

The moderating effect of education on the Trade – Poverty nexus. A dynamic analysis for Africa.

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Abstract

The trade and poverty nexus has been extensively studied but the findings remain mixed and are very often sensitive to modelling choices and different data sources. A critical gap in this area is the limited research done on the moderating role of education on this relationship for the African continent. Hence, the study addresses this shortcoming and uses a panel autoregressive distributed lag model (PARDL) to examine how education enhances the trade-poverty nexus. The results confirm the complementarity of trade and education in the quest for reducing poverty in both the long run and short run. There is also support for the importance of economic growth in reducing poverty and similar results were obtained for government spending which reduces poverty levels. Additionally, the Dumitrescu Hurlin Causality test shows a unidirectional causality from trade openness to poverty reduction. Hence, policymakers should emphasise educational reform and implement skill development initiatives to complement trade liberalisation policies in order to ensure reduction in poverty.

Keywords: Trade, Poverty Reduction, Panel Autoregressive Distributed Lag Model, Second Generation unit root, Africa

1. Introduction

Trade reforms have important economic and social implications for developing economies, in particular, with significant effects on employment, poverty and livelihoods (Cattaneo and Dodd, 2007). Trade has been recognised as a powerful engine for inclusive economic growth and poverty reduction in the 2030 Agenda for Sustainable Development (WTO, 2018). Developing and emerging nations have long strived to use trade policy as a tool for attaining their economic growth objectives. It should be noted that the average trade-to-GDP ratio for Africa, is roughly around 25.3% as of 2022, with a slight decrease to 22.4% in 2023¹. However, an important portion of the African population lives in poverty with 490 million people estimated to live under the poverty line of 1.90 PPP\$/day in 2021. It should be noted that trade policies alone cannot support inclusive growth mainly because of structural constraints like low human capital and poor institutions².

The link between trade and poverty has been analysed mainly in terms of the impact of trade liberalisation on economic growth (Sekkach Ali, 2021) and its effects on income distribution (Olukayode, 2021). By spurring economic growth, trade can help in alleviating poverty. Further, trade influences the income of poor countries through various channels: via its effects on relative prices, macroeconomic stability, and government revenues (Winters, 2002; Winters et al., 2004). Long-term trade-development outcomes can also be generated through a decline in child malnutrition, higher school attendance and performance³. Trade can lead to a reduction in poverty only if it serves to redistribute income and assets from the rich to the poorer groups or increases income in favour of the poor. Another channel via which trade can foster economic growth is through firm innovation. Trade liberalisation increases the market size and incentives to innovate. The extent to which technical knowhow is embodied in products helps in generating knowledge spillovers through increased access to imports. Greater openness to trade further enhances product market competition and productivity, generating more output and income for societies, which will in turn help in alleviating poverty. Though trade can create new opportunities and benefits, it can also involve adjusting costs for the most vulnerable segments of society. Access to international markets may deliver higher average income for those who specialise in export products but may bring in greater competition that reduces demand for those workers and producers in import competing sectors (WTO, 2018).

We referred to the endogenous growth theories as well as the human development models by analysing the channels through which trade can influence poverty levels and how education has the potential to strengthen

¹ [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=World trade in goods and services - an overview#:~:text=The%20ratio%20of%20international%20trade%20in%20goods,then%20fell%20back%20to%2022.4%20in%202023.&text=As%20such%2C%20in%202022%20it%20stood%201.6%20percentage%20points%20above%20its%20share%20in%202012.](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=World_trade_in_goods_and_services_-_an_overview#:~:text=The%20ratio%20of%20international%20trade%20in%20goods,then%20fell%20back%20to%2022.4%20in%202023.&text=As%20such%2C%20in%202022%20it%20stood%201.6%20percentage%20points%20above%20its%20share%20in%202012.)

² <https://unctad.org/press-material/facts-and-figures-7#:~:text=While%20in%202019%2C%20478%20million%20people%20lived,than%20what%20was%20projected%20without%20the%20pandemic.&text=In%202019%2C%20Africa%20accounted%20for%202.8%20of%20world%20trade.>

³ <https://openknowledge.fao.org/server/api/core/bitstreams/7ca7c051-6ad2-4595-820b-c373fdb365f1/content/state-of-agricultural-commodity-markets/2024/trade-affect-nutrition.html>

this link. Emphasising on the endogenous growth theory (Grossman & Helpman, 1991), trade results in an increase in economic growth which in turn has the ability to reduce poverty. It should be noted that the transmission from trade to poverty is not automatic and that's where education plays a significant role. Education increases the ability of individuals to benefit from opportunities created by trade. For example, skilled employment in the export driven sectors leads to an increase in productivity through knowledge diffusion (Le Goff et al, 2014). Moreover, the complementarity hypothesis by Bacchetta et al., (2017), highlights the fact that education act as a stimulus in the poverty reducing effects of trade as it makes labour more adaptable in an open economy. The poor may be excluded from the benefits of trade if educational attainment is low, thus aggravating income inequality and nurture the poverty traps (Easterly, 2001).

It is observed that, the contribution of international trade to economic development and poverty alleviation has long been debated and analysed in terms of its net effects on countries and vulnerable groups. Some empirical works have argued that free trade leads to a favourable long term poverty outcome (Nessa and Imai, 2023 and Nutassey et al, 2024). Others dispute the linkage that could be ascribed between the two variables (Dollar and Kraay, 2001; 2012; Yusuf et al, 2013 and Onakoya et al., 2019 and Mbah et al, 2022). Indeed, the benefits of trade are not automatic, but instead depend on associated policies aimed at promoting education and improving governance, amongst others (Fambeu and Yomi 2023). These policies allow countries to benefit from the opportunities offered by opening up their economies, by reallocating resources away from less productive activities to more promising ones. Trade liberalisation is thus successful to boost welfare when they are complemented by other policies. Trade can then lead to poverty reduction as it allows people to exploit their productive potential, assists economic growth, curtails arbitrary policy interventions and helps to insulate against shocks.

Even though there is an extensive literature on the trade-poverty nexus and an expectation that trade will reduce poverty and stimulate economic growth through employment creation, poverty level remains persistently high in the African continent. The findings in the literature as to the impact of trade on poverty levels are not settled, with differing results. In addition to that, the existing research have ignored the role of education as an important channel which drives trade and thus spillover on the economic and social development of economies. Indeed, education has the ability to enhance the benefit from trade opportunities and thus its interaction with trade openness can significantly determine the degree to which poverty is reduced. Hence, given this significant shortcoming, the present paper aims at filling this gap by examining the extent to which education moderates the trade poverty nexus in Africa over the period 1990 to 2019. The study contributes to the existing literature in several ways. We extend on the previous and recent studies on the African region by adopting a dynamic analysis with a panel autoregressive distributed lag model to differentiate between short run and long run relationship between trade and poverty reduction. Moreover, we consider the moderating effect of education on the trade-poverty nexus.

The rest of this paper is organised as follows: section 2 discusses the theoretical and empirical literature; section 3 defines the methodological approach used while section 4 delineates and discusses the findings and finally section 5 concludes.

2. Literature Review

Poverty arises from a combination of factors namely lack of assets, income, poor access to communal resources and public services, geographical isolation, poor health and education, powerlessness and vulnerability, amongst others (Cicowiez and Conconi, 2007). It remains an important challenge for governments and policy makers in developing countries so much that alleviation of poverty is a prime development objective. It is widely argued that for countries to reduce poverty, they need to grow. Trade may affect growth and thereby have an indirect effect on poverty alleviation.

Standard trade theories provide several arguments on how trade liberalisation stimulates economic growth. Once an economy opens up to trade, it can access new markets, modern technologies as well as appropriate intermediate and capital goods, which help in expanding production, economies of scale and improving competitiveness. The endogenous growth theory postulates that trade liberalisation can promote long-term economic growth through dynamic effects (Wacziarg and Welch, 2003). The model shows that internal factors like knowledge and internal factors are important derivatives of economic growth. Trade openness is found to foster technology transfer however, it depends on the education systems which empowers individuals to fully benefit from these advantages. Trade openness in isolation does maximising poverty reduction. Moreover, the Human capital theory by Becker (1964), posits that individual's productivity and earning capabilities are improved with education. In the present scenario, education help individuals to take employment opportunities resulting from trade openness. Hence, education act as a moderator in the trade poverty nexus.

Moreover, the Heckscher-Ohlin and Stolper-Samuelson trade theories postulates that countries having abundant factors, gain from trade. In developing countries, unskilled labour is in abundance and therefore theoretically, an increase in demand for such labour will increase wage thereby reducing poverty. However, in the absence of an adequate education, workers will be trapped in performing low skilled jobs with low pay. Education act as an ingredient to shift labour supply towards more skilled jobs and thus fully benefit from trade openness. Hence, while trade in isolation may generate growth, human capital development ensures that this growth is more inclusive and results in poverty reduction.

Empirical findings on the trade poverty linkage remain ambiguous in line with the arguments put forward on the positive and negative effects of trade liberalisation on poverty. Nonetheless, one aspect, which needs attention, is that the impact of trade openness on growth and poverty is subject to the existence of other, complementary macroeconomic and structural policies and the creation of appropriate institutions. McCulloch et al. (2001) recognise the importance of institutions as well as political and social factors in explaining the linkages between trade and poverty. For example, exposing the economy to international trade without implementing appropriate macroeconomic and exchange rate policies will not essentially promote growth and may be detrimental to poor and vulnerable households. Hence, in the presence of other distortions or market failures in the economy, free trade may not be the best option for inclusive growth. The benefits of trade will not trickle down to the poor people in economies where industries stagnate and fail to grow due to limited learning by doing or when comparative advantages reside in activities of little value added. Factors of production may also flow out of poor areas to rich ones hence generating the so-called 'growth traps' (Easterly, 2001). The above channels explaining the complex relationship between trade and poverty attempt to connect the two variables from the macroeconomic down to the micro level. However, these mechanisms fail to unpack the complexities of poverty at the micro level in terms of livelihoods (Kanji and Barrientos, 2002).

The existing recent empirical work on developing countries is rather mixed. For instance, studies for Nigeria by Aigheyisi (2013) reveals that financial and trade openness has significant negative effects on both economic growth and human development for the period 1999 to 2011. The impact on economic growth was however more important than the trade liberalisation effects on human development. Likewise, using the Vector Error Correction Model on data from 1970 to 2008, Ayinde (2013) shows that trade liberalisation increases poverty and economic growth and advocates for good macroeconomic policies along with appropriate governance structures for Nigeria to gain from trade openness.

Also, Salimi et al. (2014) probe into the trade liberalisation, income growth and income inequality relationship across 30 countries from 2000 to 2011. Their results from the GMM indicate a feedback effect between trade liberalisation and income growth and the interaction between trade liberalisation and income growth reduces income inequality. Fatima et al, 2020 also analysed the effect of trade liberalisation on poverty and inequality in developing countries. Using the Computable General Equilibrium (CGE) models they found that trade tends to reduce poverty but may increase income inequality. Nessa and Imai, (2023) analysed the effect of trade Openness on working poverty. The study shows that increased trade openness significantly reduces the working poverty rate, mainly in upper-middle-income developing countries. Durongkavoroj, (2024) found a direct effect of openness on poverty reduction and argued that the more open the economies are, the greater is the impact of growth on poverty. Yusuf et al. (2013) who investigate the relationship among trade openness, income growth and poverty reduction in Nigeria from 1980 to 2011 showed that trade liberalisation does not contribute to poverty reduction in the country.

Onakoya et al. (2019) investigate the impact of trade liberalisation on poverty in 21 African countries from 2005 to 2014. Using the pooled OLS technique, their study indicates that trade reduces poverty levels across African economies. Also, Sunge et al. (2021) employ the Generalised Method of Moments across Sub Saharan African countries for the period 2003 to 2017 and their results reveal that trade from MENA and within Sub Saharan Africa offer more gains and these poverty gains from trade are further strengthened with better institutional quality. To further boost the trade benefits, the study argues for greater investment in better institutions across the African region, with particular emphasis on good governance and eradication of corruption. Yameogo and Omojolaibi (2021) also explore the link between trade openness, economic growth and poverty levels in 40 Sub Saharan African countries from 1990 to 2017. Their findings show that trade liberalisation, institutional quality and population growth rate lead to poverty reduction in the long run, while trade openness has adverse effects in the short run. Recent studies conducted on Africa still lacks consensus. For instance, the study carried out by Mbah et al. (2022) for the case of Nigeria shows that trade openness results in higher poverty rates in both the short and long run. It thus implies that trade in isolation may further increase inequalities. Moreover, Nutassey et al. (2024) conducted similar investigation for Sub Saharan Africa. Using a dynamic GMM, the authors found that strong institutional quality is important for trade openness to reduce poverty in the region concerned. Similarly, Fambeu and Yomi (2023) found democracy and trade openness should be considered together in order to alleviate poverty in Sub Saharan Africa.

Other studies have investigated the relationship between education, culture and poverty based on a panel of data from 34 European countries, over a 5-year period, 2015–2019. Their results showed that increasing education and culture levels in these countries reduce poverty. For instance, using the panel Autoregressive

Distributive Lag, Gonese et al, (2023), found that trade openness results in a reduction in non-income poverty for SADC region in the long run. This result is reinforced when economic growth and human capital is high in the countries. The paper found that improved education quality is important for capitalising the benefits of trade openness in reducing poverty levels. Moreover, Olagunju et al, (2019), also found that globalisation through trade openness reduces poverty for the case of developing countries. They also argued that education promotes the welfare outcomes confirming the moderating role of education in the trade-education nexus for the panel of 110 developing countries considered. Also, Further, Nyarkoh (2017) gauges at the trade-poverty nexus for Ghana from 1960 to 2003 and finds that increasing trade leads to a fall in poverty levels in both the short and long runs.

To sum up, no general consensus on a direct relation between trade and poverty could be reached both at theoretical and empirical levels. The methodology used across the varied studies are quite similar applying either the ARDL technique on time series analysis or the Generalised Method of Moments on panel data. This study builds on existing work on the trade-poverty nexus for Africa and extends to the current empirical literature by adopting a dynamic analysis with a Panel autoregressive lag Model. This technique will help in differentiating between short run and long run.

3. Methodology

Model Specification

The study aims at investigating the relationship between trade openness and poverty reduction in sixteen selected African economies over the period 1990 to 2019.

More specifically the period 1990 to 2019 has been selected as there was a significant evolution of trade liberalisation policies across Africa in the 1990s. Moreover, this period also registered important educational reforms in many African countries, aligning well with the focus of the present study. Moreover, reliable and consistent data on trade, education and poverty across various African countries are available for this period. Prior to 1990, poverty data are scant for these Africa countries. Also, the period ends with 2019 allowing the investigation of both the short run and long run dynamics in the trade-poverty relationship. Due to the COVID 19, data beyond 2019 have not been included to avoid distortions in the results.

The 16 African countries included in the study have different degrees of trade liberalisation and educational progress, making this sample an ideal one to investigate the moderating impact of education on the nexus between trade and poverty. Also, this sample of countries have consistent data for the key variables considered under the regression model adopted.

The model adopted is grounded from past relevant literature (see Shahbaaz et al (2010), Fauzel et al, (2015) and Fauzel, (2020).

$$\text{POV} = f(\text{TRADE}, \text{EDU}, \text{TRADE*EDU}, \text{GDP}, \text{TRADE*GDP}, \text{GSP}, \text{CPI}) \quad (1)$$

Poverty is multidimensional and can be measured in either monetary or non-monetary terms. As far as welfare variables are concerned, the existing literature is being referred to in order to select the appropriate variables. However, it should be noted that such studies are limited. Also importantly, development is a multi-

dimensional phenomenon and poverty alleviation is subject to various factors. For instance, poverty incidence is a complete measure of welfare in a country and takes into consideration various aspects of an individual's living condition in order to assess standard of living. The poverty headcount index (Fauzel, 2020 and Seetana et al, 2009) is used to capture the level of poverty in the present study. The data has been extracted from the WDI.

Furthermore, trade openness is measured by the ratio of imports and exports to GDP as per Fauzel et al, (2016). This indicator measures a country's 'openness' or 'integration' in the world economy. This indicator represents the combined weight of total trade in its economy, a measure of the degree of dependence of domestic producers on foreign markets and their trade orientation (for exports) and the degree of reliance of domestic demand on foreign supply of goods and services (for imports). It is expected that as trade flows increases in the countries, the level of poverty will fall. Hence, a negative coefficient for this variable is expected

GDP has been widely used in the literature (Sharma & Gani 2004) as a welfare measure to assess the advancement of countries. Since, GDP per capita is capturing the economic dimension of the investigation; this variable has been included in the study. However, although GDP is extensively applied, it captures only the economic dimension of welfare and since development is a multi-dimensional phenomenon, other factors need to be taken into consideration. Welfare depends on crucial elements such as education, government spending and other factors.

Education is very often referred to as the great equaliser. It creates various opportunities in terms of employment, access to resources and upgrading standard of living. Education helps the individuals, households as well as a whole community to come out of the vicious cycle of poverty. Hence, the secondary enrolment ratio has been used to measure education in the present study and an increase in education is expected to reduce poverty rate.

Another variable included in the regression is the government spending (GSP). Government spending is used as a proxy to capture government investment (Lofgren et al, 2008). A positive impact of this variable is expected on the wellbeing of the population and this is justified by the fact that the aim of the government is to maximise social welfare and thus investment by the state will help achieve this aim.

We also included the consumer price index (CPI), a proxy used to measure inflation as another control variable in the study. Inflation intensifies the problem of poverty. The poor lack control over their purchasing power and experience greater strain when prices go up and with increasing prices of food, the poor have to spend larger shares of their income on basic necessities and thus save less (Chani et al, 2011).

Interactive Terms

Also, education is an important factor which can enhance the potential contribution of trade on poverty reduction in developing countries like Africa. Education makes individuals more productive and can better adapt to the global economy. Educated individuals have the potential to better take advantages arising from trade such as employment in sectors with export potentials. Hence, to investigate the moderating effect of education on trade-poverty nexus in Africa, an interactive variable has been used and proxied by trade*edu. Similar method was used by Fatima et al, (2020) investigating the indirect or the cross-effect of trade openness and human capital accumulation on economic welfare.

Moreover, economic growth can also be a moderator in the trade poverty nexus and hence, the interaction between trade and GDP has also been considered in the regression (Fetahi-Vehapi et al, 2015). Trade can benefit the poor by stimulating economic growth. Increased growth enables the poor to increase their initial endowments (better access to education and increased savings through capital accumulation) and earn better rewards for supplying their resources⁴. Also, the literature highlights that internationally active countries are more productive than countries which produce only for its domestic market. International trade is seen to promote efficient allocation of resources and lead to better economic welfare and sustained economic growth is a powerful tool for poverty reduction.

To sum up, a variable description table is included.

Table 1: Variable Description

Variable	Variable definition	Related Literature	Source of data	Expected results
POV	proportion of poor households in the respective countries	Fauzel, 2020	WDI	
TRADE	the ratio of imports and exports to GDP	Fauzel et al, 2016	WDI	Negative
EDU	Secondary enrolment ratio	Ackland and Falkingham (1997)	WDI	Negative
GDP	GDP per capita	Sharma & Gani 2004	WDI	Negative
GSP	Government spending	Lofgren et al, 2008	WDI	Negative
CPI	Consumer price index	(Bruno et al, 1998, Chani et al, 2011)	WDI	Positive

'Source: Authors own creation

The econometric specification can be written as follows:

$$LPOV_{it} = \alpha_0 + \beta_1 LTRADE_{it} + \beta_2 LEDU_{it} + \beta_3 LTRADE_{it} * LEDU_{it} + \beta_4 LGDP_{it} + \beta_5 LTRADE_{it} * LGDP_{it} + \beta_6 LGSP_{it} + \beta_7 LCPI_{it} + \mu_{it} \quad (2)$$

where t denotes the time dimension and i denotes countries. We adopted a double logarithmic function for the ease of interpretation (that is the interpretation will be in percentage change terms). Data has been obtained from the World Development database.

Cross sectional dependence

We conducted the cross-sectional dependence in the panel data, as ignoring the same might bring about erratic outcomes.

⁴ https://www.wto.org/english/res_e/booksp_e/wto_wbjointpublication_e.pdf

Panel Unit Root Tests & Panel Cointegration test

It is crucial to make an investigation of the time series properties before estimating the model. As identified by Phillips, (1986), one may get biased results from regressing time series data mainly because of the likelihood that the data might be non-stationary. Also, because of cross sectional dependence in the data the second-generation unit root test, namely Pesaran Cross sectional IPS test is performed for this effect. After checking for stationarity of the variables, we proceeded to investigate whether co-integration exists between the variables or whether there is a long run link between the variables

Panel ARDL model

Given the mixture of $I(0)$ and $I(1)$, the panel ARDL framework will be adopted. There are several benefits of the PARDL framework. For instance, both the long run and short run results are obtained simultaneously and this approach is used in the case of mixed order of integration. Pesaran et al., (1999), postulate that the PARDL can be written by using ARDL (p,q) approach. The lags of the dependent variables are represented by p, while q represents the lags of the independent variable. Equation 1 is re-written as follows:

$$POV_{it} = \mu_i + \sum_{j=1}^p \beta_0 POV_{i,t-j} + \sum_{j=0}^q \beta_1 TRADE_{i,t-j} + \sum_{j=0}^q \beta_2 X_{i,t-j} + \varepsilon_{it} \text{-----} (3)$$

By reparametrising eq. (3) becomes:

$$\begin{aligned} \Delta POV_{it} = & \mu_i + \Phi_i (POV_{i,t-j} - \theta_1 TRADE_{i,t-j} - \theta_2 X_{i,t-j}) \\ & + \sum_{j=1}^{p-1} \lambda_{ij} \Delta POV_{i,t-j} + \sum_{j=0}^{q-1} \lambda'_{ij} \Delta TRADE_{i,t-j} + \sum_{j=0}^{q-1} \lambda''_{ij} \Delta X_{i,t-j} + \varepsilon_{it} \end{aligned} \quad (4)$$

where i and t represent country and time respectively, POV and Trade are as defined above and X is the set of control variables. Notation λ , λ' , λ'' are the short-run coefficients of the lagged dependent variable, TRADE and other control variables respectively. The long-run coefficients are θ_1 and θ_2 for TRADE and other control variables. Lastly, Φ_i shows the speed of adjustment.

It should be noted that the PARDL is a dynamic econometric estimation technique which allows for estimation in both the short run and long run. Static models such as the fixed and random effect estimation are not used as the independent variables have more of a lagged (dynamic) effect on the dependent variables instead of a contemporaneous (static) effect. Also, the PARDL framework provides a comprehensive analysis of both temporal dimensions in the trade-poverty nexus. In addition to that, the estimators used in the model take into consideration heterogeneity across cross sections (different African countries) which is important for studies including multi-country scenario where there may be different education levels and trade structures.

5.0 Findings

The descriptive statics are shown below followed by the correlation matrix

Table 2: Descriptive Statistics

	LPOV	LTRADE	LEDU	LGDP	LGSP	INF
Mean	4.358389	3.459159	2.728538	6.765756	2.940905	10.52846
Median	4.384391	3.565949	2.522999	6.711343	2.956598	9.146563
Maximum	4.439116	3.854394	3.896999	7.097870	3.304862	31.11159
Minimum	4.219226	3.042809	1.652643	6.592577	2.376615	-2.814698
Std. Dev.	0.069709	0.268148	0.704405	0.143111	0.234396	8.231233
Skewness	-0.538744	-0.197945	0.390856	1.307932	-0.633425	0.713408
Kurtosis	1.881450	1.513487	1.822075	3.450715	3.051208	2.998937
Jarque-Bera	48.24268	47.32903	39.97160	140.9177	32.15065	40.71607
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	2092.027	1660.396	1309.698	3247.563	1411.635	5053.659
Sum Sq. Dev.	2.327629	34.44181	237.6730	9.810265	26.31701	32453.78
Observations	480	480	480	480	480	480

Source: Authors own creation

Table 2 presents the summary statistics for the six variables used in the study based on a dataset of 480 observations.

Table 3: Correlation Matrix

	LTRADE	LEDU	LGDP	LGSP	INF
LTRADE	1.0000	-0.0444	0.2695	0.0603	-0.0436
LEDU	-0.0444	1.0000	-0.7664	0.7889	-0.2897
LGDP	0.2695	-0.7664	1.0000	-0.5532	0.0525
LGSP	0.0603	0.7889	-0.5532	1.0000	-0.1412
INF	-0.0436	-0.2897	0.0525	-0.1412	1.0000

'Source: Authors own creation

From table 3, it can be noted that there is no strong correlation between the independent variables since all correlations are below 0.9.

We then proceeded towards investigating whether the cross sections are interdependent, or not. This is an essential step to determine the suitable unit root and cointegration tests. The Breusch Pagan LM, Pesaran Scaled LM and Pesaran CD tests were performed and the results are reported in Table 4 below. It shows that the cross-sections of the data are dependent.

Table 4: Cross sectionally dependence test

Test	Statistics	Prob
Breusch Pagan LM	3600.000	0.0000
Pesaran Scaled LM	224.6330	0.0000
Pesaran CD	60.00000	0.0000

Source: Authors own creation

Given the existence of cross sectionally dependence in the data, we conducted the second-generation unit root test. For this purpose, the Pesaran CIPS unit root tests were employed. The results from Table 5 indicate that the variables are stationary at $I(0)$ and $I(1)$.

Table 5: Second generation Unit root test- Pesaran CIPS (CROSS SECTIONALLY IPS test)

Panel unit root test	Level	First Difference	Decision
LPOV	0.9999	0.0017	1(1)
LTRADE	0.9999	0.0695	1(1)
LGDP	0.0005	-	1(0)
LEDU	0.6229	0.0000	1(1)
LGSP	0.0000	-	1(0)
LCPI	0.0000	-	1(0)
LTRADE*LEDU	0.0014	-	1(0)
LTRADE*LGDP	0.0495	-	1(0)

Source: Authors own creation

In the next step, we investigate the presence of the long-run relationship between the variables using with the Bounds cointegration tests. Table 6 below shows the Bounds F test result. The first stage is to estimate the F-test value which is indicative of the presence of the long run relationships among the variables. As the calculated F-statistic of 41.77 exceeds the upper bound critical value, the null of no cointegration is rejected. As cointegration is confirmed, we move to the second stage where the PARDL model can be established to determine long run and short run relationships.

Table 6: Bounds Cointegration Test

Model	Critical value band						Estimated F Value	Pass/Fail
Model	10%		5%		1%			
Equation (?)	$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$		Pass
	2.277	3.498	2.730	4.163	3.864	5.694	41.77148	

Source: Authors own creation

Given the mixture of $I(0)$ and $I(1)$, we used the panel ARDL framework.

Table 7: Estimated long run coefficients using the ARDL approach (PMG).

Panel Data Estimates		
Dependent Variable: LPOV		
Variable	Coefficient	t ratio
LTRADE	-0.348818***	-8.660801
LEDU	-0.032203***	-4.467945
LTRADE*EDU	-0.029254***	-4.886825
LGDP	-0.599166***	-11.58352
LTRADE*GDP	0.333418***	10.95444
LGSP	-0.090951***	-25.45198
LCPI	-0.000814***	-12.18016
Constant	7.029963***	37.22531

*** shows statistical significance at 1%

Source: Authors own creation

Analysing the results for trade openness and poverty reduction from table 7, it is observed that the coefficient is negative and significant and this confirms that nations more open to trade have resulted in an increase in welfare or a reduction in poverty. The results confirm the Stolper–Samuelson theorem, arguing that the abundant factor should see an increase in its real income when a country opens up to trade. This framework suggests that the poor in Africa will benefit the most to gain from trade (Durongkavoroj, W., 2024). Moreover, other scholars like Winters (2002) also found that trade is generally a strong positive contributor to poverty alleviation as it allows people to exploit their productive potential, assists economic growth, curtails arbitrary policy interventions and helps to insulate against shocks. Indeed, trade openness allows access to international markets as well as promoting specialisation. The more open economies are, foreign investment also tend to increase thereby contributing to economic growth. Relating this result to Africa, it is observed that a number of these countries have been employing measures to boost the level of trade. The trade facilitation agreement signed by the WTO in (2013) has outlined the measures to be taken to further encourage the level trade. The agreement summaries measures for expediting the movement, release and clearance of goods at borders.

Moreover, an increase in education also helps in reducing the poverty level in the sample of African countries considered under the present study. Similar findings were obtained by Spada et al, (2023). Improvement in human capital is argued to be an important determinant through which there can be an improvement in living standard of people and a boost in societal welfare. Moreover, education is recognised as the great equaliser and it results to job creation and help people to thrive. As mentioned by UNESCO, if students in low-income countries could have at least basic reading skills, an estimated of 171 million people could avoid poverty, Also, if all adults could finish secondary education, global poverty could reduce by half⁵.

In addition to that, we used the interactive term between trade and education to investigate its joint impact on poverty reduction. While human capital is argued to be a principal enabler of trade growth, it is also an important ingredient to facilitate trade (Maitra, B. and Chakraborty, M, 2023). Skill reinforces the effect of trade and together contribute to a magnified reduction in poverty reduction. Our findings support this argument as we found that the interactive variable is negative and significant and the overall impact on poverty reduction through trade and human capital is $(0.35+0.03)$ 0.38%. It implies that a 1% increase in trade and human capital leads to 0.38% reduction in poverty. Hence, human capital is crucial for inclusive trade. The results is in line with Nessa and Imai, (2023) highlighting that an increased in trade openness reduces significantly working poverty (skilled labour) in developing countries.

Further zooming on the results, we note that economic growth has also been important in alleviating poverty for the set of African countries considered under the present study. For instance, a 1% increase in real GDP has led to a 0.60% decrease in poverty level. This result is in line with Squire (1993) who regressed the rate of poverty reduction against its rate of economic growth and found that a one percent increase in the growth rate reduced the poverty headcount (\$1 per person per day) by 0.24 percent. Another study by Bruno, Ravallion and Squire (1998) doing the same investigation for 20 developing countries also found a negative relationship between trade and poverty reduction. As argued by Le Goff et al, (2014), economic growth is very important to sustain poverty alleviation while trade liberalisation is claimed to increase productivity to sustain growth. Free trade boosts investment, competition and brings in new ideas and innovations. However, when we interact GDP with trade, we found that the net impact on poverty reduction is $(-0.60+0.33)$ -0.27 which is still negative and significant. This imply that an increase in GDP given trade has reduced poverty by 0.27%. More recent studies like Balasubramanian et al, (2023) found that a 10% increase in GDP decreases multidimensional poverty by approximately 4–5%.

Another significant observation from the long run results relates to the coefficient of government spending. It is observed that countries with high government spending also results in a reduction in poverty. For instance, public spending has the capacity to affect growth and poverty reduction. For instance, it can increase the overall growth performance of the economy, and it can increase the chance of the poor to contribute to the growth process mainly by strengthening human capabilities and reducing transaction costs (Wilhelm et al, 2005). Government spending plays a crucial role in poverty reduction mainly for low-income countries. The Keynesian theory highlighted the fact that public spending may contribute towards increasing aggregate demand thereby stimulating economic growth and employment thus reducing poverty (Zouhar et al, 2021). In addition to that, the Musgrave theory (Musgrave, 1959) of public finance focussed on government spending. It postulates that government spending contributes to economic growth and development which is essential to sustain and reduce poverty. Expenditure on education, health and welfare are essentially

⁵ <https://concernusa.org/news/how-does-education-affect-poverty/>

important to contribute towards social welfare. However, we found that inflation reduces poverty, but the coefficient is rather small at 0.0008%. It can be explained by the fact that there was moderate inflation which has not been detrimental to social welfare in the set of countries considered in the present study.

ARDL-ECM– Short Run Dynamics

In addition to the ARDL results, our next set of findings report the short run estimates. The fact that the variables in the model are cointegrated provides support for the use of an ECM representation in order to investigate the short run dynamics. The results are shown below;

$$D(LPOV) = 1.147D(LPOV (-1))^{***} - 0.025D(LTRADE(-1))^{***} + 0.021D(LEDU(-1))^{***} - 0.011D(LTRADE*EDU(-1))^{***} - 0.030D(LGDP(-1))^{***} + 0.014 D(LTRADE*GDP(-1))^{***} + 0.004D(LGSP(-1))^{***} + 0.006D(LCPI(-1))^{***} - 0.121ECM(-1)^{***} \text{-----eq 3}$$

*** shows statistical significance at 1%

Source: Authors’ compilation (2024)

Analysing the short run results, we found that the ECM is negative and significant which depicts the presence of a long run relationship among the variables. We further observed that the positive and significant coefficient of POV(-1) suggests that poverty is a vicious cycle, since the responsiveness of current period poverty measures with respect to their respective last year values is high and significant, confirming the existence of dynamism and endogeneity in the modelling framework. In addition to that, trade continues to reduce poverty even in the short run and the interactive term has the expected sign and is significant. Hence, a 1% increase in trade accompanied by an increase in education reduces poverty by 0.036% (0.025+0.011). Similarly economic growth also reduces poverty in the short run and the joint impact of trade and economic growth, reduces poverty by 0.016% (-0.030+0.014). Moreover, the results of the short run dynamics of the variables are small, thus we can conclude that these variables take time to have an impact on poverty reduction.

To further investigate whether any causal relationship exists between the different variables, the Pairwise Dumitrescu Hurlin Panel Causality Test is adopted and the results are summarised in table 7 below;

Pairwise Dumitrescu Hurlin Panel Causality Test

Having ascertained that a co-integrating relationship exists among the variables, the final step in this study is to verify if trade openness causes poverty reduction, economic growth causes trade openness and education causes poverty reduction.

In order to do so, we made use of the pairwise Dumitrescus Hurlin panel test. Dumitrescus and Hurlin (2012) proposed a simple approach for testing the null hypothesis of homogeneous non-causality against the alternative hypothesis of heterogeneous non-causality. Under the null hypothesis, no causality in any cross-section is tested against the alternative hypothesis of causality at least for some cross-sections. The rationale for using this panel causality test is determine whether there is heterogeneous causality across the variables which this makes the test flexible for real world cases where correlation may vary across different variables. Also, this test allows us to test causation instead of correlation.

Table 8: Pairwise Dumitrescus Hurlin Panel Causality Test

<i>Null Hypothesis</i>	<i>W-Stat</i>	<i>Prob.</i>	<i>Causality</i>
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LOPEN does not cause LPOV	21.0750***	0.0000	Unidirectional Causality LOPEN → LPOV
LPOV does not cause LOPEN	2.93444	0.2169	
LGDP does not cause LPOV	83.6369***	0.0000	Unidirectional Causality LGDP → LPOV
LPOV does not cause LGDP	1.32911	0.1528	
LEDU does not cause LPOV	169.273***	0.0000	Unidirectional Causality LEDU → LPOV
LPOV does not cause LEDU	2.10224	0.8836	

($X \rightarrow Y$ implies X Causes Y)

*** shows statistical significance at 1%

Source: Authors own creation

Investigating the impact of trade openness on poverty reduction from table 8, the results show that there is a unidirectional causality between the two variables. The causality direction runs from the trade openness to poverty alleviation. Also, it is argued that the key to sustained poverty alleviation is economic growth (Ben et al, 2001). Hence, Economic growth does stimulate poverty reduction and a unidirectional causality running from economic growth to poverty reduction is found. Finally, a unidirectional causality is also detected between education and poverty reduction. The result is in line with Hofmarcher (2021) who carried out a study on the causal relationship between education, educational level and different dimensions of poverty. The result showed that any additional year of education reduces the chances of being under the poverty line

6. Conclusion and Policy Implications

Theoretically, the effect of trade openness on poverty alleviation is ambiguous. Freer trade regime is debated to alter relative factor prices in favour of the more abundant factor. If poverty originates from abundance of labour, then superior trade openness should contribute towards higher labour prices and a reduction in poverty. However, such may not be the case if the re-allocation of factors is hindered. This theoretical ambiguity on the trade-poverty nexus is also found in the empirical literature. To resolve this opacity, the present paper employs the PARDL method, and investigates whether any links exist between trade openness and poverty reduction in selected African countries from 1990 to 2019. The results show that indeed trade openness has resulted in reducing poverty level. The results confirm the complementarity of trade and education in the quest for reducing poverty in both the long run and short run. There is also support for the importance of economic growth in reducing poverty and similar results were obtained for government spending and education which both reduces poverty levels. The Dumitrescu Hurlin Causality test is further adopted to assess any causal relationship between trade and poverty. A unidirectional causality between trade openness and poverty reduction is noted. Similar results were found for trade openness and economic growth as well as education and poverty reduction.

These findings have implications for public policy across African economies. As highlighted by the results, trade liberalisation in isolation is insufficient to significantly reduce poverty. There is a need for both education and trade policy to ensure inclusive growth. Policy wise, the African government must prioritise educational reform and the development of skills which are in alignment with industrial demands to facilitate

industrialisation and greater value addition across key sectors. Such moves will allow the African economies to climb up the global value chain and more sustainable employment will be created. Trade policies are as well essential mainly those which promote the transfer of technology through FDI and public private partnerships. Moreover, governments should boost regional trade infrastructure such as transport and trade logistics to ease intra African trade mainly under initiatives like the African Continental Free Trade Area (AfCFTA). Through these policies, the African countries can maximise the benefits from trade liberalization and effectively reduce poverty as well as creating a more inclusive economic setting.

The practical implications of the study encompass both the economic and social spheres. Liberalizing trade and strengthening the human capital base of the economies can efficiently contribute towards poverty reduction and results in economic development and social equity.

However, the study is based on macro level data and within country disparities may not be detected effectively. Also, the paper uses secondary data and does not capture the informal forms of skill acquisition in the countries. Future research can use firm level data in order to analyse the channels through which trade and education together result in employment creation and thus contribute towards a reduction in poverty.

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