Growth Spillovers Effects Through Trade in Africa: A Spatial Econometric Approach

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Abstract

This research purposed to assess the regional impact of growth induced by intra-regional trade in Africa from 2001 to 2015. Indeed, there is not much literature on the impact of trade on neighbouring countries in the same regional integration area. In addition, the methods used so far do not allow explicitly handling these spillovers. Recent developments in spatial analysis allow reconsidering these aspects at theoretical and methodological levels. The standard dynamic panel approach shows that intra-regional trade has no impact on growth in Africa. In contrast, estimates of the spatial model reveal the existence of growth spillover effects related to trade between countries. In addition, these effects are larger at the sub-regional level, demonstrating that African trade remains more regional than continental.

Keys words: trade, growth, spillover
JEL classification: F14, 047, 055

1. Introduction

Can regional trade have a significant influence on growth in member countries? Although this question would appear rather strange with regard to current trends in trade within industrialized countries (whose commercial exchanges are made primarily between themselves), the concern is of interest for developing countries where intra-regional trade remains modest.

From a theoretical perspective, according to the Heckscher-Ohlin model, countries with different factor endowments would exchange more. Consequently, due to similarity of demand and supply factors, the intra-regional traditional approach to integration posits that South–South commercial agreements would lead to exchange diversion and a distortion in the growth process (Diaw and Tran, 2009). However, the new trade theories (Krugman, 1979) show that countries with similar levels of income produce and consume goods of similar quality and, hence, have a higher tendency to trade between themselves. The endogenous growth theories indicate that trade may constitute a growth and convergence determinant between different economies (Grossman and Helpman, 1991).

The new trade theories emanating from the developments of geographical economy advocate the integration of the spatial dimension in the analysis of growth and trade (Krugman, 1991; Baldwin et al, 2001). These analyses highlight the importance of geographical proximity with regard to commercial, technological, cultural interactions etc. and, consequently, the growth diffusion. The idea is that through various channels, notably the trade channel, growth can be diffused to countries sharing the same geographical area (Ortega and Peri, 2014). Thus, Henderson (1996) notes that in the presence of openness, the impact of trade on national economic space strongly depends on the precise geographical location of countries. This introduces notions of spatial analysis, such as the spatial autocorrelation phenomenon and geographical spillovers (Anselin, 1988; Baumont et al, 2006).

In Africa, many regions have started accelerating markets integration. In particular, since 2012, the countries have committed to accelerate the building of an African common market through the creation of a Continental Free Trade Area (CFTA). For the African countries, the advantages of intra-regional trade include wider regional markets, capital flows, and most of all, higher regional growth. The regional agreements may constitute important growth leverage by promoting the increase of trade exchanges between member countries.

However, even though efforts have been made regarding the removal of trade barriers, at the level of regional economic communities (REC), achievements remain limited. The volume of exchanges is low. During the 2000–2010 decade, inter-African trade accounted for only 12% of total trade. This figure stood at 40% for North American countries and 63% for Western Europe countries (ECA-AU, 2012). However, some RECs showed encouraging dynamics towards consolidation of trade integration and trade facilitation. Likewise, large economies like South Africa and Nigeria appear to be the main actors (champions) of intra-African trade (see Annex A), which allows for unleashing a certain potential for growth.

This research has sought to contribute to the debate on the link between trade and growth, by analysing the contribution of space and proximity in the diffusion of growth between countries through bilateral trade. Even though it is not a recent debate, the empirical studies reported on the issue in the literature are not conclusive. Moreover, few specific studies have been carried out in developing countries, and these do not explicitly integrate the spatial dimension.

Thus, the main contribution of this research is the integration of space in the analysis of the link between trade and growth. Regarding the trade relations, different theoretical approaches (Krugman, 1991; Henderson, 1996; Ortega and Peri, 2014) highlight the importance of proximity and contiguity. The second contribution is related to methodological approach as this study will use spatial econometric tools in the analysis of trade and growth. Although spatial autocorrelation problems have been raised and tackled in the growth literature (Baumont et al, 2006; Bouayad-Agha and Vedrine, 2010), it is only recently that some authors have suggested a different weight of geographical distances, notably by bilateral trade flows (Ertur and Koch, 2007; Ho et al, 2013), which are more appropriate to account for the interactions that may occur through trade.

The objective of this research was to evaluate the growth spillovers generated by the regional trade in Africa during the period 2001–2015. The remainder of the paper is structured as follows: Section 2 presents the literature review; section 3 outlines the methodology of the study; section 4 analyses the results; and section 5 presents the conclusions of the study.

2. Literature review

Since the early 1990s, influential analyses in the economic literature suggest that international trade is an important growth transmission channel between countries (Mankiw et al, 1992; Barro and Sala-i-Martin, 1992). Thus, Grossman and Helpman (1991) carried out theoretical analyses on growth performance of a country when scientific and technological innovations coming from abroad are linked to the diversity of its external trade. For the authors, trade generates spillovers which coexist with national innovation.

Furthermore, in the context of the increasing internationalization of goods and services exchanges, the relationship between trade and growth was the subject of a vast debate where most analyses underlined the positive effects of openness to trade (Sachs and Warner, 1995; Rodrick, 1999). Those authors consider trade an important growth and catching-up factor (Rodrick, 1999). Indeed, through the trade channel, the know-how has a positive impact on growth and productivity in the exporting country, but also in the trade partner countries (Coe and Helpman, 1995). In this regard, Keller (1998, 2004) underlines that studies dealing with growth externalities induced by international trade assume implicitly that knowledge transfer between countries is proportional to the size of commercial flows, since the traded goods incorporate the know-how of the exporting countries. Consequently, for a small country the flow of scientific and technological knowledge depends on its openness degree. Notwithstanding the above contributions, the empirical studies on the issue were contradictory, to say the least.

In Western Africa, although some studies exist on the determinants of trade between member countries of the Economic Community of West African States (ECOWAS) and the impact of openness on growth, studies dealing with spillovers from intra-regional trade are few. The reason is that intra-regional trade is very weak and many authors believe that South–South trade agreements will likely lead to diversion of exchanges and divergence of incomes (Diaw and Tran, 2009) due to the weak diversity of those economies. Starting from this assumption and analysing the dynamics of the intra-regional trade in different African regional blocs, Musila (2005) shows, however, that the trade creation effect is higher in ECOWAS and the exchange diversions are weak in general. Conversely, Diaw and Tran (2009) investigated whether being a member of the West African Economic and Monetary Union (WAEMU) would improve Senegal's external trade. They found that Senegal benefited from the regional integration by increasing its exports in the sub-region. These studies implicitly attempt to demonstrate the positive effect of intra-regional trade on income.

According to Young Song (2014), a surprising characteristic in the literature on the link between trade and growth, is that the regression equations are formulated under the assumption that all the countries around the world are in autarchy. Yet, a fundamental idea in classical theory is that the exchange of goods is a trade of factors which are incorporated in goods (Young Song, 2014). An open economy must exhibit an accumulation model that is different from that of a closed one. The new economic geography (NEG), while trying to reconcile spatial and international economy, opens new prospects in that direction. Indeed, the analyses based on NEG theories suggest that the development of regions is affected by determinants presenting an explicit spatial dimension (Bouayad-Agha and Vedrine, 2010) in which trade relations (together with technological transfers and human capital movements) are the most illustrative examples. Trade is then an interaction and diffusion channel of development spillovers between different geographical areas. These interactions make it possible to link the development of a region to that of its neighbouring countries.

The integration of space in the accumulation process is a very important step in the research on growth. In this regard, Mankiw (1995) challenges the fact that countries are assumed to be independent from each other in standard models. In the same vein, Temple (1999) cautions about the issue of errors autocorrelation and spatial spillovers while considering them as omitted variables. Moreover, Venables (2003) claims that a trade agreement between countries benefits larger economies (those economies attract more manufacturing firms). Thus, the trade integration and the spatial diffusion schemes are related.

The spatial analysis applies methodological approaches allowing an explicit modelling of interactions between countries and growth diffusion processes. From an empirical standpoint, many authors (Baumont et al, 2006); Bouayad-Agha and Vedrine, 2010; Bonnefond, 2013; Evans and Kim, 2014) used those tools and established in the case of developed countries, the existence of important growth spillovers operating through a simple binary interaction matrix based on contiguity and distances. However, in most of those studies, the spatial interactions are investigated in a global context. The specific impact of trade received little attention in the literature. Moreover, distances may be a biased representation of transaction costs.

To circumvent that obstacle, Ertur and Koch (2007) adopted a different approach and used bilateral commercial flows (average of the period 1990–2000) as a weight matrix to show the importance of trade. Furthermore, Ho et al (2013), attempted, through a spatial econometric approach, to evaluate the spillovers of bilateral trade for Organisation for Economic Co-operation and Development (OECD) countries. Using a spatial panel model on a sample of 26 OECD countries for the period 1971–2005, they found the existence of a positive ripple effect (or spillover effect) of the growth in a country with regard to its trade partners. Both studies show that integration of spatial interactions may help to reflect in a satisfactory way the proximity links and notably to better capture the regional growth spillovers generated through bilateral trade.

3. Methodology and data

In the literature, different models are allowed to analyse growth with cross-section data UNCLEAR (Mankiw et al, 1992; Barro and Sala-i-Martin, 1995). However, most theoretical frameworks showed limits in light of the empirical debate. The panel data analysis was popularized in recent literature (Datta and Agarwal, 2004; Ding et al, 2008), given the advantages it offered over the traditional approach. It allows for simultaneously considering the individual and temporal dimensions in the convergence relationship. More recently, the econometric approach suggests explicitly integrating space in the model specification. The methodology adopted falls within a synthetic framework, including endogenous growth and geographical economy. It consists of extending the standard growth model (Mankiw et al, 1992; Islam, 1995) to spatial context.

We start from the theoretical framework of Mankiw et al (1992). After substitution and linearization, they proposed the following equilibrium output model:

$$ln\left(\frac{Y_t}{L_t}\right)^* = lnA_0 + gt + \frac{\alpha}{1-\alpha}ln(s) - \frac{\alpha}{1-\alpha}ln(n+g+\delta) \quad (1)$$

where Y_t represents output and L_t denotes population. A_0 represents technological progress, s the savings rate, n the population growth rate, g the technological progress growth and δ the capital depreciation.

Islam (1995) proposes an extension of the theoretical framework of Mankiw et al (1992) to a panel data setting and the integration of the unobserved factors $A0$. Islam (1995) finally outlines a dynamic representation of a panel data model with a conventional expression of the literature on dynamic panel data models:

$$y_{it} = \alpha y_{i,t-1} + \sum_j \beta_j X_{i,t}^j + \eta_t + \mu_i + v_{it} \quad (2)$$

with $X^j_{i,t}$ representing a set of control variables.

However, even though this model is one of the most used in the empirical literature, it does not allow for explicitly accounting for spatial interactions. Anselin (2001) advocates that omitting spatial dimension in the specification of the model would introduce important bias affecting the quality and robustness of the estimations.

Dynamic and spatial modelling was preferred to explicitly capture the spillover effects in modelling the growth process. Following Tobler (1979), it is likely that the observations taken individually might in fact be correlated with other observations, and even more strongly correlated with those they are "spatially" more close to.

Modelling the spatial effects requires the specification of spatial links existing between the selected variables. On this level, the definition of a spatial interaction matrix is crucial as it summarizes the spatial links existing with each country. For each country i = (1,…,n) a neighbourhood is defined in terms of contiguity. The spatial links between countries are measured through a spatial weight matrix, W, for each year t = (1…, T).

$$W_t = \begin{pmatrix} 0 & w_t(d_{j,i}) & \dots & w_t(d_{j,l}) \\ w_t(d_{i,j}) & 0 & \dots & w_t(d_{i,l}) \\ \vdots & \vdots & \ddots & \vdots \\ w_t(d_{l,j}) & w_t(d_{l,k}) & \dots & 0 \end{pmatrix} \tag{3}$$

where $w_{t(}d_{ij}$ defines the functional form of the weight between two countries i and j. The choice of criteria defining the geographical proximity is then crucial in this step of the analysis.

In general, to analyse the interactions between an important number of regions (interactions originating from trade or technology transfers), the simple binary contiguity matrix is used, of which value is 1 when regions share a common border and 0 otherwise. A more elaborate variant is the binary matrix based on distances, captured by the matrix of k-nearest neighbours, and w_{ij} representing the neighbouring relationship between regions i and j.

$$\begin{cases} w_{ij}(k) = 0 & if\ i = j \\ w_{ij}(k) = 1 & if\ d_{ij} \le d_i(k) \\ w_{ij}(k) = 0 & if\ d_{ij} > d_i(k) \end{cases}$$

However, to account for the spatial interactions related to trade, the weight can be based on the bilateral exchanges:

$$\begin{cases} w_{ij}(k) = 0 & if\ i = j \\ w_{ij}(k) = 1 & if\ j\ is\ part\ of\ k\ main\ neighbours\ of\ i \\ w_{ij}(k) = 0 & otherwise \end{cases}$$

In general, the spatial dynamic model takes the following specification (Kukenova and Monteiro, 2009):

$$Y_{i,t} = \alpha Y_{i,t-1} + \rho W_{1,t} Y_{i,t} + \beta X_{i,t} + \varepsilon_{i,t} \tag{3}$$

$$\varepsilon_t = \eta_i + \phi W_{2,t} \varepsilon_t + \upsilon_{i,t}, \qquad t = 1, \dots, T \tag{4}$$

where Y_t and X_t are N x 1 vectors . $W_{1,t}$ and $W_{2,t}$ are the N x N weight matrixes exogenous to the model.

Equations 3 and 4 suggest respectively that the spatial dependence (Anselin et al, 1997) is captured through the dependent variable (spatial autoregressive model) or through the disturbances (model with auto-correlated errors).

When some restrictions to parameters are made two conventional specifications can be derived from the general spatial specification, that is, the spatial autoregressive model (Ø=0) and the dynamic model with auto-correlated errors (ρ =0) (Kukenova and Monteiro, 2009). The first model accounts for the dependence through the regressors while the second captures dependence through the errors process (Bouayad-Agha and Vedrine, 2010).

The spatial autoregressive model is a direct modelling of the relationship between dependent variables which are assumed to be spatially related. The estimated coefficient of the spatial autoregressive variable characterizes the simultaneous relationship between two spatially related cross-section observations (Kubis and Schneider, 2012).

The following equation represents the general specification of the spatial autoregressive model (Kukenova and Monteiro, 2009):

$$y_{it} = \alpha y_{i,t-1} + \rho W y_{i,t} + \beta X_{i,t} + \mu_i + v_{i,t} \qquad (5)$$

where W, the spatial interaction matrix, is assumed to be constant from one year to another. However, in this research the interaction criterion is based not on distances but on the bilateral trade flows between two countries. In other words, the coefficient of spatial autoregressive term captures the average impact of the y_t (output) of the main trade partners, that is the spillover effects of growth through trade. In an explicit manner, the term $W_t y_t$ is the average output of the main trade partners of a country. This term allows one to evaluate the existence of a link between the per capita income of a country and that of the other trade partners. Lastly, X_t is a set of control variables. The standard growth model can be specified as:

$$lgdp_{i,t} = \alpha lgdp_{i,t-1} + b_1 infl_{i,t} + \beta_2 health_{i,t} + \beta_3\ inv_{i,t} + \beta 4 trade_{i,t} + \eta_t + \mu_i + \nu_{i,t} \qquad (6)$$

i denotes the African countries in the equation ; $lgdp_{i,t}$ represents the GDP per capita ; μ_i and η_t are respectively the parameters of individual and temporal effects. When the lagged endogenous variable is included, that model is similar to dynamic panel data models. The other variables are explained in Table 1. Equation 7 describes the spatial model accounting only for the lagged spatial variable, but also capturing other control variables:

$$lgdpi,t = \alpha lgdpi,t\text{-}1 + \rho Wlgdpi,t + b1infli,t + \beta 2healthi,t + \beta 3\ invi,t + \beta 4tradei,t + \mu i + \nu i,t \qquad (7)$$

The estimation of that model allows identification of the existence of significant growth spillovers from the main trade partners. To capture the spillover effects related to trade, the spatial weight will be built on the basis of the main trade partners in Africa. W is a N x N binary spatial matrix of which value is 1 if a country is part of the main trade partners of the selected country for the period 2001–2015 (defined in Annex B) and 0 otherwise. Thus, if the matrix is standardized, the obtained spatial autoregressive represents the annual average income of the main trade partners of each country during the period. Table 1 gives a description of variables.

Table 1: Description of variables

Growth factors	Denomination	Acronym	Measure	Average	Minimum	Maximum
Initial conditions	Lagged GDP	lgdp(-1)	Lagged real GDP per capita	2297.89	194.87	20333.94
Economic structurs	Inflation	infl	Inflation rate (average)	10.20	-105.43	654.5
Human capital	Health	health	Life expectancy	58.70	38.70	76.29
Financial resources	Investment	inv	Gross fixed capital formation in % of GDP	26.34	5.42	76.72
Trade openness	Total trade	trade	Imports + exports in % of GDP	75.63	19.10	311.35
	Intra african trade	tradeAf	Imports + exports to Africa in % of GDP	9.67	0.08	242.39

Source: The author

The list of countries in the sample is given in Annex C. The estimation strategy uses the Generalized Method of Moments (GMM) estimator and the spatial GMM. Indeed, Monte-Carlo simulations have shown that the GMM system extended to spatial context provides better results than the existing spatial estimators hitherto, inasmuch as the dynamic panel data and spatial models in the presence of other endogenous variables are concerned.

Most of the data used are drawn from the World Bank (2017) World Development Indicators. The data on bilateral trade are sourced from the UNCTAD Trade Map database.

4.0 Results

To choose the specification of the spatial model, it is first important to determine the nature of the model to be used. Diagnostic tests of the spatial autocorrelation (Annex D) suggest that there is a general spatial correlation of the data. More precisely, the Lagrange Multiplier (LM) Lag-Anselin and LM Lag-Robust (Shehata, 2016) demonstrate the presence of spatial autocorrelation in the dependent variable that is spatially lagged. Table 2 gives the results of autocorrelation test of spatial panel on the spatial endogenous variable.

Table 2: Autocorrelation test of Spatial Panel Lag Model (MLE)

	Value	Probability
-LM Lag (Anselin)	18.0066	0.0000
-LM Lag (Robust)	2.33e+04	0.0000

Binary weight matrix (0/1)
Ho: The spatial endogenous variable has spatial autocorrelation
Source: The author

Thus, the spatial autoregressive model seems appropriate in this analysis. Table 3 displays at the same time the estimated results of the standard model for the set of countries (columns 1 and 2) and of the spatial model with the usual weight based on geographical distance (column 3).

Table 3: Estimation results (all the countries)

	(1)	(2)	(3)
lgdp (-1)		0.9883*** (0.000)	0.9797*** (0.000)
Infl	0.9988*** (0.000)	-0.0057 (0.263)	-0.0029* (0.098)
Health	-0.005* (0.064)	-0.0016* (0.051)	0.0088 (0.165)
Inv	0.004 (0.632)	0.0021 (0.326)	-0.0043) (0.222)
TotT	0.0022 (0.622)		
IntrafT	0.0091*** (0.01)	0.0004 (0.485)	
P			0.0112** (0.048)
Number of countries	51	51	51
Spatial weight	No	No	Geographic distance
AR(1)	0.000	0.005	0.000
AR(2)	0.277	0.592	0.363
Sargan/Hansen	0.149	0.197	0.255

Note: The figures between brackets are p-values; ***, **, and * significant at 1%, 5% and 10% levels respectively. AR (1) and AR (2) and Sargan/Hansen are critical probabilities of autocorrelation tests of order 1 and 2 of Arellano-Bond and of instruments validity of Sargan/Hansen.

Source: Computed by the author

The control variables had the expected signs, save for investment which had a negative sign in all the equations. It also emerges that the openness variable (Trade) was significant, but very low. Thus, in accordance with the literature (Sachs and Warner, 1995; Adeleye et al, 2015), trade openness remains an important growth determinant. On the contrary, the variable IntrafT was not significant: the intra-African trade had no significant impact on the income in the standard model. The spatial interaction coefficient (ρ) based on geographical distances was also significant and confirms the importance of geographical proximity in growth diffusion.

Table 4 provides the estimation results of the model with spatial weight based on trade flows. In addition to the global estimation for all the countries, we have also considered three sub-regions corresponding to different integration areas: Western Africa with ECOWAS, Central Africa with ECCAS (Economic Community of Central African States) and lastly Southern Africa with SADC (Southern African Development Community).

Table 4: Estimation results of spatial model (group of countries)

	(4) Africa	(5) Western Africa (ECOWAS)	(6) Central Africa (ECCAS)	(7) Southern Africa (SADC)
lgdp[-1]	0.9813***	0.9887***	0.9767***	0.9832***
	(0.000)	(0.0000)	(0.0000)	(0.000)
Infl	-0.0038	-0.0007	-0.0023*	-0.0004**
	(0.236)	(0.233)	(0.056)	(0.034)
Health	-0.0025	-0.0055***	-0.0196**	-0.0088***
	(0.312)	(0.002)	(0.0370)	(0.000)
Inv	0.0065**	0.0044**	0,00988*	0.0131*
	(0.026)	(0.016)	(0.0765)	(0.067)
P	0.0399*	0.0591*	0,0446	0.0804**
	(0.060)	(0.074)	(0.189)	(0.046)
Number of countries	51	15	11	16
Spatial weight	Trade	Trade	Trade	Trade
AR(1)	0.000	0.000	0.000	0.000
AR(2)	0.102	0.147	0.113	0.311
Sargan/Hansen	0.172	0.241	0.187	0.524

Note: The figures between brackets are p-values; *** ,** and * , significant at 1% ,5% and 10 % level respectively.
Source: Computed by the author

The spatial autoregressive term Wlgdp represents the average income of the main trade partners of a country in the sub-region. The ρ coefficient associated with Wlgdp allows evaluation of the growth spillovers (or growth spillovers) through trade. This coefficient was significant, even though it is low (0.0399). This means that the average per capita income in Africa is positively affected by that of its main trade partners. Thus, an increase of 1% in the income of the main trade partners of a country i induces on average, all other things remaining unchanged, an increase of 0.0399% of the per capita income of that country. This result suggests that through trade, growth can propagate within countries engaged in trade exchanges. This result is also consistent with those obtained by Ertur and Koch (2007) and Ho et al (2013) for OECD countries. Contrary to Venables (2003), they also show that trade may benefit small countries.

However, the estimations made for sub-regions provide additional information. In this regard, the spatial interaction coefficient through trade ρ is higher, but is only significant for Western and Southern Africa. Economic and trade giants which can play a leading role in promoting growth are located in those areas. South Africa trades the most by far (in value) with other African countries as it accounted for more than 20% of the total trade (imports and exports) within the continent in the period 2001–2015 (see Annex C). Likewise, Nigeria is another important player in African trade with 8.36% of total trade. In fact, these two countries account for around one-third of the trade flows on the continent. These countries (besides Côte d'Ivoire, Ghana and Namibia) have played a leading role in promoting growth in their respective sub-regions and thus generated spillover effects in their neighbouring countries through proximity and trade. In contrast, no central African country emerges as an economic growth driver in intra-African trade (see Annex A). This would provide an explanation for the lack of growth diffusion through trade in this region.

The existence of growth spillovers through trade is related with trade integration policy that kept on spreading into the different Regional Economic Communities (RECs). Particularly in Western Africa, several customs unions have been created since the early 2000s. Efforts in terms of diversification, notably in Southern African, with South Africa as an industrial driving engine, have significantly improved the production capacities and the diversity of exchanged goods. Today, countries such as Mauritius have linked their trade policy to industrialization, through the development of export free economic zones and the resource processing industries strategy. Of course, this is not the case in the other regions, even in Western Africa, where achievements are limited (interaction intensity is modest). Indeed, Nigeria which is an industrial driving engine in that African region is struggling to diversify its economy, alongside the petroleum sector. The erratic trend of the economic policy in Nigeria and political instability explain the limited growth spillovers in the sub-region. This country has experienced two-digit inflation since 2001 (12% on average between 2001 and 2015) and the national currency, Naira, has been continuously depreciating since 2010, encouraging illegal trade. Furthermore, most Western and Central African countries share the same currency, the CFA franc, which can limit Nigeria's influence on those countries. Lastly, other important countries like Côte d'Ivoire or Ghana have experienced political or economic crises.

South Africa has a more structured economy and a credible currency (the Rand is the strongest currency in Africa), which allowed it to play a more important role in regional growth. Furthermore, other countries in the sub-region have been able to act as intermediaries in spillovers transmission, after the implementation of pertinent economic reforms and a diversification policy of their economies. This is the case for Botswana, Namibia and Mauritius. This may explain the fact that a regional growth economic dynamics took place and was significantly propagated in that African region.

The fact that growth spillover effects are two times higher within sub-regions highlights the importance of proximity in the commercial relations and growth diffusion. This also confirms the intuition that the intra-African trade is primarily regional. This observation should be linked to the efforts made in the RECs to promote trade and reduce barriers. It can also be explained by the persistence of trade costs. Nonetheless, this situation is not isolated. As pointed out by Prager and Thisse

(2010), the transport costs and other barriers may indeed have lowered, but they did not eliminate the “distance tyranny”. Distance still plays an important role in the distribution of economic activities and flow of trade. Similar to what is observed in other regions of the world, trade with distant countries has increased in the course of time, but in parallel, trade with neighbouring countries has increased faster. This confirms the idea that RECs and regional trade constitute the first foundation from which the African exchanges will be developed.

Moving forward, the regional, industrial and trade policies are key to optimizing trade interactions and, hence, the resulting growth spillovers. The main question is notably to tackle the non-tariff barriers which hamper intra-African trade, that is through the harmonization of trade policy, the exchange facilitation, the reinforcement of productive capacities and structural transformation, the development of infrastructure and markets integration. To achieve this, it is necessary to reduce the trade transaction costs which are still very high. It is also imperative to promote transparent and common custom procedures. Complex regulation affects in particular landlocked countries. This is the case for 16 out of 54 African countries. It is also necessary to reduce the complexity of procedures while maintaining efficient levels of government controls. Afterwards, it will be imperative for the states to put in place an effective implementation mechanism and a satisfactory guarantee that the regulations and procedures will be sustained over time. This is necessary to assure the launch of a virtuous dynamic based on reciprocal confidence and long-term commitments.

However, economic stability is fundamental to supporting sustained exchanges between countries. Structural reforms must not only deal with economic stability and eradication of corruption notably in trade transactions to limit illegal trade, but also with the transformation of the economies, promoting in particular the industrial sector which constitutes the foundation and the future of the trade between countries.

Lastly, the regional integration must be top priority. Integration is crucial for accelerating trade facilitation and reform implementation. At this juncture, the Continental Free Trade Area (CFTA) is a unique opportunity for African leaders to accelerate trade facilitation. Likewise, harmonization of means of payment, at least at the sub-regional level, would accelerate intra-African trade. The prospect of a common currency at the RECs level (ECOWAS) and in Africa would help to support and facilitate exchanges on the continent.

5.0 Conclusion

The objective of this research was to investigate the effect of intra-African trade on countries' growth, notably in terms of spillovers. Indeed, despite the low level of exchanges, the development theories and the evolution of the structure of the exchanges suggest that proximity trade can have an important impact on growth through trade spillovers. To capture this, the econometric analysis combines dynamic and spatial modelling. This approach led to two results: first, the existence of growth spillovers through trade between countries; second, those effects are more important at sub-regional level.

These results suggest that the intra-regional trade is an important growth determinant in Africa and may constitute a privileged channel of interactions between countries, even in developing regions. However, the exchange dynamic is more regional oriented. Thus, the integration policy should capitalize on the positive relations existing between countries sharing the same geographical space. In particular, it is necessary to accelerate the structural transformation in order to stimulate production capacities and widen the variety of goods to be exchanged, but also to reduce trade barriers. The existence of growth spillovers also shows that through trade, big economies can pull smaller countries which will then have access to more important proximity markets (for their exports as well as for their imports): this is the economic driver principle. The removal of constraints to regional trade development, notably the control of transaction costs and the diversification of African economies, must be top priority for research and decision makers. In this regard, pursuing the consolidation of measures to consolidate trade facilitation remains crucial in order to extend the exchange barriers to continental dimension.

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Annexes

Annex A: The champions of intra-regional trade (2001–2015)

Pays	Exports and importations to Africa (in thousands US$)	Share in intra-African trade in % (exports and imports)
South Africa	317,789,515	19.72
Nigeria	134,664,910	8.36
Namibia	78,216,369	4.85
Ivory Coast	74,186,849	4.60
Botswana	72,655,295	4.51
Zimbabwe	68,976,986	4.28
Zambia	65,239,474	4.05
Ghana	54,440,764	3.38
Egypt	53,810,389	3.34
Kenya	45,773,100	2.84
Algeria	42,429,450	2.63

Source: Computed by the author, data from UNCTAD (2018) database (TradeMap)

Annex B: Six main trade partners in Africa for one country (average 2001–2015)

Country	Country Code (Norm ISO 3166)	Six main trade partners in an descending order	Share in total trade (%)
South Africa	ZAF	Nigeria, Mozambique, Zimbabwe, Angola, Botswana, Namibia	59.20
Algeria	DZA	Tunisia, Egypt, Morocco, South Africa, Ivory Coast, Niger	92.75
Angola	AGO	South Africa, Swaziland, Ethiopia, Mozambique, Mauritania, Botswana	97.98
Benin	BEN	Togo, Nigeria, Côte d'Ivoire, Ghana, South Africa, Chad	78.85
Botswana	BWA	South Africa Namibia, Zimbabwe, Zambia, Mozambique, Democratic Republic of Congo	99.36
Burkina Faso	BFA	Côte d'Ivoire, Togo, Ghana, South Africa, Mali, Benin	84.28
Burundi	BDI	Kenya, Tanzania, Uganda, Zambia, South Africa, Rwanda	86.10
Cape-Verde	CPV	Côte d'Ivoire, Senegal, Morocco, South Africa, Ghana, Equatorial Guinea.	83.28
Cameroon	CMR	Nigeria, Equatorial Guinea, South Africa, Chad, Gabon, Côte d'Ivoire	69.41
Comoros	COM	South Africa, Mauritius, Madagascar, Tanzania, Kenya, Egypt	93.67
Dem Rep. Congo	ZAR	Zambia, South Africa, Uganda, Tanzania, Kenya, Zimbabwe	84.67
Congo	COG	Angola, Gabon, Nigeria, Cameroon, South Africa, Equatorial Guinea	82.28
Ivory Coast	CIV	Nigeria, Ghana, Burkina Faso, South Africa, Mali, Senegal	73.69
Djibouti	DJI	Ethiopia, Egypt, South Africa, Kenya, Morocco, Sudan	96.67
Egypt	EGY	Libya, Algeria, Sudan, Morocco, Kenya, South Africa	73.05
Eritrea	ERI	Egypt, South Africa, Swaziland, Kenya, Nigeria, Sudan	96.91
Ethiopia	ETH	Somalia, Soudan, Djibouti, Egypt, South Africa, Kenya, (Morocco)	89.41
Gabon	GAB	South Africa, Cameroon, Congo, Morocco, Ghana, Senegal	63.67
Gambia	GMB	Côte d'Ivoire, Senegal, Guinea, Mali, Guinea-Bissau, South Africa	93.24
Ghana	GHA	South Africa, Togo, Uganda, Burkina Faso, Nigeria, Côte d'Ivoire	87.11
Guinea	GIN	Côte d'Ivoire, Ghana, South Africa , Morocco, Mali, Nigeria	74.72
Equatorial Guinea	GNQ	Nigeria, Côte d'Ivoire, Congo, Cameroon, South Africa, Morocco	95.12
Bissau-Guinea Bissau	GNB	Senegal, Ghana, Togo, Côte d'Ivoire, Gambia, Morocco	90.75
Kenya	KEN	South Africa, Uganda, Tanzania, Egypt, Sudan, Congo	76.53
Lesotho	LSO	South Africa, Zimbabwe, Swaziland, Zambia, Botswana, Mauritius	99.65
Liberia	LBR	Nigeria, Côte d'Ivoire, South Africa, Congo, Ghana, Algeria	85.83

Libya	LBY	Tunisia, Egypt, Morocco, Algeria, South Africa, Ethiopia	98.91
Madagascar	MDG	South Africa, Mauritius, Egypt, Seychelles, Kenya, Morocco	88.71
Malawi	MWI	South Africa, Mozambique, Zimbabwe, Zambia, Tanzania, Kenya	91.59
Mali	MLI	South Africa, Senegal, Côte d'Ivoire, Benin, Togo, Ghana	93.44
Morocco	MAR	Algeria, Egypt, Tunisia, South Africa, Nigeria, Libya	69.80
Mauritius	MUS	South Africa, Madagascar, Seychelles, Kenya, Egypt, Mozambique	88.83
Mauritania	MRT	Morocco, Côte d'Ivoire, Senegal, South Africa, Swaziland, Nigeria	75.13
Mozambique	MOZ	South Africa, Zimbabwe, Malawi, Namibia, Tanzania, Swaziland	96.35
Namibia	NAM	South Africa, Angola, Botswana, Zambia, Congo, Mozambique	97.51
Niger	NER	Nigeria, Côte d'Ivoire, Togo, Burkina Faso, Ghana, Benin	84.87
Nigeria	NGA	South Africa, Côte d'Ivoire, Ghana, Algeria, Cameroon, Eq.Guinea	77.19
Uganda	UGA	Kenya, South Africa, Sudan, DR Congo, Rwanda, Tanzania	90.65
Central African Republic	CAF	Cameroon, South Africa, Congo, Gabon, Namibia, Côte d'Ivoire	77.01
Rwanda	RWA	Kenya, Uganda, Tanzania, DR Congo, South Africa, Egypt	92.71
São Tomé and Príncipe	STP	Congo, South Africa, Gabon, Cameroon, Angola, Cape Verde	78.88
Senegal	SEN	Nigeria, Mali, Côte d'Ivoire, The Gambia, South Africa, Guinea	69.82
Seychelles	SYC	South Africa, Mauritius, Madagascar, Kenya, Tanzania, Tunisia	91.93
Sierra Leone	SLE	South Africa, Côte d'Ivoire, Guinea, Senegal, Ghana, Nigeria	84.43
Sudan	SDN	Egypt, Kenya, Ethiopia, South Africa, Uganda, Zimbabwe	88.84
Swaziland	SWZ	South Africa, Mozambique, Zimbabwe, Côte d'Ivoire, Uganda, Nigeria	95.25
Tanzania	TZA	South Africa, Kenya, Congo, Uganda, Zambia, Mozambique	84.62
Chad	TCD	Cameroon, Nigeria, Benin, Senegal, Morocco, Côte d'Ivoire	84.60
Togo	TGO	Ghana, Burkina Faso, Benin, Côte d'Ivoire, Nigeria, Niger	75.63
Tunisia	TUN	Libya, Algeria, Morocco, Egypt, Ethiopia, Côte d'Ivoire	90.23
Zambia	ZMB	South Africa, DR Congo, Zimbabwe, Kenya, Tanzania, Malawi	92.97
Zimbabwe	ZWE	South Africa, Zambia, Mozambique, Botswana, Congo, Malawi	91.18

Source: Computed by the author, with data from UNCTAD (2018) database (TradeMap)

Annex C: The intra-African trade, 2001–2011: relative shares (%)

Regional economic communities	Share of intra-African exchanges in total exchanges		Share of intra-African exchanges within same regional economic community	
	2001–2006	2007–2011	2001–2006	2007–2011
COMESA	13.5	13.3	42.6	48.6
EAC	26.0	23.1	49.4	52.1
ECCAS	7.7	9.3	18.7	19.8
ECOWAS	14.7	14.2	72.7	65.5
IGAD	15.1	14.3	48.4	40.5
SADC	16.1	16.4	83.6	78.4
AMU	4.0	5.0	63.5	59.5

Source: UNCTAD, 2013

Annexe D: Tests of panel spatial autocorrelation (Spatial Panel Lag Model—MLE)

Binary (0/1) Weight Matrix (W): (non-normalized)

Ho: Error has no spatial autocorrelation

- GLOBAL Moran MI = -0.1047 P-value > Z(-5.262) 0.0000
- GLOBAL Geary GC = 1.0846 P-value > Z(3.788) 0.0002
- GLOBAL Getis-Ords GO = 0.6283 P-value > Z(5.262) 0.0000
- Moran MI Error Test = -0.8179 P-value > Z(-41.557) 0.4134
- LM Error (Burridge) = 27.7363 P-value > $Chi^2(1)$ 0.0000
- LM Error (Robust) = 2.33e+04 P-value > $Chi^2(1)$ 0.0000

Ho: Spatial lagged dependent variable has no spatial autocorrelation

- LM Lag (Anselin) = 18.0066 P-Value > $Chi^2(1)$ 0.0000
- LM Lag (Robust) = 2.33e+04 P-Value > $Chi^2(1)$ 0.0000

Ho: No general spatial autocorrelation

- LM SAC (LMErr+LMLagR) = 2.33e+04 P-value > $Chi^2(2)$ 0.0000
- LM SAC (LMLag+LMErrR) = 2.33e+04 P-value > $Chi^2(2)$ 0.0000

Source: Computed by the author

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