

Trade openness, institutions and economic growth in Sub-Saharan Africa

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DOI: 10.22437/ppd.v8i6.10653	Received: 06.10.2020	Revised: 03.01.2021	Accepted: 13.01.2021	Published: 01.02.2021
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Abstract

This research investigates the interactive effect of trade openness and the institutional quality on economic growth in sub-Sahara Africa. The sample consists of 38 sub-Saharan African countries and covers the period 1986-2015. Pooled OLS, fixed effect, and Dynamic GMM were used as estimation techniques. The empirical section used a nonlinear growth regression specification that interacts trade openness with law and order, bureaucratic quality, corruption, government stability, and democratic accountability. The study found that corruption, government stability, law and order, and bureaucratic quality as institutional quality variables harm economic growth. The interaction of trade openness and institutional quality variables positively impacted economic growth. It is an indication that trade openness better impacted economic growth in the presence of high-quality institutional variables.

Keywords: *Corruption, Economic growth, Government stability, Trade, Institutions*

JEL Classification: F14, F15, F43

INTRODUCTION

Countries of the world have made various painstaking efforts to boost their economy to improve their citizen's wellbeing. Growing works in the literature have investigated the various factors affecting economic growth, principally in developing nations (Upreti, 2015 and Anyanwu, 2014). Studies have found trade openness to be one of the factors that are effective in stimulating long-run growth (Tahir & Azid, 2015; Alesina, Spolaore & Wacziarg, 2000; Ades & Glaeser, 1999; Dollar, 1992; Keho, 2017; Sachs & Warner, 1995; Frankel & Romer, 1999). However, some studies are also critical of the positive effect of trade openness on economic growth (e.g., Sarkar, 2005; Rodriguez & Rodrik, 2000; Edwards, 1993; Rigobon & Rodrik, 2004 and Easterly, 2008). These studies argued that developing countries had become a dumping ground for goods from developed countries due to trade openness.

The negative association between trade openness and economic growth has been attributed to the low institutional quality level. Studies like Acemoglu, Johnson, & Robinson (2003) and Dollar & Kraay (2003) emphasized that institutions' quality is key to the success of any economic reforms in developing countries. A study conducted in North African countries by Addison & Balamoune-Lutz (2006) shows that institutions'

quality affects trade reform's influence on growth. Studies like Hall & Jones (1999) and Acemoglu, Johnson, & Robinson (2001) indicated that good institutional quality ensures that property rights are crucial for long-run growth. Most of the studies that investigated the importance of institutions stated that sound institutional quality facilitates trade, reduces transaction costs, and promotes confidence.

Several research works have examined the association between trade openness and economic growth (e.g., Musila & Yihevis, 2015; Brueckner & Lederman, 2015; Zahonogo, 2016; Mangir, Kabaklarli, & Ayhan, 2017), and mixed results have emerged. Likewise, several studies have examined the association between institutions and economic growth (e.g., Kilishi, Mobolaji, Yaru, & Yakubu, 2013; Ebaidalla, 2014; Akinlo, 2016; Epaphra & Kombe, 2018). However, only a few works have examined institutions' influence on the relationship between trade openness and economic growth in sub-Saharan Africa. Matthew & Adegboye (2014) are a few studies that examined the relationship between trade openness, institutions, and economic growth in sub-Saharan Africa by focusing on the individual effect of trade openness and institutions on economic growth without investigating their interaction effects.

The lack of enough evidence on the complementary role of trade openness and institutional quality on economic growth in sub-Saharan African (henceforth SSA) motivates this study. This study is particularly interested in investigating the effect of trade openness on economic growth that depends on institutional quality. This study's findings are expected to help policymakers make reliable and effective economic decisions in the sub-Saharan region.

LITERATURE REVIEW

Increasing literature has investigated the relationships between economic growth and openness to trade. From the theoretical perspective, Richardo's theory postulates that trade liberalization increases economic growth through a comparative advantage and efficiency gains. While in contrast, like the Prebisch-Singer hypothesis, Nurkes (1962) claim that openness leads to losses in less developed countries in the long-run. The author attributes this to decreasing terms of trade, as the bulk of what these countries export are primary products that are income inelastic. Krueger (1978) and Bhagwati (1978) claim that liberalization of trade strengthens concentration in sectors with economies of scale and improves efficiency and productivity in the future.

Furthermore, the fresh endogenous growth models illustrate a positive association between trade openness and economic growth as the outcome of the international diffusion of advanced technologies (Romer, 1994; Coe & Helpman, 1995; Grossman & Helpman, 1991a). Many countries with a high level of trade liberalization possess a better capacity to employ technologies produced in advanced economies. Moreover, this capacity engenders them to grow more speedily than countries with a lower level of liberalization.

Developing countries possess much to benefit from foreign trade like technologically developed countries. Edwards (1998) argues that poorer countries have imitation cost of innovation smaller than imitation cost in developed economies. However, the poor and less developed economies grow quicker than the developed ones, and the tendency toward convergence is high.

The trade structure in terms of goods regarding its growth effect also matters (Hausmann, Hwang & Rodrik 2007; Kali, Méndez, & Reyes, 2007). The gain of a country from foreign trade likewise relies on the simplicity with which foreign

technologies are learned and deployed in the local economy (Grossman & Helpman, 1991b).

Some works from the body of knowledge have supported the argument that trade liberalization has a positive impact on economic growth (Sachs & Warner, 1995; Frankel & Romer, 1999; Dollar & Kraay, 2003a; Alcalá & Ciccone, 2004; Tahir & Azid, 2015; Keho, 2017; and Asamoah et al. 2019). However, studies like Vamvakidis (2002), Ulaşan (2015), and Manwa et al. (2019) could not establish any argument in favor of the trade-led growth hypothesis. While Rigobon & Rodrik (2005), on the other hand, established that there exists a harmful impact of international trade on income levels. Furthermore, Fenira (2015) found that the association between trade openness and economic growth is not strong. He also established that countries with smaller GDP benefit better from international trade than countries with higher GDP (Rassekh, 2007).

Also, many studies have looked at the interactions between institutional quality and per capita income, including Acemoglu, et al. (2001 and 2002), Hall & Jones (1999), Kaufmann et al. (1999), Acemoglu & Johnson (2005), Dowson (1998) and Easterly & Levine (2002). A growing literature has proven the role of institutions on economic growth in the long run. The regulatory burden, taxes, corruption level, infrastructure services, regulation in the labor market, and finance are the links through which property rights protection would affect costs. Institutional quality influence risks via policy predictability, property rights, and contract enforcement. It also eliminates competition obstacles by regulating start-up and bankruptcy, competition law, and entrance into financial and infrastructure markets (Ahmed, 2012).

Acemoglu et al. (2002) claim that institutions' roles in development are in two ways; firstly, by influencing motivations of the main agents in an economy, and secondly by influencing investments and the production organization. Acemoglu & Johnson (2005) also found that property rights impact positively on long-run growth. Furthermore, that economies with substantially high GDP per capita are the ones that possess more fortification against expropriation by influential leaders. Furthermore, Dowson (1998) claims that countries with better institutional settings tend to have higher total factor productivity and investment.

Many studies have made efforts to look at trade and institutions' impact on growth per capita in nations' cross-section. There exists a considerable unanimity in the body of knowledge pointing at the fact that weak economic institutions cause; lower growth rates in the economy, reduced output levels, and reduced performance of trade (Acemoglu et al. 2001, 2002; de Groot, Linders, Rietveld & Subramanian 2004; Méon & Sekkat 2008; Oliva & Rivera-Batiz 2002; Persson 2002; Bonnal & Yaya 2015). Dollar & Kraay (2003a) investigated the partial impacts of trade with institutions on the economic growth rate, and they established that economies with good institutions do more trade and grow quicker.

In a simulation work conducted by Navas (2013), the author analyzes the effect that openness has on economic growth via an institutional change in pre-industrial societies. The author suggested that many economies experience higher growth and earlier institutional change if they are open to trade. De Groot et al. (2004) claim that the institutional framework is a vital factor in illustrating the size of transaction costs. Formal rules that govern interactions in the economy are vital in determining the vagueness and opportunism in market exchange. Also, the low standard of governance raises the cost of transaction expended in the exchange. Furthermore, they argued that institutions' consequence of private trade and investment is crucial in foreign exchange and domestic transactions.

Investigating the partial impact of openness of trade and institutional quality on the economic growth rate, in the long run, Ahmed (2012) found a robust role of both trade openness and institutional quality in causing economic growth. The author claimed that the partial effects of trade openness on output per-capita growth are higher for developing countries. However, neither trade openness nor institution has significant effects for developed countries. These findings by Ahmed and the absence of unanimity in the body of knowledge spur the authors to investigate the situation in SSA as regards the trade-institution-growth debate.

METHODS

This study's central empirical objective is to examine whether trade openness's growth effect depends on institutional qualities. Based on this, we work with panel data, focusing on sub-Saharan African countries. Therefore, we started using linear growth regression specification and expanded the model to include the interaction terms between trade liberalization and the institutional quality measures.

Regression specification

This study's sample is made of an unbalanced panel dataset, which comprises 38 sub-Saharan African countries. The panel data covers a period of 1986-2015. Appendix A supplies a comprehensive list of nations in the sample.

Our basic linear regression equation is specified as:

$$\ln y_{i,t} = \beta_0 \ln y_{i,t-1} + \beta_1 \ln hum_{i,t} + \beta_2 \ln phy_{i,t} + \beta_3 \ln open_{i,t} + \beta_4 \ln gove_{i,t} + \varepsilon_{i,t} \quad (1)$$

The subscripts *i* represents the country, *t* represents the period, *y* signifies GDP per capita, *hum* represents human capital, *phy* denotes physical capital, *open* represents trade openness, *gove* represents government expenditure, and $\varepsilon_{i,t}$ is the error term.

The next step is to incorporate the interaction terms between trade openness and institutions into Eq. (1). It is necessary as it will allow us to investigate if the impact of trade liberalization on the economic growth rate is conditional on institutional quality. Both the signs and the interactive terms' significance will provide information on whether the institutional quality influences trade openness on economic growth. Because of this, we modify equation 1 as follows;

$$\ln y_{i,t} = \beta_0 \ln y_{i,t-1} + \beta_1 \ln hum_{i,t} + \beta_2 \ln phy_{i,t} + \beta_3 \ln open_{i,t} + \beta_4 \ln gove_{i,t} + \beta_3 \ln open_{i,t} * ins_{i,t} + \varepsilon_{i,t} \quad (2)$$

where *ins* represents all the institutional variables. The institutional variables include bureaucracy quality (*bur*), government stability (*govs*), law and order (*rul*), and corruption (*cor*). The other variables remain as defined earlier. We interact trade openness with each institutional variable to see the influence of the interactions of openness to trade with every institutional measure on economic growth.

Estimating Eq. (2) by ordinary least squares (OLS) will produce biased results. However, to solve this problem, we adopt alternative models that deal with pooled regression, which nest data by incorporating fixed effects (FE). The fixed-effects model has few assumptions about the behavior of residuals, and the equation to be estimated is given as:

$$\ln y_{i,t} = \beta_0 + \beta_1 \ln hum_{i,t} + \beta_2 \ln phy_{i,t} + \beta_3 \ln open_{i,t} + \beta_4 \ln gove_{i,t} + \beta_3 \ln open_{i,t} * ins_{i,t} + u_{i,t} \quad (3)$$

Therefore, Eq. (3) will be estimated using ordinary least squares (OLS) and fixed effects.

Measurement of variables and data source

In this study, panel data containing 38 countries that span from 1986-2015 is used for the analysis. The accessibility of data determines the choice of countries and the period of this study.

As common in the body of knowledge, per capita, real GDP growth stands as the dependent variable (i.e., the log difference of GDP per capita). Openness to trade is measured in this study as the sum of trade volume. That is the sum of total exportation and total importation expressed in the percentage of real GDP.

We anticipate that the relationship between openness to trade and economic growth is negative. It is due to the composition of trade in the region. The region specializes in the export of primary products against industrial products from developed countries, making trade disfavor the region. Human capital plays a major role in technology adoption as permitted by trade openness.

The labor force total measures human capital. We expect a positive relationship between human capital and economic growth. Physical capital shows the degree of investment in an economy and also an indicator of infrastructural availability. In this study, physical capital is measured by gross fixed capital formation. According to traditional growth theories, we expect a positive relationship between physical and economic growth.

Government expenditure is measured by government expenditure as % GDP. The impact of government expenditure can be negative or positive. The impact of government expenditure depends on whether government expenditure is tending towards productive or non-productive sectors. This study's institutional quality variables are government stability, law and order, bureaucracy quality, and corruption control.

All the data aside from institutional quality data are obtained from the World Bank, while institutional quality measures were obtained from the International Country Risk Guide (ICRG). It is published by Political Risk Services (PRS), of about 145 countries between 1984 and 2014.

We used four PRS indicators to measure general institutional quality. They are, (i) corruption- which represents the probability that officials will ask for unlawful remuneration or take advantage of his/her position or power for their personal benefits. (ii) law and order - which shows the extent to which the people are willing to be subjected under an authority that makes and implements laws and to adjudicate disputes. (iii) bureaucratic quality - which implies freedom from political pressure, strength, and expertise to govern without radical changes in government policy or disruptions in government services, along with the presence of a known system for recruitment and training of bureaucrats. (iv) Government stability - measure the government's capability to implement its intended policy and remain in power without interference. The four variables are usually scaled from 0 to 10, where higher values implied improved institutional quality and vice versa. We use institutional data from ICRG because it has a broader institutional quality measure (Maruta, 2019; Knack and Keefer, 1995).

The summary of the variables employed in this paper and where they were sourced from are supplied in Appendix B. At the same time, the descriptive statistics of the data are presented in Appendix C.

Estimation method

The two growth regression equations (i.e., Equations 1 and 2) presents two major challenges for estimation. The first challenge is concern about the presence of unobserved period and country-specific effects. Usually, the time effects are accounted for by the inclusion of period-specific dummy variables. The conventional methods of dealing with

country-specific effects (that is, within-group or difference estimators) are inappropriate given the regression's dynamic nature. The second challenge is the endogeneity problem. It is the situation where some of the explanatory variables are jointly endogenous with economic growth. As a result of this, the biases that occur through simultaneous or reverse causation must be controlled. The econometric methodology used to control for country-specific effects and joint endogeneity in this study is discussed in the next three paragraphs.

The generalized method of moments (GMM) estimators, which were introduced by Holtz-Eakin et al. (1988), Arellano & Bond (1991), and Arellano & Bover (1995), is used in this study. This generalized method of moments (GMM) estimators is particularly developed for dynamic models of panel data. The generalized method of moments (GMM) estimators is based on the following; first, using instruments to control for unobserved effect or differencing regressions. Second, on using lagged-dependent variables as instruments and preceding observations of explanatory variables. After time-specific effects are accounted for, Eq (1) and Eq (2) can be re-writing as follows:

$$y_{i,t} = \alpha y_{i,t-1} + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t} \quad (4)$$

The first difference of Eq (4) is taken to eliminate the country-specific effect.

$$y_{i,t} - \alpha y_{i,t-1} = \alpha(y_{i,t-1} - y_{i,t-2}) + \beta'(X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \quad (5)$$

By the act of difference, all the variables that are constant over time are eliminated. However, their interaction with the trade openness is not eliminated (given that this does vary over time). As a result, there is the need to use instruments to deal with the possible endogeneity of the independent variables and the problem that, by construction, new error term, $\varepsilon_{i,t} - \varepsilon_{i,t-1}$, is correlated with the lagged lagged-dependent variable, $y_{i,t-1} - y_{i,t-2}$. The instruments take advantage of the panel nature of the dataset in that they consist of previous observations of the explanatory and lagged-dependent variables. Conceptually, this assumes that any shocks to economic growth (that is, the regression error term) is unpredictable given past values of the explanatory variables. However, the method does allow for current and future values of the explanatory variables to be affected by growth shocks. It is the type of endogeneity problem that the method is developed to handle the basic assumptions that the error term, $\varepsilon_{i,t}$, is not serially correlated. Also, that the independent variables are weakly exogenous (that is, the explanatory variables are assumed to be uncorrelated with future realizations of the error term), our application of the GMM dynamic panel estimator uses the following moment conditions:

$$E[y_{i,t-2} \cdot (\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \quad (6)$$

$$E[X_{i,t-2} \cdot (\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \quad (7)$$

for $t = 3, \dots, T$. Note that we use only a limited set of moment conditions. In theory, the potential set of instruments spans all sufficiently lagged observations (and, thus, grows with the number of periods, T). However, in case the sample size is limited in the cross-sectional dimension, overfitting bias can only be avoided through the use of a restricted set of moment conditions (see Arellano & Bond 1998; the comprehensive note and discussion on overfitting bias in the context of panel-data GMM estimation can be found in Roodman, 2007). It is the case of this study, and as a result, the first appropriate lag of each time-varying independent variable is used only as an instrument. Specifically, regarding the difference regression corresponding to the periods t and, we use the following instruments: for the variables measured as period averages – trade openness,

human capital, physical capital, government expenditure, and institutional quality variables – the instrument corresponds to the average of the period; t_{-2} ; for the variables measured as initial values – per capita GDP – the instrument corresponds to the observation at the start of the period t_{-1} . Likewise, the multiplicative interaction terms are not used as instruments as an additional measure in preventing overfitting.

The GMM estimator based on the conditions in Eqs. (6) and (7) is known as the difference estimator. Notwithstanding its advantages concerning simpler panel-data estimators, the difference estimator has important statistical shortcomings. According to Blundell & Bond (1998) and Alonso-Borrego & Arellano (1999) when there is persistence in the explanatory over time, in the regression equation in differences, the lagged levels of these variables are a weak instrument. A weak instrument influences the asymptotic and small-sample performance in the difference estimator toward inefficient and biased coefficient estimates. However, the potential biases and imprecision associated with the difference estimator can be reduced using an estimator that combines the regression equation in differences and the regression equation in levels into one system (developed in Arellano & Bover, 1995, and Blundell & Bond, 1998). The instruments stated above are for the equation in differences. For the equation in levels (Eq. 4), the instruments are given by the explanatory variables' lagged differences. These are appropriate instruments under the assumption that the correlation between the explanatory variables and the country-specific effect is the same for all periods. That is,

$$E[y_{i,t+p} \cdot \eta_i] = E[y_{i,t+q} \cdot \eta_i] \text{ and } E[X_{i,t+p} \cdot \eta_i] = E[X_{i,t+q} \cdot \eta_i] \text{ for all } p \text{ and } q \quad (8)$$

Using this stationarity property and the assumption of exogeneity of future growth shocks, the moment conditions for the second part of the system (the regression in levels) are given by:

$$E[(y_{i,t-1} - y_{i,t-2}) \cdot (\eta_i + \varepsilon_{i,t})] = 0 \quad (9)$$

$$E[(X_{i,t-1} - X_{i,t-2}) \cdot (\eta_i + \varepsilon_{i,t})] = 0 \quad (10)$$

Like in the difference equation, the instruments are based only on the time-varying explanatory variables. In the level equation, in the regression specification, all the variables that are constant over time are present and at the same time included in the estimation process. However, as earlier mentioned, the identification of their corresponding coefficients is not possible. It is as a result of lack of availability of interments for time-invariant variables based on either their own lagged changes (since they are constant) or the lagged changes of the time-varying variables (because if these changes are uncorrelated with the unobserved country-specific effect, they are also likely to be uncorrelated with the observed constant variables). Therefore, we use the moment conditions presented in Eqs. (6), (7), (9), and (10) and employ a GMM procedure in generating consistent and efficient estimates of the parameters of interest and their asymptotic variance-covariance (Arellano & Bond, 1991; Arellano & Bover, 1995). The following formulas give these:

$$\hat{\theta} = (\bar{X} Z \hat{\Omega}^{-1} Z' \bar{X})^{-1} \bar{X}' Z \hat{\Omega}^{-1} Z' \bar{y} \quad (11)$$

$$AVAR(\hat{\theta}) = (\bar{X} Z \hat{\Omega}^{-1} Z' \bar{X})^{-1} \quad (12)$$

where θ represents the vector of parameters of interest (α, β); signifying dependent variable stacked first in differences and then in levels; \bar{X} is the explanatory-variable matrix including the lagged dependent variable ($y_{i,t-1}, X$) stacked first in differences and

then in levels; Z implies the matrix of instruments that is derived from the moment conditions, and Ω represents a consistent estimate of the variance-covariance matrix of the moment conditions.

RESULT AND DISCUSSION

Trade in Sub-Saharan Africa

The volume of trade of SSA with the rest of the world has increased over the years. The bulk of the trading activities that SSA countries organize are with other regions of the world. According to Manners & Behar (2007), in 2006, the low-income SSA countries export about 80% of their total export to nations outside the sub-Saharan region (85.2bn US dollars). During the same period, their total export to the middle-income countries in SSA is about 4.5 billion US dollars and 9.4 billion US dollars to other low-income in SSA. Likewise, the majority of the exports of the middle-income countries of SSA are to countries outside Africa. Manners & Behar (2007) stated that exports' growth rate in the 1980s and 1990s was very slow. However, since 2002 the percentage increase in total exports in the SSA region is greater than world exports in current US dollars.

From 2008 to 2009, the SSA region accounts for about 3 percent of the world's exports and imports against 6% in Latin America and a massive 27-30% in developing Asia (Chea, 2012). The author claimed that to gain more from the world's trade, the SSA region must increase its productivity and trade.

Appendix D presents the average growth export of SSA in comparison with and other regions. Between 2010 and 2015, the average growth of export in SSA was about -4.0% below the world average of 1.5%, and those of developing countries in Asia (3.7%) and developing/developed America (0.3/2.8% respectively). There seems to be modest growth in the average nominal export across the regional communities between 2010 and 2015. Between 1992 and 2015, the average nominal export growth of SSA was about 6 percent, slightly below the average at the global level of 6.8 percent and those of Asia's developing nations (9.8 percent) and developing America (8.3 percent respectively) but higher than that of developed America (5.3 percent).

The percentage share of SSA in the entire world's export remained low during the study period compared with what obtains in developing Asia (see table 1). Among the major RECs in Africa, ECOWAS recorded the lowest percentage share of World total export with about 2.1, 1.5, and 1.7 percent in 1986, 2000, and 2015. In the regional contexts, the share of the World's export of the RECs increased much slower than Asia's developing countries (13.9 percent in 1986; 21 percent in 2000; 36.6 percent in 2015).

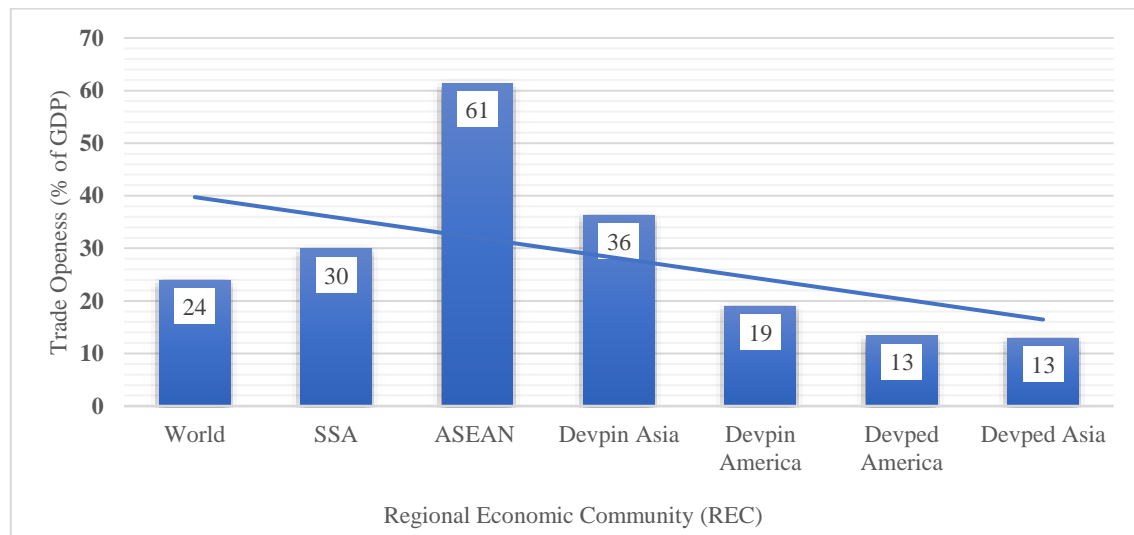
Import growth has also experienced a similar trend (Appendix E). The world's import portion of all RECs in SSA grew much slower than those in developing Asia (14% in 1986; 20.9% in 2000; 32.4% in 2015). The average annual growth rate of imports between 2010 and 2015 in SSA (3.5%) exceeds that of Asia's and America's developing countries (3.0% and 2.6%, respectively), resulting in growth accessibility of SSA countries to international trade flows.

Nevertheless, the nominal trade does not indicate the real adjustment in the size of exports or imports. The real export indices do not show any better performance of SSA export over developing Asia or developing America. Between 2002 and 2008, SSA's average real trade growth is 3.3%, behind both developing Asia's 12 percent and America's 4.3 percent over and above that of the world's economy as a whole of 6.9 percent. For instance, ECOWAS's real export performance of 0.5 percent was not as impressive as an inducement for viable development in SSA (UNCTAD, 2012). In general, according to Grosse-Wiesmann (2007), there is a rise in the proportion of

developing countries in international trade. Though, full potential is not yet depleted. SSA region remains below average as far as international trade is concerned.

The SSA region's trade structure is comparable with SSA's deal with other parts of the world, predominantly on a few primary commodities. The low intra-regional trade was linked to SSA's resource curse; so many countries export relatively the same commodities. SSA countries failed to develop significant merchandise exports because it is easy to export commodities within the continents. However, it is believed that SSA countries could trade with each other more, but intra-SSA trade is hindered by self-inflicted reasons (Economist, 2012). Intra-SSA liberalization since implementing the Lagos Plan of Action in the 1980s seems to have not provided improved intra-SSA trade. The unimpressive intra-SSA and RECs trade were linked to some factors, particularly, aside from the typical economic limitations resulting from small market size and low incomes, are SSA's faulty trade policy such as tariff removal unproductive non-tariff barriers among others (UNTAD, 2012).

A look at trade openness in SSA for the study period shows that openness has not been poorly done in the region. Though the volume of imports seems higher than export, SSA continues to export majorly primary products to the outside world.



Source: UNCTAD Globestat database and computed by authors.

Figure 1. Average trade openness in Sub-Saharan Africa (1986-2015)

Figure 1 shows the average of exports and imports as a fraction of GDP between 1986 and 2015. The indicators are computed for trade in goods, trade in services, and total trade in goods and services. The average of imports and exports, which shows roughly the size of international trade, is the number of imports and exports divided by two. SSA recorded a slightly high value (30%) though below ASEAN (61%) and developing Asia (36%) and above the world average of 24 percent, indicating a relatively high trade openness in SSA over the between 1986 and 2015.

Empirical results

The empirical analysis of this study starts with the examination of the stationarity of the variables. The result of the unit root test is presented in Table 1. Table 1 shows that all the variables aside from physical capital are not stationary at level. However, all the variables are stationary at first difference. It implies that physical capital is I(0) variable while all other variables are I(1).

Table 1. Unit root test result

Variable	Levine <i>et al</i>		Im <i>et al</i>		Panel PP- Fisher		OI
	level	1st diff	level	1st diff	level	1st diff	
GDP	-2.6114**	-6.6619***	-0.039	-9.9119***	84.9152	897.724***	I(1)
PHY	-4.142***	-12.288***	-3.289**	-17.613***	131.675***	1889.42***	I(0)
HUM	-11.707***	-3.581***	-6.709***	-2.005**	68.977	143.043***	I(1)
GOVE	-2.4075**	-11.229***	-1.198	-15.016***	102.336**	1189.08***	I(1)
OPEN	-0.898	-9.230***	-1.554*	-15.147***	272.737***	2396.63***	I(1)
BUR	-0.480	-13.165***	1.489	7.78113***	46.7206	234.563***	I(1)
GOVS	-0.343	-16.920***	2.286	-14.898***	35.4259	354.833***	I(1)
RUL	-1.7038**	-17.739***	0.159	-14.913***	98.162**	453.839***	I(1)
COR	-0.832	-17.566***	1.576	-15.656***	38.621	369.906***	I(1)
INS	-2.282**	-18.274***	1.432	-16.328***	297.837***	488.477***	I(1)

Note: All the variables are in log form. ***, ** and * denote the significance of the individual coefficients at 1%, 5, and 10% levels, respectively

The interaction effect of trade openness and institutions on economic growth is presented in Tables 2 and 3. In model 1 of Table 3, institutional variables are not included in the estimations. The model presents the result of the direct impact of trade openness on economic growth. In models 2, 3, 4, and 5, bureaucracy, corruption, government stability, law, and order are used as institutional variables. However, in Table 3, we follow Law & Azman-Saini (2012) and Baltagi, Demitriade, & Law (2007) by summing all the institutional variables and used different estimation techniques.

Table 2 shows that the lagged dependent variable's coefficients are negative in all the models and statistically significant in models 1, 4, and 5. It is consistent with Chang, Kaltan, & Loayza (2009). This negative coefficient of the initial GDP per capita implies that the conditional convergence hypothesis is valid for the studied sample. It means that if other factors that determine growth is held constant, the countries that have low GDP per capita will grow faster. Economic growth is positively impacted by physical capital. The coefficient of physical capital is significant at 1% in all the models. This finding implies there is a need for more investment in sub-Saharan Africa. It will entail an increased investment in social and economic infrastructure. The government of sub-Saharan African countries must reduce consumption expenditure and channel more funds to infrastructure development. Infrastructure development in terms of good roads, stable electricity, and improved health facilities will accelerate the region's economic growth. Government expenditure is negative in models 1 and 2 while positive in models 3, 4, and 5. However, the coefficient of government expenditure is significant at 5% in model 1 only. The negative coefficient of government expenditure might occur due to the pattern of spending of the government. For example, if the government is spending more on recurrent expenditure at the expense of capital expenditure, government expenditure might harm economic growth.

Human capital is negatively signed in model 1. However, it significantly positive in models 3, 4, and 5. Trade openness is positive in model 1 and significant at 5%. In other models, it is a significant negative. However, since model 1 is the benchmark model and equation (1) specifications allow only linear effect, we conclude that human capital has an inverse relationship with economic growth while trade openness positively impacted economic growth. The positive relationship between trade openness and economic growth found in this study is consistent with Ahmed (2012). The trade openness coefficient implies that a 1-point percentage increase in trade openness will lead to a 1.72 percentage point increase in economic growth in sub-Saharan Africa.

On the institutional variables used in the study, in model 2, bureaucracy quality hurts economic growth. The coefficient of bureaucracy quality is significant, at 5%. The coefficient of corruption is negative and statistically significant, at 10% in model 3. It is consistent with Hadhek & Mrad (2015), who found an inverse relationship between

corruption and economic growth. A high rate of corruption reduces the level of investment in the economy and hinders economic growth. In model 4, government stability has an inverse relationship with economic growth. Lack of government stability will reduce the investment level as economic agents need some guarantee of economic stability and certainty before investing. Law and order equally negative and significant at 1% in model 5. The negative impact of law and order on economic growth indicates the absence of law and order in the economy. Law and order enable orderly manner transactions to take place. It helps economic agents know that every decision they make and the contracts they undertake are properly protected by law and enforced. Savers, investors, consumers, entrepreneurs, workers, and risk-takers of all kinds need a framework of rules if rational, optimizing decisions are to be made. Currently, the legal system constitutes one of the issues in sub-Saharan Africa. Lack of practicality and clarity in the legal system make business transaction difficult. Also, a lack of respect for law and order results in violations and corruption, which hinders the inflow of foreign direct investment and economic growth.

Table 2. The complementary effect of openness and institutions on economic growth (dependent variable: GDP per capita)

	Model 1 Benchmark: No Interactions	Model 2 Bureaucracy Quality	Model 3 Corruption	Model 4 Government Stability	Model 5 Law & Order
<i>GDP</i> ₋₁	-0.0106*** (-4.2177)	-0.0029 (-1.2124)	-0.0027 (-1.2389)	-0.0038* (-1.7798)	-0.0046** (-2.1806)
PHY	0.0433*** (8.5049)	0.0236*** (4.7462)	0.0228*** (5.0096)	0.0249*** (5.4524)	0.0220*** (4.8202)
GOVE	-0.0164** (-2.6761)	-0.0013 (-0.2133)	0.0043 (0.6935)	0.0042 (0.7001)	0.0014 (0.2275)
HUM	-0.0044*** (-4.6207)	0.0016 (1.2992)	0.0032** (2.099)	0.0042** (2.6334)	0.0067*** (4.0141)
OPEN	0.0172** (3.0274)	-0.0140** (-2.3149)	-0.0227** (-2.8771)	-0.0411*** (-4.6969)	-0.0367*** (-4.5914)
Institutions					
BUR	-	-0.1372** (-2.2189)	-	-	-
COR	-	-	-0.0376* (-1.7598)	-	-
GOVS	-	-	-	-0.0488** (-26133)	-
Law & Order	-	-	-	-	-0.1354*** (-3.6432)
Interactions					
OPEN*BUR	-	0.0754** (2.1920)	-	-	-
OPEN*COR	-	-	0.0205* (1.6966)	-	-
OPEN*GOVS	-	-	-	0.0433*** (4.0053)	-
OPEN*RUL	-	-	-	-	0.0894*** (4.2403)
J-statistics	15.865	9.88	6.650	0.26	0.53
Instrument rank	6	8	8	8	8
Sargan test	7.0403	0.1605	0.1078	0.6547	0.4795

Notes: All the variables are in logs. The t-values for the system GMM estimates are in brackets. ***, ** and * denote the individual coefficients' significance at 1%, 5 and 10% levels, respectively. The Sargan test is for the over-identifying restrictions. The instrument used is lagged of all independent variables.

The coefficients of trade openness interaction with all institutional quality measures enhance economic growth on the interaction terms. It shows that the interaction of trade openness with all the institutional quality variables used in this study positively affects economic growth. It indicates that institutional quality variables enhance the effect of trade openness on economic growth. More openness results in a larger increase in economic growth when the bureaucracy quality is stronger, corruption is lower, government stability is consistent, and law and order is reliable. This result is not surprising as sound institutional quality can boost trade openness by reducing transaction costs and improving economic agents' confidence. Institutional quality facilitates trade by reducing risk and uncertainty related to international transactions, which in turn boosts economic growth.

To provide a robustness check for the results presented in Table 2, we sum all the institutional variables into a single variable. Besides, pooled OLS, fixed effect, difference, and system GMM are used as estimation techniques. In Table 3, system GMM is taking as the lead estimation.

Table 3. The complementary effect of openness and institutions on economic growth (dependent variable: GDP per capita)

	Pooled OLS	Fixed Effect	Difference GMM	System GMM
C	5.2249*** (5.5297)	1.8821** (2.5634)	-	-
GDP ₋₁	-	-	0.5281*** (30.3708)	-0.0037* (-1.7647)
PHY	0.1707** (2.7189)	0.0602*** (4.0998)	0.1325*** (18.8768)	0.0238*** (5.1704)
GOVE	0.5152*** (6.1362)	0.0879** (3.7976)	-0.0811*** (-7.0872)	0.0018 (0.3096)
HUM	-0.0727** (-5.1457)	0.2089* (1.9386)	0.1828*** (5.1065)	0.0050** (3.0350)
OPEN	-1.7090*** (-3.0658)	-0.3508 (-0.3507)	-0.3820 (-13.6104)	-0.0495*** (-5.1306)
Institutions				
INS	-3.0313*** (-4.0345)	-0.3099** (-2.0247)	-0.0349*** (-10.3269)	-0.0401** (-3.0556)
Interactions				
OPEN*INS	1.9036*** (4.3299)	0.2417** (2.5445)	0.0212*** (10.7884)	0.0389*** (4.6296)
Adjusted R ²	0.26	0.97		
J-statistics	-	-	28.83	0.064
Instrument rank	-	-	37	8
F-Statistics	44.53	529.14	-	-
Sargan test				0.8064

Notes: All the variables are in logs. The t-values for the system GMM estimates are in brackets. ***, ** and * denote the individual coefficients' significance at 1%, 5, and 10% levels, respectively. The Sargan test is for the over-identifying restrictions. The instrument used is lagged of all independent variables.

From Table 3, the result of the lagged dependent variable in difference GMM is contrary to system GMM. In dynamic GMM, the coefficient of the lagged dependent variable is positive and significant at 1%. However, in system GMM, the coefficient of the lagged dependent variable is significantly negative. This contrary result might be due

to the estimations instrument used indifference and system GMM. Roodman (2007) stated that the instrument used in the difference GMM is weak when the panel data set is short, and the outcome variable shows persistence. Therefore, system GMM tends to perform better in a short sample like in this study.

Physical capital is positively impacted economic growth in all the estimations. Government expenditure is positive in pooled OLS, fixed effect, and system GMM while it negative indifference GMM. In terms of significance, the government expenditure coefficient is significant in all the models apart from system GMM. Human capital is negative pooled OLS, but dynamic and system GMM is significantly positive in fixed effect. The coefficient of trade openness is negative in all the estimations. However, it only significant in pooled OLS and system GMM. In all the estimates, the coefficient of institutions is significantly negative.

On the coefficients of interactive terms, the results show that the interaction of trade openness and institutions (OPEN*INS) is positive in all the estimations. It is significant at 1% in pooled OLS, dynamic, and system GMM, while it is significant at 5% in fixed effect. It implies that there is an existence of complementarity between trade openness and institutions in sub-Saharan Africa. It is consistent with the result in Table 2. According to Canh, Schinckus & Thanh (2019), a sound institutional quality couple with trade openness enables foreign investors to easily transfer technology into host economies, thereby boosting their economies. It is obvious that sub-Saharan African countries are deficient in technology advancement and, as a result, need technology transfer to have access to modern technology.

CONCLUSIONS AND RECOMMENDATIONS

This study found that trade openness enhances economic growth during the study period. This finding implies that trade openness is very significant to expanding the economies in sub-Saharan Africa economies. Therefore, it requires introducing trade reforms that will allow the region to maximize its benefits from trade openness. The reforms that will promote the exports and prevent the region from becoming a dumping ground are necessary. It will boost productivity and as well as increase revenue generation in the region.

The study revealed that institutional quality failed to contribute to economic growth in sub-Saharan Africa. It implies that the current level of institutional quality is too low to contribute to economic growth positively. Based on the evidence from the literature that institutional quality is crucial to economic growth, the policymakers in sub-Saharan Africa must pay attention to institutional quality development. It might require the introduction of stable and systematic reforms that can improve the quality of institutional quality. Low institutional quality will slow down economic growth as it cannot encourage free and transparent markets, political stability, effective government, and legal systems necessary for rapid economic growth.

On the interaction between trade openness and institutional quality measures, the study found that institutional quality enhances the impact of openness on economic growth in sub-Saharan Africa. This finding implies that the policymakers must pay attention to institutional quality and trade openness in the region. It means that the policymakers must introduce policies that will simultaneously target institutional quality development and enhance trade openness since the growth impact of trade openness depends on sound institutional quality. Sound institutional quality will promote a conducive environment and ensure low transaction costs, increasing the output of goods and services. It can also boost investors' confidence and other mechanisms that allow a

trade to have an optimum economic growth effect. The business's environment is transparent, and a civil right is protected, political stability is guaranteed is necessary for the increased inflow of goods and services traded in the region. An increasing inflow of trade will lead to higher production capable of engendering economies of scale.

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APPENDIX

Appendix A. List of the selected SSA countries

• Angola	• Congo, Dem. Rep	• Guinea-Bissau	• Niger	• Swaziland
• Benin	• Congo, Rep	• Kenya	• Nigeria	• Tanzania
• Botswana	• Cote d'Ivoire	• Madagascar	• Rwanda	• Togo
• Burkina Faso	• Equatorial Guinea	• Malawi	• Senegal	• Uganda
• Burundi	• Gabon	• Mali	• Seychelles	• Zambia
• Cameroon	• Gambia	• Mauritius	• Sierra Leone	• Zimbabwe
• Central African. Rep	• Ghana	• Mozambique	• South Africa	
• Chad	• Guinea	• Namibia	• Sudan	

Appendix B. Measurement of variable and source

Variables	Measurement	Source
Real GDP per capita	proxies by log difference of GDP per capital.	WDI, 2017
Physical Capital (PHY)	This is proxied by gross fixed capital formation	WDI, 2017
Human Capital (HUM)	This is measured by the total labor force	WDI, 2017
Government Spending (G)	This is measured by the General government final consumption expenditure (% of GDP)	WDI, 2017
Trade openness	This is the sum of export and import (% of GDP)	WDI, 2017
Corruption	It is more concerned with actual or potential corruption in the form of excessive patronage, nepotism, job reservations, favor-for-favors, secret party funding, and suspiciously close ties between politics and business.	ICRG
Government Stability	Government stability measures both the governments' ability to carry out its declared program(s) and its ability to stay in office. The risk rating assigned is the sum of three subcomponents: Government Unity, Legislative Strength, and Popular Support	ICRG
Law and Order	To assess the “Law” element, refers to the strength and impartiality of the legal system while the “Order” element is an assessment of popular observance of the law.	ICRG

Appendix C. Descriptive statistics

Variable	Mean	Stdev	Minimum	Maximum
GDP per capita	3.0262	0.4369	2.2090	4.0764
Physical Capital	1.2572	0.2117	0.1833	1.7432
Government expenditure	1.1419	0.1744	0.3111	1.8057
Human capital	6.6170	0.5347	5.5407	7.7593
Trade Openness	1.7898	0.1746	1.0594	2.2191
Bureaucracy quality	0.1722	0.1911	-0.7781	0.6020
Corruption	0.7680	0.2319	0.0347	1.0413
Law and order	0.4396	0.1629	-0.3010	0.7781
Government Stability	0.8780	0.1291	0.3010	1.0446

Appendix D. Total exports of Africa, selected RECs and other groupings (US\$ Million at current prices), 1986-2015

Groupings	1986	1990	1995	2000	2005	2010	2015	Average Growth Rate (%)	
								2010-2015	1992-2015
World	2140963.0	3495675.4	5176236.3	6452317.9	10502488.5	15302138.0	16487879.5	1.5	6.8
SSA	45829.8	68394.7	76666.4	94589.9	199171.1	355074.7	286814.8	-4.0	6.2
Developing Asia	298371.9	589790.1	1085924.6	1538457.5	2903638.6	5016322.2	6028297.1	3.7	9.8
Developing America	94642.3	145622.3	230745.4	367998.3	586481.4	891598.2	922489.5	0.3	8.1
Developed America	317828.6	521758.5	777382.9	1058864.5	1262015.4	1666376.7	1912953.8	2.8	5.3
Developed Asia	217911.3	299660.0	462162.1	510700.2	637711.3	828186.9	688488.0	-4.2	3.3
ASEAN	67623.9	144147.8	321409.3	430202.5	656573.7	1050050.0	1160541.7	1.8	9.0
COMESA	19167.7	25782.2	24080.6	30108.0	66154.2	118526.0	70572.6	-7.7	5.5
ECCAS	6547.2	11981.9	11425.3	17194.8	49645.4	92008.7	63680.5	-6.1	7.2
ECOWAS	12145.7	21408.7	22213.5	30344.7	67098.0	114800.3	87812.5	-4.9	6.2
SADC	27413.8	38737.6	44142.4	50710.2	98021.7	180966.0	157558.8	-2.8	6.0
CEN-SAD	2528.8	2030.7	3586.4	4690.7	10260.5	21069.6	15280.3	-6.2	6.2
IGAD	29665.8	47363.9	50592.8	66134.5	145431.4	247029.8	169766.2	-5.5	10.1
UMA	20588.9	34344.2	32078.0	48393.2	99668.9	141995.9	82664.3	-8.3	4.2
EAC	2339.2	1699.0	3177.9	2973.4	6094.4	11236.7	13908.7	3.3	9.1
The percentage share of World Total (%)									
SSA (%)	2.1	2.0	1.5	1.5	1.9	2.3	1.7		
Developing Asia (%)	13.9	16.9	21.0	23.8	27.6	32.8	36.6		
Developing America (%)	4.4	4.2	4.5	5.7	5.6	5.8	5.6		
ASEAN (%)	3.2	4.1	6.2	6.7	6.3	6.9	7.0		
ECOWAS (%)	0.6	0.6	0.4	0.5	0.6	0.8	0.5		
SADC (%)	1.3	1.1	0.9	0.8	0.9	1.2	1.0		
IGAD (%)	1.4	1.4	1.0	1.0	1.4	1.6	1.0		
UMA (%)	1.0	1.0	0.6	0.8	0.9	0.9	0.5		

Source: UNCTAD Globstat database.

Appendix E. Total imports of Africa, selected RECs and other groupings (US\$ Million at current prices), 1986-2015

Groupings	1986	1990	1995	2000	2005	2010	2015	Average Growth Rate (%)	
								2010-2015	1992-2015
World	2212414.7	3609254.6	5234374.7	6654568.6	10777641.6	15420513.1	16656897.3	1.4	6.6
SSA	42259.0	57688.0	78756.1	82332.5	173708.9	310371.6	367410.9	3.5	8.1
Developing Asia	309748.1	575212.7	1126456.6	1392999.3	2619779.9	4631138.5	5391270.0	3.0	9.1
Developing America	86681.1	124885.8	248194.7	388885.8	537829.2	895898.4	1029048.9	2.6	8.0
Developed America	468638.4	641357.3	939951.0	1505232.0	2056779.3	2373753.2	2753315.7	2.6	6.3
Developed Asia	138358.7	252161.7	365463.6	417196.0	563007.9	755268.2	712971.8	-1.4	4.7
ASEAN	64918.2	162345.8	355311.1	380640.5	602730.5	953112.5	1091578.6	2.6	8.2
COMESA	25295.2	28068.9	33240.6	35511.1	65047.3	134915.2	160036.3	4.5	8.4
ECCAS	6534.1	7295.0	6250.7	7897.8	19737.4	43234.7	51684.3	4.4	9.3
ECOWAS	11124.4	14373.3	19457.9	20625.6	43584.3	83585.7	97717.0	3.6	7.3
SADC	22249.8	34524.8	47560.2	48520.5	99703.0	165210.9	192377.6	2.9	7.9
CEN-SAD	37348.8	45107.6	60432.8	65446.7	122338.9	240029.3	265135.7	2.8	7.8
IGAD	4445.7	4520.7	7309.0	8475.5	20145.2	37277.7	50319.7	6.6	11.4
UMA	20587.1	27760.8	33849.2	33457.7	61831.1	117679.5	124971.2	2.7	7.6
EAC	3407.8	4391.8	6193.3	6526.1	11887.0	26571.3	35510.6	5.7	9.7
Percentage Share of Worlds Total									
SSA (%)	1.9	1.6	1.5	1.2	1.6	2.0	2.2		
Developing Asia (%)	14.0	15.9	21.5	20.9	24.3	30.0	32.4		
Developing America (%)	3.9	3.5	4.7	5.8	5.0	5.8	6.2		
ASEAN (%)	2.9	4.5	6.8	5.7	5.6	6.2	6.6		
ECOWAS (%)	0.5	0.4	0.4	0.3	0.4	0.5	0.6		
SADC (%)	1.0	1.0	0.9	0.7	0.9	1.1	1.2		
IGAD (%)	0.2	0.1	0.1	0.1	0.2	0.2	0.3		
UMA (%)	0.9	0.8	0.6	0.5	0.6	0.8	0.8		

Source: UNCTAD Globstat database.