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Sub-regionalism and Intra-Regional Trade in Africa, Issues and Implications: Evidence from a Static Effect Estimation

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Abstract

This study examines how Regional Economic Integration (REI) has influenced intra-regional trade among African countries. The study employs panel data for 38 of the 53 African countries over the period 2000–2024, comprising 798 observations obtained from the UNCTAD database and the World Bank's World Development Indicators. Intra-regional trade is modelled as a function of the simple average Most Favoured Nation tariff (MFN) and the tariff bound rate (TRB) as proxies for REI, together with GDP, the real exchange rate and population, and is estimated using pooled ordinary least squares, fixed effects and random effects (static) models, with the Hausman test used to select between the panel estimators. The results show that the Hausman test favours the fixed effects model ($\chi^2 = 223.614$; $p < 0.001$). Under fixed effects, MFN (0.111), TRB (0.034), GDP (0.075), the real exchange rate (0.073) and population (1.052) all have positive and statistically significant effects on intra-regional trade at the 1% level, and the model explains 52.8% of its variation. The findings of this study suggest that deeper regional economic integration, reflected in tariff arrangements, together with economic growth and real exchange rate movements, is associated with higher intra-regional trade among African countries.

Keywords: Regional economic integration; Intra-regional trade; Fixed effect; Random effect..

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1. Introduction

In the last twenty years, the world has seen an increase in Regional Trade Agreements (RTAs). According to Kahouli (2016), the World Trade Organization (WTO) had approved over 546 RTAs and only 354 remained in force by January 2013. The main reason for these accords is to minimize problems that block the movement of goods, services, capital, labor and other types of transactions. Regional integration, as explained by Songwe (2018), can result in putting resources together and opening local markets to improve production, trading and investment. Trading within the same region is hindered by things like tariffs and non-tariff barriers (Oyejide, 1997). Oyejide (1997) pointed out that besides tariff and non-tariff barriers, failure to stick to and put off the agreed-upon schedule for trade liberalization has also prevented intra-regional trade from growing. However, the methods that have been picked for regional integration almost certainly discourage intra-regional trade instead of encouraging it. Another important part of regional integration in Africa is the presence of several projects that aim to achieve it which has caused African countries to have involvement in a variety of Regional Trade Agreements (RTAs). Many African countries are members of several of these organizations. A total of 27 countries are part of Europe or Europe and Asia, 18 belong to Europe, Asia and Oceania and one belongs to all four regions. Just seven nations have stayed in the same bloc over the years. There are a number of disadvantages to the complex way integration in Asia is currently organized. According to the ECA in 2008, when different regulatory frameworks and organizations exist in the same region and overlap, it makes it confusing to reach integration goals and can encourage unhealthy competition between nations and organizations.

The cogent barriers to intra-regional trade in Africa are not having enough productive capacity which reduces the supply of products on the market; slow implementation of free trade agreements, resulting in high tariffs and raising trade costs; and high non-tariff-related costs which lower the competitiveness of businesses and entire economies. The trade costs associated with business and trade facilitation are significantly high, which can be attributed to the deficiencies in hard and soft infrastructure across Africa. These shortcomings affect transport and transit expenses as well as costs incurred at the border and beyond (UNCTAD, 2019; UNECA, 2017). Trade within Africa accounts for only a minor portion of the region's global exports; there was a rise from 10% of intra-African exports to total African

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exports in 1995 to almost 17% in 2017. Nevertheless, this figure is low compared to Europe, where it was 69%, and Asia and North America, with figures of 59% and 55% respectively (Economic Commission of Africa, 2017). The main reason for the relatively low percentage of intra-Africa trade in relation to its global trade was the sluggish implementation of regional integration arrangements aimed at eliminating tariff and non-tariff barriers to trade (UNECA, 2017).

The focus of this paper is to examine the ways in which Regional Economic Integration (REI) has influenced trade within Africa with evidence from static effect model estimation. Following the introductory section of the paper, section 2 contains the literature review, conceptual clarification and empirical review, section 3 contains the data employed in the study, in section 4, the empirical result is presented and the paper is concluded in section 5.

2. Literature Review

2.1. Conceptual Review

Regional integration or more crudely 'Sub-Regionalism' is "any policy designed to reduce trade barriers between a subset of countries regardless of whether those countries are actually contiguous or even close to each other" (Winters, 2004). Regional Economic Integration (REI) is the commercial strategy aimed at boosting intra-regional trade by selectively lowering or removing trade barriers among member countries. Intra-regional trade, as defined by Duma (2017), refers to trade that emphasizes economic exchanges primarily among countries within the same region or economic zone.

There are numerous theories of sub-regionalism and intra-regional trade. Ricardo's Theory of comparative advantage is one of these foremost theories. Ricardo (1817) views trade between inefficient nations as beneficial nonetheless, offering some advantages to both. The best strategy for the country is to sell abroad the good it produces efficiently (its comparative advantage) and import the good it struggles to manufacture (its comparative disadvantage).

Another viewpoint, called liberal inter-governmentalism, combines rationalism, liberalism and intergovernmental institutionalism (Moravcsik, 1993). Most of the theory sees countries' negotiations and responses as the major factors. Because they are not structured like governments and each act differently, non-state actors are not key actors in setting the outcome of negotiations (Anderson, 2016). During the 1990s, the liberal inter-governmental theory was formulated as a framework to account for the different occurrences in the European integration process that were not foreseen by existing integration literature. In Moravcsik's view (1993), developing regional integration passes through three main stages: shaping national interests, securing agreements between governments and formation of institutions. It is easy to tell apart the domestic and international marketplaces. The preparation used at the first stage supports the discussions that will happen between states internationally. Various stakeholders, including government officials and non-government bodies, have meetings where they discuss the effects of integration at the national level and it is important for the central government to be involved too (Anderson, 2016). According to Cockerham (2010), the pursuit of larger profits is what motivates governments to try to integrate. Therefore, the underpinning theories for the study are Ricardo's Theory of Comparative Advantage and Liberal-inter governmental theories.

On the empirical front, Muhammad and Magai (2019) researched how greater integration between African countries has promoted trade within Africa through five regional communities: EAC, COMESA, ECOWAS, SADC and AMU. Panel data analysis was done in this study with the help of an augmented Gravity Model and both OLS and fixed effects estimation for the years 1995 to 2016. It is evident from the results that the African Union has greatly increased trade within Africa, between African countries and their neighbors and with the rest of the globe.

A study done by Cheong, Kwak and Tang in 2018 looked at the effect of both tariffs and other trading changes on trade in preferential agreements, they carried out the study on tariff rates between countries from 1996 to 2010 with 90 importing and 149 exporting economies by applying OLS and FE regression models. It was revealed that revisions and updates to non-tariff measures in preferential trade agreements, including Customs Unions (CUs), Free Trade Agreements (FTAs) and Partial Scope Agreements (PSAs), help increase trade participation and trade flows among various businesses.

Using information from 1995 to 2014, Ngepah and Udeagha (2018) studied the regional trade agreements among 11 Regional Trade Arrangements located in Africa. To estimate the gravity model, the Robust Covariance Poisson Pseudo-Maximum Likelihood (RPML) method introduced by Eicker and White was applied to the effects of trade creation and trade diversion. The research did not find much proof of trade with third countries being directed away from the RPA or RPC. According to them, the RTA may lead to less trade between members of ECCAS and between

ECCAS and other countries. They uncovered pure trade creation within the IGAD. There was a considerable increase in intra-EAC trade, while Trade with other countries did not change for the members or non-members. There is clear proof that the other seven RTAs have experienced considerable amounts of trade growth between their members and also between the members and countries that are not part of the same RTA.

Senadza and Diaba (2017) worked with data from 11 economies recognized as Sub-Saharan Africa and used the pooled mean estimator to conduct their research. It becomes apparent from the report that import levels are not greatly influenced by exchange rates. It is shown by the study that exports experience a negative impact from volatility in the short term, but this influence becomes positive in the long term. Karamuriro (2015) made use of an improved trade gravity model along with the PPML technique to study how the COMESA agreement affected intra-exports in the region, using data from 1980 to 2012. According to the study, COMESA's establishment has enhanced export performance in its member states by over 35%. Additionally, the research identifies the primary factors affecting trade levels: convergence of economic levels, infrastructure quality, presence of a common official language, and geographical contiguity.

On the study of intra-African trade, Alemayehu and Seid (2015) took panel data ranging from 1993 to 2010 with gravity models and applied on West, North, South, East and Central African countries. Although it is possible for more trade within Africa, reaching this potential and co-operation through intra-Africa trade is held back by similarities in exports and imports and weaknesses among potential suppliers. Thus, fostering economic unity between nations in Africa is very important for its growth and development, considering how beneficial these aims are for Africa. It is evident that a lack of emphasis on sub-regional trade dynamics constitutes a deficiency in the empirical papers reviewed.

Although numerous studies investigate various regional trade agreements (RTAs) as a group, the intra-trade dynamics of sub-regions (e.g., within ECOWAS or SADC exclusively) are frequently aggregated. This aggregation can obscure particular sub-regional barriers, advantages, or trends. Also, Limited Consideration of Non-Tariff Barriers (NTBs) exists, as only Cheong et al. (2018) explicitly consider non-tariff measures. However, in the context of African trade, non-tariff barriers (NTBs) such as infrastructure deficits, border delays, corruption, and bureaucracy can be equally or even more significant than tariffs in determining intra-regional trade flows. Many models and datasets utilized in these studies (e.g., gravity models based on formal trade statistics) overlook informal cross-border trade, which constitutes a significant portion of intra-African trade, particularly in areas such as East and West Africa. This oversight could seriously impact the validity of inference. From a methodological perspective, while gravity models are widely employed and yield results, the majority of research depends almost entirely on gravity model frameworks. These models may not adequately account for institutional or political factors that influence trade. Also often assume symmetrical trade behavior and may neglect the asymmetries between stronger and weaker economies within the same region. Moreover, certain studies employ scopes and dynamics that are relatively short, which may not accurately capture the effects of recent integration efforts, the implementation of AfCFTA, or disruptions caused by COVID-19. It is for this reason that this study employes the static effect estimation which provided clear contemporaneous estimates of trade determinant, making it highly interpretable and useful for policy evaluation in a specific time period.

3. Research Method and Materials

This research utilized secondary data spanning 20 years (2000–2024) and encompassing 38 African countries. These were chosen based on data availability, employing a non-probability sampling technique with panel data series. Unlike cross-section and time series analysis, panel data allows for the control of unobserved individual-specific characteristics that affect trade. The data was primarily sourced from significant secondary sources; The United Nations Conference on Trade and Development (UNCTAD) database is the source of the mentioned trade data. Information about population, exchange rate and GDP came from the World Bank - World Development Indicators. Total exports, total imports and population in millions of countries were used in the estimation process.

3.1. Technique of Data Analysis

3.1.1. Model Specification

This study applied recent approaches in the field of intra-regional trade (Muhammed & Magai, 2019; Kahouli, 2016; and Kahouli & Maktouf, 2014). So, the model is estimated with little modification as follows:

$$TRX = f(MFN, TRB, GDP, TEXR, POP) \quad (1)$$

Furthermore, the above mathematical model can also be re-stated into an econometric equation or model:

$$TRX_{ij} = \beta_0 + \beta_1 MFN_{it} + \beta_2 TRB_{it} + \beta_3 GDP_{it} + \beta_4 REXR_{it} + \beta_5 POP_{it} + u_t \quad (2)$$

Where: TRX represent the intra-regional trade, MFN is simple average tariff-Most Favoured Nation and TRB is tariff bound rate (which are proxy for Regional Economic Integration), GDP proxy for economic growth, REXR denote real exchange rate, and POP represents population. $\beta_1 - \beta_5$ denote the coefficients of the parameters to be estimated. The coefficients described the directions and strengths of the relationship between regional economic integration and intra-regional trade among African countries respectively with the factors that used to determine intra-regional trade in the model (called Explanatory Variables). i stands for indices of country, t stands for time indices, while μt, represents the error term for the models. This is in line with the work of Mohammed and Magai (2019). The estimation techniques employed for this study consists of descriptive statistics and inferential statistics techniques. Descriptive statistics included mean, median, standard deviation, minimum, maximum, skewness and kurtosis. Inferential statistics involve using pooled OLS, Fixed Effects, Random Effects and the Hausman test for checking robustness.

4. Results and Discussion

4.1. Data Presentation

This sub-section depicts the descriptive statistics and the results of the Ordinary Least Square regression (OLS) with robust option to account for outliers and heteroscedasticity problem, Fixed Effect estimation, Random Effects and the Hausman test were conducted. The interpretation of these analyses is also provided.

Table 1. Results of descriptive statistics

Variables	Mean	Median	Max.	Min.	St. Dev.	Skew.	Kurt.	Obs.
TRX	0.9027	0.9834	1.2338	0.0000	0.3284	-1.9302	5.6937	798
MFN	0.5581	0.8808	1.4608	-0.1549	0.5382	-0.0242	1.0890	798
TRB	0.9325	1.2787	2.0824	0.0000	0.8729	-0.0293	1.1735	798
GDP	8.5951	9.9183	11.671	0.0000	3.5679	-1.9050	4.8825	798
REXR	0.8917	0.0000	3.6989	0.0000	1.1555	0.8273	2.1503	798
POP	6.9896	7.1016	8.3141	4.9091	0.6836	-0.7691	3.5548	798
Obs.	798	798	798	798	798	798	798	798

Source: Authors' Computation using E views 10, (2024).

The research looks at the variables along with their important statistics, all of which are shown in Table 1. The panel data has numbers for thirty-eight (38) African countries and consists of seven hundred nineteen eight (798) observations. The most commonly used statistics are mean, median, standard deviation, maximum and minimum values, Skewness and Kurtosis of the variables over the studied period. Importance was given to several factors; how regions integrate economically, the amount of trade with neighboring countries and things that affect it.

The Mean average value of intra-regional trade, simple average tariff - Most Favored Nation (MFN), tariff bound rate; economic growth, real exchange rate, and population all have positive Mean values. This implies that the variables employed in this study have more of increase than decrease in the changes amongst the variables.

The average Mean value of 0.90 for intra-regional trade lies at the lower end of the distribution. The average Mean value of intra-regional trade is 0.90 with a standard deviation of 0.32 which is very low. This means that intra-regional trade had positive or negative impacts spread over the sample mean. A one standard deviation shock in intra-regional trade has a positive or negative impact on Most Favored Nation (MFN) tariff; tariff bound rate, economic growth, real exchange rate, and population. The low standard deviation of intra-regional trade over the average mean value implies that intra-regional trade is less dispersed.

Results reveal that economic growth has the highest standard deviation of 3.56 than any other variables used in the study. This suggests that the degree of variability in economic growth on intra-regional trade is high compared to majority of the variables. Nevertheless, intra-regional trade has the lowest standard deviation, which means that the

variability of the data is close to its average Mean value. The values of Skewness of -1.9302, -0.0242, -0.0293, -1.9050, -0.7691 revealed that intra-regional trade, tariff for Most Favored Nation (MFN), tariff bound rate, economic growth and population are all skewed to the left, also the value of 0.8273 shows that exchange rate is skewed to the right. The value of Kurtosis indicated that the values of tariff for Most Favored Nation (MFN), tariff bound rate, and real exchange rate are flat relative to normal as the kurtosis are less than 3, while intra-regional trade, economic growth, and population are peaked relative to the normal since the Kurtosis statistical value is greater than 3.

Table 2 presents the findings of the employing a static model in Pooled Ordinary Least Squares, Fixed Effect regression and Random Effect regression

Table 2. Results of the static model

Independent variable	(1) Pooled OLS	(2) Fixed effect	(3) Random effect
MFN	0.178909***	0.110522***	0.178909***
	(0.017)	(0.020)	(0.015)
TRB	0.032758	0.033532***	0.032758***
	(0.011)	(0.013)	(0.010)
GDP	0.045199	0.075051***	0.045199
	(0.0026)	(0.0035)	(0.0023)
REXR	0.028525	0.072718***	0.028525***
	(0.0083)	(0.0208)	(0.0075)
POP	-0.054785***	1.051927***	-0.054785
	(0.014)	(0.173)	(0.012)
Constant	0.741355	-7.252753	0.741355
	(0.097)	(1.224)	(0.088)
Observations	798	798	798
R^2	0.388685	0.528371	0.388685
Adjusted R^2	0.384825	0.502135	0.384825
F-statistic	100.7134***	20.13891	100.7134
Prob (F-statistic)	0.000000	0.000000	0.000000
Durbin-Watson statistic	2.297776	1.676798	2.297776

Note: Dependent variable: intra-regional trade (TRX). Standard errors in parentheses; *** denotes significance at the 1% level.

Source: Authors' computation using EViews 10 (2024).

The dependent variable is Intra-regional trade TRX while the independent variables include MFN, TRB, GDP, REXR and POP. All these factors were already explained in the study. The study applying Pooled Ordinary Least Square explains that LTRX was positively influenced by the log of MFN, TRB, GDP and REXR, but it was negatively impacted by the log of POP at significance level of 1%. It means that 38% of the changes in LTRX are influenced by the variables in this model. The F statistic is 100.71 and the probability associated with it is less than 1%. There are 798 observations and the number of cross-sectional units or countries is 38.

The Fixed Effect estimation shows that all explanatory variables have a positive and statistically significant relationship with the dependent variable. For instance, a one percent change in LMFN has a 0.11% change in LTRX under ceteris paribus. LTRB has a positive and statistically significant relationship with LTRX at 1% level of significance. A one percent change in LTB has 0.03 percent change in LTRX. The coefficient LGDP has a positive and statistically significant effect on LTRX at 1% level of significance. A one percent changes in LGDP causes 0.07 changes in LTRX. The coefficient LREXR posit a positive and statistical effect on LTRX showing that a one percent in LREXR causes 0.072 changes in LTRX. The coefficient LPOP has a positive effect on LTRX at 1% level of significance. It also indicates that a one percent change in LPOP causes 1.05 changes in LTRX. The average of dependent variable is 0.90 and its standard deviation is 0.32, showing that data is deviating from the mean. There is a less than 1% chance the F statistics could be this extreme due to chance alone. So, the coefficients in the model are the same as zero which shows it is a good fit. There are 38 cross-sections shown.

Random Effect regression leads to results that are not the same as Fixed Effects regression. There is a positive and strong link between LMFN and LTRX at the 1% level of significance. A one percent change in LMFN changes LTRX increase in LTRX by 0.17%. The coefficient LTRB reports a positive and statistically significant effect on LTRX at 1% level of significance. A one percent change in LTRB changes LTRX by 0.032. The coefficient LGDP has a positive and statistically significant effect on LTRX at 1% level of significance. A one percent change in LGDP changes LTRX by 0.045%. LREXR also has a positive and statistically significant effect on LTRX at 1% level of significance. A one percent change in LREXR changes LTRX by 0.028. However, the coefficient LPOP shows a negative and statistically significant relationship with LTRX at 1% level of significance. It also shows a 1% change in LPOP changes or reduces LTRX by -0.054.

Statistical analysis of the data shows that using Fixed Effect or Random Effect models is both effective and correct. Do a Hausman test as a rule before settling on Fixed or Random Effects for your model. Should the null hypothesis be true in the Hausman test, it bolsters the view that the (Fixed or Random) effect is independent of the variables in the other mode and that a Random Effect model is preferred or is the appropriate one. If the null hypothesis is rejected, choose the Fixed Effect model; for any test that does not reject the null, the Random Effect model should be selected.

Table 3. Result of the Hausman test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	223.614	5	0.0000

Source: Authors' computation 2024

The result of Hausman specification test indicates that the Fixed Effect estimation is appropriate. This is because the probability value is less than 0.05.

5. Summary of Findings, Conclusion and Recommendations

This study empirically investigated sub-regionalism and intra-regional trade among African countries using static effect estimation. The sample period covered for this study is from 2000 to 2024 of a heterogeneous panel data covering 38 countries out of 53 African countries. However, selection of the countries and period was based on the availability of data in form of non-probability sampling technique using panel data series.

Thus, this study employed the pooled OLS, Fixed effect and Random effect estimation, popularly known as static effect estimation to establish whether relationship exists among the heterogeneous panel for the sample period taken. From the techniques of estimation employed, the following findings were revealed:

1. It was found that in the Pooled Ordinary Least Square regression, the effect of logarithms for MFN, TRB, GDP and REXR is positive and significant (at 1% level), but for POP it is negative and significant as well.
2. It turns out that all the explanatory variables are positively related to and statistically significant for the dependent variable. A one percent boost to LMFN means there is a 0.11% increase in LTRX when nothing else is affected.
3. LTRB is not only related to LTRX, but also the relationship is highly significant. There will be a 0.03 percent change in LTRX as a result of a 1 percent change in LTRB. LGDP helps to explain why LTRX is related to LGDP. A percentage change in LGDP equals 0.07 in LTRX.
4. The coefficient LREXR posit a positive and statistical effect on LTRX showing that a one percent in LREXR causes 0.072 changes in LTRX. The coefficient LPOP has a positive effect on LTRX at 1% level of significance. It also indicates that a one percent change in LPOP causes 1.05 changes in LTRX.
5. The outcomes of a Random Effects regression contrast with what you get from a Fixed Effects regression. The log coefficients LMFN, LTRB, LGDP and LREXR have a positive and statistically significant link with LTRX at a 1% level of significance. Still, there is a significant negative relationship between LPOP, measured at 1% significance level and LTRX. It also indicates that a change in LPOP changes or reduces LTRX by -0.054.

5.1. Conclusion

Regional Economic Integration policy initiated to boost trade among regions in Africa is debated as to whether the policy has led to improvement in intra-regional trade in Africa. This policy is further followed by the African Free

Continental Free Trade to further support activities of trade in the regions. In addition, tariff which is an important indicator under the clause deliberated upon in the trade policy agreement has rarely been complied with in the first instance by trading partners. This implies there are variations in the case of tariff compliance by African countries.

An increase in economic growth, real exchange rate and intra-regional trade is positively and significantly linked in the African countries studied. In addition, both economic growth and real exchange rate appear to affect the amount of intra-regional trade in the period studied. The number of people living in African countries is strongly linked to how much trading happens within the region. All in all, regional economic integration increases the level of trade within the same group of African countries during the sample period. Moreover, economic growth, real exchange rate, and population are the main determinants of intra-regional trade among the selected African countries in this study. This confirms the findings by Muhammad and Magai (2019).

5.2. Recommendations

More African trade could result from greater openness to commerce, changes in society and the economy and fewer tariffs and non-tariff barriers because of Regional Economic Integration (REI). It would help if institutions working on policies put in place and applied rules for trade among nations to encourage the economic integration of the region more quickly. Intra-regional transactions among African nations should be very important for their economic development since these deals are closely tied to economic growth. This means research suggests that African countries should remove non-tariff barriers to boost trade between themselves. It also pointed out the importance of training workers to handle the challenges of population growth on trade among countries in the region.

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