REGIONAL ECONOMIC INTEGRATION AND ITS IMPACT ON INCOME DISTRIBUTION AND THE POVERTY LEVEL: THE CASE OF THE WAEMU ZONE

Claire E. W. Yameogo, Joseph A. Omojolaibi

Department of Economics, University of Lagos, Lagos, Nigeria

Manuscript received: September 12, 2021
Revised version: January 14, 2022

Yameogo C.E.W., Omojolaibi J.A., 2022. Regional economic integration and its impact on income distribution and the poverty level: The case of the WAEMU zone. *Quaestiones Geographicae* 41(2), Bogucki Wydawnictwo Naukowe, Poznań, pp. 21–35. 3 figs, 11 tables.

Abstract: This study investigated the influence of regional economic integration (REI) on poverty reduction and the revenue distribution in the West African Economic and Monetary Union (WAEMU) over the period 1994–2018. The second generation panel unit root tests and the Westerlund panel cointegration test were employed for preliminary analysis. The elasticities of the variables were investigated using the Pooled Mean Group (PMG) approach. The results showed that REI reduced income inequality and increased the poverty rate. Moreover, the causal relationship revealed the presence of a bidirectional relationship between REI and poverty. The feedback causal effect operated between REI and remittances, while unidirectional causality runs from REI to income inequality, from economic growth per capita to income inequality, from remittances to poverty, from the control of corruption to income inequality, and from remittances to economic growth. Consequently, the study recommends an easing of governmental regional integration restrictions and provision of subsidies that help to increase the volume of trade and financial development while reducing poverty in the union.

Keywords: economic integration, poverty, income inequality, remittances, WAEMU, PMG

JEL Codes: F15; D31; I32

Corresponding author: Claire E. W. Yameogo, Department of Economics, University of Lagos, University Road Lagos Mainland Akoka, Yaba, Lagos, Nigeria; e-mail: emilieyam@yahoo.fr

Introduction

As a process of globalisation, regional integration has been pursued by different economic blocs as a strategy to boost economic growth and eliminate poverty and income inequality. This strategy has been in force for more than half a century. In Africa, in the 1980s, a surge of regionalism resulted in the development of several regional groupings and institutions across the continent, alongside various regional trade agreements. Since 1994, regional economic integration (REI) in the West African Economic and Monetary Union (WAEMU) has progressed rapidly in terms of trade and investments. The biggest investors in WAEMU are the European Union, national central banks and regional multinational enterprises, and this state of affairs has led to significant expansion of production and distribution in the union (Ezaki, Nguyen 2008). The objective of WAEMU is to strengthen economic and financial competitiveness, leading to a de-escalation of major issues in the zone. As Kweka and Mboya (2004) has found, regional integration within

https://doi.org/10.2478/quageo-2022-0014
ISSN 2082-2103, eISSN 2081-6383

the Southern African Development Community (SADC) and the East African Community (EAC) improves trade, thus reducing poverty.

Moreover, theoretical evidence suggests that economic integration can promote "capital accumulation, productivity and economic growth, through international trade, macroeconomic stability, strong institutions, price transparency, technological transfer, financial integration and development, exploitation of the single market and reduction in exchange-rate volatility" (Okafor 2013; Bose, Bristy 2017; Park, Claveria 2018a). As a result, one critical issue is that an economic union may face some economic and institutional challenges that will impede its operations and effectiveness. Some of these challenges include productivity disparities and rising trade deficits, fiscal and financial union incompatibility (Bose, Bristy 2017), and the common central bank's limited power. The recent evolution of international relations indicates the necessity for a review of REI. However, the question has remained how freer regional trade and a more competitive regional economy affect poverty and income distribution. Over the last several decades, poverty and income disparity have remained serious development issues in Africa.

Several studies have looked into the effects of regional integration for income inequality and poverty reduction in Africa. For example, Alderson and Nielson (2002) and Beckfield (2006) argue that integration widens the income gap, thus increasing poverty, while Osakwe (2015), Muriel and Guo (2016), Park and Claveria (2018), as well as Ean et al. (2020) suggest that African integration may reduce income disparity and the poverty level. Decreasing the poverty level and the income gap remains a fundamental concern for all WAEMU economies (Figs 1–3). One of the most difficult tasks for developing countries, particularly WAEMU members, is the fight against poverty and inequality. They are among the less-developed according to the World Bank. These countries adjust to an economic environment characterised by trade liberalisation and centred on a desire to make globalisation work for poorer people, which might be difficult for them at times. On the contrary, we observe the adverse effects, i.e., globalisation increases the poverty level of the developing countries. Also, this kind of study on the WAEMU zone is missing in the literature.

The debate on the need to increase economic growth while keeping the poverty rate and income inequality at a minimum is not a new one. However, the role of REI in achieving growth and sustainable development goals is a relatively new issue. There is no doubt that regional economies are increasing their production of goods and services, and liberalising international trade in order to reduce poverty and income inequality. High economic growth, on the other hand, necessitates advanced technology, high production and high demand, resulting in widening poverty

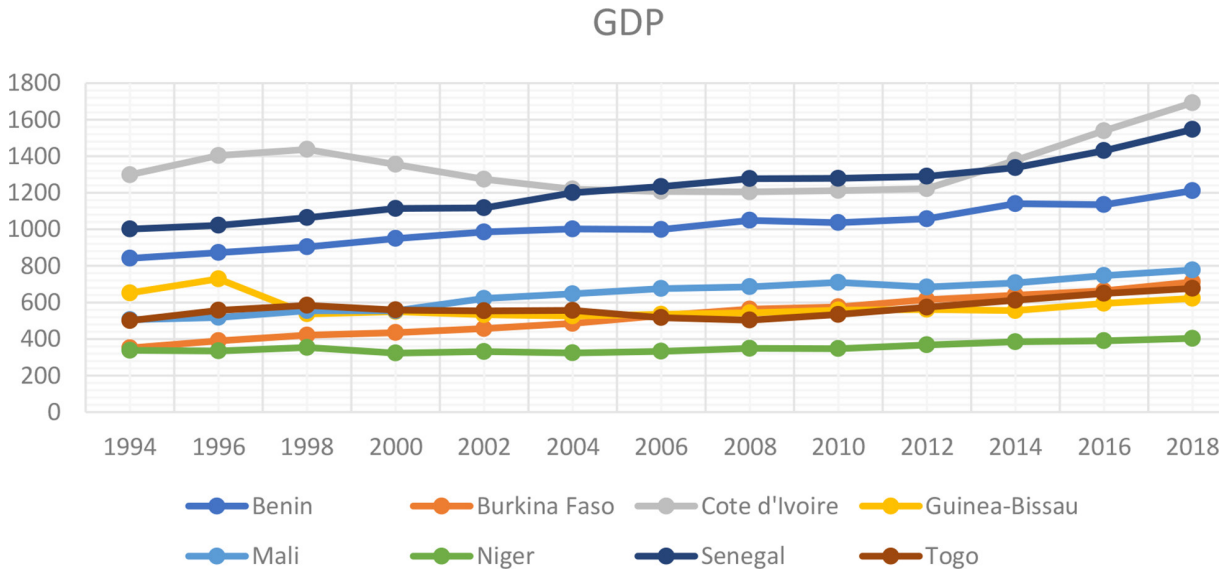

Fig. 1. GDP per capita.
Source: authors' computation.

and income gaps. In terms of per-capita income, Côte d'Ivoire and Senegal appear to be performing well as high-income groups in the region, followed by Benin and Mali.

REI is another important determinant of poverty and income inequality. It is a phenomenon that has a large impact on the social, political and economic features of people's life (Zafar et al. 2019). It also removes cross-border limitations, allows for technology transfers and increases foreign flows (Mishkin 2009). It results in financial and trade liberalisation, which influence economic growth, income distribution and poverty; but it can also raise income inequality and poverty. To be sure, migration flows and inflation rates are expected to increase inequality in income. According to De Melo et al. (2006) and Anyanwu (2011), the inflation rate increases income inequality and, hence, poverty.

As Fig. 3 shows, the poverty headcount is fairly high in the WAEMU countries. Niger shows a high level of poverty while Cote d'Ivoire has a low poverty rate. This might be explained by the economy's performance in terms of growth,

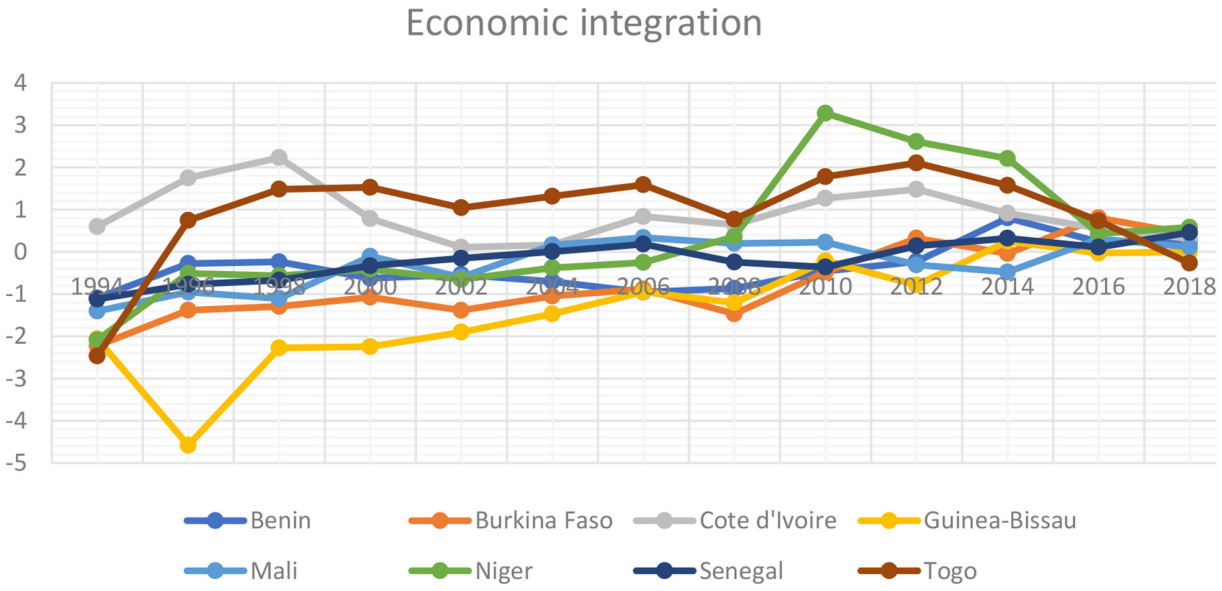

Fig. 2. Regional economic integration index.
Source: authors' computation.

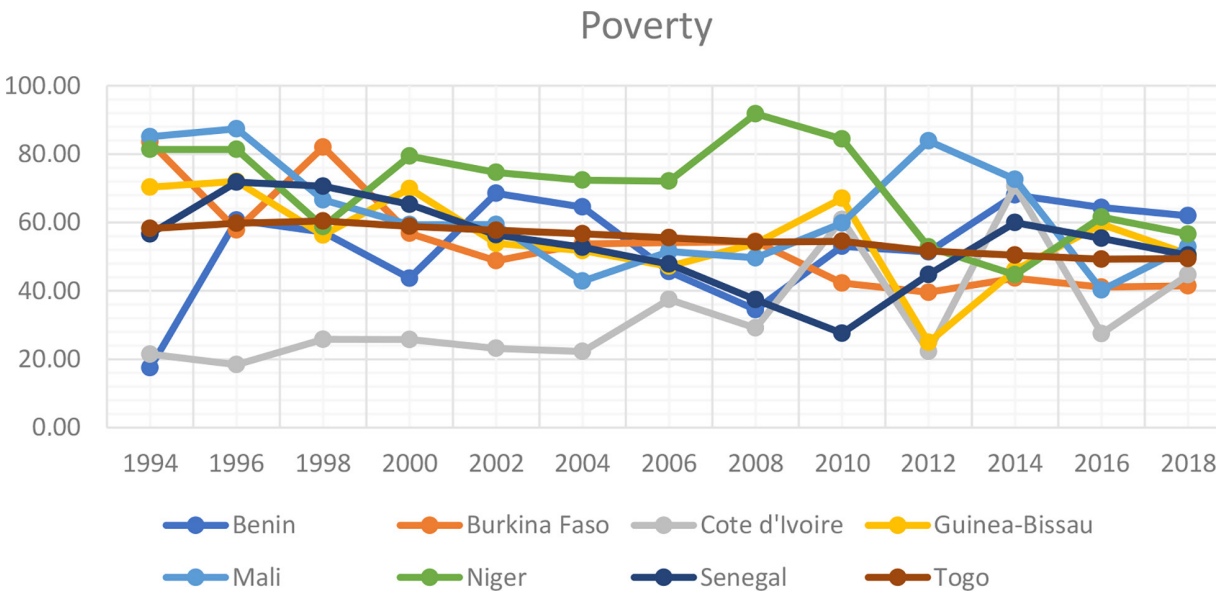

Fig. 3. Poverty headcount rate.
Source: authors' computation.

trade, production, etc. Although it has been observed that the economic growth and regional integration indices of the economies of the WAEMU countries have been rising, these figures do not quite indicate any significant reduction of poverty in the region (Onyekwena, Oloko 2016).

Benin, Togo, Côte d'Ivoire, Guinea-Bissau and Burkina Faso have recorded significant increases in inequality (WDI, 2019), thus suggesting that income distribution is unequal in these countries. Despite the increase in growth as seen above, however, the income inequality figure shows a wide disparity between the rich and the poor in the WAEMU bloc. The extreme value of income inequality may be due to the inequality of wealth distribution in countries, poor health status, and so on. The focus in the present study is to determine why income inequality and poverty increase alongside the economic growth and REI level. Thus, the study explores the effects of REI on poverty reduction and income inequality in the WAEMU region. The specific objective is to investigate the effects of REI on poverty in WAEMU, as well as to determine the influence of REI on income distribution in the economic bloc.

Three major contributions to the literature are made by this study. First, it is the opening study to look at the influence of REI on poverty reduction and income inequality for selected countries in the WAEMU economic bloc over the period 1994–2018. Second, it calculates both the REI index and the poverty headcount index in order to provide comprehensive and trustworthy data on the subject matter. Third, in addition to panel estimation, this study gives results for time-series long-run estimation utilising a more robust and policy-relevant Dynamic Ordinary Least Squares (DOLS) approach.

The remainder of the paper is organised as follows: Section II is the literature review while Section III describes the data and model used. Section IV presents the empirical findings and Section V presents the conclusion and recommendations.

Literature review

Theoretical review

There are several theoretical approaches to how regionalisation impacts poverty and income distribution across countries. REI is expected to increase income inequality since economic integration helps create a larger labour market (Alderson, Nielson 2002; Beckfield 2008). Economic integration also increases the amount of trade and investment in the concerned economies. However, if the laws guiding such regional integration are not strong enough, this will lead to income inequality and poverty increase since workers in such economies will now have to compete with more highly skilled workers from other countries. Kuznets (1955) hypothesises that income inequality increases in the early stages of economic development until a certain point, when it starts diminishing, thereby reflecting an inverted U-shaped relationship with economic growth.

The Heckscher–Ohlin (HO) model postulates that international trade leads to an increase in national incomes for participating countries based on comparative advantages of factor endowments. A country produces goods and services in which they have factor endowments and adequate labour supply while importing goods for which they have scarce resources (Cornia 2011). As a result of the operation of the forces of trade, production that is based on capital-intensive techniques is relinquished in favour of labour-intensive approaches that favour exports. This has the benefit of increasing economic growth and reducing inequality in the countries. Stolper and Samuelson's theory also shows that trade openness increases income with abundant resources.

Empirical review

Adequate understanding of the regional integration and poverty reduction relationship can help policymakers to adopt appropriate and suitable economic policies. Bergh and Nillson (2011) examined the role of globalisation on poverty for a panel set for the period 1988–2007. The study employed the panel fixed-effects model and found that globalisation, information and trade restrictions significantly reduced poverty. However, Sharma (2013) found that globalisation increased unemployment, income inequality and human deprivation, and therefore does not contribute to poverty reduction in developing countries. Muriel and Guo (2016) analysed the nexus between regional integration and income

inequality for Latin America for the 2000–2013 period. The study employed the fixed-effects model and showed that regional integration reduced inequality; the study also confirmed the existence of an inverted U-shaped relationship between trade and income in the community. Employing the fixed-effects estimation method, Bui et al. (2016) analysed the effect of economic integration on inequality and poverty in Vietnam for the period 2006–2010. The study showed that economic integration had a minimal effect on income distribution and poverty reduction in Vietnam. More recently, Huh and Park (2019) investigated the impact of regional integration and globalisation on economic growth and income inequality of 158 countries for the period 2006–2014. The study employed the fixed-effects model to show that globalisation and extra-regional integration increase economic growth while reducing income inequality.

Castilho et al. (2009) assessed the impact of trade liberalisation on poverty and inequality in Brazilian states for 1987–2005. The Generalised Method of Moments (GMM) results showed that trade increased both inequality and poverty level in the urban zone, while it had adverse effects in rural areas. Cornia (2011) investigated the role of economic integration in the evolution of income inequality and the growth rate in a comparative analysis of Latin America and European countries for the 2000–2008 period. The estimation results suggested that European countries' GDP figures were higher than those of Latin American countries, although they both experienced a rise in inequality. Muriel et al. (2018) examined the nexus between regional integration and income inequality for the Economic Community of West African States (ECOWAS) for the 2004–2013 period. Using the Least Square Dummy Variable (LSDV), they found that political integration reduced income inequality while economic integration increased inequality in the zone. Park and Claveria (2018b) examined the impact of regional integration on economic growth, income inequality and poverty in over 156 countries for 2006–2016, using the System GMM methods. The results indicated that regional integration had been a significant driver of economic growth, poverty reduction and income distribution.

Javid et al. (2012) examined the impact of remittances on growth and poverty in Pakistan for 1973–2010, using the Auto-Regressive Distributed Lag (ARDL) method. The authors reported a significant and positive relationship between remittances and growth, as well as between remittances and poverty reduction. More recently, Kousar et al. (2019) probed the impact of remittances and financial development on poverty and inequality for Pakistan over the period 1980–2016, using the ARDL-Bounds testing method. The results suggested that foreign remittances increased poverty and inequality in both the long and short terms. Financial development, however, reduces income inequality and the poverty rate in the short term. The study also found support for the inverted U-curve relationship between income inequality and per-capita income in the short term.

Using the multinomial probit model, Adams and Cuecuecha (2013) sought to identify the impact of remittances on investment and poverty in Ghana for the 2005–2006 period and showed that remittances reduced poverty and increased investment. Onyekwena and Oloko (2016) analysed the effects of regional integration on inclusive development (growth, poverty, transport sector, etc.) in the case of the ECOWAS region for the period 1995–2014. The results of the descriptive analysis indicated that regional integration increased growth and extra-regional trade, in addition to having a significant impact on poverty reduction in the region.

Using the Computable General Equilibrium (CGE) model, Nguyen and Ezaki (2005) probed the impact of REI on growth, inequality and the poverty level for Vietnam for 2001. The results suggested that REI increased growth, improved income distribution and reduced poverty in Vietnam. Hartono et al. (2007) investigated the link between regional integration, growth, poverty and inequality in Indonesia for 2000. The CGE results showed that regional integration improved income distribution and poverty reduction. Ezaki and Nguyen (2008) analysed the impact of East Asian economic integration on economic growth, income distribution and the poverty level for 2001. The CGE model results revealed that the East Asian community increased economic growth and improved income distribution, thus reducing the region's poverty rate. Ean et al. (2020) employed the Fully Modified Ordinary Least Square (FMOLS) method to examine the effect of REI on inequality in the Association of Southeast Asian

Nations (ASEAN) countries over the 2005–2018 period. The results showed that trade integration, as well as the agricultural and manufacturing sectors, reduced income disparity.

The influence of regional integration on income distribution and poverty has been a hotly debated topic among academics and policymakers alike. Although this subject of research has been extensively researched, previous research on this issue failed to control for common proxies of variables, that is, failed to use the appropriate methodology.

Data sources and model specification

Data

This study examines annual time-series data from 1994 to 2018 for eight WAEMU countries: Benin, Burkina Faso, Cote d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo. Table 1 displays the definitions and data sources for selected variables. This study builds on the work of Muriel et al. (2018), and Huh and Park (2019) in the literature to create a weighted indicator for REI. REI is a multifaceted process that goes beyond trade liberalisation measures. Considering simply one factor, such as trade, may understate the impact of regional integration on poverty and inequality reduction. The weighted regional integration is calculated by applying Principal Component Analysis (PCA) to the trade liberalisation (% of GDP), foreign direct investment (% of GDP), migration flow (%) and inflation rate (%) figures for the eight WAEMU countries. The PCA results are shown in Table 11. Using this method helps in discovering useful relevant information about the variables while removing the possibility of multicollinearity in the regression model (Park, Claveria 2018a, b; Huh, Park 2019). For the poverty data, the poverty headcount index from the Foster–Greer–Thorbecke (FGT)[1] model was calculated, with the study employing the World Bank poverty line of 1.90$. The data for trade, GDP, remittances, control of corruption and population growth were taken from World Development Indicators and the United Nations Conference on Trade and Development (UNCTAD) statistical database, while GINI data were collected from the SWIID database.

Model specification

This section introduces a theory that connects economic integration and income distribution to

[1] Foster et al. (1984)

Table 1. Definition and data sources.

Variable name	Symbol	Definition	Unit	Source
Poverty	POV	It is a situation where someone lacks the necessary resource he/she needs.	%	World Development Indicators and POVCALNET
Income inequality	GINI	It measures the distribution of wellbeing.	Index	World Development Indicators and Standardized World Income Inequality Database (Solt 2019).
Remittances	REM	It is the sum of money sent by migrants to their families at home or for saving.	%	World Development Indicators
Control of corruption	CC	It is the extent to which public officers use public power/resource for private gain. A higher value indicates a high level of corruption.	Index	Worldwide Governance Indicators
Gross domestic product per capita	GDP	It is the gross domestic product divided by population.	Constant 2010 US$	World Development Indicators
Population growth	POP	It is the annual growth rate of the population.	%	World Development Indicators
Regional economic integration	REI	It is measured with trade liberalisation (% of GDP), foreign direct investment (% of GDP), migration flow (%) and inflation rate (%, CPI).	Index	World Development Indicators, UNCTAD statistics database, United Nations Population Division

Source: authors' compilations.

the level of poverty. The main theoretical nexus of REI, income inequality and poverty is captured in the HO model. According to this theory, trade increases unskilled workers' income in developing countries and those of skilled workers in developed countries, thereby reducing income disparity and poverty in developing countries while increasing both in developed countries. According to Meschi and Vivarelli (2009), trade allows for the transfer of new and high technologies between countries using skill-intensive production techniques; as such, the HO model is appropriate for this study. As per Castilho et al. (2009), as well as Bukhari and Munir (2016), the study model is defined as follows:

$$Y_{i,t} = \beta_0 EI_{i,t} + \sum_i \beta_i X_{i,t} + \mu_i + \varepsilon_{i,t} \quad (1)$$

where Y is the level of income inequality/poverty and EI represents economic integration. X is the set of control variables used in this study. The subscripts i and t represent country-specific and time respectively, while μ_i is an unobserved individual effect and $\varepsilon_{i,t}$ is the error term.

Based on the objectives of the studies, the two equations have been expressed separately as follows:

(i) REI and income distribution

$$GINI_{i,t} = a_0 + a_1 GINI_{i,t-1} + a_2 EI_{i,t} + a_3 REM_{i,t} + a_4 GDP_{i,t} + a_5 CC_{i,t} + a_6 POP_{i,t} + \mu_i + \varepsilon_{i,t} \quad (2)$$

where *GINI* stands for income inequality and *EI* represents economic integration. The control variables *REM*, *GDP*, *CC* and *POP* represent remittances, economic growth, control of corruption and population growth, respectively. The subscripts a_0 to a_6 are the coefficients, while μ_i is an unobserved individual effect and $\varepsilon_{i,t}$ is the error term.

(i) REI and poverty

$$POV_{i,t} = a_0 + a_1 POV_{i,t-1} + a_2 EI_{i,t} + a_3 GINI_{i,t} + a_4 REM_{i,t} + a_5 GDP_{i,t} + a_6 CC_{i,t} + a_7 POP_{i,t}\, \mu_i + \varepsilon_{i,t} \quad (3)$$

where *POV* is the poverty headcount, *GINI* stands for income inequality and *EI* represents REI. The control variables *REM*, *GDP*, *CC* and *POP* represent remittances, economic growth, control of corruption and population growth, respectively. The subscripts a_0 to a_7 are the coefficients, while μ_i is an unobserved individual effect and $\varepsilon_{i,t}$ is the error term.

The study employed a dynamic analysis since past values of income distribution and poverty can affect present values of income distribution and poverty. The past values of $GINI_{i,t-1}$ and $POV_{i,t-1}$ are thus associated; moreover, Arellano and Bover's (1995) System of Generalised Method of Moments (SYS-GMM) can be employed to control the individual and time-specific effects, as well as to counteract the endogeneity bias of the variables induced by the lagged values. However, the method cannot be used here since it accounts for 'short time and large panel members'. The alternative model is the Pooled Mean Group (PMG), introduced by Pesaran et al. (1999). It provides for short-run coefficients and a country-by-country variability in adjustment speed. Long-run coefficients, on the other hand, are homogeneous since they are similar across countries. Finally, the magnitude of T and N is important in helping to avoid bias in average estimators, in addition to helping to resolve the issue of heterogeneity. Both models are estimated through the PMG.

$$\Delta(y_i)_t = \alpha_i ECT_{i,t} + \sum_{j=1}^{p-1} \gamma_j^i \Delta(y_i)_{t-j} + \sum_{j=1}^{q-1} \delta_j^i \Delta(X_i)_{t-j} + \varphi^i [(y_i)_{t-1} - \{\beta_0^i + \beta_1^i (X_i)_{t-1}\}] + \varepsilon_{i,t} \quad (4)$$

where y is employed for income inequality and the poverty headcount, X stands for the independent variables such as REI, control of corruption, remittances, economic growth and population growth, γ and Δ denotes the short-run coefficients of lagged variables, ECT means error-correction term, β represents the long-run coefficients and φ is the coefficient representing the speed of adjustment to the long-run equilibrium. The subscripts i and t represent country and time, respectively. All variables are in logarithm except for the income inequality index, regional integration index, corruption index and population growth.

Results and discussion

Descriptive statistics

Table 2 displays the findings of the descriptive statistics. The findings indicate that the average

Table 2. Descriptive statistics.

Variables	POV	GINI	REI	REM	GDP	CC	POP
Mean	53.612	22.059	0.000	3.689	779.831	−0.663	2.840
Median	54.468	24.288	−0.062	2.559	648.281	−0.676	2.798
Maximum	92.847	49.900	5.408	10.711	1,692.545	0.176	3.907
Minimum	10.029	−28.100	−4.583	0.226	322.778	−1.563	1.912
Std. Dev.	16.818	18.421	1.224	2.823	351.196	0.381	0.449
Skewness	−0.193	−0.064	0.254	0.959	0.601	0.074	0.558
Kurtosis	2.882	1.311	5.810	2.712	2.128	2.541	3.073
Jarque-Bera	1.355	23.911***	67.976***	31.370***	18.363***	1.935	10.411***
Probability	0.508	0.000	0.000	0.000	0.000	0.380	0.005

Note: *** indicates significance at 1% level.
Source: authors' compilations.

poverty rate is very high (53.61%) in the WAEMU countries and the average values (mean) GINI and REI are low (22.05 and 0.00, respectively). On average, the value of remittances is equal to 3.68% and economic growth per capita is 779.83, while the institutional quality value is −0.66 and population growth value is 2.84%. The maximum values of POV, GINI, REI, REM and GDP are, respectively, 92.84%, 49.9, 5.40, 10.71% and 1,692.54. The standard deviation values are large enough to explore the variations in the data. The results also show that only poverty and the income distribution index are adversely skewed, whereas others are positively skewed. The Kurtosis values reveal that poverty, income inequality, remittances, economic growth and control of corruption have platykurtic distributions, whereas other variables have leptokurtic distribution. According to the Jarque–Bera test statistics, only poverty, as well as control of corruption, fulfils the requirements of normal distribution.

Correlation analysis

The outcomes of the correlation matrix and the Variance Inflation Factor (VIF) coefficients tests are presented in Tables 3 and 4, respectively.

Table 3. Correlation results.

	POV	GINI	REI	REM	GDP	CC	POP
POV	1.000						
GINI	−0.256	1.000					
REI	−0.214	0.239	1.000				
REM	−0.070	−0.175	0.222	1.000			
GDP	−0.486	0.204	0.147	0.038	1.000		
CC	−0.023	0.181	−0.021	−0.028	0.287	1.000	
POP	0.210	−0.141	0.297	−0.183	−0.381	0.210	1.000

Source: authors' compilations.

Table 4. VIF results.

Variables	VIF	1/VIF
POP	2.14	0.467
REI	1.75	0.572
GDP	1.68	0.595
CC	1.48	0.676
GINI	1.37	0.727
REM	1.34	0.747
Mean VIF	1.63	

Source: author's compilations.
VIF – Variance Inflation Factor.

The correlation analysis shows a positive link between poverty and population growth (0.21), while income disparity displays a positive link with REI, economic growth and control of corruption. Moreover, the association between economic growth and poverty is negative and has a moderate value, which means that they are perfectly correlated. REI, economic growth and population growth are positively correlated. In addition, financial integration regressors and economic growth are positively correlated. A negative correlation exists between remittances and control of corruption regressors.

The results in Table 4 show that the VIF coefficient is equal to 1.63, which means that there is no collinearity among the regressors in the study. Both tables indicate no multicollinearity among the variables.

Cross-sectional dependence (CD)

Since countries in the study are interlinked via WAEMU, a CD test is necessary. The study thus employs the CD test of Pesaran (2004), as well as the Lagrange multiplier (LM) tests of Breusch Pagan (1980) and Pesaran, to check for

Table 5. Cross-sectional dependence results.

	Breusch-Pagan LM	Pesaran scaled LM	Pesaran CD
lnPOV	85.085***	7.628***	0.760
GINI	66.641***	5.163***	−0.270
REI	144.761***	15.602***	8.739***
lnREM	223.665***	26.146***	2.875***
lnGDP	276.497***	33.206***	12.214***
CC	116.811***	11.867***	−0.423
POP	278.034***	33.412***	−0.801

Note: *** indicates significance at 1% level.
Source: authors' compilations.

dependence in the panel data. The null hypothesis is that there is no CD among the regressors.

Table 5 shows that only the results of the Pesaran CD test of poverty, income inequality, control of corruption and population are not significant, thus suggesting rejection of the null hypothesis. The overall results show that the variables are significant at a 1% level, and thus the null hypothesis of no CD is rejected.

CD is important in deciding which stationary test and cointegration tests are necessary for the study. Having shown that there is CD in the model, the second-generation unit root tests (CIPS and CADF)[2] of Pesaran (2007) are employed. Table 6 displays the findings of both unit tests.

Table 6. Panel unit root test results.

Variables	CIPS		CADF	
	Level	First difference	Level	First difference
lnPOV	−3.417***	−5.345***	−3.017**	−3.970***
GINI	−4.849***	−6.420***	−3.129***	−4.710***
REI	−2.959**	−5.540***	−2.446	−4.277***
lnREM	−1.727	−3.885***	−1.948	−3.322***
lnGDP	−2.142	−4.587***	−2.547	−3.856***
CC	−2.174	−4.565***	−2.031	−3.417***
POP	−4.263***	−4.937***	−5.180***	−5.568***
Critical values	1%: −3.1 5%: −2.86 10%: −2.73		1%: −3.100 5%: −2.860 10%: −2.730	

Note: *** and ** indicate significance at 1%, and 5% levels, respectively. A constant and a trend are included in the tests. The results are reported at lag 1 except for population growth that used 2 lags.
Source: authors' compilations.

[2] Cross-section Augmented Im-Pesaran-Shin (CIPS) and Cross-section Augmented Dickey-Fuller (CADF).

Panel unit root test

Table 6 presents the results of the unit root test of the variables. The results suggest that poverty, income inequality, REI and population fulfilled the criteria of the CIPS test and are therefore stationary at level. To arrive at stationarity for all the remaining variables, the data are first differentiated. The results of the CADF test also show that poverty, income inequality and population growth are stationary at level, and to arrive at stationarity for all the remaining variables, the data are first differentiated. Therefore, the study concludes that although some of the variables are not stationary at levels, they all become stationary at first difference at a 1% level of significance. There is a presumption of cointegration among the regressors.

Westerlund cointegration test

The problem of long-run cointegration is resolved via the Westerlund (2007) test, which employs four error-correction tests that are divided into two groups. The first group (Gt and Ga) assumes that the whole panel is cointegrated, while the second group (Pt and Pa) assumes that at least one cross-section is cointegrated (Zafar et al. 2019). The null hypothesis states that no cointegration exists between the variables. The results in Table 7 reveal that Gt and Pt are significant at 1%, implying that the null hypothesis is rejected; therefore, the variables are cointegrated in the long run.

Table 7. Westerlund panel cointegration test results.

Statistics	Value	Z-value	P value	Robust P value
Income distribution equation				
Gt	−30.138	−83.323	0.000	0.000
Ga	−7.610	3.576	1.000	0.380
Pt	−42.230	−34.492	0.000	0.000
Pa	−7.164	2.670	0.996	0.460
Poverty equation				
Gt	−4.010	−2.560	0.005	0.010
Ga	−2.350	5.513	1.000	1.000
Pt	−10.378	−2.035	0.021	0.020
Pa	−1.986	4.639	1.000	0.980

Note: A constant and a trend are used with 0 lag and 0 lead.
Source: authors' compilations.

Results of the elasticities

The PMG models are estimated according to Eq. (4) and Table 8 summarises the findings of the models. As for the GINI model, the link between REI and income inequality is statistically significant and positive in the long run, with a 1-unit rise in economic integration increasing income disparity by 0.068. In other words, increased economic integration increases income disparity and reduces the equal distribution of wealth. Regional integration through migration and inflation increases population, thereby reducing job opportunities and increasing unemployment as well as income inequality. This correspondingly explains why population growth significantly increases income inequality in the region, with REI benefitting mostly highly skilled workers. Cornia (2011), Bui et al. (2016) and Muriel et al. (2018) reported similar results.

The coefficient of remittances with respect to the GINI index are negative and not significant in short and long runs. Keeping other things equal, a 1% increase in remittances decreases income inequality and improves income distribution. The findings indicate that remittances reduce income inequality and are a substantial contributor to income increase in the countries under investigation. This is explained by the fact that remittances to the poor help increase their income, thus enabling them to invest in education and get more employment opportunities so that income inequality can decrease. Economic growth and population growth increase income disparity both in short- and long-run estimates owing to the poor or negative growth experienced by member countries. The worsening state of income inequality might be justified here by the slow GDP growth rates of WAEMU member countries; moreover, the increasing population is also not helpful in regulating the distribution in the region. As a result, the findings have implications for both short-term economic growth and long-term population increase.

Controlling corruption increases income inequality in the short run while decreasing it in the long run.

Table 8. PMG estimation results.

Variables	GINI index		Poverty headcount	
	Coefficient	Std. err.	Coefficient	Std. err.
Short run				
ECT	−0.760***	0.131	0.0697	0.0971
ΔlnPOV(−1)	–	–	0.510***	0.0369
ΔREI	−0.176	0.137	0.162	0.121
ΔEI(−1)			−0.129	0.0993
ΔGINI	–	–	−0.0191	0.0354
ΔGINI(−1)	–	–	0.0138	0.0174
ΔlnREM	−0.470	0.487	−0.263	0.171
ΔlnREM(−1)	–	–	0.338	0.222
ΔlnGDP	45.44**	20.92	−1.456	1.114
ΔCC	1.509**	0.695	0.0910	0.194
ΔPOP	9.780	8.824	−0.880	0.702
ΔPOP(−1)	–	–	0.931	1.396
Constant	9.221**	4.700	0.128	0.108
Long run				
REI	0.0684*	0.0367	−0.0761***	0.0224
GINI	–	–	−0.0475***	0.0111
lnREM	−0.0308	0.059	0.172***	0.0439
lnGDP	0.138	0.211	0.549***	0.204
CC	−0.0804	0.154	0.126**	0.0643
POP	0.753***	0.132	1.136***	0.213
Number of observation	192		184	

Note: ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively. The optimum lag length is selected through SIC criterion. Income distribution lag length is (1 0 0 1 0 0), and those for poverty is (2 2 2 2 0 0 2).
Source: authors' compilations.

As for the poverty model, the relationship between REI and poverty headcount is statistically significant and negative over time, with a 1-unit increase in economic integration significantly increasing poverty reduction by 0.076%. In other words, increased economic integration reduces poverty, possibly because it increases economic activities, thus leading to higher GDP per capita and resulting in poverty reduction. Greater participation in integration significantly contributes to poverty reduction. Regional integration through trade and foreign direct investment (FDI) increases domestic savings, productivity (through knowledge spillovers) and welfare, which also possibly creates job opportunities for the population and leads to a decrease in unemployment as well as income inequality and, hence, the poverty rate. Correspondingly, this explains why the income distribution index significantly reduces the poverty rate in these countries. Since the integration of the countries, important transformations have also been achieved that lead to improvements in economic activities, growth and income distribution. Nguyen and Ezaki (2005), Hartono et al. (2007), Ezaki and Nguyen (2008), as well as Park and Claveria (2018) reported similar results. The findings may support Agénor's (2004) J-curve hypothesis, which states that growing globalisation may raise poverty in the short run while lowering it in the long run. The coefficient on the lagged POV is statistically significant, implying that lagged poverty has an effect on the contemporaneous poverty headcount.

The coefficient of remittances with respect to poverty is significantly positive in the long run. Keeping everything else constant, a 1% increase in remittances increases poverty by 0.17%. These findings agree with those of Kousar et al. (2019) for Pakistan. This is explained by the negative effects of remittances and financial instability; however, it is contrary to the general belief that remittances lead to poverty reduction in poor households. Per-capita economic growth, control of corruption and population growth significantly increase poverty in long-run estimates, thus suggesting that poverty reduction in the WAEMU bloc depends on corruption and population control.

This work investigates time-series models for robustness using the DOLS approach, the

Table 9. Time-series analysis results based on the DOLS method.

Countries	Benin		Burkina Faso		Côte d'Ivoire		Guinea-Bissau		Mali		Niger		Senegal		Togo	
	GINI	POV	GINI	POV	GINI	POV	GINI	POV	GINI	POV	GINI	POV	GINI	POV	GINI	POV
REI	21.72*** (0.404)	−0.410*** (0.0778)	13.70*** (0.504)	−0.0439 (0.0610)	37.51*** (0.218)	8.256*** (0.0426)	−27.39*** (1.284)	−1.738*** (0.0427)	−20.88*** (0.639)	3.868*** (0.0848)	−4.117*** (0.331)	−0.0763*** (0.0125)	−6.574*** (0.773)	4.694*** (0.0930)	0.889*** (0.0629)	0.0473*** (0.00293)
GINI	-	0.434*** (0.0261)	-	0.0161 (0.0101)	-	−0.0378** (0.0158)	-	0.0118*** (0.00398)	-	−0.0750*** (0.00875)	-	0.210*** (0.00354)	-	0.961*** (0.0101)	-	−0.0615*** (0.00318)
lnREM	3.935*** (0.574)	0.430*** (0.131)	−25.24*** (0.729)	0.490*** (0.0755)	−11.50*** (1.060)	−9.812*** (0.217)	47.94*** (1.891)	3.426*** (0.0643)	524.8*** (0.886)	−2.416*** (0.128)	−18.06*** (1.013)	0.452*** (0.0384)	−16.40*** (0.710)	−14.39*** (0.0851)	−0.405*** (0.130)	0.246*** (0.00541)
lnGDP	−336.6*** (4.239)	−5.705*** (0.952)	11.89*** (2.466)	−1.061*** (0.258)	96.68*** (2.409)	4.606*** (0.470)	180.7*** (11.51)	−0.817* (0.429)	−1,490*** (3.473)	−0.0993 (0.507)	13.76** (6.074)	−1.598*** (0.248)	82.09*** (3.111)	−3.765*** (0.383)	16.14*** (1.195)	0.421*** (0.0520)
CC	82.29*** (1.202)	−1.150*** (0.235)	−1.217 (2.310)	1.367*** (0.243)	16.78*** (0.995)	4.571*** (0.192)	110.2*** (6.415)	5.054*** (0.214)	451.2*** (2.953)	−1.850*** (0.383)	42.24*** (3.598)	−3.687*** (0.138)	12.12*** (0.726)	−8.876*** (0.0846)	9.481*** (0.951)	0.00849 (0.0399)
POP	−152.2*** (1.578)	9.313*** (0.306)	−186.1*** (7.143)	5.575*** (0.770)	−106.6*** (0.722)	−12.98*** (0.138)	56.74*** (5.049)	3.464*** (0.181)	−566.3*** (1.891)	2.314*** (0.252)	51.68*** (6.414)	2.547*** (0.244)	1.946* (1.087)	20.10*** (0.133)	6.701*** (0.332)	1.271*** (0.0142)

Note: ***, ** and * indicate significance at 1%, 5%, and 10% levels, respectively. () indicates standard errors of the variables.
Source: authors' compilations.

findings of which are also provided in Table 9. It is also important to examine the elasticities of income distribution and poverty, as well as other variables, for each WAEMU member country. For this, the study employed the DOLS techniques designed by Saikkonen (1991) and Stock and Watson (1993). This method controls for endogeneity and autocorrelation problems by adding the leads and lags of first-difference regressors. Table 9 summarises the findings.

REI has a positive and significant influence on income disparity in Benin, Burkina Faso, Côte d'Ivoire and Togo, and a positive and significant impact on poverty in Côte d'Ivoire, Mali, Senegal and Togo, according to the results. Table 9 reveals that the coefficient estimates of income inequality are positively and statistically significant, with respect to poverty in Benin, Guinea-Bissau, Niger and Senegal. Remittances significantly reduce poverty in Côte d'Ivoire, Mali and Senegal and significantly improve income distribution in Burkina Faso, Cote d'Ivoire, Niger, Senegal and Togo. Economic growth per capita shows a negative and significant impact on income disparity for Benin, Mali and Niger and significantly reduces poverty in Benin, Burkina Faso, Guinea-Bissau, Mali, Niger and Senegal.

The results in Table 9 also show that control of corruption only has a negative and insignificant impact on income disparity for Burkina Faso, probably because income distribution insignificantly improves with a reduction of corruption. It however significantly reduces the poverty level in Benin, Mali, Niger and Senegal. Population growth significantly increases income inequality in Guinea-Bissau, Niger, Senegal and Togo and significantly increases the poverty rate in Benin, Burkina Faso, Guinea-Bissau, Mali, Niger, Senegal and Togo.

Causality analysis

The study employed the Dumitrescu and Hurlin (2012) panel causality method to reveal the relationship between the variables, given the presence of cointegration between poverty/income distribution and its determinants. The results of this test are shown in Table 10. REI and poverty have a bidirectional causal relationship, implying that REI causes poverty and vice versa. The results also suggest that there is a unidirectional causal relationship between REI and income disparity, as well as between economic growth per capita, control of corruption, population growth and income inequality. The findings also point out a bidirectional causal relationship between REI and remittances, showing that REI causes remittances and vice versa. Table 10 shows that remittances, economic growth and population growth cause poverty, that is, poverty has a unidirectional causal relationship with remittances, economic growth per capita and population growth.

Table 10. Heterogeneous panel causality test results.

	lnPOV	GINI	REI	lnREM	lnGDP	CC	POP
lnPOV		−0.5599 (0.5756)	2.0470** (0.0407)	0.4123 (0.6801)	1.1441 (0.2526)	−0.3039 (0.7612)	0.6270 (0.5307)
GINI	0.6428 (0.5204)		−0.4899 (0.6242)	0.8665 (0.3862)	0.3513 (0.7254)	−0.6080 (0.5432)	−0.1381 (0.8902)
REI	3.1594*** (0.0016)	2.7527*** (0.0059)		3.8692*** (0.0000)	0.5314 (0.5951)	−0.5156 (0.6061)	0.9304 (0.3522)
lnREM	2.7370*** (0.0062)	0.9483 (0.3430)	2.2553** (0.0241)		2.6512*** (0.0080)	3.2922*** (0.0010)	−0.1016 (0.9191)
lnGDP	2.3861** (0.0170)	0.9317*** (0.0000)	2.5827*** (0.0098)	2.8435*** (0.0045)		−0.1012 (0.9033)	2.7147*** (0.0066)
CC	−0.5047 (0.6138)	2.9592*** (0.0031)	1.6822* (0.0925)	2.2788** (0.0227)	1.8482* (0.0646)		1.2308 (0.2184)
POP	6.2131*** (0.0000)	3.6573*** (0.0003)	2.7282*** (0.0064)	4.6874*** (0.0000)	2.7159*** (0.0066)	2.2000** (0.0278)	

Note: ***, ** and * show significance at the 1%, 5%, and 10% levels, respectively. Optimum lag length is selected through SIC criterion.
Source: authors' compilations.

Table 11. Principal component analysis details.

Number	Value	Difference	Proportion	Cumulative value	Cumulative proportion
Panel A: Eigen values of the observed matrix					
1	1.491	0.490	0.373	1.491	0.373
2	1.001	0.171	0.250	2.492	0.623
3	0.831	0.153	0.208	3.323	0.831
4	0.677	–	0.169	4.000	1.000
Panel B: Eigenvectors (loadings)					
Variable	PC1	PC2	PC3	PC4	
REI1	0.558	0.448	0.173	−0.677	
REI2	0.550	0.398	−0.404	0.613	
REI3	0.483	−0.416	0.708	0.304	
REI4	−0.391	0.684	0.552	0.272	
Panel C: Ordinary correlations					
	REI1	REI2	REI3	REI4	
REI1	1.000				
REI2	0.297	1.000			
REI3	0.178	0.119	1.000		
REI4	−0.064	−0.121	−0.186	1.000	

Source: authors' compilations.

Conclusion and policy implications

This study explored the influence of economic integration on income distribution and the poverty level for the WAEMU countries for the period 1994–2018. Methodologically, the Pesaran CD test, the Westerlund cointegration test, the PMG panel tests, the DOLS time-series approach and the panel causality approaches were employed.

According to the empirical findings, REI reduces income inequality while increasing poverty among the countries. Improvement in income distribution also leads to poverty reduction while remittances, economic growth, control of corruption and population growth significantly increase the poverty level. The DOLS analysis also shows that REI significantly increases income disparity in Benin, Burkina Faso, Côte d'Ivoire and Togo, while it significantly increases poverty in Côte d'Ivoire, Mali, Senegal and Togo.

The panel causality results of Dumitrescu and Hurlin (2012) reveal a bidirectional causative relationship between REI and poverty, as well as between REI and remittances. A unidirectional causal relationship exists between poverty and remittances as well as between economic growth and population growth. The findings indicate a unidirectional causal relationship between REI and income inequality as well as between economic growth, per-capita income, control of corruption, population growth and income inequality.

Consequently, the following policy implications derive from the study's empirical results:

- Governments should remove barriers to regional integration and provide subsidies to boost trade and financial development while reducing poverty.
- Governments should take steps to promote money transfer at least to the poorest of the poor in order to reduce economic disparity and poverty.
- Government should build institutions that will train workers and reduce corruption, which contributes to the reduction of income disparity and poverty.
- Government should check population growth, which contributes to the long-term increase in income inequality and poverty.

This study has some limitations, however. It is advised that future studies analyse the impact of WAEMU members' pre- and post-regionalisation on poverty and income distribution. Moreover, additional research can be conducted to evaluate the influence of each dimension of regional integration on poverty in order to assist governments in developing comprehensive policies to achieve the sustainable development goals.

Author's contribution

Claire E. W. Yameogo: writing – original draft, data curation, formal analysis, methodology. Joseph A. Omojolaibi: writing – review and editing.

Conflicts of interest

The authors do not have any conflict of interest to disclose.

Data availability statement

The data that support the findings of this study are available in World Development Indicators at https://data.worldbank.org/indicator

References

Adams R.H., Jr., Cuecuecha A., 2013. The impact of remittances on investment and poverty in Ghana. *World Development* 50: 24–40.

Agénor P.R., 2004. Does globalization hurt the poor? *International Economics and Economic Policy* 1(1): 21–51.

Alderson A., Nielsen F., 2002. Globalization and the great U-turn: Income inequality trends in 16 OECD countries. *American Journal of Sociology* 107: 1244–1299.

Anyanwu J.C., 2011. International remittances and income inequality in Africa. *Review of Economic and Business Studies* 4(1): 117–148.

Arellano M., Bover O., 1995. Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics* 68(1): 29–51.

Beckfield J., 2006. European integration and income inequality. *American Sociological Review* 71(6): 964–985.

Beckfield J., 2008. *The net effect of regional integration on total income inequality in the European union*. Presented at the conference on Inequality Beyond Globalization: Economic Changes and the Dynamics of Inequality in Neuchatel, Switzerland.

Bergh A., Nilsson T., 2011. *Globalization and absolute poverty* – A panel data study. IFN Working Paper No. 862, Stockholm, Sweden.

Bose T.K., Bristy J.F., 2017. Are countries participating into regional integration performing better in growth and liberalization than non-participators? A study on European countries. *International Journal of Business and Management* 12(2): 171–198.

Breusch T.S., Pagan A.R., 1980. The Lagrange multiplier test and its application to model specifications in econometrics. *Review of Economic Studies* 47: 239–253.

Bui T., Dungey M., Nguyen C., Pham P., 2016. *Impacts of economic integration on living standards and poverty reduction of rural households*. Munich Personal RePEc Archive (MPRA) Paper No. 71129. Online: https://mpra.ub.uni-muenchen.de/71129/ (accessed: 1 September 2021).

Bukhari M., Munir K., 2016. *Impact of globalization on income inequality in selected Asian countries*. Munich Personal RePEc Archive (MPRA) Paper No. 74248.

Castilho M., Menéndez M., Sztulman A., 2009. *Trade liberalization, inequality and poverty in Brazilian states*. Document de travail DT/2010-02, Institut de Recherche pour le Développement (IRD), Dauphine Université Paris, France.

Cornia G.A., 2011. Economic integration, inequality and Growth: Latin America versus the European Economics in Transition. *Reviews of Economics and Institutions* 2(2): 31.

De Melo J., Gourdon J., Maystre N., 2006. *Openness, inequality and poverty: Endowments matter*. Centre for Economic Policy Research (CEPR) Discussion Papers No. 5738. London.

Dumitrescu E.I., Hurlin C., 2012. Testing for granger non-causality in heterogeneous panels. *Economic Modelling* 29(4): 1450–1460. DOI 10.1016/j.econmod.2012.02.014.

Ean T.G., Mansor S.B.A., Ling S.W.S., 2020. Regional economic integration and income inequality in selected ASEAN countries. *International Journal of Academic Research in Business and Social Sciences* 10(2): 648–664. DOI 10.6007/IJARBSS/v10-i2/6955.

Ezaki M., Nguyen T.D., 2008. *Regional economic integration and its impact on growth, income distribution and poverty in East Asia: A CGE analysis*. Graduate School of International Development (GSID) Discussion Paper No. 167. Nagoya University, Japan.

Foster J., Greer J., Thorbecke E., 1984. A class of decomposable poverty measures. *Econometrica* 52(3): 761–766. Online: http://ideas.repec.org/a/ecm/emetrp/v52y-1984i3p761-66.html.

Hartono D., Priyarsono D.S., Nguyen T.D., Ezaki M., 2007. Regional economic integration and its impacts on growth, poverty and income distribution: The case of Indonesia. *RURDS* 19(2): 138–153. DOI 10.1111/j.1467-940X.2007.00131.x.

Huh H.-S., Park C.-Y., 2019. *A new index of globalization: Measuring impacts of integration on economic growth and income inequality*. Asian Development Bank (ADB) Economics Working Paper Series No. 544, Philippines. DOI 10.22617/WPS190245-2.

Javid M., Arif U., Qayyum A., 2012. Impact of remittances on economic growth and poverty. *Academic Research International* 2(1): 433–447.

Kousar R., Rais S.I., Mansoor A., Zaman K., Shah S.T.H., Ejaz S., 2019. The impact of foreign remittances and financial development on poverty and income inequality in Pakistan: Evidence from ARDL-Bounds testing approach. *Journal of Asian Finance, Economics and Business* 6(1): 71–81.

Kuznets S., 1955. Economic growth and income inequality. *The American Economic Review* 45(1): 1–28.

Kweka J., Mboya P., 2004. *Regional integration and poverty: A case study of Tanzania*. Working Paper, Economic and Social Research Foundation, Dar es Salaam.

Meschi E., Vivarelli M., 2009. Trade and income inequality in developing countries. *World Development* 37(2): 287–302.

Mishkin F.S., 2009. Globalization and financial development. *Journal of Developing Economics* 89: 164–169. DOI 10.1016/j.jdeveco.2007.11.004.

Muriel E.S.A., Guo P., 2016. Regional economic integration and income inequality in Latin America: The case of the Andean Community of Nations. *Journal of Economics and Sustainable Development* 7(14): 176–185.

Muriel E.S.A., Guo P., Kwami O.W., 2018. Regional integration and income inequality in ECOWAS zone. *Journal of Economic Integration* 33(3): 604–628.

Nguyen T.D., Ezaki M., 2005. Regional economic integration and its impacts on growth, poverty and income distribution: The case of Vietnam. *RURDS* 17(3): 197–215.

Okafor I.B., 2013. Revisiting the legal framework for African economic and monetary integration: Lessons from European economic depression. *Journal of Sustainable Development Law and Policy* 1(1): 100–113.

Onyekwena C., Oloko T.F., 2016. *Regional trade for inclusive development in West Africa*. Centre for the Study of the Economies of Africa (CSEA) Working Paper WPS/16/03. Abuja, Nigeria.

Osakwe P.N., 2015. *Transformative regionalism, trade and the challenge of poverty reduction in Africa*. Trade and Poverty Paper Series No.1, UNCTAD.

Park C.-Y., Claveria R., 2018a. *Constructing the Asia-Pacific regional cooperation and integration index: A panel approach*. ADB Economics Working Paper Series No. 544.

Park C.-Y., Claveria R., 2018b. *Does regional integration matter for inclusive growth? Evidence from the multidimensional regional integration index*. Asian Development Bank (ADB) Economics Working Paper Series No. 559. The Philippines.

Pesaran M.H., 2004. *General diagnostic tests for cross section dependence in panels*. Institute for the Study of Labor (IZA) Discussion Paper No. 1240, University of Cambridge.

Pesaran M.H., 2007. A simple panel unit root test in the presence of cross section dependence. *Journal of Applied Economics* 22: 265–312.

Pesaran M.H., Pesaran M.H., Shin Y., Smith R.P., 1999. Pooled mean group estimation of dynamic heterogeneous panels. *Journal of American Statistics Association* 94: 621–634. DOI 10.1080/01621459.1999.10474156.

Saikkonen P., 1991. Asymptotically efficient estimation of cointegration regressions. *Econometric Theory* 7(1): 1–21.

Sharma N.K., 2013. Globalization and its impact on the third world economy. *Crossing the Border: International Journal of Interdisciplinary Studies* 1(1): 21–28.

Solt F., 2019. The standardized world income inequality database, Version 8. *Harvard Dataverse* 2. DOI 10.7910/DVN/LM4OWF.

Stock J., Watson M., 1993. A simple estimator of cointegrating vectors in higher order integrated systems. *Econometrica* 61(4): 783–820.

Westerlund J., 2007. Testing for error correction in panel data. *Oxford Bulletin and Economic Statistics* 69: 709–748. DOI 10.1111/j.1468-0084.2007.%2000477.x.

Zafar M.W., Saud S., Hou F., 2019. The impact of globalization and financial development on environmental quality: Evidence from selected countries in the Organization for Economic Co-operation and Development (OECD). *Environmental Science and Pollution Research* 26(13): 13246–13262. DOI 10.1007/s11356-019-04761-7.