ASHA PUBLISHING

JOURNAL OF SOCIAL SCIENCES AND ECONOMICS



Volume 2, Issue 1, 2025

E-ISSN: 3047-5507
Journal of Social Science and Economics (JOSSE)
https://journal.ashapublishing.co.id/index.php/josse/index

Regional Integration and Economic Growth in the Community of Sahel Saharan States

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ABSTRACT

Regional integration is a crucial strategy to foster economic growth, competitiveness, and political stability among developing countries. This study examines the impact of regional integration on economic growth in the Community of Sahel-Saharan States (CEN-SAD) using a composite integration index that encompasses trade, finance, infrastructure, production, and the movement of persons. Grounded in endogenous growth theory, particularly the Lucas model, the research highlights human capital, trade openness, and knowledge spillovers as key drivers of long-term growth. Employing dynamic panel data methods and the System GMM estimator, the study addresses challenges such as endogeneity and heterogeneity among member countries. Key variables include regional integration indices, human and physical capital, institutional quality, and exchange rates. Robustness tests confirm the validity of the model. Results show a positive and significant effect of regional integration on economic growth, primarily through trade, finance, infrastructure development, and the free movement of people. In contrast, production integration shows no significant impact. Economic growth persistence is also observed, with past growth strongly predicting future growth across CEN-SAD countries. These findings suggest that strengthening regional integration and addressing structural challenges will likely enhance economic performance and development in the region. Policy implications include promoting greater collaboration in infrastructure, financial markets, and labor mobility to maximize the benefits of growth.

Keywords: Regional Integration, Economic Growth, CEN-SAD, Trade Integration, Financial Integration, Panel Data Analysis

INTRODUCTION

There have been insufficient resources available to implement economic development projects and programs, particularly in emerging economies. Between the mid-1960s and the late 1970s, Africa's economy experienced growth (Chang, 2009; Mkandawire, 2014). This development resulted from rising commodity prices, which led to increased investment in several countries. According to the United Nations Conference on Trade and Development, the region's economic performance began to deteriorate in the 1980s. The oil shock of the late 1970s, which led to high interest rates, restricted foreign capital flows, low commodity prices, rising unemployment, and substantial external indebtedness, further exacerbated the economy's deteriorating performance (Odhiambo, 2023). Most African nations sought assistance from the World Bank and the International Monetary Fund (IMF) due to these economic difficulties (Fonjong, 2014; Kingston et al., 2011). The Structural Adjustment Programme (SAP), a policy aimed at generating resources, was prescribed for these institutions. Trade liberalization, deregulation, commercialization, privatization, and interest and exchange rate deregulation are the fundamental elements of SAP (Hoeyi & Makgari, 2021; Makate et al., 2017). The majority of African nations implemented these policies, but rather than improving their economies, the nation's economic performance declined. Regional

integration was established as a result of the inability of SAP and other economic strategies to boost economic growth in the majority of African nations.

There are eight regional economic communities in Africa, one of which is the Community of Sahel-Saharan States (CEN-SAD). It was established in 1998 to advance the political, social, cultural, and economic integration of its member nations. According to (Dimuna, 2023; Kouladoum, 2023), the primary benefit derived by members of CEN-SAD is infrastructural development (Hailu, 2015; Singuwa & Singuwa, 2023) argued that in addition to the state-centric character of the integration efforts and the lack of infrastructure development, the integration efforts have been complicated by the overlapping multiple membership of countries to the regional grouping and insufficient monitoring.

The five dimensions of African regional integration include infrastructure, production, trade, finance, and human mobility. These characteristics are predicated on certain socioeconomic elements that are critical to Africa's integration (Laub, 1999; McCarthy et al., 2018). These range from 0 to 1, where 0 denotes no integration at all, and 1 denotes perfect integration. Several levels of integration have been observed among the several African regional economic blocs based on these parameters. According to Abdullahi (2019) and Ancharaz et al. (2011), despite the five characteristics of regional integration, rural poverty, small economies, a lack of product complementarities, poor primary export products and fundamental mineral values, and a reliance on imports for intermediate and final goods are all common. Therefore, this study examines the impact of regional economic integration on economic growth in CEN-SAD countries. The economic development of the Community of Sahel Saharan States has not proven promising. Protectionism among the nations has been blamed for this (Chuku et al., 2023; Osakwe, 2016). Regional integration emerged as a response to the need to explore alternative economic strategies following a decline in economic growth among nations due to protectionism.

Trade, production, finance, human mobility, and infrastructure are the categories used to categorize regional integration in Africa (Huh & Park, 2018; Kwaw-Nimeson & Tian, 2023; Stoffel et al., 2019). CEN-SAD is the lowest-ranked of the eight regional economic communities in Africa, with an average index of less than 0.4. Therefore, an empirical explanation for the region's low integration score and, consequently, less-than-ideal economic growth must be established. In certain aspects, some CEN-SAD members with extremely low rates of economic growth receive very high scores, whilst member nations with high rates of economic growth receive very low scores (Beri et al., 2022; Bunje et al., 2022). For example, it was found that although those from countries like Cote D'Ivoire, Djibouti, and Somalia were high, particularly on the migration of people, those from Nigeria, Egypt, Kenya, and Ghana were low. How much regional integration has aided in the economic development of CEN-SAD nations is the question that emerges.

There have been conflicting findings from studies on how regional integration affects the economic development of CEN-SAD nations (Mshai Mwasagua et al., 2021; Vhumbunu et al., 2023). For example, it has been found that economic growth is unaffected by regional integration. The majority of these studies used exports and terms of trade as stand-ins, which are thought to be insufficient measures of regional integration (Iwanow & Kirkpatrick, 2009; Okafor, 2021). As a result of cross-sectional dependence between countries, serial correlation of the error term, identification issues, and endogenous regressors, the majority of these studies also used panel data regression techniques like the pool mean group (PMG), fixed effect (FE), and random effect (RE), which are thought to be weak. This study is thought to be suitable for the instrumental variable (IV), which is based on the dynamic panel data (DPD) strategy that is pertinent in the setting of the generalized method of moments. This is particularly true given that the time dimension is smaller than the total number of CEN-SAD member nations.

Different viewpoints have been used to describe regional integration. Van-Ginkal and Van-Longenhove (2023) see it as states cooperating on trade, security, politics, and culture. In contrast, Claar and Noeike (2016) characterize it as adjacent countries working together through shared institutions and rules. Benefits, including lower trade barriers, more factor mobility, and boosted regional economic activity, are highlighted by Pinder (1969) and Carbaugh (2004). Trade, infrastructure, finance, free movement of persons, and production are the five elements of regional integration identified by the African Regional Integration Index (ARII, 2023), Janal and Ndege (2023), and AFCFTA (2022). Todaro and Smith (2011) describe economic growth as an increase in national output over time, while Angelsen and Wunder (2006) define it as rising GDP per capita, a definition also mirrored by Jhingan (2012) and Kindleberger (1965). Empirical research supports these links: Jambo and Sundjo (2021) found a connection between trade intensity in SADC and economic growth, while Razana Parany (2020) discovered positive associations between integration and economic development in ECOWAS. According to Frankel and Romer (1999), Pakistan's economy benefited from regional integration. Using GMM, Bong, and Premeratne (2018) verified a comparable impact across Southeast Asia. Nonetheless, Vanhoudt (1999) and De Melo et al. (1993) reported little to no influence on OECD member states and developing nations, respectively.

According to neoclassical growth theories, market liberalization raises per capita income by encouraging capital accumulation, savings, and investment (Todaro & Smith, 2011). They attribute long-term growth to external factors such as population expansion and technological advancements. This is expanded upon by endogenous growth theories, which incorporate advancements in technology into their models. Using the Uzawa model, Lucas places a strong emphasis on the development of human capital, with training leading to productivity improvements and trade and integration having spillover effects. Physical (Ki) and human capital (Hj) determine output (Y), and productivity is influenced by external human capital (H*). According to Viner (1950), customs unions promote trade based on trade sources, emphasizing the formation and diversion of trade. Meade (1956) contends that welfare is improved when partners' originally high tariffs are reduced. According to Balassa (1961), the dynamic effects of integration accelerate output growth and technical advancement, even though a single model cannot adequately represent them.

Research Questions.

The following research questions will guide this study:

1. What is the effect on economic growth (real gross domestic product) of the composite integration index of production, trade, infrastructure, finance, and human mobility in CEN-SAD countries?
2. How much do financial integration and the trade integration index affect economic growth in CEN-SAD nations?
3. What is the effect of the infrastructure, production, and human mobility integration index on economic growth?

Research Hypothesis.

The following testable hypotheses will align this study with the above objectives.

1. Ho: The economic growth of CEN-SAD countries is not significantly impacted by regional integration (composite, regional integration index of trade, financial infrastructure, output, and mobility of individuals).
2. Ho: The economic growth of CEN-SAD nations is not significantly impacted by the trade integration index or the financial integration index.

3. Ho: Economic growth in CEN-SAD countries is not substantially impacted by integration in infrastructure, production, or human mobility.

METHOD

The theoretical underpinning for examining the relationship between regional integration and economic growth will be the endogenous growth theory. Changes in capital levels, institutional quality, and productivity growth brought about by regional integration may have a significant impact on the growth rate, according to the Endogenous Growth Model (EGM), which highlights the potential for increasing returns to capital and accounts for the long-term or permanent effects of regional integration on economic growth. Because it is expected to protect physical capital and accelerate the adoption of technology, the development of human capital will, therefore, have a long-term impact. According to Tinta et al. (2018), the development of integration agreements and the extensive use of dissemination technologies may also hasten economic growth. The theory also explains how global trade fosters economic expansion through human capital, which is seen as a growth engine (Lucas, 1988). The dynamic theory of integration, on the other hand, distinguishes two types of effects of regional integration: (1) the rate of growth of factor inputs accelerates due to integration, which causes output to grow more quickly, and (2) the rate of technological advancement within the economic union accelerates, which causes output to grow more quickly even when input growth remains constant. The fact that Kreinin (1964) examined the dynamic effects of integration—that is, the economic expansion resulting from increased investment and quicker technological advancement is noteworthy.

The study's theoretical foundation is the Lucas Endogenous Growth model, developed by Lucas (1988), and an extension of the AK model through a two-sector arrangement. It posits that a variety of technologies generate both human and physical capital. The Lucas model illustrates how the development of human capital results in sustained economic success. It makes a distinction between the outward effects of human capital, which arise from knowledge spillover through trade and integration, and the internal benefits of human capital, which include increased productivity for those who receive training. This paradigm posits that human capital, rather than physical capital, is the driving force behind trade and integration-driven spillover effects that increase the level of technology in the economy. The following is a description of the output function:

$$Y_i = A(K_i).(H_i).H^e \quad (1)$$

A represents technical efficiency, Ki and Hi are the inputs of human and physical capital that companies utilize to produce goods, and Yi is the output that will be proxied by RGDP. The amount of human capital across the economy is represented by the variable H. The degree to which human capital has an external impact on an organization's output is indicated by the metric e. The Lucas model states that while scalability returns remain constant for individual enterprises, they increase for the overall economy. Experiential learning, on-the-job training, and the spillover effects of human capital—all of which are facilitated by trade and integration—contribute to the economic diffusion of technology. It should be noted that in this paradigm, technology is endogenously generated as a result of firm investment decisions made when they interact with other firms beyond state lines, and its users regard it as a public good.

Model Specification

A model including various equations connecting the relevant variables recognized as significant elements in the context of regional integration and economic growth in CEN-SAD is developed based on the theoretical foundations of economic growth and regional

integration that have been previously explored. Economic growth is the dependent variable (RGDPP). The composite regional integration index (RICI) and the five integration dimensions—integration in trade index (ITI), financing index (IFI), infrastructure index (III), productive index (IPI), and movement of people index (IMI)—are the primary explanatory factors. The study found that domestic value-added (VAD) is one of the most significant determinants of the performance of global value chains. Domestic value-added quantifies the percentage of export earnings that go to domestic labor and capital, as well as the percentage of exported goods that are unfinished and will be processed before being exported from other nations (Tinta et al., 2018; Adekunle, et al., 2022).

Gross capital formation (GFCF), foreign direct investment (FDI), the exchange rate (EXCR), the human capital index (HCI), the central component of the Lucas model, and institutional quality (INSQ), which measures the efficacy of national public administration, are among the control variables that have been employed, according to the literature (Andersen & Babulal, 2008; Pam, 2017; Yaya, 2017; Tinta, 2018). GFCF and FDI are two indicators of the amount of money invested in a country. While FDI is linked to technology transfer, transportation, and infrastructure, as well as the country's attractiveness level, it has a significant impact on growth. In contrast, the GFCF promotes growth by valuing domestic investment, which is closely tied to the nation's industrial development (Tinta et al., 2018). The EXCR measures the competitiveness of a country's internal currency. Our models modify Tinta et al. (2018) model in the following ways to align with our selected bloc and particular goals:

$$RGDPP_{it} = f(RGDPP_{it-1}, RICI_{it}, HCI_{it}, GFCF_{it}, VAD_{it}, FDI_{it}, EXCR_{it}, INSQ_{it}) \quad (2)$$

$$RGDPP_{it} = f(RGDPP_{it-1}, ITI_{it}, IFI_{it}, III_{it}, IPI_{it}, IMI_{it}, HCI_{it}, GFCF_{it}, VAD_{it}, FDI_{it}, EXCR_{it}, INSQ_{it}) \quad (3)$$

The basis of the Dynamic Panel Data (DPD) model structure is the lag of the dependent variable (RGDPP), or RGDPPit-1. The other names include RGDPPit, RICIit, ITIit, IFIit, IIIit, IPIit, IMIit, HCIit, GFCFit, VADit, FDIit, EXCRit, and INSQit. Subscripts i and t stand for the particular country (i = 1, 2, 3,…., 15; N = 15 selected CEN-SAD members) and time dimensions (2010 – 2023: t = 1, 2, 3,…., 13; T = 13), respectively. Equations 2 and 3 are given in their complete econometric forms, while Equations 4 and 5 are obtained by applying the natural logarithm transformation to both sides of the equations:

$$LRGDPP_{it} = a_0 + a_1 LRGDPP_{it-1} + a_2 LRICI_{it} + a_3 LHCI_{it} + a_4 LGFCF_{it} + a_5 LVAD_{it} + a_6 LFDI_{it} + a_7 LEXCR_{it} + a_8 LINSQ_{it} + \mu_{it} \quad (4)$$

$$LRGDPP_{it} = \beta_0 + \beta_1 LRGDPP_{it-1} + \beta_2 LITI_{it} + \beta_3 LIFI_{it} + \beta_4 LIII_{it} + \beta_5 LIPI_{it} + \beta_6 LIMI_{it} + \beta_7 LHCI_{it} + \beta_8 LGFCF_{it} + \beta_9 LVAD_{it} + \beta_{10} LFDI_{it} + \beta_{11} LEXCR_{it} + \beta_{12} LINSQ_{it} + \nu_{it} \quad (5)$$

L is the natural log notation, μit and vit are the uncorrelated random disturbance terms (with the typical features of N(0, σ2)) from each model, and αi (i = 0, 1, 2, …., 8) and βi (i = 0, 1, 2, …., 13) are the parameters from Equations 4 and 5, respectively. By using natural log form for all variables, it aims to standardize the pertinent data, eliminate heteroskedasticity and excessive levels of variability throughout the selected cross-section, and make it easier to interpret the model coefficients as elasticities.

A Priori Expectation

All the regressors from Equations 3.4 and 3.5 are predicted to have a positive impact on economic growth based on the theoretical framework and existing literature.

Estimation Technique

The System Generalized Method of Moments (GMM-S) estimator and a dynamic model are used to capture the economic performance pattern of the 15 CEN-SAD nations that were selected. While accounting for the short- and long-term impacts of regressors on the dependent variable, we also tackle the problems of endogeneity, measurement error, omitted variables, and country-specific heterogeneity. The possibility of endogeneity, the connection between the error term and unobserved country-fixed effects, and the consistency of the Fixed Effect (FE) or Random Effect (RE) estimator raise doubts about whether the assumption of orthogonality is met. Blundell and Bond's (1998) System GMMs (GMM-SYS) estimator and Arellano and Bover's (1995) first-differenced GMM (GMM-FD) estimate were introduced as alternatives. Because GMM-FD is often associated with statistical problems, including weak instruments and overly persistent regressors, Bond et al. (2001) decided to utilize GMM-S instead of GMM-FD. The GMM-SYS is expected to be able to resolve this problem by using lagged differences and lagged levels of the regressors and/or other tools. The foundation of this method is the estimation of a system of two simultaneous equations, one with lagged first levels and the other with lagged first differences as instruments. However, the simple process is to estimate the FE regression, whose parameter is the lower bound, after the Pool Mean Group (PMG) regression, whose parameter is the upper constraint. We'll compute the parameter estimate for the GMM-FD and compare it to the FE regression. If the parameter from the GMM-FD regression is smaller than or nearer the parameter from the FE regression, the GMM-S is more appropriate for our panel. This suggests a downward bias in the GMM-FD. The consistency of the GMM-S estimator is evaluated using the Hansen test of over-identifying limits for the gross validity of the instruments and a test that evaluates the null hypothesis that the error component is not serially correlated. The model gains credibility due to its failure to refute both null hypotheses (Arellano & Bond 1991; Arellano & Bond 1995; Blundell & Bond 1998; Osabuohien, Efobi & Gitau 2015). The p-value for the Arellano-Bond AR(2) test is then displayed.

Evaluation Technique

The model's theoretical plausibility, statistical reliability, and econometric robustness are frequently evaluated following the estimation of the models using a specific set of criteria. The computed parameters are assessed using three criteria: econometric, statistical, and economic.

Economic A priori Criterion

This criterion states that the expected signs and sizes of the parameters of economic connections that adhere to the principles of economic theory are assessed using the a priori expectations. This is among the criteria used to evaluate the estimations' theoretical relevance (Koutsoyiannis, 1973).

Statistical Criterion (First-Order Test)

Even if parameter estimates pass the a priori test, it is widely known that they are useless for policymaking if they do not satisfy the relevant test statistics' requirements for statistical significance. Therefore, in order to assess the dependability of the estimated models using a statistical criterion, the formal approach was taken into consideration in this study. The relative significance of the parameter estimates was evaluated by examining the related probability values of the relevant coefficients. As required by the written procedure, this test was conducted at the 5% significance level. Second, the total significance of all factors was

determined using the Wald Chi-sq test at the 5% significance level. This is a formal process as well.

Econometric Criterion (Second-Order Test)

The validity of the statistical theory is examined by these criteria, which are also referred to as the second-order test. It is also recognized that if the underlying assumptions of the estimator are not met, the results of an estimated model may be incorrect even after extensive statistical testing. We used the Arellano-Bond (AB) test of serial correlation, the Durbin (1954), Wu (1974), and Hausman (1978) endogeneity tests, as well as the Sargan test of over-identifying limits, to determine if the fundamental assumptions of the GMM-S are met.

Test of Hypotheses

A hypothesis is an assertion or presumption regarding a population parameter that has not yet been confirmed. A hypothesis test is used to determine if a hypothesis is true or not. Data from a sample selected from the population is used to test the hypothesis for any population parameter. We must reject the hypothesis when the tested theory and the sample results are incompatible. To test the hypotheses, the t-test will be used. The t-test can be used to determine the individual significance of each parameter estimate at a given significance level. Here are the specifics of the hypothesis:

H_0: $\beta i = 0$ (parameter estimate is statistically insignificant)

The t-table for the significance level with (n-k) degrees of freedom (df) yields the crucial value for a two-tailed test. Where n is the number of data, k is the number of parameters in the regression, including the intercept, and $\alpha = 5\% = 0.05$; $= 0.025$. Decision Rule: H0 is rejected if /tcal/ > t0.025 (n-k); else, it is accepted.

RESULTS AND DISCUSSION

Data Presentation

This chapter presents the data used for the empirical investigations, and E-views version 12 was used for data analysis and model estimations.

Table 1: Summary of Descriptive Statistics.

Variable	Mean	Std. Dev.	Minimum	Maximum
RGDPP	2.278594	3.781823	-22.18762	18.06517
GFCF	21.77730	6.561761	1.251276	52.41832
HCI	0.368796	0.040719	0.297922	0.450056
RICI	0.345300	0.090012	0.200000	0.720000
VAD	22.13231	6,483885	3.669052	35.23447
EXCR	1534.995	2653.726	1.431025	10772.03
FDI	18.28966	26.66179	-53.61357	159.696
INSQ	23.65079	11.51403	2.285714	54.19048
Obs.	**132**	**132**	**132**	**132**

Source: Computed by the Researcher using E-views 12

Correlation Analyses of Regressors

Table 2 presents the results of the correlation analysis for the regressors in Models i and ii.

Table 2: Correlation Analysis of Model One Regressors

Model 1	*LRGDPP*	*LGFCF*	*LHCI*	*LRICI*	*LVAD*	*LEXCR*	*LFDI*	*LINSQ*
LRGDPP	1.000							
LGFCF	0.221	1.000						
LHCI	0.304	0.249	1.000					
LRICI	0.426	0.256	0.326	1.000				
LVAD	0.820	0.321	0.062	0.245	1.000			
LEXCR	0.920	0.315	-0.486	-0.305	-0.148	1.000		
LFDI	0.801	-0.290	0.415	-0.251	-0.213	0.221	1.000	
LINSQ	0.619	-0.261	-0.217	-0.304	-0.501	-0.200	0.402	1.000

Model 2	*LRGDPP*	*LGFCF*	*LHCI*	*LITI*	*LIFI*	*LIII*	*LIPI*	*LIMI*	*LVAD*	*LEXCR*	*LFDI*	*LINSQ*
LRGDPP	1.000											
LGFCF	0.481	1.000										
LHCI	0.641	0.114	1.000									
LITI	0.107	-0.260	-0.041	1.000								
LIFI	0.500	0.344	-0.092	0.208	1.000							
LIII	0.391	0.130	0.082	0.192	0.209	1.000						
LIPI	0.743	0.274	0.068	0.054	0.046	0.303	1.000					
LIMI	0.810	0.290	0.307	0.112	0.120	0.014	0.229	1.000				
LVAD	0.105	-0.219	0.231	0.248	-0.184	0.147	0.341	0.425	1.000			
LEXCR	0.109	0.317	-0.302	0.156	0.154	0.401	0.469	0.511	-0.138	1.000		
LFDI	0.112	0.090	0.287	-0.030	-0.207	0.052	0.500	0.092	0.172	-0.126	1.000	
LINSQ	0.090	-0.134	-0.063	-0.075	-0.305	0.111	0.357	0.101	-0.301	-0.335	0.141	1.000

Source: Computed by the Researcher using E-views 12

Residual Cross-Section Dependence Tests

When the temporal dimension was smaller than the cross-section dimension (i.e., T=13 <N=15), the Pesaran CD test statistic was used to evaluate cross-section dependency. Since the p-value of the Pesaran CD test statistic for models 3.2 and 3.3 is greater than 0.05, we were unable to rule out the null hypothesis of cross-section independence based on the results shown in Table 4.3. Therefore, we conclude that there are no cross-section dependencies in our panel. This means that we can go on to the following phase of this analysis.

Table 3: Residual Cross-Section Dependence Test of Models 3.2 and 3.3

	Test	**Statistic**	**d.f.**	**Prob.**
Model 1	Breusch-Pagan	29.1012	66	0.2134
	LM	0.83723		0.4123
	Pesaran Scaled	-0.33412		0.9011
	LM			
	Pesaran CD			
Model 2	Breusch-Pagan	34.0591	25	0.1917
	LM	1.21103		0.1033
	Pesaran Scaled	-0.11021		0.7544
	LM			
	Pesaran CD			

Source: Researcher's Calculation using Eviews 12

Validation of System GMM Procedure

A rule of thumb is usually used to assess the process prior to determining the System GMM (GMM-S). To do this, three equations are estimated in dynamic forms: Pool OLS (POLS), Fixed Effect (FE), and First Difference GMM (GMM-FD). Dependent variables with a one-period lag are regarded as independent variables since their coefficients serve as the primary signaling parameter in these equations. The one-period lag coefficient of the dependent variable represents the lower bound in the FE model, while the one-period lag coefficient of the dependent variable represents the higher bound in the POLS model. The GMM-S is selected because the GMM-FD has a downward bias if the dependent variable's one-period lag coefficient is smaller than the FE's. As the coefficients of LRGDPP (-1) in Models 3.2 and 3.3 are smaller than those of FE, the results in Table 4.4 show that GMM-FD has a downward bias. This is because, for Models 3.2 and 3.3, the coefficients of a period lag of LRGDPP (i.e., LRGDPP (-1)) are smaller than those of FE. The GMM-S is therefore recommended for the analysis in this paper.

Table 4: Validation of System GMM Procedure

	Variable	POLS (Upper Bound)	FE (Lower Bound)	GMM-FD
		Coefficient	Coefficient	Coefficient
Model 1	LRGDPP(-1)	0.649122	0.429113	0.398841
Model 2	LRGDPP(-1)	0.451298	0.339120	0.200154

Source: Researcher's Calculation using Eviews 12

Results of Estimated System GMM Models

The results of the estimated system GMM are summarized on table 4.5.

Table 5: Results of the GMM System Estimation (*T* = 13, *N* = 15)

Dependent Variable: *LRGDPP*		
Variable	**Composite Measure**	**Five Dimensions**
C	-2.299431	1.566634
	(0.3030)	(0.9840)
LRGDPP(-1)	0.826129**	0.387496**
	(0.0021)	(0.0000)
LGFCF	0.423422*	0.206690*
	(0.0423)	(0.0397)
LHCI	0.766681*	0.100126*
	(0.0501)	(0.0462)
LRICI	0.210339*	
	(0.0271)	
LITI		0.282444*
		(0.0107)
LIFI		0.331283*
		(0.0241)
LIII		0.103540*
		(0.0312)
LIPI		0.147634
		(0.2351)
LIMI		0.247497*
		(0.0465)
LVAD	0.249979*	0.243855*
	(0.0301)	(0.0325)
LEXCR	0.424371*	0.310451*
	(0.0338)	(0.0256)
LFDI	0.469280**	0.364820*
	(0.0018)	(0.0171)
LINSQ	0.179076*	0.115822*
	(0.0297)	(0.0461)
Sargan Over-Identification Test	1.5509	1.3640
	(0.5312)	(0.2926)
Durbin-Wu-Hausman Test	0.6844	0.8492

	(0.0304)	(0.0201)
AB Test for AR(1)	5.8883	4.6273
	(0.0043)	(0.0038)
AB Test for AR(2)	0.7856	0.7528
	(0.8745)	(0.5219)

NB: ** (*) denotes significance at the 1% (5%) levels.
All figures in Parentheses are the P-values.
The estimation is based on a two-steps System GMM and the instruments used are a period lag difference and a period lag level of independent variables and lag 2 of dependent variables.
Durbin–Wu–Hausman and Sargan Tests are based on asymptotic Chi-square distribution.
Source: Researcher's Calculation

Every regressor in both models satisfies theoretical assumptions, as shown in Table 4.5. Despite the moderate growth rate, the coefficient of a period lag of LRGDPP (i.e., LRGDPP(-1)) is positive and significant, suggesting that economic growth is generally persistent and sustainable across the 15 selected CEN-SAD zone. As a result, the region's future economic growth is significantly and favorably impacted by the CEN-SAD members' prior economic success. According to Adekunle et al. (2022), our results are in agreement with their positive findings.

As expected by theory, gross fixed capital creation (LGFCF) has a favorable and considerable impact on the economic growth of the chosen CEN-SAD countries. As a result, an increase in LGFCF will boost CEN-SAD economic growth and vice versa, provided that all other factors remain same. According to the strength of the association, regional economic growth in the CEN-SAD is expected to be impacted in proportion to an increase in LGFCF, and vice versa. It is important to remember that any policy change that affects the CEN-SAD area's gross fixed capital creation would have an effect on the economic growth of the region. Additionally, the human capital index (LHCI), a stand-in for human capital, has a significant impact on CEN-SAD economic growth, as expected. An increase in the human capital index score will lead to higher economic growth, assuming all other parameters stay the same.

According to Table 4.5's Column 2, the results show that the economic growth of the chosen CEN-SAD nations is positively and significantly impacted by composite regional integration (LRICI), which encompasses the five dimensions of regional integration. The substantial impact indicates that CEN-SAD nations gain a great deal by bolstering their regional economic cooperation, and the positive correlation between composite regional integration and economic growth is consistent with theoretical assumptions. This result is in contrast to that of Adekunle et al. (2022), who discovered a marginally beneficial effect of composite regional integration on ECOWAS economic development.

In reference to the five facets of regional integration, our findings (found in Table 4.5, Column 3) demonstrate that integration in infrastructure, trade, finance, and free movement of people considerably boosts economic growth in the chosen CEN-SAD nations. On the other hand, productive integration has little effect on regional economic growth. Further evidence is presented about the beneficial effects of integration on infrastructure, free movement of people, and productivity, even if our findings on trade and financial integration are consistent with those of Adekunle et al. (2022). The result is that to support the economic growth of the CEN-SAD member countries, additional measures are required to fortify regional integration in trade, banking, infrastructure, and the free movement of people. The results also show that trade, finance, infrastructure, and free movement of people are the main sources of the benefits that the CEN-SAD countries derive from regional integration.

The exchange rate (LEXCR), institutional quality (LINSQ), and domestic value-added (LVAD), among other regressors in Model 2, all kept their coefficient signs in Model 3.3. As expected by theory, the results show that domestic value-added has a considerable and positive impact on the economic growth of CEN-SAD members, and that any change in domestic value-added results in a significant change in the economic growth of CEN-SAD

members. Therefore, a rise in domestic valued-added will have a significant effect on the economic growth of the CEN-SAD region.

According to the theoretical presumptions, currency rate devaluation or depreciation promotes economic growth in the chosen CEN-SAD countries since the exchange rate plays a major role in economic growth. Additionally, our results show that FDI has a positive and noteworthy effect on the economic growth of the chosen CEN-SAD countries. Therefore, attracting foreign direct investment should be at the core of CEN-SAD nations' growth policies, in addition to enhancing the regional integration of its members. The region may have significant economic growth if CEN-SAD countries have robust institutions, as shown by the positive and statistically significant coefficient of institutional quality (LINSQ).

Based on the findings of the estimated models in Table 4.5, the hypotheses developed in Chapter One to direct the investigation are examined in this section. First, we reiterate the following hypotheses:

1. H0: Economic growth (real gross domestic product) in CEN-SAD nations is not significantly impacted by regional integration (composite regional integration index).
2. H0: Economic growth (real gross domestic product) in CEN-SAD nations is not significantly impacted by trade integration (trade integration index) or financial integration (financial integration index).
3. H0: Economic growth (real gross domestic product) in CEN-SAD countries is not substantially impacted by integration in infrastructure, production, and population movement.

The estimation findings in Table 4.5 can be used to test the aforementioned hypotheses. The composite regional integration (LRICI) coefficient is positive and statistically significant at the 5% level, as shown in Table 4.5. Therefore, we reject the null hypothesis and come to the conclusion that regional integration has a considerable impact on the economic growth of CEN-SAD countries, as measured by its composite index.

We use the coefficients of the integration index in infrastructure, productivity, trade, finance, and free movement of people in Model 3.3, Column 3 of Table 5 for the second and third hypotheses. The findings show that, of these five integration dimensions, all but productive integration have coefficients that are statistically significant at the 5% level. Therefore, we reject the null hypotheses and come to the conclusion that the economic growth of CEN-SAD countries is considerably influenced by integration in trade, banking, infrastructure, and free movement of people.

This study looks at how regional integration affects the economic growth of the chosen CEN-SAD members. Finding the effects of composite regional integration (as measured by the composite regional integration index) on the following five dimensions—trade, financial, free movement of people, regional infrastructure, and productive—was the main objective of the study. The study also examined the precise effects of infrastructure, trade, finance, free movement of people, and productive integration on economic growth. The study covered variables such as gross fixed capital formation, the human capital index, foreign direct investment, exchange rates, domestic value-added, and institutional quality. While Model 3.2 estimated aggregate regional integration in five dimensions (composite regional integration index) in accordance with the literature and the control variables, Model 3.3 substituted integration in five specific dimensions in accordance with the study's primary goals. A panel data with N = 15 and T = 13 members was produced by the study, which involved 15 CEN-SAD members who were chosen and took place between 2010 and 2023. To ensure the robustness and dependability of the estimations, the System GMM model framework was employed. Estimating the impact of regional integration on the economic growth of CEN-SAD countries yielded some intriguing findings.

First, the results show that the economic growth of CEN-SAD countries is significantly influenced by regional integration across five dimensions (composite regional integration index). The findings of Kamau (2010), Bong and Premaratne (2018), Park and Claveria (2018), who found a significant and positive impact of regional integration in 156 countries, Tinta et al. (2018), who concluded that regional integration could boost the economic potential of ECOWAS members, and Kamau (2010), who confirmed a significant positive relationship between regional integration and economic growth in COMESA, EAC, and SADC, are all supported by our findings. De Melo et al. (1993), Landau (1995), Vanhoudt (1999), Badinger (2001), TeVelde (2008), Adekunle, et al. (2022), and others were unable to demonstrate the benefits of regional integration agreements in their separate case studies, but our results disprove their findings.

Second, the results show that, in line with theoretical assumptions, integration on other dimensions, such as trade, banking, infrastructure, and free movement of people, has a mainly positive impact on the economic growth of CEN-SAD nations, with the exception of productive integration. Although our results on trade and financial integration align with those of Adekunle et al. (2022), further proof is provided on the positive impacts of integration on productivity, infrastructure, and free movement of people. Therefore, further work is needed to enhance regional integration in infrastructure, trade, finance, and free movement of people in order to boost the economic growth of the CEN-SAD member nations. The result also implies that trade, finance, infrastructure, and free movement of people are the main areas where the CEN-SAD countries stand to gain from regional integration. Given that historical evidence indicates that the majority of CEN-SAD nations have demonstrated a significant level of integration in these four dimensions, this result is not surprising. Furthermore, our results support the conclusions of the majority of earlier research on how trade and financial integration affect economic expansion. For instance, Kamau (2010) discovered that trade and economic integration have a significant and favorable impact on the economic growth of COMESA, EAC, and SADC. Our results, however, contradict those of Park and Claveria (2018), who found that financial openness and trade control are essential for enhancing the development impact of regional integration in the 156 countries that were sampled; Tinta et al. (2018) also came to the conclusion that international trade is not the best way for ECOWAS countries to increase economic growth.

Additionally, Levine and Renelt (1992), Dollar (1992), Barro and Sala-I-Martin (1995), Sachs and Warner (1995), Edwards (1998), and Greenaway et al. (1998) all support our findings regarding trade integration and economic growth by demonstrating that trade distortions brought on by government intervention resulted in low growth rates. By coming to the conclusion that trade promotion is the key to economic growth, Haveman et al. (1998), Frankel and Romer (1999), Rodriguez and Rodrik (2000), Noguer and Siscart (2005), Baldwin (2008), Nuh (2011), Adom (2012), Tahir and Khan (2014), Hubert and Satoshi (2016), Arunnan, Abu and Puah (2016), and Calderon and Cantu (2019) all backed up the trade-led growth hypotheses. Our findings are supported by numerous earlier research that documented the connection between financial integration and economic growth. One of the most important and prominent studies to indicate a favorable and significant association between financial integration and economic growth is Quinn (1997). Our findings were supported by other studies, including those by Edison et al. (2002), Brezigar-Masten et al. (2008), Osada and Saito (2010), Schularick and Steger (2010), Juraev (2013), Saafi et al. (2016), Kouki and Rezgui (2017), and Hong Vo et al. (2020). In contrast to our findings, Rodrik (1998) did not uncover any indication of a major impact of capital account liberalization on economic development.

Furthermore, in accordance with the theoretical paradigm, which highlights human and physical capital as the primary drivers of economic growth, our research shows that gross fixed capital formation and human capital significantly boost the economic growth of CEN-SAD members. This result is in line with Tahir and Khan's (2014) finding that human and

physical capital are important factors in promoting economic growth. Additionally, the findings demonstrate that the exchange rate and foreign direct investment have a considerable and favorable impact on the economic growth of CEN-SAD nations. The results support the positive relationship between foreign direct investment and economic growth, as reported by Torstensson (1999), Osada and Saito (2010), Muriuki and Kosimbei (2015), Park and Claveria (2018), Nuh (2011), and Ezzeddine and Hammami (2017). Rodriguez and Rodrik's (2000) findings on the connection between the exchange rate and economic development corroborate ours. Our results, however, contradict those of Muriuki and Kosimbei (2015), who found a substantial negative association between the exchange rate and the growth of the gross domestic product. Even though the majority of CEN-SAD countries appear to have weak institutions, as seen by their low average score, we also discovered that institutional quality has a considerable impact on economic growth throughout the chosen CEN-SAD countries. In addition to other studies who have experimentally confirmed that strong institutions are required to maximize the growth benefits of regional integration (Bong & Premaratne, 2018) and (Park & Claveria, 2018), our findings contradict the findings provided by Edison et al. (2002).

CONCLUSION

The development literature has extensively documented the growth effect of regional integration. On the other hand, economic development has continued to be a major issue for modern economies, especially those of rising nations. This study examined how regional integration affected the economic growth of CEN-SAD countries between 2010 and 2023. In addition to utilizing the composite measure of integration to analyze the effect of regional integration on the economic growth of CEN-SAD nations, we also looked at the effects of regional integration in five distinct areas: infrastructure, trade, finance, productivity, and free movement of people. This study used an Instrumental Variable (IV) regression based on the Dynamic Panel Data (DPD) method, specifically within the framework of the Generalised Method of Moments (GMM-SYS), in light of the potential issues that include cross-sectional dependence among countries, serial correlation of the error term, and—above all—the issue of identification and endogenous regressors that characterize some weak panel data regression methods like the Pool Mean Group (PMG), Fixed Effect (FE), and Random Effect (RE).

The findings indicate a significant correlation between the economic growth of CEN-SAD nations and regional integration in composite indicators. It's interesting to note that, aside from productive integration, other particular dimensions such as trade, finance, infrastructure, and free movement of people significantly boost the economic growth of the chosen CEN-SAD countries. This suggests that CEN-SAD countries benefit from intense integration in these areas. Gross fixed capital formation, human capital, local value-added, foreign direct investment, and currency rates are further important factors that contribute to economic growth in the CEN-SAD region. Therefore, we draw the conclusion that CEN-SAD countries benefit from regional integration, but that the benefits increase when factors like trade, finance, infrastructure, and free movement of people are given more attention. Regarding regional economic growth, this finding has significant policy ramifications for the CEN-SAD's regional integration initiatives.

This study suggests that CEN-SAD countries should increase their regional integration because it has a good effect on economic growth. Enhancing infrastructure, trade, finance, and free movement of people should be the main priorities of policymakers. While financial integration necessitates regional currency convertibility, trade integration can be enhanced by fully implementing the African Continental Free Trade Area (AfCFTA). To increase the interchange of human capital, shared infrastructure, such as roads and seaports, should be

coordinated and freedom of movement encouraged. Growth policies should prioritize attracting foreign direct investment, which should be bolstered by stable environments and corporate incentives. To increase exports and economic growth, a managed-floating exchange rate is also recommended.ctitioners, and policymakers to refine and implement the POAC framework more effectively.

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