The region is heavily endowed with scarce natural resources, including minerals, raw materials, and agricultural products. The intra-African trade provides the greatest platform for building sustainable economic development and integration among African economies. Intra-African trade is a key driver for economic development, fostering regional integration and reducing dependence on external markets.

On a single monetary payment system, Africa should establish a common African monetary system, where African economies would share a common currency. In Southern Africa, countries including South Africa, Namibia, Lesotho, and Eswatini have established a Common Monetary Area (CMA). In this monetary union, member countries share a common currency, specifically the South African Rand. The region must strengthen the Pan-African Payment and Settlement System (PAPSS), which is a cross-border financial market payment and settlement infrastructure for intra-African trade and commerce payments that enables payment transactions across Africa. Currently, this African settlement system is underutilised and requires effective utilisation to promote intra-African trade and regional economic integration and development.

Regarding natural resources, Africa remains the world's most resource-rich continent, possessing vast reserves of crude oil, gold, diamonds, platinum, coal, uranium, and many more. The resources are key commodities in the global market for consumption in the energy sector, technology, and infrastructure. Most of Africa's primary exports are processed in advanced economies and usually undergo little processing before they are re-exported to Africa as finished products

with a high value. African countries need to effectively work together through the AfCFTA to establish local refineries for the local processing of minerals and raw materials. Local processing and consumption of local commodities and subsequently the export of value-added finished products to foreign countries would effectively create employment opportunities and foster regional economic development in Africa. This process would ultimately promote industrialisation, regional economic integration, and development.

## References

African Commerce Bank (2025). Available online from: https://africancommercebank.com/post/sojnek013m-top-10-exported-commodities-in-africa-in-2023? [Accessed on 12/06/2025].

Aiyar, S., D. Malacrino, and A. Presbitero. (2024). Investing in Friends: The Role of Geopolitical Alignment in FDI Flows. European Journal of Political Economy, 83(3), 102508.

Bush, R.C. 2007. *Poverty and neoliberalism: persistence and reproduction in the global South*. New York: Pluto Press.

Carmody, P. 2011. *The new scramble for Africa*. Cambridge: Polity Press.

Gordon, H. and Wolpe, H. 1998. The other Africa: An end to Afro-Pessimism. *World Policy Journal,* 15(1):49–58.

Harvey, D. (2005). *A brief history of neoliberalism*. Oxford: Oxford University Press.

International Monetary Fund (IMF). (2023). World Economic Outlook, April 2023: Geoeconomic Fragmentation and Foreign Direct Investment, Chapter 4. Washington, DC: International Monetary Fund.

Krugman, P. (1990). *Rethinking international trade*. Cambridge, Mass: MIT Press.

Lypko, N. (2022). The gravity model of trade: The case of Central and Eastern Europe. *LeXonomica*, 14(2), 187-212.

McKinsey & Company (2025). Available online from: https://www.mckinsey.com/featured-insights/future-of-asia/asia-the-epicenter-of-global-trade-shifts [Accessed on 05/06/2025].

Sichei, M. M., Erero, J. L., & Gebreselasie, T. (2008). An augmented gravity model of South Africa's exports of motor vehicles, parts, and accessories. *South African Journal of Economic and Management Sciences*, 11(4), 494-510.

Sims, C. A. (1980). Macroeconomics and reality. *Econometrica*, 48(1), 1-49.

Statista (2025). Available online from: https://www.statista.com/statistics/1362621/eu-international-trade-share-gdp/. [Accessed on 16/06/2025].

Tansey, M. M., & Touray, A. (2010). The gravity model of trade applied to Africa. *International Business & Economics Research Journal (IBER)*, *9*(3).

Tinbergen, J. (1962). Shaping the World Economy: Suggestions for and InternationalEconomic Policy. New York: The Twentieth Century Fund.

Ukwandu, D. C. (2015). David Ricardo's theory of comparative advantage and its implication for development in Sub-Saharan Africa: A decolonial view.

Virag-Neumann, I. (2014). Impacts of the integration on trade of EU members—a gravity model approach. *Deturope—the Central European journal of regional development and tourism*, 6(1), 33-49.