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Regional integration and non-tariff barriers to Intra-Sub-Saharan Africa trade

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Abstract

The paper assesses the ex-post trade effect of sub-regional trade agreements (RTAs), financial integration and other non-tariff barriers on intra-regional trade involving 43 Sub-Saharan Africa (SSA) countries. The objective is to find out if RTAs within SSA had increased trade flows to inform current efforts of establishing a successful continental free trade area in SSA. Estimating a gravity model augmented with measures of trade agreements and financial integration, the paper made use of bilateral trade flows and key gravity covariates from CEPII database over the period 1960–2015. After controlling for the endogeneity of the trade agreement dummy, multilateral price resistance and zero-valued trade flows, we find RTAs within SSA and especially among Economic Community of West African States and Southern Africa Development Community members to have had a positive and significant impact on bilateral trade. Financially integrated trading partners also traded more, while we also found distance, landlockedness, common currency and colonial link to have an impact on trade costs and bilateral trade flows within SSA. The results indicate the need to focus on policies to expand and integrate regional markets in SSA by removing impediments to trade and improving on trade facilitation measures to significantly improve trade performance under the newly established African Continental Free Trade Area.

KEYWORDS
intra-African trade, regional integration, trade agreements, trade policy

1 | INTRODUCTION

Recently, regional economic integration has received much attention globally on account of the benefits it generates among participating countries. The relative success of the monetary and currency integration by the European Union (EU) has played a significant role in the accelerated commitment by other regional integration efforts in the developing world. As noted by Ackah et al. (2013), it is the enormous potential trade benefit of greater integration that has encouraged most economies to seek to be part of the greater interdependence generated by integration efforts. Trade is widely accepted as an important engine of economic growth and development, and through trade, many regions and countries have achieved tremendous success in lifting people out of poverty to prosperity. Sub-Saharan Africa (SSA), however, remains the only region globally that has not been able to use trade as a potent instrument for the achievement of rapid and sustainable economic growth and development. The sub-region remains at the periphery of global trade as it continues to lag in terms of contribution to global trade, contributing on average about 2% between 2010 and 2019 (IMF, 2021).

The African Union Programme on Boosting Intra-African Trade indicated that intra-African trade as 2012 stood at about 13%, and at most not more than 20% (if allowance is made for unrecorded informal cross-border trade). Although it could be argued that the major reason for the low levels of intra-SSA trade is that most SSA countries have similar comparative advantage (export similar commodities), the relatively high trade costs within SSA have also contributed to the low levels of intra-SSA trade flows. Non-policy-induced non-tariff barriers (NTBs) have been recognised to constitute the major contributors to higher trade costs within SSA and thus the most significant hindrance to trade and integration. These barriers have been recognised to be more important in affecting the volume and direction of trade flows than price factors such as tariffs and currency exchange cost.

Within SSA inadequate trade facilitation including the poor state of infrastructure, excessive delays at borders mainly because of burdensome administrative procedures for clearing goods for import and export, a lack of coordination and uniformity between countries within the sub-region regarding technical regulations, rules of origin and standards, policies on licences and permits, higher transport costs, remoteness and long overland distances continue to hinder trade and integration efforts. Studies such as Ackah et al. (2012), Turkson et al. (2020), Wilson et al. (2008), Mbabazi et al. (2006) and Limao and Venables (2001) have confirmed that the relatively low level of African trade flows is largely due to the poor state of infrastructure and inadequate trade facilitation measures. It is suggested that reducing such NTBs through regional integration will go a long way in increasing SSA trade flows.

Over the last three decades, regions and countries globally have increasingly sought to make use of trade policy in the form of regional trade agreements (RTAs) to reduce NTBs to trade. With regard to SSA, there has been an increase in the number of RTAs among countries within the sub-region, with several cross-membership reported among countries belonging to different regional economic communities (RECs; Turkson, 2015). Very little is known about what motivates the increasing interest in RTAs in SSA, especially when the trade-enhancing impact has not been clearly positive (see for instance, Turkson, 2015 for a discussion about the trade-enhancing impact of RTAs in Africa), and trade policy measures have not been effective in reducing NTBs and increasing bilateral trade flows within the sub-region.

Theoretically, it has been argued that given the similarities of comparative advantage and structural supply-side characteristics, trade agreements in SSA should not be expected to contribute significantly to bilateral trade flows (Turkson, 2015). Empirically, institutional bottlenecks, the lack of political will, high external trade barriers (both Tariff and non-Tariff barriers) and the nature of the complex web of overlapping trade agreements have been cited as factors that hamper intra-regional trade (ECA, 2004; Gunning, 2001; Johnson, 1995; Lyakurwa et al., 1997; Yang & Gupta, 2005).

The need to reduce these NTBs has seen a bouquet of trade policy reforms that have been pursued to boost trade from SSA. The various RECs within the sub-region have variously sought to eliminate these NTBs to encourage intra-sub-regional trade, yet some challenges still remain. As far back as 2012, the AU decided to establish a Pan-Africa Continental Free Trade Area (CFTA) by 2018 and to pursue an AU Action Plan for Boosting Intra-Africa Trade. It was envisaged that boosting intra-Africa trade will deepen Africa's market integration while at the same time serve as an effective instrument for the attainment of rapid and sustainable socio-economic development.

The newly established African Continental Free Trade Agreement (AfCFTA) is an agreement that purposely creates a common African market, which is expected to contribute to the bigger vision of deepening economic integration (facilitated by movement of persons) to provide greater opportunities for Africa's structural transformation, economic diversification and development. The agreement aims to create a liberalised market for goods and contribute to the movement of natural persons and capital. The realisation of the AfCFTA however depends to a large extent, on the way various obstacles hampering intra-regional trade on the African continent are addressed, and how the exiting regional integration efforts under the various RECs can serve the needed building blocks in fostering intra-Africa trade.

While an attempt to unpack the NTBs that hinder bilateral trade within SSA will inform the debate of how to get AfCFTA to take off successfully, an estimation of an intra-Africa trade cost function will enable estimates of the contribution of policy and behind the border trade measures to SSA trade costs to be obtained. Indeed, previous attempts at reducing NTBs have failed in boosting intra-regional trade in Africa partly as a result of data and measurement problems relating to most NTBs to trade within SSA (Turkson, 2012). Data on many components of trade frictions in Africa are either not readily available or limited if available. Though this is not peculiar to SSA, data issues relating to absence or unavailability, the improper combination of available data with other fragmentary or missing data to make it useful and aggregation bias are more profound in the SSA case relative to other regions within the global trading system.

It is against this background that the study seeks to examine the important role that sub-regional integration efforts, mostly through trade agreements and NTBs have played in impacting on trade costs and intra-regional bilateral trade flows in SSA.

Specifically, we seek to answer the question:

a. To what extent have trade agreements and NTBs within SSA impacted on bilateral trade flows within the sub-region?
b. To what extent have trade agreements and NTBs explain variations in trade cost for SSA?

A clear understanding of the role of trade costs in impacting trade flows is very important in order to promote deeper integration of the economies across the sub-region. Such an exercise will have important policy relevance in the context of current efforts by the African Union to boost intra-SSA trade through the newly established Africa Continental Free Trade Area (AfCFTA).

2 | REGIONAL ECONOMIC AND TRADE INTEGRATION IN SSA

Prior to the establishment of AfCFTA in 2018, SSA had five main RECs in West Central, East, Horn of Africa and Southern Africa.[1] The origins of regional integration on the continent can be traced to the establishment of SACU in 1910, through to the historic Pan African Congresses, to the first regional federations. African trade integration has included numerous arrangements at regional and sub-regional levels. The RECs were established mainly to foster and promote economic integration between member states within the various sub-regions and through the wider African Economic Community (AEC), which was established under the Abuja Treaty in 1991. The RECs include Economic Community of West African States (ECOWAS), Economic Community of Central African States (ECCAS), Southern Africa Development Community (SADC), East African Community (EAC) and Intergovernmental Authority on Development (IGAD). Although the AU recognises a sixth community—the Common Market for Eastern and Southern Africa (COMESA), it involves three RECs in South, East and Central Africa and Egypt.

2.1 | Economic integration in West Africa-Economic Community of West African States

Economic Community of West African States was founded on 28 May 1975 by a sub-regional group of 15 West African countries, with the signing of the Treaty of Lagos to foster and promote economic integration. To achieve 'collective self-sufficiency' it was envisaged that by establishing ECOWAS a single large trading bloc through an economic and trading union will be created. As a result of the inability of member states in harmonising policies, most of the ideals of ECOWAS remained unrealised at the end of the 1980s. However, in 1993 there was a revision of the Treaty of Lagos towards establishing a common market in West Africa by creating a free trade zone and customs union, removing trade mobility restrictions and giving the right of residence and establishment to member states. Within ECOWAS, tariffs have been removed on unprocessed goods and handicrafts, and there has been a complete elimination of tariffs on industrial goods and abolishing of entry and exit visas for residents travelling within the sub-region.

The 2019 Africa Regional Integration Index (ARII),[2] shows that the overall integration index of ECOWAS scored an average of 0.425, reflecting a moderately integrated community. The scores on the five dimensions of integration show that ECOWAS' strongest dimension is free movement of people (0.733), whereas its weakest dimension is productive integration (0.220). The high score of free movement of people demonstrates the vision and fulfilment of ECOWAS, thus creating a borderless region and open visa policies for its member countries.

2.2 | Economic integration in Central Africa-Economic Community of Central African States

Economic Community of Central African States was formed out of the Customs and Economic Union of Central Africa (UDEAC of UAEAC) in 1981, which was established by the Brazzaville Treaty in

[1]The five (5) RECs and member countries and states are listed in Appendix 5.

[2]ARII uses 16 indicators, grouped into five dimensions (including free movement and trade integration), to measure how well each country and region in Africa is integrated with its neighbours. ARII also measures the state of regional integration for the continent as a whole. See https://www.integrate-africa.org/about-the-index/.

1966 as a customs union with a free trade area between member states and a common external tariff for imports from non-member countries. Economic Community of Central African States began functioning in 1985 but remained inactive due to several financial difficulties which lead to a delay in the formal contact between the AEC and ECCAS up till October 1999.

To promote economic integration among francophone states of Central Africa,[3] UDEAC in June 1999 signed a treaty for the establishment of the Economic and Monetary Community of Central Africa (CEMAC). On 24 January 2003, the European Union (EU) concluded a financial and unification agreement between ECCAS and CEMAC, with ECCAS taking responsibility for the peace and security and CEMAC for issues regarding customs and monetary union. The association of CEMAC to AEC is mainly through ECCAS. CEMAC's objectives are trade promotion, instituting a genuine common market, and greater solidarity among people and towards underprivileged countries and regions. ARII 2019 indicates that ECCAS is moderately integrated with an overall score of 0.442. Its strongest dimension is macroeconomic integration with a score of 0.684 and its weakest dimension is productive integration with a score of 0.323. The disparities among member states in terms of trade integration, free movement of people, infrastructure integration, macroeconomic integration and productive integration are large.

2.3 | Economic integration in South Africa: Southern Africa development community

Southern Africa Development Community was founded out of the Lusaka declaration in 1980 by Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, Tanzania, Zambia and Zimbabwe to reduce the economic dependence on South Africa and promote economic integration. Initially known as the Southern African Development Coordination Conference (SADCC), SADC was formalised in 1992 under the Windhoek declaration to deepen economic cooperation and cross-border trade integration. In 1996, SADC member states signed a protocol of trade to eliminate trade barriers and harmonise trade procedures and documentation.

Southern Africa Development Community scores 0.337 based on the 2019 ARII score, with 9 of its 16 members performing at a level that is average for the community. Its score indicates the community is relatively poorly integrated. Its strongest regional integration dimension is free movement of people with a score of 0.490, and its weakest regional dimension is infrastructural integration with a score of 0.214. Southern Africa Development Community's country rankings appear to reflect the current state of socio-economic integration, where the best performers are flourishing and experiencing a good standard of living.

2.4 | Economic integration in East Africa: East African community

The East African Community, an intergovernmental organisation, currently comprises five east African countries Burundi, Kenya, Rwanda, Tanzania and Uganda. Originally founded in 1967 by Kenya, Tanzania and Uganda, the EAC collapsed in 1977 but was revived by 7 July 2000.

In 2008, after negotiations with the SADC and the COMESA, the EAC agreed to an expanded free trade area including the member states of the three Regional Trade Agreements (RTAs).

[3]Cameroon, Central African Republic, Chad, Republic of Congo, Equatorial Guinea and Gabon.

The ARII (2019) shows that the REC performs most strongly on the free movement of people dimension, where its countries average 0.644. However, its macroeconomic integration dimension is not far behind with a score of 0.660. No EAC member has a bilateral investment treaty in force, and EACs' score on trade integration is not high (0.440). This is mostly attributed to the low share of regional exports, although the community has eliminated tariffs among its member countries.

2.5 | Economic integration on the horn of Africa: Intergovernmental authority on development

Initially established as the Intergovernmental Authority on Drought and Development (IGADD) in 1986, IGAD was intended to support member states to cope with the problems of recurring and severe droughts and other natural disasters that had caused ecological degradation and economic hardship in the Horn of Africa between 1974 and 1984. On 18 April 1995, IGAD was revitalised by expanding its areas of regional cooperation through the creation of a full-fledged regional political, economic, development, trade and security entity similar to the SADC and ECOWAS.

The IGAD assembles eight countries that range from Kenya, a continental powerhouse to the economically small Somalia. Its overall regional integration score is 0.438 indicating that the community is moderately integrated with its best performers being Uganda and Kenya and its worst performers being Eritrea and South Sudan. Intergovernmental authority on development performs best in the free movement of people (0.540), as most of its members have committed to liberalising mobility on the continent. The productive integration dimension (0.321) is where it has the most to improve. For the dimension of free movement of people, Djibouti and Somalia are the top performers. Uganda leads IGADs in integrated production and integrated trade. It has the highest score for the export of intermediate goods in the community. It has the best trade share and the second-best export share.

2.6 | Multiplicity of trade agreements in SSA

One of the interesting aspects of African regional trade agreements is the array of such trade agreements and the extent of overlapping membership. Authors such as Gunning (2001), Yang and Gupta (2005) and Chacha (2013) have argued that the overlapping memberships undermine the effectiveness of African RTAs because it adds to the financial burden of members states and makes it difficult for customs officials to deal with different tariff reduction rates, rules of origin, trade documentation and statistical nomenclatures. Invariably, these have been counterproductive to the trade facilitation goals of these agreements.

Interestingly, the multiplicity of trade agreements within SSA gives an impression of the trade creation effect of these agreements, otherwise what explains the dense web of such agreements within SSA. What is unknown is whether the existing trade agreements/customs unions have facilitated increased trade and any welfare gains for member states. Indeed, the conclusions from previous studies that have sought to assess the ex-post trade effects of RTAs in SSA have remained inconclusive. For instance, while Johnson (1995), Lyakurwa et al. (1997), Gunning (2001), ECA (2004), Yang and Gupta (2005) and Chacha (2013) confirmed the conventional belief that RTAs in SSA have not enhanced trade among member countries, studies such as Deme (1995), Elbadawi (1997), Cernat (2001), Carrère (2004), Coulibaly (2007), Afesorgbor and van Bergeijk (2011) and Turkson (2015) found SSA RTAs to have been trade-creating.

3 | METHODOLOGY

3.1 | Empirical strategy

The empirical approach adopted in this paper is the estimation of a two-part analytical framework. In the first part, a multiplicative gravity equation is estimated using a panel of bilateral trade flows and standard gravity covariates to unpack the NTBs that impede or promote intra-Africa trade and also to estimate the trade effect of regional trade integration on intra-African trade flows.

We adopt the Anderson and van Wincoop (2003) theory-based gravity model assumed in a multiplicative form as:

$$X_{ijt} = \varphi_0 . Y_{it}^{\varphi_1} . Y_{jt}^{\varphi_2} . d_{ij}^{\gamma} . Z_{ijt}^{\alpha_k} . BLOC_{ijt}^{\beta} . \eta_{ij} . \upsilon_t . \epsilon_{ij}. \tag{1}$$

The econometric specification in logs is of the form:

$$\begin{aligned} \ln\left(X_{ijt}\right) \quad &= \delta_0 + \delta_1 \ln\left(Y_{it}\right) + \delta_2 \ln\left(Y_{jt}\right) + \varphi ln\left(d_{ijt}\right) + \alpha_1 \ln\left(YPC_{it}\right) + \alpha_2 \ln\left(YPC_{jt}\right) \\ &+ \alpha_3 Adjacency_{ij} + \alpha_4 Colonial_{ij} + \alpha_5 Comcur_{ij} + \alpha_6 Comlang_{ij} + \alpha_7 Landlocked_{ij} \\ &+ \alpha_8 Remoteness_{ijt} + \alpha_9 FinInter_{it} + \alpha_{10} FinInter_{jt} + \beta_1 ECOWAS_{ijt} + \beta_2 ECCAS_{ijt} \\ &+ \beta_3 EAC_{ijt} + \beta_4 SADC_{ijt} + \beta_5 IGAD_{ijt} + \eta_{ij} + \upsilon_t + \varepsilon_{ijt}, \end{aligned} \tag{2}$$

where X_{ijt} is bilateral exports at time t and is specified to be a function of GDP of origin and destination (Y_{it} and Y_{jt}), GDP per capita of origin and destination (YPC_{it} and YPC_{jt}), the distance between bilateral trading partners (d_{ijt}), a vector Z of controls thought to proxy for other aspects of bilateral and country characteristics (Zij) including adjacency, colonial link, common currency, common official language, landlockedness, remoteness and trade agreement dummies $\left(ECOWAS_{ijt}, ECCAS_{ijt}, EAC_{ijt}, SADC_{ijt}\ and\ IGAD_{ijt}\right)$. We also include degree of financial integration of the origin and destination countries $\left(FinInter_{it}\ and\ FinInter_{jt}\right)$ to capture the extent of export diversification into higher value addition. As noted by Kose et al. (2006), financial integration can help capital-poor countries diversify away from their production of agricultural or primary products for exports into higher value addition and this diversification should increase exports and thereby reduce macroeconomic volatility. As shown in equation 2, we also control for bilateral fixed effects $\left(\eta_{ij}\right)$ and time (ϑ_t).

Most empirical studies have assumed an exogenous dummy variable to represent the effect of belonging to a trade agreement. As noted by Trefler (1993) and Baier and Bergstrand (2007), in reality trade agreement dummies are not exogenous, because, for unobservable reasons (such as political factors, notariff barriers and domestic policies that inhibit bilateral trade), countries can endogenously select into a trade agreement. According to Baier and Bergstrand (2007), the potential endogeneity of the trade agreement (either RTA or PTA) dummy could thus be attributed to omitted variables and sample selection bias. Thus, the trade agreement dummy coefficient is generally underestimated because the dummy within the gravity framework is correlated negatively with the error term leading to the classical 'attenuation bias' of the FTA coefficient towards zero.

To correct for omitted variables and selection bias arising from the endogeneity of regional trade agreement dummies (included to capture the impact of the various intra-SSA RTAs), we will adopt the Hausman–Taylor panel technique to estimate the gravity equation as stated in equation (2).

Based on instrumental variables, the Hausman–Taylor panel estimator in dealing with the endogeneity bias from the trade agreement dummies assumes the existence of correlation between

some explanatory variables and the individual heterogeneity effect. As a fixed effect estimator, the Hausman–Taylor panel estimator has proven to be more efficient than the panel random and fixed effects model (REM and FEM) techniques. Although the fixed effects vector decomposition (FEVD) technique also provides solutions to the econometric concerns raised against the REM and FEM, the choice of the Hausmann-Taylor over the FEVD is premised on the evidence that the FEVD is generally not well-suited for relatively large samples (see Plümper & Troeger, 2004).

The second part analytical framework that will seek to answer research question (2) estimates a bilateral trade cost function for SSA without relying on the traditional measures based on the gravity-related quantifiable trade costs components. Recent improvements in empirical methodology in the trade literature with respect to trade costs have made it possible to estimate bilateral trade cost without relying on the traditional measures. Novy (2013) following closely the work of Head and Ries (2001) derived an explicit analytical solution for the multilateral trade resistance variables, which help to solve the trade cost function of the form;

$$\tau_{ij} = \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{1/2} - 1 = \left(\frac{X_{ii}X_{jj}}{X_{ij}X_{ji}}\right)^{1/2(\sigma-1)} - 1, \tag{3}$$

where τ_{ij} is the total trade cost (i.e. measures bilateral trade costs relative to domestic trade costs),[4] $t_{ij}t_{ji}$ is the bilateral trade costs of countries i and j, and $t_{ii}t_{jj}$ is the domestic trade costs of countries i and j. The measure of the international component of trade costs net of distribution costs in the destination country is given as $\left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)$. Intuitively, equation (3) indicates that when bilateral trade costs decrease relative to domestic trade costs, total trade costs (τ_{ij}) will decrease, making it easier for countries i and j to trade relative to domestic trade. This will therefore imply that bilateral trade flows will increase relative to domestic trade flows. Similarly, if bilateral trade flows increase relative to domestic trade flows, one can infer that it has become easier for the two countries to trade (possibly because bilateral trade costs have declined relative to domestic trade cost), and this will be reflected in a decline in total trade costs.

Based on the micro-founded measure obtained from equation (3) above, we propose to estimate a multiplicative tariff equivalent bilateral trade cost function of the form:

$$\begin{aligned}\tau_{ij} &= \gamma_0 + \gamma_1 \ln\left(d_{ijt}\right) + \gamma_2 Adjacency_{ij} + \gamma_3 Colonial_{ij} + \gamma_4 Comcur_{ij} + \gamma_5 Comlang_{ij} \\ &+\gamma_6 Landlocked_{ij} + \gamma_7 FinInter_{it} + \gamma_8 FinInter_{jt} + \gamma_9 ECOWAS_{ijt} + \gamma_{10} ECCAS_{ijt} \\ &+\gamma_{11} EAC_{ijt} + \gamma_{12} SADC_{ijt} + \gamma_{13} IGAD_{ijt} + \eta_{ij} + \upsilon_t + \varepsilon_{ijt}.\end{aligned} \tag{4}$$

For SSA where measures of trade costs components are limited, and in some cases unavailable, the micro-founded measure of trade cost offers an opportunity to track changes in trade costs in SSA and to use such a measure to assess the trade effect of SSA RTAs on intra-sub-regional trade flow. This will make a meaningful contribution to the integration and trade cost literature on Africa.

3.2 | Data

Data on bilateral exports covered the period 1960 to 2015 and are obtained from the 'square' gravity data set for all world pairs of countries by the Centre d'Etudes Prospectives et d'Informations

[4]See Appendix 1 for the derivation of the Micro-founded measure of trade cost.

Internationales (CEPII).[5] This data set also contains some variables relating to the standard gravity covariates (mostly, country-specific characteristics). Data on bilateral exports for the same period are sourced from the UN-COMTRADE data set. In order to focus on SSA, we concentrate mainly on bilateral trade relations within this sub-region involving 43 countries.

With regard to data on the micro-founded trade cost measure, we will make use of the database used by Arvis et al. (2012). This data set has been subsequently updated to 2014. The bilateral measure of trade costs featured in this database is truly comprehensive in the sense that it captures trade costs in its wider sense, including not only international transport costs and tariffs but also other trade cost components discussed in Anderson and van Wincoop (2004), such as direct and indirect costs associated with differences in languages, currencies and cumbersome import or export procedures. Known as the ESCAP—World Bank-trade costs-data set, it spans the period from 1995 to 2014 and covers the primary and manufacturing sectors and involves bilateral trade involving 196 countries out of which 44 are SSA countries. Refer to Appendices 2 and 3 for the definition, source and summary statistics for the main variables.

4 | ANALYSIS OF RESULTS AND POLICY IMPLICATIONS

4.1 | Results from gravity model

The results obtained from estimating the gravity equation 2 are presented in Table 1. The results presented include the estimates of the fixed effects model (columns 1 and 2) and Hausman–Taylor (columns 3 and 4). The choice of the fixed effect estimator is based on the Hausman test results. As shown in Appendix 4, the test rejects the null hypothesis suggesting the presence of a correlation between individual heterogeneity and the covariates of the estimated gravity model, implying the inappropriateness of the random effects estimator. To control for the endogeneity of the trade agreement variable, we concentrate on the estimates of the Hausman–Taylor in columns 3 and 4.

As a result of the existence of zero-valued trade flows in the sample, we perform sensitivity analysis to examine the effect of the trade agreement variables. The inclusion of the zero-valued trade flows is to ensure that we do not omit from the analysis, the possibility of the trade agreement variable explaining in part why countries do not trade within SSA. The results in columns 5 and 6 of Table 1 are obtained by estimating equation 2 using the negative binomial pseudo-maximum likelihood estimator (NBPML), a member of the family of Poisson pseudo-maximum likelihood estimators (see Burger et al., 2009). The use of the NBPML technique allows for the inclusion of zero-valued trade flows and also for the unobserved heterogeneity between countries to be accounted for.

The results from the estimation in columns 3 and 4 of Table 1 generally perform satisfactorily as most of the standard covariates of the gravity model conform with expectations. Importer and exporter GDP, common colonial link, common language, use of a common currency, remoteness and adjacency (i.e. sharing a common border) are expected to exert a statistically significant positive effect on bilateral exports. Distance and the number of landlocked countries in a pair were found to exert a negative effect on bilateral exports, confirming prior expectations. This supports support the argument that within SSA, high transport costs resulting from trading over longer distance and with landlocked countries impose significant trade costs, implying that with SSA trade will be diverted from landlocked and longer distance partners.

[5]As generated and used by Head et al. (2010).

TABLE 1 Impact of SSA RTAs on bilateral trade within SSA

	Dependent variable (log of exports ijt)				Dependent variable (exports ijt)	
	Fixed effects		Hausman–Taylor		NBPML	
Variables	(1)	(2)	(3)	(4)	(5)	(6)
GDP_{it}	0.275	0.373	0.497***	0.487***	0.391***	0.405***
	(0.511)	(0.504)	(0.111)	(0.110)	(0.010)	(0.010)
GDP_{jt}	0.546	0.665	0.266**	0.258**	0.312***	0.328***
	(0.478)	(0.472)	(0.121)	(0.120)	(0.010)	(0.010)
$Gross\ Financial\ Integration_{it}$	0.039**	0.044***	0.035**	0.041**	0.017***	0.018***
	(0.017)	(0.017)	(0.017)	(0.016)	(0.002)	(0.002)
$Gross\ Financial\ Integration_{jt}$	0.021	0.015	0.017	0.011	0.005**	0.005**
	(0.016)	(0.016)	(0.016)	(0.016)	(0.002)	(0.002)
$GDP\ per\ capita_{it}$	0.097	−0.011	−0.119	−0.113	−0.157***	−0.116***
	(0.515)	(0.508)	(0.094)	(0.092)	(0.008)	(0.009)
$GDP\ per\ capita_{jt}$	−0.338	−0.469	−0.097	−0.093	−0.103***	−0.067***
	(0.466)	(0.460)	(0.092)	(0.089)	(0.008)	(0.009)
$Remoteness_{ijt}$	0.379*	0.446**	0.500***	0.547***	−0.073***	−0.101***
	(0.203)	(0.202)	(0.179)	(0.178)	(0.016)	(0.017)
$Common\ Currency_{ijt}$	0.405*	0.399*	0.384*	0.389*	0.026	0.216***
	(0.213)	(0.225)	(0.197)	(0.207)	(0.023)	(0.024)
$Distance_{ij}$			−1.469***	−1.448***	−0.761***	−0.735***
			(0.100)	(0.102)	(0.015)	(0.015)
$Common\ Colony_{ij}$			0.362**	0.299*	0.764***	0.661***
			(0.158)	(0.157)	(0.018)	(0.018)
$Common\ Language_{ij}$			0.632***	0.722***	0.260***	0.325***
			(0.143)	(0.141)	(0.018)	(0.018)
$Adjacency_{ij}$			1.346***	1.420***	0.350***	0.457***
			(0.212)	(0.208)	(0.026)	(0.026)
$Number\ Landlocked_{ij}$			−0.726***	−0.699***	−0.531***	−0.525***
			(0.094)	(0.094)	(0.012)	(0.012)
RTA_{ijt}	0.211*		0.218*		0.139***	
	(0.126)		(0.124)		(0.019)	
$ECOWAS_{ijt}$		0.476***		0.482***		0.239***
		(0.165)		(0.163)		(0.024)
$IGAD_{ijt}$		−0.515		−0.500		0.289***
		(0.453)		(0.449)		(0.097)
$SADC_{ijt}$		0.705***		0.692***		0.504***
		(0.180)		(0.174)		(0.028)
EAC_{ijt}		−0.263		−0.283		0.215**
		(0.491)		(0.485)		(0.104)

TABLE 1 (Continued)

	Dependent variable (log of exports ijt)				Dependent variable (exports ijt)	
	Fixed effects		Hausman–Taylor		NBPML	
Variables	(1)	(2)	(3)	(4)	(5)	(6)
$ECCAS_{ijt}$		−1.289***		−1.306***		−0.982***
		(0.375)		(0.372)		(0.046)
Constant included	Yes	Yes	Yes	Yes	Yes	Yes
Control for bilateral & time effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	25,782	25,782	25,782	25,782	50,587	50,587
Number of bilateral pairs	1433	1433	1433	1433	1433	1433

Note: Country *i* and *j* refer to exporter and importer country respectively. Robust standard errors in parentheses (clustered at the bilateral country pair).

***$p < .01$, **$p < .05$, *$p < .1$.

Generally, the results in columns 5 and 6 of Table 1 (inclusion of zero-valued bilateral exports) are quite comparable to those found in columns 3 and 4 of Table 1. Importer and exporter GDP, common colony, common currency, common language and sharing a common border were found to exert a statistically significant positive effect on bilateral exports. Distance, the number of landlocked countries, GDP per capita for both exporter and importer countries, and remoteness exerted negative effects on bilateral exports. The negative impact of GDP per capita on bilateral trade within SSA confirms the low-income elasticity of demand for primary products (agricultural exports tend to be income inelastic). While we expect that bilateral trading partners that are remote from the rest of the world should trade more, after controlling for zero-valued trade flows, we find remote countries trading less, and this is more likely because of similarity of comparative advantage.

With regard to financial integration, we find the higher degree of financial integration of the exporting partner to increase diversification and thus increase the flow of bilateral exports within SSA, although the extent of importer financial integration does not. When we include zero-valued trade flows (columns 5 and 6), we find the extent to which exporter and importer countries are financially integrated as positively impacting on bilateral trade flows within SSA, implying that the success of the AfCFTA will depend on the extent to which SSA countries are financially integrated within the global financial architecture.

We find the presence of RTAs to be statistically significant in enhancing trade. On average, membership of an RTA in SSA has a positive trade effect under the different specifications. As shown in column 3 of Table 1, bilateral exports between member countries in any of the RTAs in SSA was 24% ($\exp^{0.218} = 1.24$) higher relative to bilateral exports between non-member countries. This finding is robust when we include zero-valued trade flows (shown in column 5), as we find members trading by 15% ($\exp^{0.139} = 1.15$) higher than trade among non-members. This implies that on average SSA RTAs have been trade-enhancing.

Comparatively within specific RTAs, SADC and ECOWAS countries did better in intra-REC trade. Based on the Hausman–Taylor estimator (column 4), we find that for ECOWAS and SADC countries, bilateral exports increased by 62% ($\exp^{0.482} = 1.62$) and 100% ($\exp^{0.692} = 2.0$) respectively among member countries and states, relative to trading with non-members. Conversely, ECCAS countries traded less within their trade bloc relative to the non-members. The estimated decline in bilateral exports was about 269% ($\exp^{1.306} = 3.69$). The statistically insignificant EAC and IGAD

trade agreements could be due to the low degree of integration for the periods under consideration. When we include zero-valued bilateral trade flows, we find (see column 6) that 4 out of the 5 RTAs have been trade-enhancing. For ECOWAS, IGAD, SADC and EAC countries, bilateral exports were higher by 27% ($\exp^{0.239} = 1.27$), 36% ($\exp^{0.289} = 1.36$), 65% ($\exp^{0.504} = 1.65$) and 24% ($\exp^{0.215} = 1.24$) relative to trade with non-members respectively. For ECCAS, the negative trade effects found for positive-valued trade flows is robust when we control for zero-valued flows, although the reduction in exports is of a smaller the magnitude at 167% ($\exp^{0.982} = 2.67$).

4.2 | Micro-founded measures of trade cost in SSA

The micro-founded measure of trade cost is a relative measure that seeks to estimate the total non-tariff trade barrier costs for a country with its partners relative to domestic trade costs. To explain the variation in the micro-founded trade cost measure for regions involved in the global multilateral trading system, Table 2 shows the estimates of the average relative trade costs for Africa and those for the rest of the world between 1995 and 2014.

As can be observed from Table 2, the average relative trade cost for African countries with all their trading partners compared with the rest of the world is the highest. Even within Africa, the estimates for SSA remain higher than the continent's average. This clearly indicates that SSA has the highest trading cost, and this confirms evidence from the Doing Business and Trading Across Borders Databases etc.

Table 3 presents the regression results examining the effects of integration and/or trade agreement and other NTBs on trade cost in SSA. The dependent variable is the logarithmic transformation of the micro-founded relative trade cost measure. Columns (1) and (3) of Table 3 present the pooled results without controls for fixed effects. In order to account for multilateral resistance. Columns (2) and (4) present the pooled results with controls for country-fixed effects to ensure completeness.

In terms of the extent to which financial integration and/or trade agreement explain variation in the micro-founded trade cost measures for Africa, the empirical estimations suggest that countries in ECOWAS, IGAD, SADC and EAC tend to trade at a lower trade cost relative to trading with partners from other regional blocks in Africa. At a disaggregated level where we distinguish manufactures, the pattern is similar to what we find for all goods. For the latter, the trade cost is higher for ECOWAS and ECCAS countries. For financial integration, it was observed that it generally lowers trade cost in SSA though statistically the impact is negligible. The main implication of these results is that SSA countries need to focus on expanding and integrating regional markets to significantly improve trade performance. This can facilitate proper entry and dominance in the international market which tends to be very much competitive.

TABLE 2 Estimates of overall average relative trade cost (period averages)-all goods.

	SSA	AFRICA	AMERICA	ASIA	EUROPE
1995–1999	297.4	295.2	256.0	258.1	203.4
2000–2004	322.8	320.3	292.6	283.5	225.5
2005–2009	340.2	335.6	311.8	283.0	231.9
2010–2014	324.8	319.9	306.6	276.5	214.9
1995–2014	325.1	321.3	295.6	278.2	221.5

Source: Authors construct- estimates obtained from estimating equation (2).

Abbreviation: SSA, Sub-Saharan Africa.

Bold Values are Regions.

TABLE 3 Pooled OLS estimates of the average relative bilateral trade cost function.

	All goods		Manufacturing	
Variables	**(1)**	**(2)**	**(3)**	**(4)**
Log of Distance$_{ij}$	0.283***	0.531***	0.340***	0.582***
	(0.009)	(0.011)	(0.010)	(0.012)
Sharing Common Border$_{ij}$	−0.393***	−0.246***	−0.372***	−0.195***
	(0.014)	(0.013)	(0.017)	(0.016)
Common Language$_{ij}$	−0.136***	−0.129***	−0.124***	−0.148***
	(0.011)	(0.012)	(0.012)	(0.015)
Common Currency$_{ij}$	−0.157***	−0.136***	−0.163***	−0.137***
	(0.013)	(0.020)	(0.015)	(0.025)
Common Legal Origin$_{ij}$	−0.006	−0.079***	−0.024**	−0.083***
	(0.010)	(0.009)	(0.012)	(0.012)
Number Landlocked$_{ij}$	0.274***	0.369***	0.296***	0.004
	(0.007)	(0.043)	(0.008)	(0.083)
Net Foreign Assets$_{it}$	−0.019***	−0.005	−0.067***	0.013
	(0.006)	(0.004)	(0.023)	(0.036)
Net Foreign Assets$_{jt}$	−0.019***	−0.005	−0.067***	0.013
	(0.006)	(0.004)	(0.023)	(0.036)
ECOWAS$_{ijt}$	−0.102***	0.012	−0.061***	−0.055**
	(0.013)	(0.020)	(0.015)	(0.024)
IGAD$_{ijt}$	−0.233***	0.022	−0.122**	0.035
	(0.045)	(0.030)	(0.048)	(0.036)
SADC$_{ijt}$	−0.407***	−0.105***	−0.328***	−0.105***
	(0.015)	(0.017)	(0.017)	(0.020)
EAC$_{ijt}$	−0.481***	−0.228**	−0.302***	−0.161
	(0.104)	(0.091)	(0.117)	(0.111)
ECCAS$_{ijt}$	0.164***	0.027	0.166***	0.031
	(0.022)	(0.022)	(0.025)	(0.025)
Constant included	Yes	Yes	Yes	yes
Control for time effects	No	Yes	No	Yes
R-squared	0.450	0.692	0.454	0.667
Observations	12,490	12,490	10,068	10,068

Note: Country *i* and *j* refer to exporter and importer country. Robust standard errors in parentheses (clustered at the bilateral country pair).

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

5 | CONCLUSION AND POLICY IMPLICATIONS

This paper presents an empirical estimation of the relationship between regional and financial integration, trade costs and intra-SSA trade. It is motivated by the importance of trade cost in affecting trade flows among nations and the extent to which greater regional and financial integration and NTBs can help efforts in reducing trade cost in Africa. A clear understanding of the role of trade costs in

enhancing trade is thus very important in order to promote deeper integration of the economies across the sub-region.

Using bilateral trade flows between 43 SSA countries over the period 1960–2015, we find trade agreements to increase bilateral exports within SSA. Comparatively, SADC and ECOWAS countries did better in intra-REC trade than other RTAs and the results are robust for Hausman–Taylor and NBPML estimations. The inclusion of zero-valued trade flows produces statistically significant results for all RTAs in SSA. Intra-regional trade increased in all the RECs with the exception of countries in ECCAS. Generally, this paper contributes to the literature on the potential impact of trade agreements on trade flows within SSA. By making use of a panel of observations and controlling for bilateral fixed and time effects enabled for the correction of the endogeneity of the trade agreement variable unlike most previous studies on SSA. We also accounted for multilateral price resistance by the inclusion of the bilateral remoteness indicator (as in Frankel & Wei, 1998) and explicitly dealt with the zero-valued flows.

The results show the need for policymakers to further identify and reduce trade barriers in SSA as average trade costs are still higher on the continent relative to the rest of the world. Integration efforts to reduce trade policy barriers and deepen financial integration within the various RECs within SSA should be vigorously pursued as the evidence from our results show clearly that countries that belong to a RTA or are financially integrated trade more as a result of lower trade costs. Further policies to ensure the use of common currencies could reduce trade costs and increase bilateral trade flows within SSA, and this would be the 'sine qua non' for the success of the newly established African Continental Free Trade Area (AfCFTA). Indeed, current efforts at ensuring a smooth take-off of the CFTA for SSA should commence with the removal of all NTBs within RECs. There is no doubt that the similarity in comparative advantage explains why intra-SSA trade is relatively low; however, the increase in the production of higher value addition exports will provide enormous opportunities for increased trade within the sub-region.

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DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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APPENDIX 1: DERIVATION OF THE MICRO-FOUNDED MEASURE OF TRADE COST

Novy (2013) specifies country *i*'s domestic trade flow as:

$$X_{ii} = \frac{y_i^2}{y^w}\left(\frac{t_{ii}}{\Pi_i P_i}\right)^{1-\sigma}, \tag{A1}$$

where x_{ii} and t_{ii} are domestic (intra-national) trade flows and trade costs respectively of country *i*. From equation (A1), the product of the multilateral resistance variables can be solved as;

$$\Pi_i P_i = \left(\frac{X_{ii}/y_i}{y_i/y^w}\right)^{1/\sigma - 1} t_{ii}, \tag{A2}$$

As indicated in equation (A2), if domestic trade flows in country *i* (t_{ii}) is known, then given nominal income in country *i* (y_i), world income (y^w) and the elasticity of substitution (σ), the multilateral trade resistance variables Π_i and P_i would be known. Similarly for country *j*:

$$\Pi_j P_j = \left(\frac{X_{jj}/y_j}{y_j/y^w}\right)^{1/\sigma - 1} t_{jj}. \tag{A3}$$

Clearly equations (A2) and (A3) show that multilateral trade resistance does not depend on time-invariant proxies but rather easily observable time-varying trade data.

The explicit solution for the multilateral resistance variables can be used to solve for bilateral trade costs from the general equilibrium model. To do this Novy (2013) obtained a bidirectional gravity equation by multiplying corresponding gravity equations for trade flows from the opposite direction (i.e. $X_{ij}X_{ji}$). That is:

$$X_{ij}X_{ji} = \frac{y_i y_j}{y^w}\left(\frac{t_{ij}}{\Pi_i P_j}\right)^{1-\sigma}\left[\frac{y_j y_i}{y^w}\left(\frac{t_{ji}}{\Pi_j P_i}\right)^{1-\sigma}\right] = \left(\frac{y_i y_j}{y^w}\right)^2\left(\frac{t_{ij}t_{ji}}{\Pi_i P_i P_j \Pi_j}\right)^{1-\sigma}. \quad \text{(A4)}$$

From equations (A2), (A3) and (A4):

$$X_{ij}X_{ji} = \left(\frac{y_i y_j}{y^w}\right)^2\left[\frac{t_{ij}t_{ji}}{\left[\left(\frac{X_{ii}}{y_i}\Big/\frac{y_i}{y^w}\right)^{1/\sigma-1}t_{ii}\right]\left[\left(\frac{X_{jj}}{y_j}\Big/\frac{y_j}{y^w}\right)^{1/\sigma-1}t_{jj}\right]}\right]^{1-\sigma} = X_{ii}X_{jj}\left(\frac{t_{ii}t_{jj}}{t_{ij}t_{ji}}\right)^{\sigma-1}. \quad \text{(A5)}$$

Re-arranged

$$\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}} = \left(\frac{X_{ii}X_{jj}}{X_{ij}X_{ji}}\right)^{1/\sigma-1}. \quad \text{(A6)}$$

As bilateral and domestic trade costs can be asymmetric (i.e. $t_{ij} \neq t_{ji}$ and $t_{ii} \neq t_{jj}$), the tariff equivalent total trade costs (τ_{ij}) could be obtained by taking a geometric mean of trade costs in both directions minus one:

$$\tau_{ij} = \left(\frac{t_{ij}t_{ji}}{t_{ii}t_{jj}}\right)^{1/2} - 1 = \left(\frac{X_{ii}X_{jj}}{X_{ij}X_{ji}}\right)^{1/2(\sigma-1)} - 1. \quad \text{(A7)}$$

APPENDIX 2: MAIN VARIABLES: DEFINITION AND SOURCE

- Data on Bilateral exports (X_{ij} and X_{jt}) was sourced from sourced from UN-COMTRADE
- Measures of Economic Size: GDP measured at Current US dollars
- Measures of distance and other country characteristics such as contiguity, common language, common currency and common legal origin are sourced from CEPII
- Number landlocked is constructed based on the number of bilateral pairs of country that are landlocked
- Remoteness of country pair: a proxy variable for multilateral resistance to trade. It is calculated based on the approach used in Wei (1996) and Baier and Bergstrand (2009) as a function of bilateral distance and Gross Domestic Product.
- Gross Foreign Assets is used as a measure of financial integration and is sourced from the World Development Indicators of the World Bank.
- Trade agreement dummies generated for each RTA as follows:
  - RTA *ijt*: Dummy = 1 if *i* and *j* are SSA countries and at the same time *t* belonged to the same RTA, 0 if otherwise.

- ECOWAS RTA *ijt*: Dummy = 1 if *i* and *j* are both members of the ECOWAS RTA a time *t*, 0 if otherwise.
- SADC RTA *ijt*: Dummy = 1 if *i* and *j* are both members of the SADC RTA a time *t*, 0 if otherwise.
- EAC RTA *ijt*: Dummy = 1 if *i* and *j* are both members of the EAC RTA a time *t*, 0 if otherwise.
- ECCAS RTA *ijt*: Dummy = 1 if *i* and *j* are both members of the ECCAS RTA a time *t*, 0 if otherwise.
- IGA RTA *ijt*: Dummy = 1 if *i* and *j* are both members of the IGAD RTA a time *t*, 0 if otherwise.

APPENDIX 3: AVERAGE VALUES OF THE MAIN VARIABLES USED FOR THE ESTIMATION.

	All	No RTA	ECOWAS	IGAD	SADC	EAC	ECCAS
$Bilateral\ Export_{ij}$ (US$ Million)	5.18	2.12	10.40	49.30	41.40	13.40	2.88
GDP_i (US$ Billion)	11.60	11.30	10.80	16.80	20.40	3.07	9.44
GDP_j (US$ Billion)	11.70	11.40	10.80	16.80	20.20	3.07	9.44
$Distance_{ij}$ (1000 pop-wt, km)	3.46	3.96	1.34	1.01	1.74	0.72	1.43
$Number\ Landlocked_{ij}$	0.69	0.71	0.38	1.34	0.84	0.78	0.93
$GDP\ per\ capita_{it}$	1.15	1.17	0.53	0.40	1.85	0.20	2.30
$GDP\ per\ capita_{jt}$	1.13	1.14	0.53	0.40	1.83	0.20	2.29
$Remoteness\ Index_{ij}$ (1000)	3.14	3.19	2.83	3.87	3.34	3.93	2.65
$Gross\ Foreign\ Assets_{it}$	262.00	243.00	0.00	0.00	1420.00	0.00	0.00
$Gross\ Foreign\ Assets_{jt}$	259.00	240.00	0.00	0.00	1420.00	0.00	0.00

APPENDIX 4: HAUSMAN SPECIFICATION TEST RESULTS (EQUATION 2).

	Fixed effects	Random effects	Difference	Standard errors
	(b)	(B)	(b-B)	sqrt(diag(Vb-VB))
GDP_{it}	1.930894	1.48847	0.442425	0.16538
GDP_{jt}	3.400718	1.380291	2.020427	0.165267
$Common\ Currency_{ijt}$	0.316098	0.228222	0.087876	0.045349
$GDP\ per\ capita_{it}$	−2.18755	−1.23183	−0.95572	0.172567
$GDP\ per\ capita_{jt}$	−3.45969	−1.00864	−2.45105	0.173298
$Remoteness_{ijt}$	0.562935	−0.29998	0.862912	0.051381
$Gross\ Financial\ Integration_{it}$	−0.04802	−0.00152	−0.0465	0.003015
$Gross\ Financial\ Integration_{jt}$	0.034203	0.070014	−0.03581	0.002905
ECOWAS	−1.0603	−0.79822	−0.26207	0.043431
IGAD	−1.48827	−1.10022	−0.38806	0.088221
SADC	2.52618	2.24937	0.27681	0.044153
EAC	1.669856	1.626775	0.043081	0.053384
ECCAS	−1.86922	−1.69739	−0.17183	0.048338

b, consistent under Ho and Ha; obtained from xtreg; B, inconsistent under Ha, efficient under Ho; obtained from xtreg. Test: Ho: difference in coefficients not systematic.

$\chi^2(13) = (b - B)' \left[(V_b - V_B)^{-1}\right](b - B) = 850.37$.

Prob > $\chi^2 = 0.0000$.

($V_b - V_B$ is not positive definite).

APPENDIX 5: REGIONAL ECONOMIC COMMUNITIES (RECS)-MEMBER COUNTRIES.

No.	ECOWAS (15)	ECCAS (11)	SADC (16)	EAC (6)	IGAD (8)
1	Benin	Angola	Angola	Burundi	Djibouti
2	Burkina Faso	Burundi	Botswana	Kenya	Eritrea
3	Cabo Verde	Cameroon	Comoros	Rwanda	Ethiopia
4	Ivory Coast	Central African Rep.	Congo, Dem. Rep.	South Sudan	Kenya
5	The Gambia	Chad	Eswatini	Tanzania	Somalia
6	Ghana	Congo	Lesotho	Uganda	South Sudan
7	Guinea	Congo, Dem. Rep.	Madagascar		Sudan
8	Guinea-Bissau	Equatorial Guinea	Malawi		Uganda
9	Liberia	Gabon	Mauritius		
10	Mali	Rwanda	Mozambique		
11	Niger	Sao Tome and Principe	Namibia		
12	Nigeria		Seychelles		
13	Senegal		South Africa		
14	Sierra Leone		Tanzania		
15	Togo		Zambia		
16			Zimbabwe		

Note: Based on the 2019 Africa Regional Integration Index Report.