Eurasian Journal of Economics and Finance, 10(4), 2022, 135-151
DOI: 10.15604/ejef.2022.10.04.002

EURASIAN JOURNAL OF ECONOMICS AND FINANCE

www.eurasianpublications.com

TRADE OPENNESS AND INCOME INEQUALITY: A CASE OF SOUTHERN AFRICAN DEVELOPMENT COMMUNITY COUNTRIES†

Dorcas Gonese
Corresponding Author: University of Fort Hare, South Africa
Email: 200909489@ufh.ac.za

Asrat Tsegaye
University of Fort Hare, South Africa
Email: atsegaye@ufh.ac.za

Forget Kapingura
University of Fort Hare, South Africa
Email: fkapingura@ufh.ac.za

Sibanesizwe Alwyn Khumalo
Rhodes University, South Africa
Email: s.khumalo@ru.ac.za

Received: November 21, 2021 Accepted: December 11, 2021

Abstract

This research aims to address one of the SADC regional indicative strategic plans (RISDP) and one of the 17 Sustainable Development Goals (SDG) objectives of reducing inequality in the face of increased trade openness. The paper uses the pooled mean group (PMG) estimation technique to examine the effect of trade openness on income inequality in 16 SADC countries from 1980 to 2019. The findings of the study reveal that trade openness worsens income inequality in the long run. Again, the findings of the results indicate that it is not only trading that matters on income inequality changes. Thus, trade openness reduces income inequality when economic growth, human capital index, and financial development are high. Yet, the mediating variable of trade openness and institutional quality has a positive and significant effect on income inequality in SADC countries. As a result, this study provides SADC policymakers and governments with some recommendations, such as investing more in high-quality education and strengthening financial institutions by reducing inequalities in the financial sector. Furthermore, effective policies to stimulate local production are needed to create jobs and improve the quality of institutions to reduce income inequality in the SADC region.

Keywords: Income Inequality, Trade Openness, Panel ARDL, SADC

JEL Classifications: D31, F13, D63

† This paper is based on the PhD thesis entitled "Trade Openness, Economic Growth, Income Inequality and Poverty Nexus in SADC Countries: 1980-2019" by Dorcas Gonese.

1. Introduction

Even if trade openness is considered to be favorable to economic growth, it does not guarantee that its benefits will be evenly distributed (Santos-Paulino, 2012). In this view, the effect of trade openness on income inequality became an issue of considerable debate and concern for economists, researchers, and analysts. According to the African Development Bank (AFDB) (2016), Southern Africa is one of the unequal regions in the world. As a result, it is critical to determine whether current activities and policies, such as trade openness, impact income inequality to assist SADC policymakers in identifying factors that minimize income inequality. Again, the traditional trade theories such as the Hecksher-Ohlin and Samuelson (1941) posit that trade openness increases the return on the abundant factor such as labor in the developing countries and equally causes a reduction in the return of the scarce factor such as capital or skilled labor. According to Mahesh (2016), trade openness entails lowering trade barriers to international trade in goods and services, which results in the integration of domestic markets into a single global market. Advocates (Dollar and Kraay, 2004) of open trade regimes argue that open trade regimes continue to be effective in boosting growth and reducing income disparities. This is due to trade openness lowering domestic prices, increasing output, and increasing export opportunities, resulting in increased income (Chang *et al.* 2009; Jaumotte *et al.* 2013; Mahesh, 2016). As a result, trade openness causes wages to increase in developing countries with a plentiful labor supply, reducing income disparity (Stolper and Samuelson, 1941). On the other hand, trade openness enhances the income of the skilled labor force in advanced economies with an abundant supply of skilled labor, widening income disparity.

Thus, the theoretical argument contradicts the empirical evidence (Goh and Law, 2019) that trade openness increases the diffusion of technology and the dissemination of new knowledge and ideas, which raises the returns to skilled labor and reduces demand for unskilled labor as economic sectors shy away from international market competition. As the World Trade Organization (WTO) continues to deter boundaries and discrimination amongst its trading partners, many economists, researchers, and analysts have been keen to examine the income inequality effects of trade openness.

The current research explores the impact of trade openness on income inequality in SADC countries. The paper also intends to assess the role of complementary policies such as economic growth, human capital development, financial development, and institutional quality in the trade openness and income inequality relationship. The income distribution refers to how a country's total income is distributed amongst its population (Mahesh, 2016). An analysis of income inequality by the African Development Bank (AFDB) (2016) reveals that most (Seychelles (66), South Africa (63), Botswana (57), Lesotho (53), Namibia (60), and Zambia (57.1)) of Southern African countries have a Gini Coefficient above 50 (African Development Bank, 2016). The Regional Inter-Agency Standing Committee (RIASCO) (2017) prompts that robust economic gains have not been necessarily effective in poverty alleviation because of high levels of income inequality in Southern Africa, with six countries of this region ranking among the world's ten most unequal countries. The SADC countries have implemented inequality reduction strategies such as Social and Basic Income Grant (BIG) that are most influential in Namibia and South Africa. The SADC, in its Regional Integrative Strategic Development Plan (RISDP) blueprint, also addresses inequality as a matter of concern. Given this, a question of interest for this study is to see how practical the SADC trade openness policy activities are in reducing income inequality.

The current paper adds to the existing body of knowledge in three keyways. Firstly, this study assesses the effect of trade openness only in SADC countries. The paper considers both short and long-run effects of trade openness on income inequality. Thirdly, the current study incorporates economic growth, human capital development, financial development, and institutional quality in influencing trade openness and income inequality. The findings indicate that real trade openness is insignificant to explain income inequality in the short term but positive and significant in the long run.

Moreover, the empirical results indicate that trade openness is favorable to income inequality reduction when economic growth, human capital index, and financial development are

high. Yet, the complementary variable of trade openness and institutional quality has a positive and significant effect on income inequality in SADC countries. In addition, the PMG shows that economic growth, GDP per capita, and inflation have a negative and significant impact on income inequality, while population growth, unemployment, financial development, human capital index, and institutional quality variables have a positive and non-trivial effect on income inequality in SADC countries.

The following section summarizes the literature on the relationship between trade openness and income inequality. The third section provides the data and method of our study. The paper's empirical findings are presented in Section 4, and the last section provides the conclusion, policy implications, recommendations.

2. Literature review

The Heckscher-Ohlin (1935) and Stolper and Samuelson (1941) theories hypothesize that the trade results in an increase in the abundant factor's real wages and a decrease in the scarce factor's real wages. As a result, trade is always a compromise between profit and loss for some (Goh and Law, 2019). This implies that trade openness will reduce income inequality in developing countries and increase income inequality in developed countries, suggesting a significant trade-off between trade openness and income distribution.

The empirical literature on the effect of trade openness and income inequality in developed and developing countries is controversial. Faustino and Vali (2011) assess the effect of globalization on income inequality in OECD countries using the fixed effects and general methods of moments (GMM) estimation techniques from 1995 to 2007. The study documents the favorable effect of trade openness on income inequality. The result is consistent with Jaumotte *et al.* (2013), who claim that trade openness as measured by globalization reduces income inequality in 51 countries between 1981 and 2003. Consistently, Lim and Mcnelis (2014) support that the effectiveness of trade openness on equal income distribution depends on the stage of development. The study claims that countries with high labor intensity and greater openness generate low-income inequality in 42 low and middle-income countries. The vector error correction model (VECM) in Agusalim and Pohan (2018) also supports a favorable effect of trade openness on income inequality in Indonesia between 1978 and 2015 but only in the short run.

On the contrary, other studies suggest that trade openness exacerbates income inequality in developing economies. Thus, the ordinary least squares (OLS) in Ezcurra and Rodríguez-Pose (2013) indicate that international trade increases income inequality within 22 developing countries between 1990 and 2006. Again, the least squares dummy variable (LSDV) in Oloufade (2013) indicates that trade openness worsens income inequality in countries with a high risk of conflict between 1963 and 1999 in 39 developing countries. In addition, Wahiba (2013) postulates that trade opening aggravates income inequality due to technological changes caused by trade openness between 1984 and 2011, hence the need for training unskilled labor to meet the demands of new technologies in Tunisia. The result is in line with Khalifa (2016), who suggests that trade openness effect on income inequality depends on the level of skill in an economy.

Studies (Asteriou *et al.* 2014; Cetin and Gunaydin, 2015; Antras *et al.* 2017; Barusman and Barusman, 2017) on developed and fastest-growing economies (such as China and Russia) have mixed inferences on the effect of trade openness on income inequality. However, other studies used different estimation techniques but are in consensus that trade openness reduces income inequality. For example, Asteriou *et al.* (2014) employ the GMM to assess the effect of trade openness as measured by economic globalization on income inequality between 1995 and 2009 in EU 27 countries. The study finds that trade openness reduces income inequality. Cetin and Gunaydin (2015) employ the VECM to analyze the relationship between trade openness and income inequality in Turkey. The study indicates that trade openness reduces income inequality in the long run. However, Mahesh (2016) suggests that trade openness exacerbates income inequality in Brazil, Russia, India, and China (BRIC) countries between 1991 and 2013. This is in line with Antras *et al.* (2017), Neagu *et al.* (2016), and Barusman and Barusman (2017) who indicate that trade openness is not favorable to the income distribution in United States (US) and

Eastern and Central Europe for the period 1979-2007, 2000-2014, and 1970-2016. Another critical issue is that studies such as Mahesh (2016) and Neagu *et al.* (2016) suggest that human capital production is conducive to equalizing income distribution. This indicates that the level of education is the priority in the income distribution variations.

Other studies (Dorn *et al*. 2017; Hazama, 2017; Goh and Law, 2019) considered both developed and developing countries and used similar estimation techniques to analyze trade openness and income inequality. Yet, their results are different as some studies are in line with the Stolper-Samuelson theory and some are not. Thus Dorn *et al*. (2017) employ the OLS and the two-stage least squares (2SLS) to assess the effect of trade on income inequality in 140 countries between 1970 and 2014. The study indicates that the OLS shows that trade openness worsens income inequality in developing and emerging countries, yet the effect is insignificant for high-income countries. However, the 2SLS indicates that trade openness as measured by globalization worsens income inequality in more advanced economies. Still, economic globalization is not a determinant of income inequality changes in developing and emerging economies.

At the same time, the fixed effects in Hazama (2017) indicate that trade openness referring to exports reduces income inequality in lower-income countries, yet the result is negligible for high-income countries between 1971 and 2012. However, Goh and Law (2019) considered both developed and developing countries from 1984 to 2012 and the GMM results indicate that trade openness exacerbates income inequality in 65 developed and developing economies. On the other hand, Goh and Law (2019) suggest that institutional quality is crucial for a favorable effect of trade openness on income inequality. The inferences in Hazama (2017) corroborate with Dorn *et al*. (2021), who claim that trade openness reduces income inequality in developing but worsens income inequality in developed economies between 1970 and 2014.

The studies on trade openness and income inequality for only SADC countries are scanty except Mazorodze (2021), who assessed the effect of trade on wage disparities in one SADC country (South Africa). This study indicates that trade openness worsens wage disparities between 1995 and 2019. Other studies that attempted to assess the effect of trade openness on income inequality in SADC only considered SADC as part of their sample. For instance, Xu *et al*. (2021) employed the GMM estimation to assess the effect of trade openness on income inequality in Sub-Saharan Africa (SSA). Their findings indicate that trade openness worsens income inequality between 2000 and 2015. Studies above utilized the fixed effects and OLS that do not control endogeneity. More so, most studies focus on the direct impact of trade openness on income inequality. Again, those that used GMM and other estimation techniques such as 2SLS to control endogeneity only focused on short-run analysis.

Moreover, most studies mixed developed and developing economies (Hazama, 2017; Dorn *et al*. 2021) with different goals and challenges, violating the cross-section homogeneity assumption. What do Zambia, Madagascar, Malawi, and Germany have in common, other than the fact that they are all part of the same panel data analysis? The current study considers the ARDL estimation technique, which controls heterogeneity bias and endogeneity problems and allows long-run relationships. Again, the study examines trade openness's direct and indirect effects on income inequality by employing the mediating variables of the multiplication of trade openness with economic growth, human capital, financial development, and institutional quality to check their efficacy in SADC countries' trade openness-income inequality nexus. The study considers all SADC countries in one panel because they have similar development challenges and goals, such as reversing the increase in income inequality as indicated in the RISDP.

3. Methodology and data

The empirical specification aims to examine the effect of trade openness on income inequality and test the role of economic growth, human capital and financial development, and institutional quality in the trade openness–income inequality nexus. The data for the variables used in the research is the secondary data over the period 1980 to 2019 that was obtained from electronic

database sources such as the World Income Inequality Database (WIID), World Bank, PovCalnet, World Penn table and World Integrated Trade Solution (WITS).

In analyzing the effect of trade openness on income inequality, this study adapted and modified the Meschi and Vivarelli (2009) model of the impact of trade openness on income inequality in 65 developing countries from 1980 to 1999. Meschi and Vivarelli (2009) opine that openness to trade, exports, and imports exacerbates income inequality. The Meschi and Vivarelli (2009) model is presented in Equation 1 as follows.

$$EHII_{it} = \alpha + \rho EHII_{i,t-1} + \beta OPEN_{it} + \sum_k \sigma_k + X_{ikt} + y_t + \eta_i + \varepsilon_{it} \quad (1)$$

, where $EHII$ is the household income inequality, $EHII_{i,t-1}$ denotes the lagged values of the dependent variable, and $OPEN$ is the international trade variable which includes trade, exports, and imports. X_k are set of control variables, including GDP per capita, human capital, and inflation. y_t denotes the dummy variable and η_i represents the individual and time-invariant country's fixed effects. ε_{it} denotes the error term, and $i\ and\ t$ denote country and period, respectively.

Although the GMM estimation technique was used by Meschi and Vivarelli (2009) to control endogeneity, this study considers the panel autoregressive distributed lag (ARDL) estimator which is more robust and effective when the time dimensions are greater than the cross-sections. The panel ARDL estimation technique, which consists of the mean group (MG), dynamic fixed effect (DFE), and pooled mean group (MG) estimator, considering the country-specific heterogeneity problem (Samargandi *et al*. 2014; Pesaran *et al*. 1999). Additionally, the analysis assesses the direct effects and the conditional impact of trade openness on income inequality, taking into account factors, such as economic growth, human capital development, financial development, and institutional quality on the relationship between trade openness and income inequality. Following Nissanke and Thorbecke (2007) and Mckay and Thorbecke (2015) who advocates that the trade openness through economic growth affects income inequality, the study modifies the Meschi and Vivarelli (2009) model into a heterogeneous dynamic panel data model. Therefore, the income inequality model for this research in Equation 1 is now transformed to a reparametrized ARDL model. Thus, the income inequality model for the current study is specified as in Equation 2.

$$LINEQ_{it} = \theta\left[LINEQ_{i,t-1} - \lambda_i X_{it}\right] + \sum_{j=1}^{p-1} \zeta_{ij}\, LINEQ_{i,t-j} + \sum_{j=0}^{q-1} \beta_{ij}\, X_{i,t-1} + \omega_i + \varepsilon_{it} \quad (2)$$

where $LINEQ_{it}$ is the natural logarithm of the income inequality level for country i at time t measured by the Gini coefficient. the X_{it} represents the explanatory variables and are allowed to be purely 1(0) or 1(1). The explanatory variables are all measured in natural logarithmic form. These include the main independent variable, the real trade openness $(LRTO)$ and the control variables, which consist of the interaction variables, including the multiplication of trade openness measures with economic growth $(LRGDP)$, human capital development $(LHIND)$, financial development (LFD), and institutional quality (LPS), and the country-specific variables in this model which include foreign direct investment $(LFDI)$, financial development (LFD), expenditure, economic globalisation $(LKOF)$, GDP per capita $(LGDPPC)$, unemployment $(LUNEM)$, inflation rate $(LINFL)$, and population $(LPOPLN)$. The λ_i is the vector of the long-run relationship. $\boldsymbol{\theta}$ is the adjustment coefficient, and $\left[LINEQ_{i,t-1} - \lambda_i X_{it}\right]$ is the error correction term which represents the long-run information of the model. The error correction model comes with a different operator for the dependent variable which means that once the ARDL is differenced, there will be a loss of lag length. Therefore, the lag length is now p-1 and q-1 ζ_{ij} and β_{ij} are short-run parameters. ω_i and ε_{it} denote the unit-specific fixed effects and the error term, respectively.

The PMG is the preferred estimator in this research because it approaches regression for each observation and averages them across countries. The short-run coefficient, error term, and intercept are different across units but similar across countries (Guei and le Roux, 2018). As a result, the effect of heterogeneity on the means of the coefficients can be determined by the

Hausman (1978) test applied to the difference between the DFE, MG, and PMG (Pesaran *et al*. 1997). Thus, the researcher performs the Hausman (1978) test to decide between the DFE, MG, and PMG. The null hypothesis is that the MG/DFE and PMG estimates are not significantly different, meaning that the PMG is more efficient under the null hypothesis.

4. Empirical results

This section presents the empirical findings of the effect of trade openness on income inequality in SADC countries from 1980 to 2019. The study performed the descriptive statistic, correlation coefficient, stationarity tests, the lag length selection, and the Hausman (1978) test before performing the empirical analysis on the effect of trade openness on income inequality for SADC countries. The descriptive statistics are reported in Table 1, and other preliminary results such as the correlation matrix, stationarity tests, lag length selection, and Hausman (1978) test results are shown in Table A1, Table A2, Table A3, and Table A4 in Appendices. The Hausman (1978) test p-values in Table A4 are greater than 0.05, and thus the PMG is the more appropriate estimator. The estimation results on the short-run effect of trade openness on income inequality in SADC are presented in Table 2. The findings of the long-run impact of trade openness on income inequality are shown in Table 3. Model 1 presents the direct effect of trade openness on income inequality, while Models 2 to 5 focus only on the indirect impact of trade openness, thus the results in Models 2 to 5 are based on the last rows, which show the role of economic growth, human capital index/education, financial development, and institutional quality in the trade openness-income inequality relationship. The following table describes the data provided by the variables of the income inequality model.

Table 1. Descriptive statistics

Variables	Obs.	Mean	Std. Dev.	Min	Max
INEQ	467	0.6546	0.0695	0.5279	0.8327
RTO	456	48.5895	29.6930	2.0643	182.35
RGDP	640	3.4540	4.7750	-24	26.8
GDPPC	627	1.2661	4.7340	-26.4118	18.0660
UNEM	354	12.0374	9.5658	0.599	37.94
POPLN	640	2.2608	1.0783	-2.6286	6.0085
HIND	568	2.0589	1.3809	1.0411	12.3336
FD	584	22.5745	24.1703	0.45	131.0482
PS	592	1.2454	6.5061	-10	10
INFL	640	83.9734	981.3996	-72.7	23773.1

The descriptive statistics in Table 1 show that the average income inequality in the area between 1980 and 2019 is 66, with a trade openness value of 44%. These values indicate that the SADC region has high-income inequality, and the maximum value reaches out to 0.83 between1980 to 2019. Most importantly, as seen from Table 1, which presents the standard deviations that show the sample's variations, the standard deviation is large enough to explore the variance in the data. The following Table 2 illustrates the estimation results of the short-run effect of trade openness on income inequality in SADC countries.

Table 2 shows the relationship between trade openness and income inequality in the short term. Thus, Model 1 presents the effect of the benchmark measure of trade openness, which is real trade openness. Models 2 to 5 only focus on the indirect impact of trade openness. Thus, Models 2 to 5 are based on the last rows that show the role of economic growth, human capital index/education, financial development, and institutional quality in the trade openness-income inequality relationship. The negative and significant error correction term (ECT) in Models 1 to 5 verifies that diversions among the series in the short term are eliminated. The series goes back towards their long-term equilibrium values. Again, the p-values of the Hausman test, as shown in Table 3, are greater than 0.05%, meaning that the PMG is the appropriate estimator to use for the trade openness and income inequality regression analysis. However, the short-run

coefficients in Table 2 show that real trade openness has an insignificant effect on income inequality. Yet, the results are not the same for the long-run effects of trade openness on income inequality in SADC countries.

Table 2. Short-run PMG estimation results: trade openness and income inequality

Variables	(Model 1)	(Model 2)	(Model 3)	(Model 4)	(Model 5)
ECT	-0.0993*	-0.1340**	-0.1750*	-0.1750*	-0.0608**
	(0.0634)	(0.0552)	(0.1000)	(0.1080)	(0.0291)
D.LRTO	0.0006	-0.0084	-0.1840	0.0719	0.0290
	(0.0063)	(0.0097)	(0.1660)	(0.0567)	(0.0957)
D.LRGDP	-0.0054	-0.0155	0.0076	-0.0037	0.0084
	(0.0045)	(0.0168)	(0.0045)	(0.0049)	(0.0055)
D.LGDPPC	0.0033	0.00005	-0.0034	0.0020	-0.0030
	(0.0026)	(0.0030)	(0.0021)	(0.0026)	(0.0020)
D.LUNEM	0.0105	-0.0029	0.0018	0.0036	0.0069
	(0.0113)	(0.0120)	(0.0085)	(0.0120)	(0.0056)
D.LPOPLN	-0.5270	-0.2690	-0.3150	-0.0839	-0.5090
	(0.4680)	(0.2190)	(0.2190)	(0.1230)	(0.4780)
D.LFD	-0.0017	0.0078	0.0011	0.0740	0.0024
	(0.0172)	(0.0071)	(0.0038)	(0.0661)	(0.0101)
D.LHIND	-0.8810	-2.8500	-5.1530	-1.2390	-4.8350
	(1.7910)	(2.1650)	(3.9930)	(1.0180)	(4.6780)
D.LPS	-0.0059	(0.0980)	-0.0038*	-0.0092	-0.0129
	(0.0041)	-0.0063	(0.0026)	(0.0103)	(0.1320)
D.LINFL	0.0005	0.0011	0.00005	0.0002	0.0001
	(0.0008)	(0.0008)	(0.0005)	(0.0005)	(0.0001)
D.LRTOLRGDP		0.0038			
		(0.0044)			
D.LRTOLHIND			0.1420		
			(0.1170)		
D.LRTOLFD				-0.0121	
				(0.0149)	
D.LRTOLPS					-0.0061
					(0.0374)

Notes: Standard errors are shown in parentheses. The selected model is panel ARDL (1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1) using Stata Program and according to AIC criterion. Finally, ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

Table 3 shows the impact of trade openness on income inequality in long term. Model 1 in Table 2 presents the direct effect of trade openness on income inequality. Models 2 to 5 in the mentioned tables only focus on the indirect effect of trade openness. Thus, Models 2 to 5 are based on the last rows that show the role of economic growth, human capital index, financial development, and institutional quality in the trade openness-income inequality relationship in the long term.

The empirical results in Table 3 indicate that a 1% increase in trade openness is associated with a 0.01% increase in income inequality at a 10% significance level, in the long run holding other variables constant. This indicates that trade openness increases income inequality over the long run in the SADC region. These results are not in line with the apriori expectation of this research. The positive effect of trade openness on income inequality would be attributed to imbalances of technical mastery, meaning that the activities that drive economic growth make more intensive use of skilled labor than other activities (Grossman and Helpman, 1991).

Moreover, the positive effect would be attributed to differences in initial endowment and detrimental effects of financial instability in SADC countries. This means that the gains from trade openness are not fairly distributed among the rich and the poor in SADC countries. This result refutes the Stolper-Samuelson theory, which argues that trade openness reduces income inequality in developing countries. The finding, however, aligns with Goh and Law (2019), who posit that trade openness worsens income inequality in developed and developing economies.

This is also consistent with Kelbore (2015) and Meschi and Vivarelli (2009), who argue that trade openness reinforces demand for more skilled laborers in less skilled economies, where the exporting sectors dodge international competition. Therefore, they shy away from labor production technology to capital production technologies. Thus, the less skilled will earn less than the skilled laborers.

Table 3. Long-run PMG estimation results: trade openness and income inequality

Variables	(Model_1)	(Model_2)	(Model_3)	(Model_4)	(Model_5)
L.LRTO	0.0091*	0.0005	0.1650***	0.0599***	-0.0248**
	(0.0048)	(0.0082)	(0.0322)	(0.0127)	(0.0103)
L.LRGDP	-0.0049*	0.0260*	0.0025	-0.00202**	0.0144**
	(0.0027)	(0.0146)	(0.0026)	(0.0010)	(0.0062)
L.LGDPPC	-0.0034**	0.0014	-0.0026**	-0.0017***	0.0200***
	(0.0016)	(0.0011)	(0.0013)	(0.0004)	(0.0055)
L.LUNEM	0.0161***	0.0510***	0.0335***	0.0181***	0.1990***
	(0.0050)	(0.0105)	(0.0059)	(0.0045)	(0.0310)
L.LPOPLN	0.1270***	0.0542***	0.0903***	0.0293***	-0.1090*
	(0.0167)	(0.0099)	(0.0137)	(0.0026)	(0.0571)
L.LFD	0.0206***	-0.0011	0.0001***	0.0551***	0.0320***
	(0.0028)	(0.0026)	(0.000047)	(0.0130)	(0.0049)
L.LHIND	0.6770***	0.4020***	0.4780***	0.0944***	1.2790***
	(0.0884)	(0.0312)	(0.0955)	(0.0263)	(0.1910)
L.LPS	0.0207***	-0.0041*	0.0053***	0.0145***	-0.1480***
	(0.0053)	(0.0021)	(0.0015)	(0.0015)	(0.0266)
LINFL	-0.0100***	-0.630	-0.0007*	0.0021***	0.0166***
	(0.0011)	(1.917)	(0.0003)	(0.0007)	(0.00382)
L.LRTOLRGDP		-0.0055*			
		(0.0030)			
L.LRTOLHIND			-0.1300***		
			(0.0247)		
L.LRTOLFD				-0.0148***	
				(0.0032)	
L.LRTOLPS					0.0529***
					(0.00841)
Constant	-0.0447	-0.0133	-0.0273	0.0466	-0.0699
	(0.0294)	(0.0126)	(0.0223)	(0.0303)	(0.0486)
Hausman p-value	[1.000]	[0.8990]	[0.6922]	[0.9855]	[0.1767]
Observations	275	277	275	277	275

Notes: Standard errors are shown in parentheses. The selected model is panel ARDL (1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1) using Stata Program and according to AIC criterion. Finally, ***, **, and * represent 1%, 5%, and 10% significance levels, respectively.

The positive effect of trade openness on income inequality accords Mahesh (2016), who postulates that trade openness exacerbates income inequality in BRIC countries, namely Brazil, Russia, India, and China. The result is also in line with modern critics who argue that trade openness exacerbates income inequality in emerging economies by benefitting only the wealthy, educated, and those who manage trade-related operations (Wade, 2004; Foellmi and Oechslin, 2010). Again, the result is consistent with Meschi and Vivarelli (2009) and Khan and Bashir (2012), who document a positive link between trade openness and income inequality.

The empirical results also indicate that unemployment and population growth are drivers of income inequality over the long run. Thus, a 1% increase in unemployment and population growth is associated with a 0.02% and 0.13% increase in income inequality at 1% significance levels. The positive effect of unemployment is consistent with the economic welfare theory, which postulates that when people become unemployed, they lose their earnings which reduces their income leading to income inequality. The results accord Bjorklund (1991), Cysne and Turchick (2012) and Saunders (2002) who contend that unemployment contributed to income inequality, particularly among people with low earning capacity. More so, the findings of the PMG are

consistent with the current study's apriori expectation that unemployment and population growth are factors that foster income inequality. Unemployment and population reduction should also be addressed by SADC governments and policymakers when discussing policies to reduce income inequality.

Additionally, the empirical results indicate that a 1% increase in financial development, human capital index, and institutional quality is associated with a 0.02%, 0.7%, and 0.02% increase in income inequality respectively at 1% significant levels over the long run, ceteris paribus. The results are not consistent with the apriori expectation. The positive influence of financial growth on income inequality could thus be come into existence since capital market reforms benefit the rich more than the poor, particularly in developing economies such as SADC, and thus lead to an increase in income inequality. This is because wealthy individuals have more potential than poor ones to exploit new opportunities (Coady and Dizioli, 2017). This finding is in line with Greenwood and Jovanovic (1990) and Clarke *et al*. (2006), who advocate that access to bank credit for the poor may be impeded because of the high costs involved and that financial debt may be regressive for the poor.

Moreover, the rich and powerful could benefit from financial development because the financial markets may be rife with adverse selection and moral hazard issues, so the borrowers need collateral. Thus, even though financial markets are well developed, the poor who may not have this find it difficult to get loans. This means that growing disparities in financial sectors, where only the affluent can access financial services due to the fixed costs of entering financial coalitions, widen the region's income disparity.

The positive impact of the human capital index on income inequality might imply that the level of education in SADC countries does not meet the requirements of economic development, so that the majority of educated people appear to be unemployed, depriving them of their income earnings, thus raising the inequality of income. Moreover, poor quality of education might highly likely to contribute to less skill growth and lower paid employment in the job market. In contrast, high-quality private education obtained by those who can afford it is likely to lead to higher-paying jobs, thereby increasing income inequality (Wells, 2006). This would be attributed to the early stages of development and the production factor endowment that is already existing, meaning that a large number of the SADC countries might be less skilled. Therefore, if education increases at this stage of development, most unskilled laborers will lose their jobs and income earnings, leading to high-income inequality.

The empirical results indicate that the improvement in the quality of institutions seems to be less effective to income inequality reduction over the long run. This could be attributed to the fact that institution quality in the SADC countries may be weakened by high levels of corruption and unlimited discretion of the SADC governments. The study is in line with Goh and Law (2019), who opines that the beneficial effects of trade openness on income inequality can only be attained when institutional quality development is achieved. Again, these results accord Chong and Gradstein (2007), who suggest that weak law enforcement weakens the institutional quality since the delivery of services and allocation of resources and fair judgment becomes less than desirable. Therefore, the actual achievement of equitable distribution of income will be less than the purported aim.

Next, Table 3 indicates that a 1% increase in economic growth, GDP per capita, and inflation reduces income inequality by 0.01%, 0.003%, and 0.01% at 10%, 5%, and 1% significance levels, respectively. The negative effect of economic growth on income inequality shows that increasing economic growth would directly improve the equal distribution of income over the long run. This could be attributed to the high-income disparity due to high savings and investments by a limited number of capable individuals in the SADC economy.

The GDP per capita is expected to be negatively related to income inequality. As initially expected, the empirical estimation shows that per capita income is negatively associated with income inequality in SADC countries. The results are consistent with the apriori expectation of the study and in line with Agusalim and Pohan (2018), who suggest that GDP per capita is an income inequality reducing factor in the long run. Again, the negative effect of GDP per capita

and income inequality corroborates the findings of Mahesh (2016), which advocates that per capita income is negatively related to income inequality in BRIC countries.

The negative effect of the inflation rate on income inequality is inconsistent with the apriori expectation of the study. This result is consistent with Heer and Süssmuth (2003), who suggest that inflation reduces income inequality. This could be because changes in the pace of economic growth, the rate of real interest rate, and the value of wages mediate the overall impact of inflation in SADC countries. As a result, as inflation rises, the interest-rate effect decreases, whereas the asset-value effect might be either negative or positive. Consequently, inflation may exacerbate income disparities.

Models 2, 3, 4, and 5 in Table 3 show that greater openness reduces income inequality when economic growth is high, investment in human capital is higher, and financial institutions are more developed. Thus a 1% increase in trade openness with increasing economic growth reduces income inequality by 0.01% at 10% significance level over the long run. The results are consistent with Hecksher-Ohlin and Stolpler-Samuelson's theory which advocates that an increase in trade openness reinforces capital mobility and better use of advantaged comparative unskilled labor in developing countries prompt growth and curtail income inequality (Samuelson, 1949). Thus, creating more jobs for the poor makes the poor earn more than before, leading to low-income inequality.

Moreover, a negative effect of the interaction term of trade openness and human capital development (Model 3) implies that trade gains are beneficial to equal income distribution in SADC countries. This result is consistent with the endogenous growth theory, suggesting that the effect of trade on income inequality may depend on the adoption of technology determined by human capital, which means that increasing diffusion of technology and dissemination of knowledge through trade openness allows more individuals to carry out more productive investment in physical or human capital. Consequently, more human capital leads to more skill, investment, and income earnings, thereby reducing income inequality.

Model 4 shows the results of the estimations testing the role of financial institutions in the trade–income inequality relationship. The beneficial impact of trade openness on income inequality reduction is greater when financial institutions are stronger. This result suggests that stronger financial institutions accelerate financial development, thereby reducing income inequality through lowering bank risk-taking and costs of bank credit and providing diversification opportunities that improve borrowers' selection. The result also aligns with Destek *et al.* (2020), who opine that financial institutions are influential on income distribution in the sense that when the financial sector starts to develop through different channels such a private credit and banking and financial service sector, it directly favorably influences the distribution of income.

Furthermore, Table 3 analyzes whether the relationship between openness to trade and income inequality may hinge on SADC countries' institutional environment (Model 5). The results suggest that trade openness exacerbates income inequality as institutional quality improves. This is not consistent with the apriori expectation of the current research. Zahonogo (2016) argues that an environment with high-quality governance is more favorable to the emergence of new enterprises. In this situation, however, a positive effect would be ascribed to high rates of corruption and weaker law enforcement which deter the efficacy of institutional quality in reducing income disparity, where only small groups of enterprises gain access to political power. Therefore, they then use this power to promote their interests that favor only a smaller community, which leads to growing income inequality in the long term.

The Durbin Watson, B-Godfrey, and the White heteroscedasticity tests (Table A5 in Appendices) indicate that there is no evidence of autocorrelation in 14 out of 16 countries and heteroscedasticity in all 16 groups. The cumulative sum of squares (CUSUM) charts (Figure A1 in Appendices) shows an average line within the boundaries of the critical region, indicating the structural stability of the parameters in 12 out of 16 countries. Yet four countries are slightly stable as the other parts do not fall within the 5% critical line.

5. Conclusion, policy implications, and recommendations

This paper assessed the income inequality effects of trade openness in SADC countries using the PMG estimation technique. The correlation coefficient test results indicate that there is no exact or linear relationship between the independent variables. The lag length selection uses the AIC criterion. Thus, the lag length selection suggests except for inflation and institutional quality, and the common lag for all other variables included in the study is one. The study utilizes LLC, Im-Pesaran, and the ADF unit roots test, which indicate that the variables of concern are not integrated of the same order. In the Hausman (1978) test p-values are greater than 0.05 and thus the PMG is the more appropriate estimator. The negative and significant error correction term (ECT) in Table 2 verifies that diversions among the series in the short run are eliminated and the series go back towards their long-term equilibrium values. The diagnostic test results indicate that there is no evidence of autocorrelation in 14 out of 16 countries. The model's functional form is well specified, and there is no heteroscedasticity in all 16 groups. The CUSUM charts (Figure A1 in Appendices) indicate the structural stability of the parameters in 16 countries.

Based on the empirical results obtained using the system PMG estimator, real trade openness is insignificant to explain income inequality in the short term but positive and significant in the long run. Therefore, trade openness should not be dismissed outright as a harmful policy, especially for SADC countries. Moreover, the empirical findings show that it is not only trade openness that matters in the trade openness-income inequality relationship. Thus, real trade openness reduces income inequality when economic growth, human capital development, and financial development are high. This implies that trade-led growth is an income reduction factor and that a better-educated labor force in the SADC economy can revamp productivity and technological adoption, improving income earnings for the poor. As a result, SADC governments and policymakers should take full responsibility for promoting human capital investment, taking into account intergenerational dynamics in educational benefits. Policies must be based on a full understanding of the factors that impact household education decisions, as well as how subsidized programs might benefit the poor. Moreover, policies to improve the quality of education and increase the supply of skilled employees should also be undertaken.

Nonetheless, the empirical results indicate that real trade openness worsens income inequality when institutional quality improves. The empirical results suggest that further institutional quality improvement decreases income distribution parities. Thus, efforts to improve institutional quality should be prioritized. As a result, prior to any trade openness negotiations, SADC governments and policymakers should develop policies focused at strengthening institutional quality. The SADC governments need to create an environment conducive to equal income distribution. Macroeconomic policy should aim at stability and openness towards the rest of the world. Therefore, for all these efforts to be effective, the SADC governments must develop efficient and effective growth, financial and education systems, and institutional quality to equally distribute the gains from trade openness.

References

African Development Bank, 2016. African development report: growth, poverty and inequality nexus: overcoming barriers to sustainable development. Cote d'Ivoire. [online] Available at: <https://www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/ADR15_UK.pdf> [Accessed on 1 November 2021].

Agusalim, L. and Pohan, F. S., 2018. Trade openness effect on income inequality: empirical evidence from Indonesia. *Jurnal Ilmu Ekonomi Signifikan*, 7(1), pp. 1-14. https://doi.org/10.15408/sjie.v7i1.5527

Antras, P., de Gortari, A., and Itskhoki, O., 2017. Globalization, inequality and welfare. *Journal of International Economics*, 108, pp. 387-412. https://doi.org/10.1016/j.jinteco.2017.07.009

Asteriou, D., Dimelis, S., and Moudatsou, A., 2014. Globalization and income inequality: a panel data econometric approach for the EU27 countries. *Economic Modelling*, 36, pp. 592-599. https://doi.org/10.1016/j.econmod.2013.09.051

Barusman, A. F. and Barusman, M. Y. S., 2017. The impact of international trade on income inequality in the United States since 1970's. *European Research Studies Journal*, 20(4), pp. 35-50. https://doi.org/10.35808/ersj/818

Bjorklund, A., 1991. Unemployment and income distribution : time-series evidence from Sweden. *Journal of Economics*, 93(3), pp. 457–465. https://doi.org/10.2307/3440187

Cetin, M. and Gunaydin, D., 2015. The impact of economic growth and trade openness on income inequality: an empirical analysis for Turkish economy. *International Refereed Academic Social Sciences Journal*, 6(20), pp. 58-82. https://doi.org/10.17364/IIB.20152013533

Chang, R., Kaltani, L., and Loayza, N. V., 2009. Openness can be good for growth: the role of policy complementarities. *Journal of Development Economics*, 90(1), pp. 33-49. https://doi.org/10.1016/j.jdeveco.2008.06.011

Chong, A. and Gradstein, M., 2007. Inequality and institutions. *The Review of Economics and Statistics*, 89(3), pp. 454-465. https://doi.org/10.1162/rest.89.3.454

Clarke, G. R. G., Xu, L. C., and Zou, H., 2006. Finance and income inequality: what do the data tell us?. *Southern Economic Journal*, 72(3), p. 578-596. https://doi.org/10.1002/j.2325-8012.2006.tb00721.x

Coady, D. and Dizioli, A., 2017. Income inequality and education revisited: persistence, endogeneity, and heterogeneity. *Applied Economics*, 50(25), pp. 2747-2761. https://doi.org/10.1080/00036846.2017.1406659

Cysne, R. P. and Turchick, D., 2012. Equilibrium unemployment-inequality correlation. *Journal of Macroeconomics*, 34(2), pp. 454–469. https://doi.org/10.1016/j.jmacro.2011.12.009

Destek, M. A., Sinha, A., and Sarkodie, S. A., 2020. The relationship between financial development and income inequality in Turkey. *Journal of Economic Structures*, 9(1), pp. 1-14. https://doi.org/10.1186/s40008-020-0187-6

Dollar, D. and Kraay, A., 2004. Trade, growth, and poverty. *The Economic Journal*, 114(93), pp. F22-F49. https://doi.org/10.1111/j.0013-0133.2004.00186.x

Dorn, F., Fuest, C., and Potrafke, N., 2017. *Globalization and income inequality revisited*. CESifo Working Paper No. 6859. https://doi.org/10.2139/ssrn.3143398

Dorn, F., Fuest, C., and Potrafke, N., 2021. Trade openness and income inequality: new empirical evidence. *Economic Inquiry*. https://doi.org/10.1111/ecin.13018

Ezcurra, R. and Rodríguez-Pose, A., 2013. Trade openness and spatial inequality in emerging countries. *Spatial Economic Analysis*, 9(2), pp. 162-182. https://doi.org/10.1080/17421772.2014.891155

Faustino, H. and Vali, C., 2011. *The effects of globalisation on OECD income inequality: a static and dynamic analysis*. ISEG/DE working papers No. 12-2011/DE. 0874–4548, Portugal: ISEG.

Foellmi, R. and Oechslin, M., 2010. Market imperfections, wealth inequality, and the distribution of trade gains. *Journal of International Economics*, 81(1), pp. 15-25. https://doi.org/10.1016/j.jinteco.2010.03.001

Goh, L. T. and Law, S. H., 2019. The effect of trade openness on income inequality with the role of institutional quality. *Indonesian Journal of Economics, Social, and Humanities*, 1(2), pp. 65-76. https://doi.org/10.31258/ijesh.1.2.65-76

Greenwood, J. and Jovanovic, B., 1990. Financial development, growth, and the distribution of Income. *Journal of Political Economy*, 98(5), pp. 1076-1107. https://doi.org/10.1086/261720

Grossman, G. M. and Helpman, E., 1991. Trade, knowledge spillovers, and growth. *European Economic Review*, 35(2-3), pp. 517-526. https://doi.org/10.1016/0014-2921(91)90153-A

Guei, K. M. and le Roux, P., 2018. Trade openness and economic growth : evidence from the economic community of Western African States region. *Journal of Economics and Financial Sciences*, 12(1), pp. 1-9. https://doi.org/10.4102/jef.v12i1.402

Hausman, J. A., 1978. Specification tests in econometrics. *Econometrica*, 46(6), pp. 1251-1271. https://doi.org/10.2307/1913827

Hazama, Y., 2017. *The impact of exports on income inequality in developing countries*. IDE Discussion Papers No. 650, Japan: Institute of Developing Economies, Japan External Trade Organization (JETRO).

Heer, B. and Süssmuth, B., 2003. *Cold progression and its effects on income distribution*. CESifo Working Paper No. 951. https://doi.org/10.2139/ssrn.414043

Jaumotte, F., Lall, S., and Papageorgiou, C., 2013. Rising income inequality: technology, or trade and financial globalization? *IMF Economic Review*, 61(2), pp. 271-309. https://doi.org/10.1057/imfer.2013.7

Kelbore, Z. G., 2015. *Trade openness, structural transformation, and poverty reduction: empirical evidence from Africa*. MPRA Paper No. 65537. [online] Available at: <https://mpra.ub.uni-muenchen.de/id/eprint/65537> [Accessed on 6 November 2021].

Khalifa, S., 2016. Trade, overeducation, and wage inequality. *The Journal of Developing Areas*, 50(2), pp. 153-183. https://doi.org/10.1353/jda.2016.0093

Khan, R. E. A. and Bashir, H. N., 2012. Trade, poverty and inequality nexus: the case of Pakistan. *World Applied Sciences Journal*, 18(5), pp. 722-726. https://doi.org/10.5829/idosi.wasj.2012.18.05.1255

Lim, G. C. and Mcnelis, P. D., 2014. *Income inequality, trade and financial openness*. Melbourne Institute Working Paper No. 7/14. https://doi.org/10.2139/ssrn.2425068

Mahesh, M., 2016. The effect of trade openness on income inequality: evidence from developing countries. *Economics Bulletin*, 36(3), pp. 1751-1761.

Mazorodze, B. T., 2021. Trade and wage disparities in South Africa. *Cogent Economics and Finance*, 9(1), p. 1915516. https://doi.org/10.1080/23322039.2021.1915516

Mckay, A. and Thorbecke, E., 2015. *Economic growth and poverty reduction in Sub-Saharan Africa: current emerging issues*. New York: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780198728450.001.0001

Meschi, E. and Vivarelli, M., 2009. Trade and income inequality in developing countries. *World Development*, 37(2), pp. 287-302. https://doi.org/10.1016/j.worlddev.2008.06.002

Neagu, O., Dumiter, F., and Braica, A., 2016. Inequality, economic growth and trade openness: a case study for Central and Eastern European Countries (ECE). *Amfiteatru Economic Journal*, 18(43), pp. 557-574.

Nissanke, M. and Thorbecke, E., 2007. *The impact of globalization on the world's poor: transition mechanism*. London: Palgrave Macmillan. https://doi.org/10.1016/j.worlddev.2008.06.002

Ohlin, B. G., 1935. *Interregional and international trade*. Cambridge: Harvard University Press.

Oloufade, D. K., 2013. *Trade openness, conflict risk and income inequality*. [online] Available at: <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2135222> [Accessed on 6 November 2021].

Pesaran, M. H., Shin, Y., and Smith, R. P., 1997. *Pooled estimation of long-run relationships in dynamic heterogenous panels.* Department of Applied Economics Working Papers Amalgamated Series No. 91/21, University of Cambridge, p. 18. [online] Available at: < https://www.econ.cam.ac.uk/people-files/emeritus/mhp1/jasaold.pdf> [Accessed on 5 November 2021].

Pesaran, M. H., Shin, Y., and Smith, R. P., 1999. Pooled mean group estimation of dynamic heterogenous panels. *Journal of the American Statistical Association*, 94, pp. 621–634. https://doi.org/10.1016/j.worlddev.2008.06.002

Regional Inter-Agency Standing Committe (RIASCO), 2017. *Response plan for the El Niño-induced drought in Southern Africa*. Cape Town. [online] Available at: <https://www.humanitarianresponse.info/en/operations/southern-eastern-africa/document/report-riasco-action-plan-el-niño-induced-drought>.

Samargandi, N., Fidrmuc, J., and Ghosh, S., 2014. Is the relationship between financial development and economic growth monotonic? Evidence from a sample of middle-

income countries. *World Development*, 68, pp. 66-81. https://doi.org/10.1016/j.worlddev.2008.06.002

Samuelson, P. A., 1949. International factor-price equalization once again. *Economic Journal*, 59(234), pp. 181-197. https://doi.org/10.2307/2226683

Santos-Paulino, A. U., 2012. *Trade, income distribution and poverty in developing countries: a survey*. UNCTAD Discussion Papers No. 207. Geneva: United Nations Conference on Trade and Development.

Saunders, P., 2002. The direct and indirect effects of unemployment on poverty and inequality. *Australian Journal of Labour Economics*, 5(4), pp. 507–529.

Stolper, W. F. and Samuelson, P. A., 1941. Protection and real wages. *The Review of Economic Studies*, 9(1), pp. 58-73. https://doi.org/10.2307/2226683

Wade, R. H., 2004. Is globalization reducing poverty and inequality? *International Journal of Health Services*, 34(3), pp. 381-414. https://doi.org/10.2307/2226683

Wahiba, N. F., 2013. Trade openness and inequality. *Journal of Knowledge Management, Economics and Information Technology*, 3(6), pp. 1-12.

Wells, R., 2006. Education's effect on income inequality: an economic globalization perspective. *Globalisation, Societies and Education*, 4(3), pp. 371-391. https://doi.org/10.1080/14767720600955428

Xu, C., Han, M., and Dossou, T. A. M., 2021. Trade openness, FDI, and income inequality: evidence from Sub-Saharan Africa. *African Development Review*, 33(1), pp. 193–203. https://doi.org/10.1111/1467-8268.12511

Zahonogo, P., 2016. Trade and economic growth in developing countries: evidence from Sub-Saharan Africa. *Journal of African Trade*, 3(1–2), pp. 41-56. https://doi.org/10.1016/j.joat.2017.02.001

Appendices

Table A1. Correlation matrix

	LINEQ	LRTO	LRGDP	LGDPPC	LUNEM	LPOPLN	LFD	LHIND	LPS	LINFL
LINEQ	1.0000									
LRTO	0.1430	1.0000								
LRGDP	-0.0411	0.0686	1.0000							
LGDPPC	-0.0525	0.1329	0.8825	1.0000						
LUNEM	0.5621	0.2220	0.0072	0.0800	1.0000					
LPOPLN	0.0424	-0.4137	0.2204	-0.0119	-0.3411	1.0000				
LFD	0.0583	0.2889	-0.1216	-0.0312	0.2871	-0.4346	1.0000			
LHIND	-0.0109	0.2234	-0.1141	-0.0663	-0.0887	-0.2632	0.2336	1.0000		
LPS	0.2125	-0.0995	0.1623	0.1501	0.1225	-0.0603	0.3256	0.2592	1.0000	
LINFL	0.0959	-0.1606	0.0740	-0.0199	0.1346	0.2956	-0.3176	-0.2978	-0.0212	1.0000

Table A2. Common and individual unit root test results

	LLC		Im-Pesaran		ADF	
	Order of integration		Order of integration		Order of integration	
	1(0)	1(1)	1(0)	1(1)	1(0)	1(1)
LINEQ			3.3633	-2.8617**	-2.9787**	-3.2506**
LRTO			0.1928	-10.6364**	0.5794	-8.4632**
LRGDP	-5.6473**	-10.8442**	-108744**	-177964**	-9.5936**	-23.3245**
LGDPPC	-4.7471***	-15.188***	-8.7170***	-14.644***	-12.515***	-26.683***
LPOPLN	-9.8932**	-15.0008**	0.6090	-3.3218**	-11.1324**	-17.6552**
LUNEM			0.4025	-5.8733***	-1.7106*	-6.6249***
LHIND			3.1536	-0.7440*	0.9857	-0.5363
LFD			-1.6141***	-13.2695**	-2.2086***	-10.9661**
LPS			-	-	-0.7347	-11.6289**
LINFL	-2.6888**	-15.5267**	-5.5139**	-16.2761**	-4.9003**	19.0415**

Notes: t-statistics are presented in the table. ***, **, and * denote the significance levels at 0.01%, 0.05%, and 0.1%, respectively.

Table A3. Lag length selection

Country	INEQ	GDPPC	UNEM	POPLN	FD	HIND	INFL	PS
Angola	1	1	0	1	1	1	1	1
Botswana	1	1	1	1	1	0	1	0
Comoros	1	1	0	1	0	1	1	1
DRC	1	1	1	0	0	0	0	1
Eswatini	1	1	1	1	1	0	0	0
Lesotho	1	1	0	1	1	0	0	1
Madagascar	1	1	1	1	1	1	0	0
Malawi	1	1	0	1	1	0	0	1
Mauritius	1	0	0	1	1	1	0	1
Mozambique	1	1	1	1	1	1	0	1
Namibia	1	1	1	1	1	1	1	0
Seychelles	1	1	1	1	1	1	0	1
South Africa	1	1	0	0	0	1	1	0
Tanzania	1	1	1	1	1	0	1	0
Zambia	1	1	1	1	1	0	0	1
Zimbabwe	1	1	1	1	1	0	0	0
C_lag	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**1**

Note: The selected model is ARDL (1,1,1,1,1,1,1,1,1,1,1,0,1) based on the AIC criterion.
Source: Authors' compilation from STATA

Table A4. Panel ARDL estimation results

Variables	(PMG) ECT	(PMG) SR	(MG) ECT	(MG) SR	(DFE) ECT	(DFE) SR
ECT		-0.0993*		-0.7970***		-0.1190***
		(0.0634)		(0.2510)		(0.0220)
D.LRTO		0.0006		0.0440		0.00220
		(0.0063)		(0.0345)		(0.0034)
D.LRGDP		-0.0054		-0.0083		0.0014
		(0.0045)		(0.0079)		(0.0010)
D.LGDPPC		0.0033		0.0045		-0.0001
		(0.0026)		(0.0073)		(0.0008)
D.LUNEM		0.0105		-0.0052		0.0037
		(0.0113)		(0.0144)		(0.0029)
D.LPOPLN		-0.5270		0.0455		0.0006
		(0.4680)		(0.3000)		(0.0016)
D.LFD		-0.0017		-0.0222		0.00047
		(0.0172)		(0.0369)		(0.0016)
D.HIND		-0.8810		-1.0230		0.0009
		(1.7910)		(1.7360)		(0.0020)
D.LPS		-0.0059		0.0034		-0.0006
		(0.0041)		(0.0041)		(0.0012)
D.LINFL		0.0005		-0.0010		0.0001
		(0.0008)		(0.0016)		(0.0004)
L.LRTO	0.0091*		0.0215		0.0345*	
	(0.0048)		(0.0194)		(0.0183)	
L.LRGDP	-0.0049*		-0.0035		0.0234**	
	(0.0027)		(0.0053)		(0.0112)	
L.LGDPPC	-0.0034**		0.0002		-0.0168*	
	(0.0016)		(0.0050)		(0.00921)	
L.LUNEM	0.0161***		0.1650		0.0157	
	(0.0050)		(0.1010)		(0.0178)	
L.LPOPLN	0.1270***		0.0351		0.00378	
	(0.0167)		(0.0834)		(0.0174)	
L.LFD	0.0206***		0.0090		0.0203*	
	(0.0028)		(0.0291)		(0.0115)	
L.LHIND	0.6770***		0.5140		-0.0887***	
	(0.0884)		(0.3820)		(0.0277)	
LPS	0.0207***		-0.0313		-0.00755	
	(0.0053)		(0.0310)		(0.00733)	
LINFL	-0.0071***		0.0076		0.00333	
	(0.0011)		(0.0066)		(0.00521)	
Constant		-0.0447		0.2210		0.0534***
		(0.0294)		(0.2750)		(0.0179)
H-test p-value			[0.9923]		[1.000]	
Observations	275	275	277	277	-	-

Notes: Standard errors are presented in parentheses. The selected model is ARDL (1,1,1,1,1,1,1,1,1,0,0) with constant (according to the AIC criterion). ***, **, and * represent significance levels at 1%, 5%, and 10% respectively.

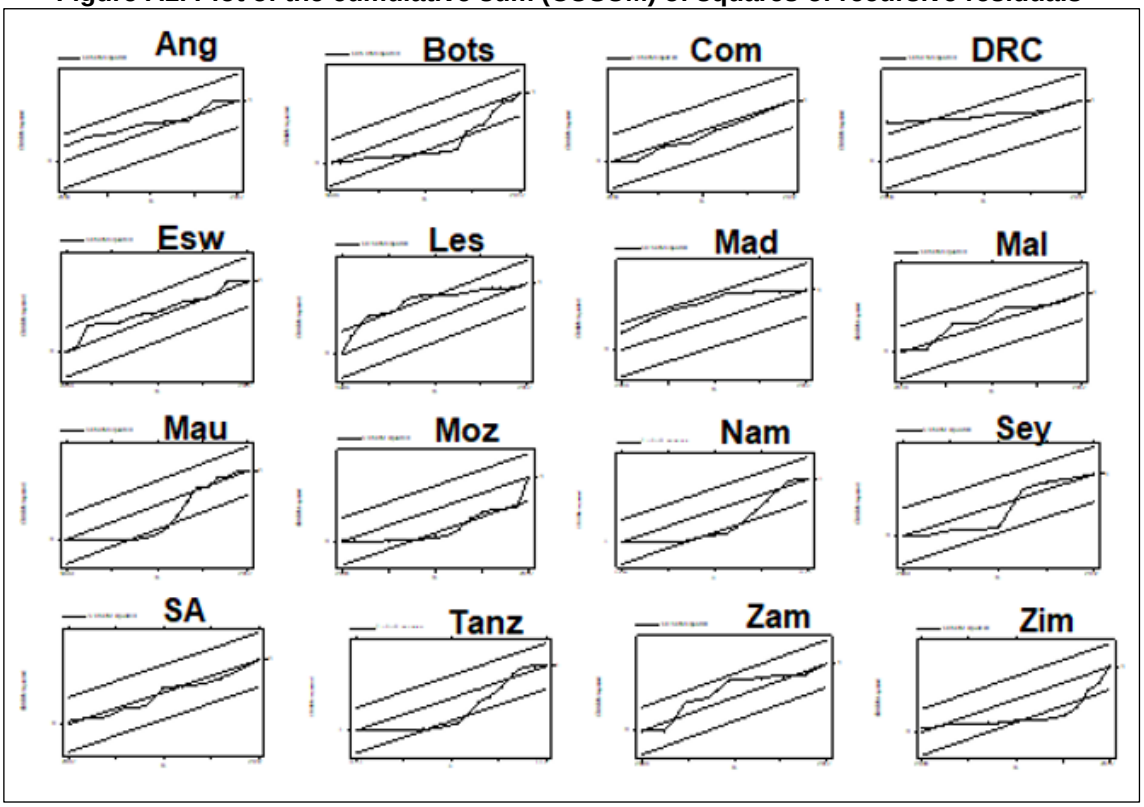
Source: Authors' own compilation from STATA Panel ARDL Regression results

Table A5. Group diagnostic tests

Group/Country	Durbin-Watson	B-Godfrey	White	CUSUM
1.Angola	1.9324	0.077	18.00	stable
2.Botswana	1.4296	0.752	22.00	not stable
3.Comoros	2.5200	3.904	18.00	stable
4.DRC	2.1720	0.676	18.00	not stable
5.Eswatini	1.7169	0.680	20.00	Stable
6.Lesotho	1.5895	0.147	20.00	not stable
7.Madagascar	2.2444	2.038	18.00	stable
8.Malawi	3.3263	10.711***	18.00	stable
9.Mauritius	1.9824	0.088	19.00	stable
10.Mozambique	1.6330	1.312	19.00	stable
11.Namibia	1.8393	0.028	21.00	stable
12.Seychelles	2.1529	2.188	17.00	stable
13.South Africa	2.8524	8.288***	20.00	stable
14.Tanzania	1.5996	0.734	19.00	stable
15.Zambia	1.3857	0.981	22.00	stable
16.Zimbabwe	2.5158	2.490	21.00	not stable

Note: ***, **, and * represent significant levels at 1%, 5%, and 10% respectively.
Source: Author's compilation from STATA ARDL diagnostic tests results

Figure A1. Plot of the cumulative sum (CUSUM) of squares of recursive residuals



Note: The straight lines represent critical bounds at the 5% significance level.
Source: Extract from STATA ARDL diagnostic tests results