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Regional Economic Integration and Growth of the African Union: Evidence from the Multi-Dimensional Regional Integration Index

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ABSTRACT

This research investigated the impact of regional trade integration (RTI), regional financial integration (RFI), and multidimensional regional integration (MDRI) on the economic growth of African Union (AU) member countries based on a panel dataset for 2010-2020. The system generalised method of moments (system-GMM) was used. The results revealed that regional trade integration exerted a positive influence, regional financial integration had no significant influence, and multidimensional regional integration had a negative impact on economic growth. Finally, from the evidence of this study, it was observed that the control variables had a stronger impact on trade performance than the regional economic integration variables. The study recommends that if the African Union countries remain committed to advancing regional integration, bolstering regional trade agreements (RTAs) and streamlining cross-border trade for the seamless movement of goods and services, the region can anticipate a tangible elevation in its trade performance.

JEL Classification: F10, O40
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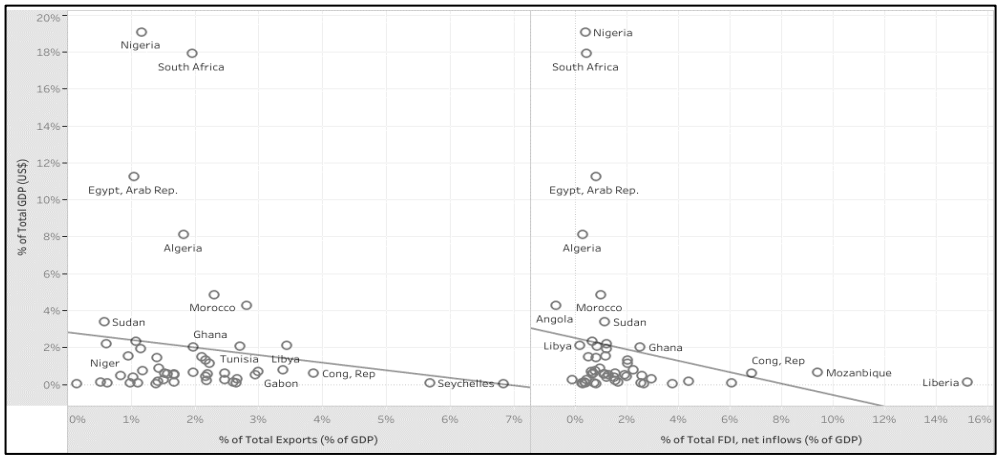
INTRODUCTION

In contemporary economies, regional integration is key to enhancing productivity and promoting specialisation among country members. There is significant concern among policymakers and academics regarding which strategy African countries should adopt to increase regional trade, improve regional finance and boost economic growth (Lee et al., 2017). However, the continent will have to harmonise its trade policies to ensure the integration of African countries into the global economic system. Regional integration is viewed as an important driver of economic growth for African countries (Abegunrin et al., 2020). Integration with the global economy will provide a strong impetus to the expansion of intra-regional trade and formal preferential arrangements. Regional integration can help countries increase the mobility of capital, goods, people, and ideas, which are important elements for the generation of both growth and development, particularly for African countries, where critical resources are either scarce or unavailable. Growth in Africa should be driven by regionalisation, with growth taking the form of regional markets for goods, services, capital, and labour. This approach will create larger and more interesting markets for African and international investors and manufacturers (Baldwin and Venables, 1995; Stevenson et al., 2014; Ganic and Novalic, 2023). Moreover, regional integration as a result of larger market increases and global competitiveness not only leads to an increase in output internally but also creates a larger and expanded market outside the regional bloc (Sideri, 1997; Anyanwu, 2014; Hartwell, 2016). In short, regional integration holds substantial potential not only to stimulate a more resilient and equitable growth but also to foster enhanced financial stability within the African context.

In 2018, the African Union (AU) established a single continental market for products and services known as the African Continental Free Trade Area (AfCFTA) to address trade issues, encourage free mobility and support industrialisation. However, the impact of AfCFTA has been limited due to underlying structural and systemic impediments. Despite numerous initiatives to promote trade integration across the continent, the African countries continue to face challenges in achieving seamless intra-regional trade, such as weak infrastructure, trade barriers, policy fragmentation, and limited value addition in export sectors, which prevent the AfCFTA from realising its full economic potential (Obeng-Odoom, 2020; Kouty, 2021).

Intra-African trade accounts for less than 20% of the total trade on the continent. This is much lower than the intra-regional trade levels of Europe (about 70%) and Asia (nearly 50%). Infrastructure deficiencies: poor transportation networks, insufficient energy sources, and limited digital connectivity all restrict the efficient flow of products and services across borders. Non-tariff barriers Persistent include cumbersome customs procedures, technical impediments and uneven trade policies, which raise transaction costs and delay businesses. Policy Fragmentation: The efficacy of regional trade agreements is compromised by the absence of uniform trade policies and standards, economic diversification and value addition among African union member states. The advantages of regional trade integration are limited in many African economies because they mostly export raw materials rather than items with added value. Institutional and Ability Limitations: The successful operationalisation of trade integration measures, such as the AfCFTA, is impeded by weak institutional frameworks and low implementation ability. Geopolitical and Security Issues: Efforts to improve trade connectivity are hampered by border disputes, political unrest, and conflicts in several parts of the continent (Cofelice, 2018).

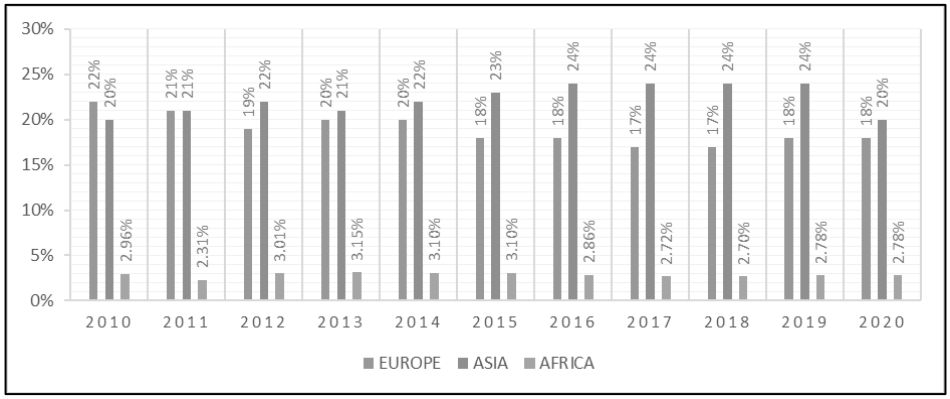
Figure 1 shows the scatter plots between gross domestic product (GDP) and exports (EXPs) as well as GDP and foreign direct investments (FDIs) in Africa between 2010-2020. The scatter plots show that there was a negative correlation between the variables of interest, GDP and FDI, and the GDP and EXPs graphs exhibited a more pronounced linear trend. This means that increases in EXPs and FDIs in African countries had an inverse effect on growth rates. Consequently, the diagram highlights that the GDP was not positively impacted by EXPs and FDIs within the African context.



Sources: Author's computation using World Bank data (2023)

Figure 1 Correlation between GDP, EXP, and FDI in the AU between 2010-2020

Figure 2 presents the percentage share of the world GDP held by the European Union (EU) countries, East Asian Community (EACT) countries, and AU countries from 2010 to 2020. Overall, the EACT had the largest share of the world GDP throughout the period, except for 2010, when the EU slightly outpaced the EACT. The EU was the second-largest contributor to the world GDP, while the AU was the smallest contributor. Although there were fluctuations in the figures for all the regions, these fluctuations were around the same percentage. The chart also shows that the AU contributed less than one-fifth of the combined GDP of the EU and EACT.



Sources: Author's computation using World Bank data (2023)

Figure 2 Percentage share of the world's GDP by region

The fundamental concern of researchers concerning trade integration in the African Union is the continuous failure to create a seamless intra-African trade, despite the establishment of frameworks for the AfCFTA. The main obstacles on the continent are poor intra-African trade, NTBs, policy fragmentation, institutional shortcomings, and geopolitical instability. To fully realise the potential of the AfCFTA and create sustained growth across the continent, it is necessary to address these concerns through coordinated policies, infrastructural investments, institutional reforms, and support for value-added industries. Regional trade integration (RTI) is a powerful driver of economic growth, primarily through resource efficiency, knowledge diffusion, and economic agglomeration. However, its benefits are contingent on the design of trade agreements, complementary domestic policies, and the institutional capacities of member states. The current trend of the African continent in harmonising trade barriers to ease the flow of goods and services remains uncertain compared to other regional trade integration trends in the EU and Asia.

The objective of this study was to investigate the impact of regional trade integration, regional financial integration, and multi-dimensional regional integration on the economic growth of African Union member countries. Future research should incorporate the nonlinear effects, dynamic impacts, and interplay between regional trade integration and global trade dynamics.

LITERATURE REVIEW

Some of the economic theories underpinning regional trade integration can be traced through the work of Solow (1956), whose neoclassical growth theory explains how trade liberalisation, a key aspect of regional trade integration, enhances resource allocation and capital accumulation to drive economic growth. However, the effects on trade in this framework are considered exogenous and temporary. Meanwhile, Krugman (1991), in a new economic geography theory, explored the spatial impacts of regional trade integration, focusing on agglomeration and regional specialisation. Lower trade costs encourage industrial clustering, increasing productivity and competitiveness within integrated regions. Baldwin and Venables (1995) traced the channels of economic growth through regional trade integration and emphasised how market size and economies of scale and larger markets created through regional trade integration allow firms to exploit economies of scale, lowering costs and spurring growth. Their theoretical framework explored the mechanisms through which integration leads to productivity improvements, industrial development, and long-term economic benefits. Furthermore, Mundell (1961) explained how regional trade integration encourages factor mobility, improving resource allocation. The removal of barriers to labour and capital movement enables the efficient utilisation of resources across borders. These insights have been foundational for understanding how regional trade and monetary integration should function to maximise economic benefits. The paper has inspired extensive research into the interaction between trade agreements, labour mobility, and economic stability in integrated regions.

Frank and Amir (2021) investigated the impact of regional trade integration on economic growth within the East African Community (EAC) using panel data from 1988-2017. They found that growth benefitted from the regional trade agreements and increased trade openness (OPENS) of the EAC. Similarly, Bong and Premaratne (2018) examined the effects of regional integration on economic growth in Southeast Asia using data from 1970-2013 and concluded that there was a positive relationship between the two. Similarly, Rahman et al. (2019) analysed economic integration in South Asia from 1980-2015 and demonstrated that it had positive impact on economic growth. Calderón et al. (2020) studied the economic growth of sub-Saharan Africa from 1970-2014 and found that there was a causal relationship between regional trade integration and economic growth.

However, Brian (2021) suggested that financial integration within the East African Community had no significant influence on economic growth in Kenya. Farahane and Heshmati (2020) confirmed that the expansion of EXPs stimulated growth in the Southern African Development Community (SADC). Tinta et al. (2018) found that while international trade is not a primary driver of growth for the Economic Community of West African States (ECOWAS), regional trade integration can enhance regional growth. In addition, Selvarajan and Ab-Rahim (2020) and Hoffmann et al. (2020) showed that a positive relationship existed between financial integration and growth before crises, while Adeyele and Ouedraogo (2019) found that there was a negative association between them in West Africa from 2001-2016. Similarly, Ehigiamusoe and Lean (2019) and Edison et al. (2002) found that financial integration had no significant impact on growth.

Regional Trade Integration and Economic Growth

Francis et al. (2021) examined the effects of regional integration on the economic growth of the East African Community using panel data from 1988-2017. The study estimated an endogenous growth model using feasible generalised least squares and panel-corrected standard error estimators. The results indicated that the regional trade agreements and $OPENS$ of the East African Community enhanced economic growth. In addition, a study by Angkeara and Gamini (2020) examined the impact of regional integration and economic and social factors on economic growth in Southeast Asia using panel data spanning 43 years from 1970-2013. A theoretical framework cross-country growth model using a generalised method of moments (GMM) in the dynamic panel framework was adopted for the data estimation. The findings suggested that regional

integration had a significant effect on economic growth. Further, Muhammad (2020) examined the role of regional economic integration in determining the economic growth of South Asian countries over the period 1980-2015. A panel unit root test, panel cointegration test and correlation causality test were employed to estimate the long-run coefficients and determine the direction of the relationship among the variables. The findings suggested that economic integration led to a significant increase in the economic growth of the South Asian region.

Furthermore, César et al. (2020) examined the effects of regional trade integration on the economic growth of Sub-Saharan Africa. The study used an unbalanced panel data on 174 countries from 1970-2014 and employed analytical methods such as the Herfindahl-Hirschman index and system generalised method of moments (system-GMM). The finding from the analysis suggested that there was a causal indication that regional trade integration promoted economic growth. In line with the studies of Francis et al. (2021), Angkeara and Gamini (2020), Muhammad (2020), and Caser et al. (2020), it was discovered that regional economic integration fostered the economic growth of the participating countries. Additionally, Pei-Ling et al. (2017) investigated the dynamic relationship between financial integration and economic growth. Home bias, which is the tendency to over-invest in domestic stock markets, is often used as an indicator of the level of financial integration. The persistence of home bias indicates the presence of international market frictions. A high degree of home bias suggests that the national stock market is not fully integrated with global capital markets, implying a slower pace of economic growth. A sample of 25 countries spanning 14 years from 2001-2014 was used for the robustness testing. It was found that home bias, variability in real exchange rates, and government openness were crucial stimuli to economic growth, of which home bias was one of the key stimuli.

However, in a contrasting study by Brian (2021) to investigate the pros and cons of regional integration in the East African Community on the economic growth of Kenya, it was discovered that financial integration in the East African Community had no substantial impact on the growth of the region. In addition, Matias and Almas (2020) did an empirical examination of the assumption that trade was an engine of growth in the SADC, which was the main objective of its formation. The study was undertaken using panel data from the region for 2005-2017. The findings suggested that EXP expansion stimulated growth. In addition, Almame et al. (2018) examined whether ECOWAS countries should develop policy approaches to increase international trade by enhancing openness. A model of estimation of panel fixed effects was used for data spanning the period 1995-2012. The study suggested that international trade was not a better way for ECOWAS countries to enhance economic growth but that regional trade integration among the countries can be the apparatus for regional growth.

Regional Financial Integration and Economic Growth

In examining Asia's shift towards regional integration and how it affects their economic growth, Sonia and Rossazana (2020) used the system-GMM to analyse panel data from 1980-1995. The empirical finding suggested a significant correlation between financial growth and pre-crises, but the impact waned in the post-crises and the overall period. Furthermore, Hoffmann et al. (2020) examined financial integration by using composite indicators in the Euro area. Panel data on price and the quantity-based financial integration on composite indicators from 1995-2019 were employed and analysed using probability integral transform, time varying benchmark, and min-max scaling. From the panel regressions for 19 member states, it was found that there was a significant positive correlation between financial integration and economic growth. Rizad et al. (2020) analysed the determinant of international financial integration in the ASEAN-5 countries from 2008-2017 using an equity-based measurement to calculate the international integration. The study utilised GMM based on dynamic panel data. The results indicated that all the variables significantly affected international financial integration in the ASEAN-5, except for domestic credit and exchange rate. Meanwhile, market capitalisation, $OPENS$, and GDP per capita ($GDPPC$) positively correlated with financial integration, while inflation ($INFL$) had a negative correlation with international financial integration.

In addition, Angkeara and Gamini (2019) investigated whether there was a relationship between financial integration and economic growth in Southeast Asia from 1993-2013. The generalised method of moments (GMM) in the dynamic panel estimation framework was used for the analysis, such as $INFL$, initial income, initial schooling, financial development, $OPENS$, corruption, and financial crisis. The estimated generalised least squares was also employed to examine the consistency of the GMM model. The results

found that financial integration had a significant positive effect on economic growth in Southeast Asia. The findings suggested that increasing financial integration, including more investments and the efficient allocation of capital, could improve the productive capacity of the economy, thus enhancing economic growth in the region. Moreover, Chin et al. (2010) examined the international financial linkages of the ASEAN-5 countries using pre- and post-crises data. The results of the Johansen co-integration test showed that there was no correlation among the ASEAN currencies post-crash. The Singapore dollar may be a possible candidate for a common currency for ASEAN. The Indonesian rupiah is Granger-caused by the Thai baht and Malaysian ringgit. The result of the Granger causality test for the first model showed that ASEAN exchange rate markets are causally correlated. Hence, governments in ASEAN economies should try to improve their fundamentals, proceed carefully with financial liberalisation and remove capital controls. Other studies considered the contribution of the degree of openness to the expansion of growth (Idris et al., 2018; Ali et al., 2021; Ali et al., 2022)

In contrast to the studies that supported a positive relationship between regional financial integration and economic growth, Iyewumi and Idrissa (2019) investigated the impact of regional financial integration and governance quality on economic growth in West Africa from 2001-2016. The study used the system-GMM, and the estimated result indicated that financial integration and governance quality did not support the growth of ECOWAS. Hence, a negative correlation was found. However, Kizito and Hooi (2019) supported Iyewumi and Idrissa (2019), but also explained that the adoption of a different currency had an insignificant effect on economic growth, which indicated that the regional financial integration did not have a positive impact on economic growth. Also, Hali et al. (2002) investigated the impact of international financial integration on economic growth and assessment. Using a wide array of measures of international financial integration for 57 countries from 1980-2000, the study employed a two-stage least squares instrumental variable estimator and GMM to analyse the correlations in the model. From the results, it was concluded that the null hypothesis could not be rejected, and therefore, international financial integration did not accelerate economic growth even when particular economic, financial, institutional, and policy characteristics were controlled.

METHODOLOGY

This section provides an intricate explanation of the formulation of the African regional trade integration index ($ARTII$), African regional financial integration index ($ARFII$), and the MDRI index ($MDRII$) designed to encompass the multifaceted aspects of regional integration. The approach drew inspiration from the methodology outlined by Park and Claveria (2018). Eight indicators were used to assess distinct dimensions of the regional trade integration and regional financial integration. The indices spanned 49 countries within the AU from 2010 to 2020, utilising a well-balanced panel data framework. The GMM represents a versatile technique that is employed for estimating parameters in statistical models. This method utilizes moment conditions that depend on both model parameters and data, with the expectation that they converge to zero, given the true parameter values. GMM is notably a dynamic panel data estimation technique. In the case of differences in GMM estimations, all the predictors were subjected to differencing to eliminate fixed effects. Nevertheless, the initial difference possessed a drawback as it involved subtracting the previous observation from the current one, thereby amplifying discrepancies in the unbalanced panel data (Arellano and Bond, 1991). In addition, to tackle endogeneity issues, the system-GMM approach was introduced by Blundell and Bond (1998). The method rectified endogeneity by incorporating additional instruments to enhance the efficiency of the model. These instruments were transformed to become uncorrelated (exogenous) with fixed effects, leading to the formulation of two equations: the original equation and the transformed equation. Furthermore, the technique employed orthogonal deviations, eschewing the subtraction of the previous observation from the current one. Instead, it subtracted the average of all the accessible observations of a variable, thus minimising data loss (Arellano and Bover, 1995). The empirical model specifications were as follows:

$$LGDPPC_{ijt} = \alpha LGDPPC_{ij-1} + \beta_1 LGCF_{ijt} + \beta_2 INFL_{ijt} + \beta_3 GER_{ijt} + \beta_4 LFDI_{ijt} + \beta_5 LEXP_{ijt} + \beta_6 LUME_{ijt} + \beta_7 LMDRII_{ijt} + \beta_8 LARTII + \beta_9 LARFII + \varepsilon_{ijt} \quad (1)$$

$$LGDPPC_{ijt} = \alpha LGDPPC_{ij-1} + \beta_1 LGCF_{ijt} + \beta_2 INFL_{ijt} + \beta_3 GER_{ijt} + \beta_4 LFDI_{ijt} + \beta_5 LEXP_{ijt} + \beta_6 LUME_{ijt} + \beta_7 LM2_{ijt} + \beta_8 LMDRII_{ijt} + \beta_9 LARTII + \beta_{10} LARFII + \varepsilon_{ijt} \quad (2)$$

$$LGDPPC_{ijt} = \alpha LGDPPC_{ij-1} + \beta_1 LGCF_{ijt} + \beta_2 INFL_{ijt} + \beta_3 LGER_{ijt} + \beta_4 LFDI_{ijt} + \beta_5 LEXP_{ijt} + \beta_6 LUME_{ijt} + \beta_7 LM2_{ijt} + \beta_8 LOPENS_{ijt} + \beta_9 LMDRII_{ijt} + \beta_{10} LARTII + \beta_{11} LARFII + \varepsilon_{ijt} \quad (3)$$

where, $LGDPPC_{ijt}$ is the logarithm of GDP per capita, $LGCF_{ijt}$ is the logarithm of the gross capital formation (GCF) (% of GDP), $INFL_{ijt}$ is the INFL as a percentage of change, $LGER_{ijt}$ is the logarithm of the government's effectiveness (GER), $LFDI_{ijt}$ is the logarithm of the FDI inflows (% of GDP), $LEXP_{ijt}$ is the logarithm of the EXP of goods and services (% of GDP), $LUME_{ijt}$ is the log of unemployment (UME), $LM2_{ijt}$ is the log of broad money (% of GDP), $LOPENS_{ijt}$ is the logarithm of OPENS, $LARTII$ is the logarithm of the ARTII, $LARFII$ is the logarithm of the ARFII, and $LMDRII_{ijt}$ is the log of the MDRII over a given time period (*t*). Meanwhile, $\beta_1 - \beta_{13}$are the coefficients of variables 1-11, $\mathcal{E}_{ijt}$ is the error term between the countries, with *i* and *j* at $t, i - j$, and the cross-sectional dimension between the countries *i* and *j* (*i* and *j*,……, *N*), and *t* is the time series (*=1*,…..*T*). The control variables were introduced to determine if OPENS and financial openness ($M2$) still affected trade performance after examining their effects on the dependent variable.

RESULTS AND DISCUSSION

This study utilised the descriptive statistics presented in Table 1. It could be inferred that the average $GDPPC$ for African countries between 2010 and 2020 was calculated as 2487.74. The accompanying standard deviation of 2845.37 indicated that the observed $GDPPC$ values were characterised by a certain level of variability, implying that they were not consistently clustered around the mean value of 2487.74. The gross domestic product per capita ($GDPPC$) had a minimum value of 202.37, which was obtained in Burundi in 2020, and a maximum value of 14232.60 which was obtained in Seychelles in 2019. Similarly, all the control variables such as the FDI, GCF, $INFL$, GER, EXP, and UME were not volatile and did not cluster around the mean across all the countries and variables. The broad money as a percentage of the average value of the GDP ($M2$) for African countries was 40.85, and it was accompanied by a standard deviation of 30.35. This suggests that the observations exhibited volatility, and lacked a consistent clustering around the mean of 40.85. On examining the broad money as a percentage of the GDP ($M2$) over the study period, the minimum value of 10.10 was recorded in the Democratic Republic of Congo in 2011, while the maximum value of 251.61 was observed in Libya in 2016. Turning to $OPENS$ among the African countries, the mean stood at 11485.23, with a corresponding standard deviation of 19287.48. This indicates that the observed data points demonstrated volatility, deviating from a uniform clustering around the mean of 11485.23. The openness ($OPENS$) of the African economies over the period of the study had a minimum value of 114.18, which was obtained in Sao Tome and Principle in 2019, and a maximum value of 126002.6, which was obtained in South Africa in 2011.

The $MDRII$ for African countries displayed an average value of 0.29, along with a standard deviation of 0.17. This indicates that the observed data points exhibited volatility and lacked a consistent clustering around the mean of 0.29. Over the study duration, the $MDRII$ attained its lowest value of 0.05 in Mauritius in 2012, while its highest value of 1.06 was recorded in Nigeria in 2017. Shifting to the $ARFII$, the African countries had a mean value of 0.17, accompanied by a standard deviation of 0.16. This suggests that the observed data points tended to cluster around the mean of 0.17. Over the study period, the $ARFII$ reached its minimum value of 0.003 in Morocco in 2017, while its maximum value of 0.92 was registered in Mauritania in 2019. The mean $ARFII$, for African countries stood at 0.170, but with a distinct standard deviation of 0.1038693. This implies that the observed data points demonstrated volatility and lacked consistent clustering around the mean of 0.17. Over the study period, the $ARFII$ recorded its lowest value of 0.03 in Algeria in 2019, while its highest value of 0.59 was observed in Eswatini in 2016.

Table 1 Descriptive statistics

Variables	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
GDPPC	539	2487.74	2845.37	202.37	14232.16
GCF	539	25.15	10.00	4.70	79.40
INFL	539	6.19	9.28	4.29	150.32
GER	539	7.66	19.72	0.94	84.13
FDI	539	720.71	1493.54	1.22	9736.29
EXP	539	2.35	3.25	0.87	2.06
UME	539	8.80	7.138	0.32	29.22
M2	539	40.85	30.35	10.10	251.61
OPENS	539	11485.23	19287.48	114.18	126002.6
MDRII	539	0.29	0.17	0.05	1.06
ARTII	539	0.17	0.16	0.003	0.92
ARFII	539	0.24	0.10	0.03	0.59

Source: Author's computation using Stata 16 (2023)

Correlation Analysis

Based on the results of the correlation analysis in Table 2, all the variables did not highly correlated with each other. The gross capital formation (GCF) fairly correlated with the GER, FDI, and $M2$ at 16%, 16% and 19%, respectively. However, all the remaining variables did not correlate with the GCF. Equally, the $INFL$ had a low correlation of 11% with $M2$ only. Similarly, the GER also fairly correlated with $M2$ and $OPENS$ with correlations of 34% and 25%, respectively, whereas the other variables did not correlate with the GER. In addition, EXP only correlated with $M2$ with a negative correlation of 15%. Likewise, $M2$ also fairly correlated with $OPENS$ and $MDRII$ with 37% and 16%, respectively. Furthermore, the other variables in the models did not correlate with $M2$. However, $M2$ moderately correlated with $OPENS$ at 37%, whereas $OPENS$ strongly correlated with $MDRII$ at 77%. Meanwhile, the other regional integration variables, such as $ARTII$ and $ARFII$, did not correlate well with any of the variables.

Table 2 Results of the correlation analysis

	GCF	*INFL*	*GER*	*FDI*	*EXP*	*UME*	*M2*	*OPENS*	*MDRII*	*ARTII*
GCF	1									
INFL	0.03	1								
GER	0.12	-0.01	1							
FDI	0.16	0.04	-.0.07	1						
EXP	-0.01	-0.06	-0.10	0.09	1					
UME	-0.03	0.07	-0.05	0.05	0.03	1				
M2	0.19	0.11	0.34	-0.05	-0.15	-0.01	1			
OPENS	-0.01	0.00	0.25	-0.09	-0.09	0.01	0.37	1		
MDRII	-0.05	-0.01	0.01	-0.07	-0.07	-0.00	0.16	0.77	1	
ARTII	0.04	-0.04	0.07	0.06	-0.02	-0.04	0.03	0.01	-0.02	1
ARFII	0.02	-0.07	0.12	0.02	-0.01	0.09	0.01	0.03	0.07	0.04

Source: Author's computation using Stata 16 (2023)

The results of the system-GMM for regional integration and economic growth are presented in Tables 3, 4, and 5, with five different alternatives in each table. Model 1, represented by Column 1, includes only the control variables. Model 2, depicted in Column 2, incorporates the overall multi-dimensional regional integration index ($LMDRII$). Moving to Model 3, seen in Column 3, both the two-dimensional sub-indices of regional trade integration ($LARTII$) and regional financial integration ($LARFII$) are simultaneously introduced. Subsequently, in Models 4 and 5, displayed in Columns 4 and 5, respectively, the two dimensions of the sub-indices are introduced separately. On analysing Table 3, the results of the baseline Model 1 (Column 1) encompasses the control variables alone. Meanwhile, Columns 2, 3, 4, and 5 represent the augmented models, each involving a measure of regional integration and control of $M2$ and $OPENS$ variables.

Table 1 Results of the system-GMM estimation baseline

Dependent Variable [$GDPPC$]	[1]	[2]	[3]	[4]	[5]
$LGDPPC.L1$	0.9926***	0.9926***	0.9938***	0.9926***	0.9926***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$LGCF$	0.0771*	0.0848*	0.0783*	0.0745*	0.0798*
	(0.065)	(0.067)	(0.078)	(0.078)	(0.066)
$INFL$	-0.00008***	-0.0008***	-0.00009***	-0.00008***	-0.00008***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$LGER$	0.0103**	0.0115**	0.0092*	0.0102**	0.0104**
	(0.041)	(0.021)	(0.081)	(0.041)	(0.048)
$LFDI$	-0.0054**	-0.0071**	-0.0057***	-0.0054**	-0.0053**
	(0.011)	(0.011)	(0.003)	(0.011)	(0.011)
$LEXP$	0.0096***	0.0109***	0.0115***	0.0097***	0.0096***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$LUME$	0.0034**	0.0047***	0.0023**	0.0034**	0.0034**
	(0.026)	(0.007)	(0.030)	(0.027)	(0.033)
$LMDRII$		-0.0030			
		(0.587)			
$LARTII$			0.0023*	0.0018	
			(0.094)	(0.362)	
$LAFTII$			-0.0005		-0.0011
			(0.896)		(0.809)
Constant	-0.4351*	-0.4912*	-0.5331**	-0.4975**	-0.4511*
	(0.057)	(0.051)	(0.042)	(0.046)	(0.061)
Observation	364	364	364	364	364
F-statistics	1.3150***	1.2106***	1.0306***	1.3206***	1.3006***
(p-values)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. of Countries	49	49	49	49	49
No. of Instruments	27	28	40	28	28
AR(2) test p-value	0.322	0.323	0.322	0.322	0.341
Hansen test p-value	0.119	0.155	0.312	0.105	0.124

Note: p-values in parentheses. ***p<0.01, **<0.05, and *<0.1 indicate significance at 1%, 5%, and 10%, respectively.
Source: Author's computation using Stata 16 (2023)

Model 2 indicates that upon introducing the MDRII into the baseline model, the specifications were $INFL$ (-0.0008), EXP (0.0109), UME (0.0047), GER (0.0115), and FDI (-0.0071), while the GCF remained significant. Other studies reported similar findings (Diellza, 2018; Islam and James, 2019; Trang et al., 2019; Pejman and Andisheh, 2020; Michael *et al*., 2020; Inekwe *et al*., 2021; Aslan and Altinoz, 2021; Nguyen, 2021). However, the $LMDRII$ exhibited negativity and insignificance across all levels. Notably, a specific insight emerged: a 1% change in the $MDRII$ corresponded to a 0.97% decrease in economic growth. Upon simultaneously introducing the $LARTII$ and $LARFII$ into the model, as seen in Column 3, the coefficients of the lag of the dependent variables of $GDPPC$ (0.9938), $INFL$ (-0.00009), FDI (-0.0057), and EXP (0.0115) were significant at the level of 1%. Unemployment (UME) (0.0023) demonstrated a statistical significance at the level of 5% in addition to the other variables, namely GCF (0.0783), and GER (0.0092). However, regional financial integration failed to achieve significance across all levels.

Similarly, when the $LARTII$ and $LARFII$ were entered separately into Models 4 and 5, the regional trade integration (0.0018) in both was statistically insignificant at all levels. This finding was consistent with the study by Almame et al. (2018), where regional financial integration (-0.0011) was also statistically insignificant at all levels, and with the findings of Iyanwumi and Idrissa (2019), Kizito and Hooi (2019), and Hali et al. (2002). The outcomes revealed no significant alterations in the significance of the control variables, with the lag of the dependent variables, $GDPPC$, $INFL$, and EXP, remaining significant at the 1% level. Additionally, the coefficients of GER, FDI, and EXP achieved significance at the 5% level. However, there were slight variations in the magnitude of the impact of the coefficients, with the coefficients in Model 5 being higher than those in Model 4 across all variables. Notably, the results obtained for Models 4 and 5 consistently demonstrated that only the lags of regional trade integration and regional financial integration were statistically insignificant across all models.

Robustness Checks

The first robustness test involved enhancing the baseline models with the $M2$ variable to ascertain whether there would be a significant divergence in the outcomes from those presented in the baseline models in Table 4. The findings revealed that with the augmentation of the baseline models by the $M2$ variable, regional trade integration became statistically insignificant across all the models. Simultaneously, regional financial

integration had a negative and significant impact on the economic growth of the African countries. However, upon introducing $M2$, the impact of regional trade integration took on a negative and statistically significant character across the models. Conversely, the impact of regional financial integration became insignificant in relation to economic growth. Furthermore, $M2$ exhibited negative and statistically significant impacts across all the models. The finding corroborated the evidence of James (2022) and Humaira et al. (2021) for East African countries. Nonetheless, it is noteworthy that the control variables wielded a more significant impact on economic growth compared to the independent variables within the models. Remarkably, the results showed no significant deviation even after the augmentation of the baseline models with the $M2$ variable.

Table 4 Results of the system-GMM estimation with M2 (log) – Robustness Check 1

Dependent Variable [$GDPPC$]					
	[1]	**[2]**	**[3]**	**[4]**	**[5]**
$LGDPPC.L1$	0.9976***	0.9997***	0.9987***	0.9994***	0.9988***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$LGCF$	0.0838*	0.0955**	0.08345*	0.08917**	0.0881**
	(0.041)	(0.026)	(0.058)	(0.028)	(0.048)
$INFL$	-0.00009***	-0.00009***	-0.00009***	-0.0009***	-0.00009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$LGER$	0.0101**	0.0093*	0.0092*	0.0095*	0.0094*
	(0.040)	(0.075)	(0.088)	(0.057)	(0.082)
$LFDI$	-0.0056***	-0.0083***	-0.0059***	-0.0088***	-0.0058***
	(0.007)	(0.004)	(0.003)	(0.002)	(0.004)
$LEXP$	0.0095***	0.0111***	0.0106***	0.0107***	0.0105***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
$LUME$	0.0030*	0.0043**	0.0032**	0.0046**	0.0032**
	(0.051)	(0.021)	(0.045)	(0.019)	(0.047)
$LM2$	-0.0115*	-0.0135*	-0.0116*	-0.0144**	-0.0117*
	(0.081)	(0.060)	(0.088)	(0.030)	(0.088)
$LMDRII$		-0.0043			
		(0.530)			
$LARTII$			0.0021	0.0025*	
			(0.116)	(0.086)	
$LAFTII$			0.0001		-0.0014
			(0.976)		(0.764)
Constant	-0.4565**	-0.5460**	-0.4690*	-0.4877**	-0.5015**
	(0.042)	(0.020)	(0.053)	(0.026)	(0.041)
Observation	356	356	356	356	356
No. of Countries	48	48	48	48	48
F-statistics	1.8506		1.1906***	0.1490***	1.2406***
(p-value)	0.000		(0.053)	(0.000)	(0.000)
No. of Instruments	28	29	30	40	29
AR(2) test p-value	0.308	0.286	0.316	0.292	0.329
Hansen test p-value	0.202	0.176	0.188	0.306	0.194

Note: p-values in parentheses. ***p<0.01, **<0.05, and *<0.1 indicate significance at 1%, 5%, and 10%, respectively.
Source: Author's computation using Stata 16 (2023)

The second robustness examination involved the utilization of $OPENS$, and demonstrated that an increase of 1% in $OPENS$ caused a decrease of 0.09% and 0.15% in economic growth in Models 1 and 5, respectively. This finding was inconsistent with the existing literature. However, in Models 2, 3, and 4, a 1% increase in $OPENS$ increased economic growth by 0.13%, 0.02%, and 0.05%, respectively. This finding was consistent with that of Qunxi et al. (2021) for Kenya and Neddy et al. (2013) for China. Consequently, it was anticipated that increasing $OPENS$ would lead to an increase in the regional trade integration and vice versa. The outcomes in Table 5 revealed that the incorporation of $OPENS$ did not modify the impact of regional trade integration and regional financial integration on economic growth within all the specified models. The variables of regional integration did not display positive attributes and were statistically significant, with the exception of regional trade integration, which exhibited negative and statistical significance across all models. This outcome contradicted initial expectations. Consequently, the results indicated that the models had been accurately formulated, thus affirming the robustness of this study and the validity of its implications.

Table 5 Results of the system-GMM estimation with OPENS and M2 (log) – Robustness Check 2

Dependent Variable [$gdppc$]	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**
$LGDPPC.L1$	0.9936***	0.9990***	0.9991***	0.9992***	0.9989***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$LGCF$	0.0957**	0.0999**	0.0924*	0.08097*	0.1027**
	(0.039)	(0.033)	(0.057)	(0.054)	(0.048)
$INFL$	-0.00093***	-0.00091***	-0.00009***	-0.00009***	-0.0009***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
$LGER$	0.0134***	0.0099*	0.0103**	0.0077*	0.0112**
	(0.009)	(0.098)	(0.027)	(0.055)	(0.019)
$LFDI$	-0.0080***	-0.0084***	-0.0079***	-0.0060***	-0.0081***
	(0.005)	(0.006)	(0.008)	(0.003)	(0.006)
$LEXP$	0.0100***	0.0101***	0.0086***	0.0112***	0.0107***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
$LUME$	0.0043**	0.0042**	0.0033*	0.0030*	0.0043**
	(0.018)	(0.023)	(0.053)	(0.063)	(0.020)
$LM2$	-0.0098*	-0.0141**	-0.0169**	-0.0119*	-0.0133**
	(0.081)	(0.036)	(0.014)	(0.069)	(0.040)
$LOPENS$	-0.0008	0.0012	0.0002	0.0005	-0.0013
	(761)	(0.685)	(0.943)	(0.768)	(0.653)
$LMDRII$		-0.0064			
		(0.537)			
$LARTII$			0.0034**	0.0030**	
			(0.026)	(0.043)	
$LAFTII$			-0.0008		-0.0002
			(0.855)		(0.960)
Constant	-0.5110**	-0.5767**	-0.4844*	-0.4594**	-0.5673**
	(0.037)	(0.030)	(0.064)	(0.047)	(0.037)
Observation	356	356	356	356	356
F-statistics	1.3106***	1.1406***	1.3306***	1.506***	1.3506***
(p-value)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. of Countries	48	48	48	48	48
No. of Instruments	29	30	32	41	39
AR(2) test p-value	0.316	0.296	0.304	0.312	0.309
Hansen test p-value	0.164	0.198	0.264	0.216	0.211

Note: p-values in parentheses. ***p<0.01, **<0.05, and *<0.1 indicate significance at 1%, 5%, and 10%, respectively.
Source: Author's computation using Stata 16, 2023.

CONCLUSIONS AND RECOMMENDATIONS

This research explored the impact of regional integration on the economic growth of AU member countries. The investigation utilised the MDRII through panel data encompassing 49 nations from 2010-2020. The study employed econometric techniques such as descriptive statistics, correlation analysis, the system-GMM, and diagnostic tests, including the $AR(2)$ and Hansen tests. The findings revealed that the combined impact of the MDRI, comprising both regional trade integration and regional financial integration on the economic growth of the AU was insignificant. When both regional trade integration and regional financial integration were introduced simultaneously into the models, only regional trade integration had a positive and significant impact on economic growth.

However, upon the inclusion of $M2$, regional trade integration lost its significant impact. Conversely, $OPENS$ had a negative and significant impact on economic growth. Furthermore, the findings from the results regarding regional trade integration indicated a lack of significant impact on economic growth. Nevertheless, when $M2$ and $OPENS$ were introduced into the models, regional trade integration began to have a negative and significant impact on the economic growth of the African countries. Additionally, the study revealed that regional financial integration had no significant influence on the economic growth of the African Union member nations across all the models.

The AU should continue to prioritise efforts towards regional integration by strengthening its regional trade agreements, reducing trade barriers, and enhancing economic cooperation among member countries. The facilitation of cross-border trade, investment, and movement of goods and services will contribute to increased trade performance within the region. In addition, policymakers should focus on fostering an enabling environment for investment and capital formation. This can be achieved through measures such as providing incentives for private sector investments, supporting small and medium-sized enterprises, and improving access to finance for businesses. Increased capital formation will stimulate economic activities, boost

productivity, and contribute to overall growth. Furthermore, effective governance and strong institutions play a crucial role in promoting economic stability and attracting investments. Policymakers should prioritise measures that enhance transparency, accountability, and the rule of law. The strengthening of institutions will create a conducive business environment, promote investor confidence, and foster sustainable economic development.

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