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IS AFRICA AN ECONOMIC SPACE?

Khadidiatou Aidara
Founty A. Fall
Abdoulaye Seck[1]

Economics Department
Cheikh Anta Diop University
Dakar, Senegal

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Abstract

This paper uses spatial dynamic panel data approach to analyze the extent to which regional integration processes in Africa has been able to generate economically-integrated space in which economic growth in one country spurs economic growth in its trading partners. The results indicate that the continent as a whole is indeed a spatially integrated economic space, although of a weak proportion compared to advanced economies. To the extent that proximity has more to do with bilateral trade than geographical distance, the results also point to a great deal of heterogeneity, as there is a positive growth spillover effect in regional groupings such as SADC, COMESA and ECOWAS, which happen to register larger intra-regional trade shares, but none in ECCAS and AMU. These results are a welcome addition into the debate over the relevance of a continent-wide free trade agreements and how they could foster inclusive and sustainable development for African economies.

JEL Codes: C23, F15
Keywords: Regional integration, trade, growth spillover, Africa, spatial dynamic panel.

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[1] Corresponding author. Email address: abdoulaye.seck@ucad.edu.sn. Tel.: +221 77 330 13 03.

1. Introduction

The quest for regional integration has always been a key component for growth and development strategies in Africa. The expansion of goods markets because of the removal of trade barriers has the potential to overcome constraints associated with small national markets and provide opportunities for technology transfers, increased productivity, income generation, as well as job opportunities.

The literature on the trade-growth nexus with a focus on the African context has shown that increased trade or openness tends to positively impact economic growth (see, for instance, Musilaa and Yiheyis, 2015; Were, 2015; and Zahonogo, 2016). To the extent that trade openness is a result of discriminatory trade policies (such as economic integration), the literature also tends to lend support to the view that greater trade ties lead to economic growth. For instance, Vamvakidis (1998) has indicated that regional integration, a form of discriminatory openness, matters for economic growth, as "countries with open, large, and more developed neighboring economies grow faster than those with closed, smaller, and less developed neighboring economies" (p. 1). Additional evidence on the potentially positive impact of regional trade on growth from both theoretical and empirical perspective include Dion (2004) who show that a reduction in transaction costs as a result of the phasing out of trade barriers can lead to faster growth and convergence in member countries, and Bong and Premaratne (2018) who find that regional integration has a significant effect on economic growth for Southeast Asian countries, as does Velde (2011) for a larger sample of countries.

These various empirical assessments of the growth impact of regional integration tend to fall short of capturing the regional spillover effects often associated with stronger economic ties. Trade flows can indeed act as a channel through which economic growth in one country will benefit growth in its trading partners. The latter will have the opportunity to meet an increasing demand for their domestic goods, hence an expansion in domestic output and exports. On the import side, growth in neighboring countries often means a greater availability of imported goods for the domestic economy, either for the final consumption or domestic production. The same can apply to the case of GDP contraction in one country that may also impair growth of the trade-dependent neighbors, in terms of reduced export opportunities and production (GDP reduction) as well as decreased imports. Trade in the end tends to somehow tie the economic dynamics of partners.

Trade can also tie nations' growth trajectories as it serves as a vehicle for knowledge flows and technology transfer. Importing knowledge- or technology-embodied inputs (machinery or equipment) has been shown by a large body of empirical literature to benefit domestic growth. For instance, Coe and Helpman (1995) and Keller (2004) provide evidence in the case of developed economies that domestic productivity is positively related to imports from partners spending more on R&D. Seck (2012) provide similar evidence of growth-enhancing technology diffusion through trade between developed and developing economies (more so than foreign direct investment).

Taking account of these growth spillover effects is more in line with the underlying solidarity spirit that governs regional integration. In most cases, through economic integration, countries aim to foster convergent economic trajectories that ensure shared prosperity. The expected mutual benefits are often underestimated by a typical regression analysis that relates growth to trade.

There is an emerging empirical literature that thrives to better capture these spillover effects, borrowing from the spatial economics. The spillover effects mean that, through trade linkages, growth in one country will benefit growth in its trading partners. Empirical evidence tends to provide ample evidence for growth

spillovers through trade. For instance, Ho *et al*. (2013) have shown that in the context of OECD countries, the growth spillover effect is significant as a result of bilateral trade, although it turns out not to be strongly persistent. Ignoring this effect has been shown to underestimate the growth convergence among these countries. Additional evidence of spatial dependence of national economic growth include Ho *et al*. (2018) for OECD countries, Saif *et al*. (2017) for the MENA area, Yu and Lee (2012) for the US states, Tian *et al*. (2010) for Chinese provinces, Ertur and Koch (2007) for a large set of countries. Most of these studies provide empirical evidence of a positive growth spillover effect between neighboring countries (in either the geographical sense or from trade partnership perspective).

This research offers to add to this burgeoning empirical literature on spatial growth spillover through trade by looking into the African context which offers a true picture of "spaghetti bowl". In effect, the continent is made up of 8 major regional economic communities (REC), and each one of the 54 countries is a member of at least one REC.[2] These regional groupings tend to differ in many respects, not only in terms of size (economic or population-wise) and age, but also, and mostly, in terms of their economic objectives and actual level of implementation, and they have translated into the level of trade and economic proximity of the member countries. For instance, most economic communities aim to achieve full economic union (such as the Economic Community of West African States – ECOWAS – or the Southern African Development Community – SADC), while others focus on the realization of common market (such as the Common Market for Eastern and Southern African – COMESA). These various objectives, coupled with different and slow implementation processes, are key reasons to expect differential growth spillovers. Taking stock of the various regional integration experiences, in terms of why some may have generated significant economic growth externalities, while others have failed to do so, could inform the design of an effective continent-wide integration scheme that would promote inclusive and sustainable development, which so far has been elusive for a host of African countries.

The main objective of this research is to assess the regional growth potential of economic integration in Africa. More specifically, it aims to (i) measure the extent of growth spillover effect through regional trade across the continent, and (ii) analyze how various specificities of the regional integration processes explain the likely heterogeneity in the ability of the regional communities to generate growth spillovers.

The paper develops a spatial dynamic panel data model to capture any spatial dependence of national growth trajectories through trade linkages. The spatial weight matrix is constructed using bilateral trade flows (and, alternatively, to the more traditional geographical distance). The spatial dimension is then added to a standard Solow growth framework, with both a spatial autoregressive term as well as a spatial time lag term.

The results provide evidence of a significant and positive growth spillover effect across the continent as a whole, and trade appears to be more conducive to these growth spillover gains than geographic proximity. However, the spatial dependence appears to be less strong than the one found in developed countries. Moreover, accounting for the spatial dependence leads to a greater economic convergence. In addition, regional groupings such as SADC, ECOWAS and COMESA appear to be driving the results, as opposed to AMU and ECCAS, owing to the larger share of intra-regional trade, as well as their significant effort to promote productive integration trough the development of regional value chains, financial and

[2] Of the 54 African countries, only11 are members of one REC, while the rest belongs to at least 2 regional communities (7 are members of 3 RECs, and 1 country – Kenya – belongs to 4 RECs). Source: UNECA (https://www.uneca.org/oria/pages/highlights-%E2%80%93-africa-regional-integration-index-report-2016, accessed on March 1, 2019).

macroeconomic integration that ensures easier convertibility of national currencies, regional infrastructure as well as free movement of people. All of these differential aspects could serve as key policy directions to further integrate the whole continent and ensure inclusive economic growth and development.

The rest of the paper unfolds as follows. Section 2 discusses the literature. Section 3 introduces the methodology and the data. Section 4 reports and discusses the results. Section 5 concludes with a summary and policy implications.

2. Literature review

Regional integration has been shown to potentially generate significant economic gains. But until relatively recently, the literature has focused on how a country's trade expansion can benefit its domestic economic growth trajectory. Such an expansion can be a result of falling tariff and non-tariff barriers in the wake of free trade arrangements. Most of the trade theories suggest indeed that international trade can lead to increased efficiency, economic growth and income by allowing greater capital accumulation, industrial structure upgrading, technological progress and institutional advancement.

More specifically, a large segment of the empirical literature has indicated that trade has a significant growth potential. For instance, very early contributions have shown that outward-oriented developing countries tend to enjoy rapid economic growth than their inward-oriented counterparts (Balassa, 1986; Dollar, 1992), in addition to alleviating poverty and reducing inequalities (Dollar and Kraay, 2004). In fact, international trade provides a country with increased supply of capital and intermediate inputs, which are not available in the domestic markets. As a result, productivity of the manufacturing sector can rise (Lee, 1995).

International trade is also a channel through which foreign technology and knowledge diffuse to the domestic economy, which then translates into substantial aggregate productivity gains and economic growth. By importing technology-embodied goods, such as machinery and equipment, the domestic economy acquires advanced technology to the extent that it develops its absorption capabilities (Coe and Helpman, 1995; Keller, 2004; Seck, 2012).

On the export side, a greater participation in foreign markets, where domestic firms face international competition, can also lead to an increase in productivity (Wagner, 2007). Exports are also associated with a learning-by-doing effect through which firms can copy from more advanced foreign competitors and subsequently gain in terms of increased efficiency (Kraay, 1999).

There is also ample evidence that cast some doubt on this positive growth effect of more trade, as a result for instance of reduced tariffs. As far as the post-war period is concerned, authors such as Vamvakidis (2002), Yanikkaya (2003), and DeJong and Ripoll (2006) have found a positive correlation between average tariff level (reduced trade) and long-term economic growth.[3] This is the case when government's tariff targets industries subject to externalities, as suggested by Krugman's (1987) model of learning-by-doing and Grossman and Helpman's (1991) endogenous growth model with research and development (R&D) externalities.[4]

[3] On the opposite side of this empirical literature on tariff and long-term growth nexus, Edwards (1992, 1998), Clemens and Williamson (2004), and Nunn and Trefler (2010) suggest a negative correlation.
[4] See Nunn and Trefler (2010) for a detailed discussion.

These unsettled results on whether more trade leads to economic growth has extended to the recent empirical literature that is more focused on Africa. For instance, Musilaa and Yiheyis (2015) have indicated in the case of Kenya that more trade or openness does not, at best, lead to significant growth gains. Moreover, they have found trade-policy induced openness to have negatively and significantly affected investment and the rate of economic growth. On the other hand, Zahonogo (2016) has showed that trade has a beneficial impact on growth up to a threshold level of openness, above which the effect then declines. To the extent that African countries tend to trade less with each others and with the rest of the world, increasing trade is good for economic growth.

The growth spillover associated with increased trade tends to be ignored in this literature, thereby underestimating the economic growth effect of increased trade ties, as a result of, for instance, regional integration. A relatively recent literature sought to directly capture the spillover effect by borrowing from geography economics. It builds on earlier attempts that relate a country's growth to the average growth of its trading partners. Such an approach tends to be not satisfactory, as it does not account for the heterogeneity of the trade ties with each single partner. Instead, spatial approaches relate a country's growth to individual growth of its neighbors. The links are obtained through a weighting matrix constructed by using bilateral trade.

This approach is better able to reveal the trade potential of regional integration. The spatial nature of the economic relationships within the geographical communities is synonymous with some synchronization of the growth trajectories. An increase

Important contributions include Ho *et al*. (2013). They develop an extended framework of the Solow growth model by considering the spillover effect due to bilateral trade in the context of OECD countries. They have shown that trade is indeed associated with significant growth spillovers, although the effect does not have a strong persistence effect. Accounting for this growth spillover effect also means that the rate convergence is higher than otherwise. Furthermore, Ho *et al*. (2018) have provided similar evidence in the context of advanced countries. Additional contributions with a focus on developing countries include Tian *et al*. (2010) for China, and Seif *et al*. (2017) for Arab countries in the Middle East and North Africa (MENA).

This paper brings to this literature the unique context of the African continent, which is a place where regional integration has always been a significant part of the economic processes. As a result of the dense web of economic integration arrangements, each one of the 54 countries is member of at least one regional community, and only only 11 are members of one regional integration community. Africa is also a place that trades less with itself. The comparative approach that looks at the regional specifies will be able to shed addition light on the various mechanisms that underlie the process of spatially-generated growth spillover associated with regional integration.

3. Methodology and data

The starting point is the Solow growth model with a Cobb-Douglas production function $Y_{it} = K_{it}^{\alpha}(AL_{it})^{1-\alpha}$, $0 < \alpha < 1$, with the standard assumptions of exogenous growth rate of the labor-augmenting technological progress g and of the labor force (or population) n. It can be derived the following steady-state equilibrium of the growth rate, widely used in the empirics of economic growth (see for instance Mankiw *et al*., 1992; Islam, 1995; and Barro, 1996):

$$\Delta y_{it} = -(1 - e^{-ct}) \ln y_{i0} - \frac{\alpha(1-e^{-ct})}{1-\alpha} \ln(n_i + g + \delta) + \frac{\alpha(1-e^{-ct})}{1-\alpha} \ln s_i + (1 - e^{-ct}) lnA_{i0} + gt \quad (1)$$

where y represents real GDP per capita, A technology, δ the depreciation rate of the capital stock (assumed to be constant across countries), and c the convergent rate across countries, and s_i the saving rate (often proxied by the investment rate). It is generally assumed that $g + \delta = 5\%$, as in Mankiw *et al*. (2012), Islam (1995) or Ho *et al*. (2013).

To relax the assumption of closed economy and allow for countries to interact through trade, we consider the following equation, augmented with spatial terms:

$$lny_{it} = \gamma lny_{it-1} + \lambda \sum_{j=1}^{N} w_{ij} lny_{jt} + \rho \sum_{j=1}^{N} w_{ij} lny_{it-1} + \beta_1 \ln(n_i + g + \delta) + \beta_2 \ln s_{it} + \beta_3 ln(1 + Inf)_{it} + \beta_4 lnInst_{it} + \mu_i + \eta_t + \varepsilon_{it} \quad (2)$$

Inf_{it} is the the inflation rate, an indication of a macroeconomic stability, and $Inst_{it}$ the institutional quality, namely, government regulation quality which "reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development".[5] To the extent that both economic stability and effective and sound governance affect the pace of technological progress, they can drive faster economic growth. μ_i and η_t are country and time fixed effects, and ε_{it} the error term. By considering a two-year interval over the period of study (2000-2016), the common convergence rate is then given by $c = -ln\gamma/2$.[6] The spatial weight matrix W, which elements are w_{ij}, allows to capture both contemporaneous ($\sum_{j=1}^{N} w_{ij} lny_{jt}$) and lagged ($\sum_{j=1}^{N} w_{ij} lny_{it-1}$) growth spillovers for country i from its trading partners j. The bilateral trade (sum of exports and imports), are averaged over the entire period.[7]

As a first approximation, we follow the standard literature that uses spatial econometrics to address various economic issues and construct W using geographical distance. This allows to see whether spatial interdependence across countries occurs "naturally", as it may relate to an exogenous proximity. The elements are then obtained from $w_{ij} = \exp(-d_{ij})$, with d_{ij} the distance between countries *i* and *j* or more precisely their capital cities (see Keller, 2002; Ertur and Koch, 2007; and Hu *et al*., 2013, for applications in the literature). Next, we consider bilateral flows tr_{ij}, and the elements of the spatial weight matrix are simply $w_{ij} = tr_{ij}$, averaged over the entire period (time-invariant). This trade-related matrix could provide room for altering the economic proximity through more or less trade. Ho *et al*. (2013) also considered both definitions of proximity, and showed that both are associated with spatial correlation, with a greater spillover effect through the trade channel.

The estimation strategy, based on a quasi-maximum likelihood (QMLE) approach, consists of first running the regressions for all African countries, and then separately for the major regional blocs in Africa, namely

[5] Source: http://info.worldbank.org/governance/wgi/#home (accessed on March 4, 2019).
[6] A more common choice in the literature is a 5-year interval. But given our time span (2000-2016) and the size of our regional groupings (which go to as low as 5 members for AMU), the closest we can get in satisfying the assumption that the number of individuals *N* (member states) is always greater than the time dimension *T* in our panel on one hand, while having sufficiently large number of total observations on the other hand, is by choosing a 2-year window.
[7] For many country pairs, however, the period is shorter than 2000-2016, due to trade data unavailability.

COMESA, AMU, ECCAS, ECOWAS, and SADC.[8] These regional communities span the whole continent. The remaining regional communities tend to either overlap (for instance, WAEMU with respect to ECOWAS, and IGAD and EAC to COMESA - with the exception of Somalia, South Sudan and Tanzania), or be too large and heterogeneous (CEN-SAD with 24 member countries). The pooling of all the countries will tell how, on average, one country's growth is beneficial to the neighboring countries. The separate regressions focusing will help reveal the specificities that make a given regional integration process more prone to generate growth spillover than the rest.

But first, Table 1 offers some descriptive statistics. It appears that the continent is trading little with itself, despite the dense web of free trade agreements. Nevertheless, the data clearly indicate positive trends for all regional groupings. In effect, they are improving their trade ties, as the share of intra-regional trade is continuously rising. SADC and COMESA have seen the largest increase, with respectively 8.4 and 5.9 percentage points. On the opposite end, regions with the smallest increase (AMU and ECCAS) turn out to be the regions where intra-regional trade is the lowest, potentially suggest an actual weaker appetite for strengthened trade ties.

Table 1. Descriptive statistics

	Africa	COMESA	AMU	ECCAS	ECOWAS	SADC
GDP p.c. 2016 (constant 2010$)	2693.6	2818.8	3383.9	3402.5	1093.6	3864.3
GDP p.c. growth, 2000-2016 (%)	2.1	1.5	1.7	2.2	1.6	2.4
Intra-regional trade, 2016 (%)	12.6	12.4	3.4	4.2	10.8	19.2
Intra-regional trade, change 2000-2016	1.4	5.9	0.8	1.1	1.9	8.4
Area (million sq. km)	30.8	12.0	5.8	6.5	5.1	10.0
# of member countries	54	19	5	11	15	15
Area/member	0.57	0.63	1.16	0.59	0.34	0.67
Population growth, 2000-2016 (%)	2.5	2.3	1.9	3.0	2.7	2.2
Investment rate, 2000-2016 (%GDP)	22.5	18.7	27.0	22.9	20.6	22.3
Inflation (GDP deflator %, 2016, and change from 2000)	10.1 (-79)	5.0 (176)	1.9 (-7)	4.1 (-320)	3.8 (-8)	8.7 (-236)
Regulation (2016, and change)	3.43 (-.22)	3.31 (-.08)	3.04 (-.79)	3.07 (.25)	3.76 (-.37)	4.09 (-.25)

Notes: The scores for the regulation quality, initially ranging from -2.5 (weak) to +2.5 (strong), have been rescaled to 0 to 10.
Source: Authors' calculations, from World Bank (WDI and WGI), COMTRADE and UNECA.

AMU, in addition to recording the smallest share and slowest pace of intra-regional trade, also turns out to be relatively larger in terms of geographical size as it relates to the number of member countries. The figure of 1.16 million square miles (sq.m.) is an indication the relative distance a good produced in a typical member country has to travel in order to get to the national border and be traded with a member partner. But the group that trade the most with itself (SADC) does seem to be the place where geographical size is relatively smaller (0.67 million sq.m., versus 0.34 for ECOWAS), which does not provide a clear indication as to whether distance might be a significant predictor of cross-regional trade.

[8] For a discussion of the QMLE approach, see Belotti *et al.* (2016): https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2754703## (accessed on March 5, 2019).

A far as economic growth is concerned, the association with intra-regional trade seems less obvious. In fact, the the region with the largest share of and increase in intra-regional trade (SADC) is also the one that have posted the largest GDP per capita growth rate over the period 16-year period (2.4%), but the second largest region, intra-trade-wise (COMESA), has experienced the slowest growth rate of 1.5%. Furthermore, ECCAS which is the second less trade-integrated region has posted the second largest growth rate of 2.2%.

The figures may not have revealed a definite, clear trend as to the extent to which domestic growth could benefit from neighboring countries' growth, either through trade or through geographical distance, as with the association between growth and inflation on one hand, and growth and governance quality. A more robust analysis should come up with a better representation of spatial dependency through a spatial weight matrix on one hand, but also design an alternative way through which growth spillover effects could materialize on the other hand. The framework would then allow growth in one country benefit growth the neighboring country as a result of greater trade (or geographical) proximity, while actually controlling for factors relevant to growth and technological progress at the steady state equilibrium.

4. Results and discussions

Table 2 shows the result of various model specifications for the continent as a whole. Going from a standard dynamic panel specification (column 1) to the augmented one with a spatial autoregressive term (columns 2 and 3), the associated coefficient (λ) appears to be significant. This suggests that results from the first standard model that ignore this relevant spatial dependence are likely to be biased, on one hand, and that Africa as whole is indeed an effectively integrated economic space to the extent that it allows economic growth externalities across countries on the other hand. Growth in one country benefits growth in trade partner countries, as it is the case for OECD countries (Ho *et al*., 2013), for OECD and developing countries (Ertur et Koch, 2011 and 2007), and for US states (Yu and Lee, 2010), through both trade and pure geographical distance.

Our results also suggest that both trade and physical distance are conducive to growth spillovers across Africa. Comparing between these two channels, the spatial dependence appears to occur more through trade than through geographical distance, suggesting that neighborhood or proximity has more to do with economy (trade) than physical distance in the African context. In effect, the coefficient estimate on the spatial time lag term is higher when the spatial weight matrix is constructed by using bilateral trade than physical distance. Moreover, the common convergent rate of 7.9% is higher when trade-related spatial weight is considered than weight constructed through physical distance (5.4%), and even more so than the model ignoring spatial dependence (5.7%). Furthermore, the estimated elasticity of output with respect to capital (α) is also higher at 66.9% for the trade-weighted spatial model.

These results appear to be generally consistent with the literature although with some noticeable differences. The higher convergence rate associated with the inclusion of spatial dependence in standard models is also found by Ho *et al*. (2013) for OECD countries, although our estimated convergence rate appears to be much larger (7.9% against 5.2% for the trade-weighted spatial model). Like the authors, the notion of neighborhood is more associated with trade than pure geographical distance, as far as growth spillovers are concerned. However, their estimated spatial autoregressive coefficient is about twice as much as our estimate (0.589 against 0.237). This is an indication that the African continent is less of an integrated economic space than the OECD group when it comes to trade-associated growth externalities. This owes to the fact that these countries trade more with one another (65% within EU and 50% between US, Mexico,

and Canada in 2015), and the production base (GDP) is much larger and allows for more exports and imports.[9]

Table 2. Estimation results for the whole African continent

Variables	(1)	(2)	(3)	(4)	(5)
$Ln(y_{it-1})$ --- (γ)	0.893***	0.898*	0.854*	0.882***	0.873***
	(0.08)	(0.49)	(0.48)	(0.08)	(0.08)
$Ln(n_{it}+0.05)$ --- (β_1)	-0.178*	-0.182**	-0.276**	-0.263***	-0.259*
	(0.13)	(0.08)	(0.14)	(0.04)	(0.14)
$Ln(s_{it})$ --- (β_2)	0.078	0.192**	0.296***	0.223**	0.079
	(0.08)	(0.09)	(0.08)	(0.09)	(0.09)
$Ln(1+Inf_{it})$ --- (β_3)	-0.043**	-0.039*	-0.038*	-0.046**	-0.047**
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
$Ln(Inst_{it})$ --- (β_4)	0.068	-0.059	-0.062	0.035	-0.029
	(0.08)	(0.08)	(0.09)	(0.07)	(0.08)
Spatial autoregressive (λ)	---	0.015*	0.237*	0.153*	0.286**
	---	(0.08)	(0.14)	(0.09)	(0.11)
Spatial time lag (ρ)	---	---	---	-0.068	0.142
	---	---	---	(0.16)	(0.09)
N	46	46	46	46	46
T	8	8	8	8	8
Obs.	368	368	368	368	368
Implied α	0.421	0.653	0.669	0.653	0.384
Convergence rate	0.057	0.054	0.079	0.063	0.068
Spatial weights	No	Geog. dist.	Trade	Geog. dist.	Trade
Country FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is log of real GDP per capita. The common convergence rates (c) are obtained from γ=exp(-ct), with t=2 (the time interval), and the elasticity of output with respect to capital (α) from $\beta_2 = \frac{\alpha}{1-\alpha}(1-\gamma)$. The sum of the exogenous rate of technological progress and the capital depreciation rate is assumed to be equal to 5%. Columns (2) and (3) introduce the spatial autoregressive term, while columns (4) and (5) add the spatial lag term. Total bilateral trade flows (sum of exports and imports) are used to construct the trade-related spatial weight matrix which is then row-standardized, as well the distance-related matrix. All regressions include both country and time fixed effects. Standard errors are between parentheses, and significance at 1, 5, and 10% is denoted by ***, **, and *.

Furthermore, the general premise that macroeconomic stability is good for economic growth is supported by the results, as reduce inflation is associated with increased real GDP per capita. Institutional quality, as captured by the quality of government regulation, however, does not seem to be significantly correlated with economic growth. This could be an indication of effective coping mechanisms in the face of unfriendly

[9] Moreover, our implied return to capital, proxied by the elasticity of output with respect to capital, is much higher (66.9% against 51.7%), which could be indicative of the relatively scarce capital stock throughout the continent as opposed to the more advanced economies that make up the OECD.

(business) environment, or, as suggested in Table 1, a lack of improvement in public governance (Table 1 indicates in fact a slightly deteriorating institutional quality during the time period).

When the spatial time lag is introduced (columns 4 and 5), the associated coefficient (ρ) turns out to be insignificant, regardless of how the spatial weight matrix is constructed. Although the inclusion of an irrelevant spatial time lag term tends to not be associated with an obvious efficiency loss, as suggested by Tao and Yu (2012), we prefer dropping that variable. In the end, growth spillovers happen contemporaneously: domestic growth in a given year would benefit from growth happening the same year in neighboring countries, not from neighboring growth in the past (2 years). We therefore favor model specification in (5) – contemporaneous spatial autoregressive term, with trade-related spatial weight matrix – to see whether this broad continental picture of spatially integrated economies may be hiding some heterogeneity among the component regional blocs.

As one would have expected, Table 2 shows that regional groupings that happen to be trading more within themselves (COMESA, ECOWAS, and SADC) appear to be driving the results in Table 1 for the whole continent, as their combined member countries make up most of the continent (87%). In effect, only for these three groupings is the trade-related spatial spillover effect significantly positive.[10] The combination of relatively high economic growth, stronger trade ties which have increase more than anywhere else, and relatively moderate geographical size traded goods have to travel to reach national boundaries could explain why these entities are more integrated economic spaces, insofar growth spillovers through trade are concerned.

According to the AU-AfDB-UNECA measurement of regional integration across Africa, bilateral trade has been the dimension along which Africa as a whole has made more effort, with a score of 0.54, as of 2016.[11] This is an indication of reduced customs duties as well as increased intra-regional trade shares. At the opposite end, area where economic integration has been lagging across the continent is financial and macroeconomic integration. The average score of 0.38 suggests that, as far as trade and growth spillovers are concerned, regional convertibility of national currency is still an issue for it raises uncertainty and adds to the already high trade transaction costs, thereby reducing trade flows. Whereas the regional groupings have been making almost similar progress on regional infrastructure (such as intra-regional flights and roaming costs) and production integration (such as trade on intermediate inputs and trade complementarity), they tend to fare differently on the fronts of free movement of people and financial and macroeconomic integration, with ECOWAS faring better on both dimensions.

The relationship between growth and institutions on one hand, and with inflation on the other, within the subgroups tend to generally reflect the overall finding for the continent as a whole (shown in Table 1). In effect, higher inflation tends to be associated with, at best, no significant change in economic growth, while institutional quality change does not significantly affect growth, except for ECCAS member countries where the impact is more in line with the general finding in the relevant literature on a positive impact of

[10] The results for AMU seem very imprecise and inefficient, as suggested by the larger standard errors, owing certainly to the smaller sample size as well as to the imbalance between the two dimensions of the panel structure (T exceeds N). We also argue that differences in the results are a translation of differentiated integration processes.

[11] The overall index relies on five dimensions: trade integration, regional infrastructure, productive integration, free movement of people, and financial and macroeconomic integration. The score ranges from 0 (lowest) to 1 (highest). The 2016 report can be found here: http://www.tralac.org/images/docs/9384/africa-regional-integration-index-report-2016.pdf (accessed on March 1, 2019).

governance quality improvement. This could be due to the fact that only this region has seen an improvement in the average score over the time period

Overall, ECOWAS and SADC have registered the highest average scores, mostly when it comes to free movement of people, financial and macroeconomic integration, and regional infrastructure. COMESA fare relatively well on the dimension of trade and productive integration. The results showing that these three regional blocs being more conducive to growth spillover through trade are another translation of their relatively greater effort to integrate their economic space. The results are also an indication that, in addition to increased trade flows and regional value chains, free movement of people, financial and macroeconomic integration, and regional infrastructure are key to generating a more integrated economic space that allows economic growth in any domestic economy to benefit economic growth in trading partners.

Table 3. Estimation results for regional groupings

Variables	COMESA	AMU	ECCAS	ECOWAS	SADC
$Ln(y_{it-1})$ --- (γ)	0.687***	0.785	0.892***	0.862***	0.754***
	(0.04)	(0.90)	(0.24)	(0.25)	(0.15)
$Ln(n_{it}+0.05)$ --- (β_1)	0.193*	-0.283	-0.031	-0.248**	-0.252***
	(0.11)	(0.56)	(0.09)	(0.11)	(0.09)
$Ln(s_{it})$ --- (β_2)	0.040	0.397	0.104**	0.294*	0.293***
	(0.03)	(0.20)	(0.04)	(0.17)	(0.07)
$Ln(1+Inf_{it})$ --- (β_3)	-0.018	0.006	-0.023**	-0.039*	-0.036*
	(0.02)	(0.18)	(0.01)	(0.02)	(0.02)
$Ln(Inst_{it})$ --- (β_4)	0.042	-0.24	0.068**	0.035	0.052
	(0.03)	(0.85)	(0.03)	(0.06)	(0.12)
Spatial autoreg. (λ)	0.216*	0.193	-0.038	0.284***	0.263***
	(0.12)	(0.43)	(0.18)	(0.10)	(0.04)
N	14	5	9	15	12
T	8	8	8	8	8
Obs.	112	40	72	120	96
Implied α	0.113	0.580	0.491	0.681	0.544
Convergence rate c	0.188	0.121	0.057	0.074	0.141
Spatial weights W	Trade	Trade	Trade	Trade	Trade
Country FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Notes: The dependent variable is log of real GDP per capita. In all regressions, the elements of spatial weight matrix are total bilateral import and export flows. The regressions also include both country and time fixed effects. Standard errors are between parentheses, and significance at 1, 5, and 10% is indicated by ***, **, and *.

5. Summary and conclusion

This paper was concerned with the ability of regional integration processes across Africa to generate growth spillover through trade, in the prospect of the upcoming African Continental Free Trade Area (AfCFTA). Using a spatial dynamic panel data model, the paper showed that indeed Africa is a place where national economic growth benefits from growth in neighboring countries, more so through trade ties than through geographical proximity. However, the generated spillover gains appeared to be of a small magnitude when compared to economic spaces of more advanced countries, such as OECD or US states. The results also indicated that this overall picture hide a great deal of heterogeneity across regional economic communities, with SADC, ECOWAS and COMESA registering significant, positive spillover effect across their respective members, while groupings such as ECCAS and AMU showed no significant spatial correlation, owing mainly to the length at which they have gone to improve bilateral trade flows.

For AfCFTA agreements to produce inclusive and sustainable economic growth and development, the spatial dependence of economic entities needs to be further strengthened, so as national growth trajectories could be reinforcing one another, in line with the solidarity spirit that govern this collective initiative. To that end, trade ties have to be further strengthened, for instance by continuously reducing trade impediments (particularly non-tariff barriers that tend to be left out of major agreements). Harmonized industrial policies should also contribute to the development of regional value chains, on the one hand, while financial and macroeconomic policies should ensure easier convertibility among the too many national currencies on the other hand, with the goal to further reduce the high cross-border transaction costs and increase the growth spillover conduciveness of trade across the continent.

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Annexes

A. Data Sources

Bilateral trade data are obtained from COMTRADE. Geographical distances are provided by CEPII. Macroeconomic variables (real GDP per capita, and investment rate) and population growth rate come from the World Bank's World Development Indicators, and data on regulation quality from the World Bank's World Governance Indicators. Area size and other relevant information regarding the continent and the regional groupings are from UNECA (https://www.uneca.org/oria/pages/regional-economic-communities).

B. Regional groupings and country lists

COMESA (Common Market for Eastern and Southern Africa): Burundi, Comoros, Democratic Republic of Congo, Egypt, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Uganda, Zambia, and Zimbabwe (exclusion of Djibouti, Eritrea, Seychelles, Sudan and Swaziland).

AMU (Arab Maghreb Union): Algeria, Libya, Mauritania, Morocco, and Tunisia.

ECCAS (Economic Community of Central African States): Angola, Burundi, Cameroon, Central African Republic, Congo, Democratic Republic of the Congo, Equatorial Guinea, Gabon, and Rwanda (exclusion of Chad and Sao Tome and Principe).

ECOWAS (Economic Community of West African States): Benin, Burkina Faso, Cabo Verde, Cote d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

SADC (Southern African Development Community): Angola, Botswana, Democratic Republic of Congo, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Tanzania, Zambia, and Zimbabwe (exclusion of Lesotho, Seychelles, and Swaziland).