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Modelling Trade Liberalisation-Poverty Nexus for Ghana

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Abstract

The paper examines the effect of trade liberalisation on poverty incidence for Ghana for the period 1960-2013. The estimation methods are the Johansen test, Vector Error Correction (VECM) test, and the Ordinary Least Square (OLS). The findings of the study suggest that poverty incidence is negatively related to trade liberalisation in the long-run and short-run. The implication of the finding is that poverty incidence is reducing with trade liberalisation. Future studies should consider the current topic in a multivariate modelling

Keywords: Poverty incidence, Trade Liberalisation, Economic growth
JEL Codes: I30, I31, I32, F14

01. Introduction

The relationship between trade liberalisation (absence of trade restrictions) and poverty incidence (for review of the definition of poverty, see Ringen, 1988; Sumodiningrat, 1999; World Bank, 2000; Ravallion, 2001; Asian Development Bank, 2006; Meth, 2006) has gained attention in development literature (Winters, 2002b, Mackay & Winters, 2004; Akmal, Ahmad, Ahmad, & Butt 2007) since poverty have many negative consequences in an economy. Among the various policy tools to deal with poverty reduction is trade liberalisation. According to researchers (Ferreira & Rosi, 2001; Hay, 2001; Winters, 2001; Berg & Krueger, 2003; David & Scott, 2005) poverty reduction is a function of trade liberalisation by ensuring equal income distribution, provision of more resources, and increase in income.

The theoretical basis for the relationship between trade liberalisation and poverty reduction is based on total factor productivity (TFP) and the factors that increases total factor productivity. The empirical findings of the increase effect of trade liberalisation on TFP as a result of increase import competition are found in the works of Lee (1996), Ferreira and Rosi (2001), and Jonsson and Subramanian (2001), for Korea, Brazil, and South Africa respectively.

The findings of empirical assessment of the effect of trade liberalisation on poverty reduction are found in the works of various researchers (Rodriguez & Rodrik 2000; Calderon & Chong, 2001; Dollar, & Kraay, 2001; Anwar, 2002; Dollar & Kraay, 2002; Dollar & Kraay, 2004; Neutel, & Hesmati, 2006; Figini, & Santarelli, 2006; Harrison & McMillan, 2006; Akmal et al., 2007; Goldberg & Pavnick 2007b; Thirlwall & Pacheco-López, 2008; Cicowiez, Díaz-Bonilla, & Díaz-Bonilla, 2010; Khan, & Sattar, 2010; Khan & Bashir, 2012).

The empirical verification of the relationship between trade liberalisation and poverty has produced inconsistent results in the literature. Some studies have produced positive relationship

between poverty and trade liberalisation whereas other studies have yielded negative relationship between poverty reduction and trade liberalisation. Some studies have also reported of no significant relationship between poverty reduction and trade liberalisation.

Dollar and Kraay (2004) explained that trade liberalisation leads to poverty reduction through economic growth, which results in increase in the income levels of the poor. They recommend trade liberalisation as a policy to reduce poverty in developing economies such as Ghana.

According to Winters et al. (2004), there is an indirect effect of trade liberalisation on poverty reduction, whereas Harrison and McMillan (2006) opined that trade liberalisation affects poverty reduction given that there are trade reforms. They indicated that there are losers and winners in trade liberalisation.

Akmal et al. (2007) used the Johansen cointegration test and error correction test, for long-run and short-run investigation for Pakistan and reported that trade liberalisation has a cumulative effect on poverty reduction in the long-run but not in the short-run.

Cicowiez et al. (2010) examined the relationship between trade and poverty. The findings of the study suggest that total trade liberalisation (including subsidies and import taxes, but not export taxes) for agricultural and non-agricultural goods, reduces poverty and inequality in Argentina for the period under discussion. In a study by Khan and Sattar (2010) for Pakistan on the link between poverty and trade liberalisation, for the period 1973 to 2009, they reported that international trade can play an important role towards growth and ultimately poverty reduction.

Khan and Bashir (2012) examined the relationship between trade liberalisation and poverty and inequality in Pakistan for 1975-2010. The findings of the results show that trade liberalisation has no significant effect on poverty whereas poverty has negative effect on trade.

The review indicates that trade liberalisation effect on poverty reduction is still empirical fact since there is inconsistent findings in the literature and the effect have not been equal (Cashin et al., 2001; Ravallion, 2007; Santos-Paulino, 2012). The aim of the study is to examine the effect of trade liberalisation on poverty incidence (proxied by child mortality) for Ghana for the period 1960 to 2013. The findings in the literature are inconsistent and that has necessitated the present study. In addition few empirical works exist on the link between poverty reduction and trade liberalisation in less developing economies such as Ghana (Santos-Paulino, 2012).

The poverty reduction and income inequality have become intractable in the study area and there have been various policy tools to reduce poverty and income inequality. Among the policy tool is trade liberalisation. Ghana is considered as '*small and open economy'*. This is an indication that Ghana engages in international trade in an unprecedented manner. The paper is based on the assumption that trade liberalisation has significantly reduced poverty incidence in the long-run.

The rest of the paper is organised into three sections as follows. The econometric methodology is provided in section 2. The empirical results are dealt with in section 3, whereas section 4 considers the conclusions.

02. Econometric Methodology

2.1 Estimation Method

Stationarity properties of the variables (poverty incidence, and trade liberalisation) were examined using the augmented Dickey-Fuller (ADF) unit root test procedure and the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) unit root test procedure. The KPSS is based on the null assumption that there is stationarity around a deterministic trend (i.e. trend-stationary) against the alternative of a non-stationarity. The ADF test is based on the null assumption that there is unit root in the variables in levels against the alternative of stationarity in levels. The ordinary least square test procedure (OLS) is used to test for the relationship between trade liberalisation and poverty incidence (proxied by child mortality). The long-run relationship between trade liberalisation and poverty incidence is tested using the Johansen method. The short run relationship between trade liberalisation and poverty incidence is tested using the vector error correction test procedure (VECM).

The ADF is specified as in equation (1).

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \partial_1 \Delta y_{t-1} + ... + \partial_{p-1} \Delta y_{t-p+1} + e_t \quad (1)$$

where α is a constant, β the coefficient on a time trend, ϱ the lag order of the autoregressive process, and e_t is the error term. The constraints are: α=0, and β=0 and they correspond to modelling a random walk whereas using the constraint β= 0 corresponds to modelling a random walk with a drift. The KPSS is specified as in equation (2), with deterministic time trend (t), a random walk and a stationary residual.

$$X_t = \beta t + (r_t + \alpha) + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where $r_t = r_{t-1} + u_t$ is a random walk, the initial value $r_0 = a$ serves as an intercept, t is the time index, u_t are independent identically distributed $(0, \sigma_u^2)$. The null and the alternative hypotheses are formulated as follows:

$H_o : X_t$ is trend (or level) stationary or $\sigma^2_u = 0$: $H_1 : X_t$ is a unit root process

The Johansen test is specified in VAR (ϱ) form as in equation (3).

$$Y_t = \mu + \Phi D_t + \prod_p Y_{t-p} + \ldots + \prod_1 Y_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where t=1,…,T. The Π_p, and Π_1 are matrixes of variables. The lag length in the VAR is p lags on each variable. The Johansen method has two main forms, the trace test, and the eigenvalue test, and these are equivalent test. They are used to test the long run hypothesis. The null hypothesis for the trace test is that the number of cointegration vectors is r=r*<k, where are the alternative hypothesis is that *r=k*. The Test proceeds sequentially for *r**=1, 2, 3… T. The first non-rejection of the null hypothesis is taken as an estimate of *r*. The null hypothesis for the "maximum eigenvalue" test is the same as that for the "trace" test but the alternative hypothesis is r=r*+1. The test proceeds sequentially also for *r**=1, 2, 3 … T, with the first non-rejection used as an estimator for r. The VECM is specified as in equation (4).

$$\Delta Y_t = \mu + \Phi D_t + \prod Y_{t-p} + \Gamma_{p-1}\Delta Y_{t-p+1} + \ldots + \Gamma_1 \Delta Y_{t-1} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

For t=1,…,T. Where $\Gamma_i = \prod_1 + \ldots + \prod_i - 1, i = 1, \ldots, p-1$.

2.2 Data

The empirical study is based on annual secondary data on poverty incidence (proxied by child mortality), and trade liberalisation (proxied by trade openness) for Ghana for the period 1960 to 2013. Data was obtained from World Bank database. The sample size for the study is 54.

Data Description	Source
Trade liberalisation (TO) is proxied by Trade Openness	World Bank World Development Indicator (WDI)
Poverty incidence (POV) is proxied by Child Mortality	World Bank World Development Indicator (WDI)

Table 1: Data Description, Proxies and Sources Source: World Bank, 2014

2.3 Conceptual Framework and the Empirical Model

The relationship between trade liberalisation and poverty incidence is modelled for Ghana to determine whether trade liberalisation affect poverty incidence in the long run and short run. The relationship between trade liberalisation and poverty incidence is modelled in the current study in a bivariate model as indicated in equation (5). The dependent variable in the model is poverty incidence (POV) whereas the independent variable is trade liberalisation (TO). The model is specified in log-linear form in equation (5).

$$\ln POV_t = \ln TO_t + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(5)$$

03. Empirical Results

3.1 Descriptive Statistics

Table 2 shows a summary statistics of the variables in the estimated model. The mean is use to measure the central tendencies, and the values indicate a good fit. The coefficient of variation is used to measure the volatility of the data set. The results of the coefficient indicate that poverty incidence (0.3328) is less volatile than trade liberalisation (0.5073). Poverty incidence falls as low as 66.5000 and as high as 210.9000, whereas poverty incidence falls as low as 6.3203, and as high as 116.0500. The standard deviation is used to measure the dispersion of a set of data from its mean. The more spread apart the data set, the higher the deviation. The results indicate that poverty incidence is more spread (47.8440) than trade liberalisation (27.2770). The coefficient of skewness is a measure of the nature of distribution of the variables. The results show trade liberalisation (0.4110) is positively skewed, whereas poverty incidence is negatively skewed (-0.0604). The coefficient of kurtosis is a measure of the nature of peakness. The value for poverty (1.4515), and trade liberalisation (0.6387), are more than zero and does not indicate more flat-topped distribution.

Variable	Mean	Median	Minimum	Maximum
POV	143.8	146.9	66.5	210.9
TO	53.77	44.947	6.3203	116.05
Variable	**Std. Dev.**	**C.V**	**Skewness**	**Ex. Kurtosis**
POV	47.84	0.3328	-0.0604	-1.4515
TO	27.28	0.5073	0.411	-0.6387

Table 2: Summary Statistics, using the Observations 1960 – 2013

Source: Author's Computation January 2017

3.2 Results on Correlation Test

The results on the correlation test results between poverty incidence and trade liberalisation are reported in Table 3. The results indicate that there is significant strong negative association between poverty incidence and trade liberalisation.

	POV	TO
POV	1.0000	
TO	-0.6848	1.0000

Correlation coefficients, using the observations 1905/05/13 - 1905/07/05
5% critical value (two-tailed) = **0.2681** for **n = 54**
Under the null hypothesis of no correlation:
t(52) = -6.77721, with two-tailed **p-value 0.0000**

Table 3: Correlation Matrix for the correlation between Poverty Incidence and Trade Liberalisation

Source: Author's Computation January 2017

3.3 Results on Unit Root Test

3.3.1 Time Series Plot

The time series plot results are depicted in figure 1 to figure 4. The figures indicate that the variables (POV, and TO) are non-stationary in levels (figure 1 to figure 2). However, the variables attained stationarity after they were differenced (in the case of POV) (figure 3 to figure 4). The unit root properties are further scientifically examined using the ADF test, and the KPSS test. Tables 4 and Table 5 show the results.

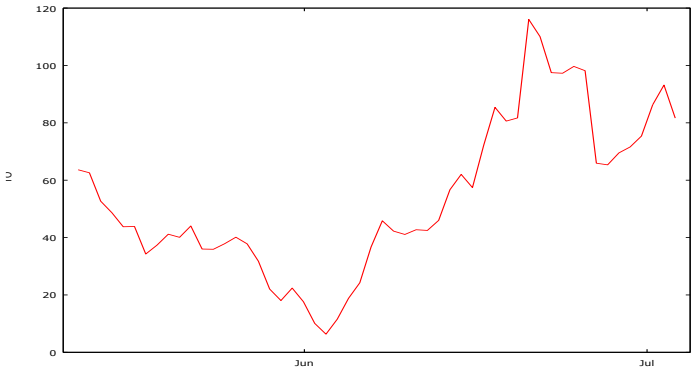

Figure 1. Time Series Plot of TO (levels)

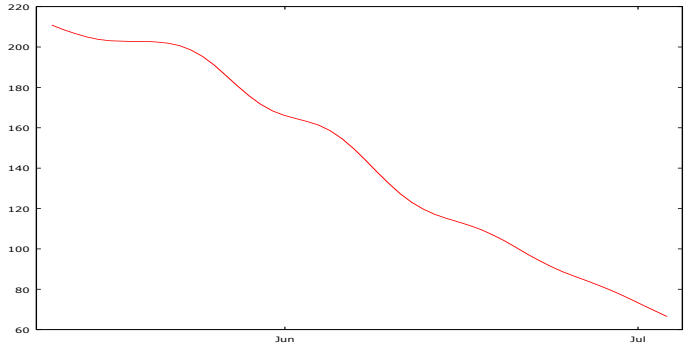

Figure 2. Time Series Plot of POV (levels)

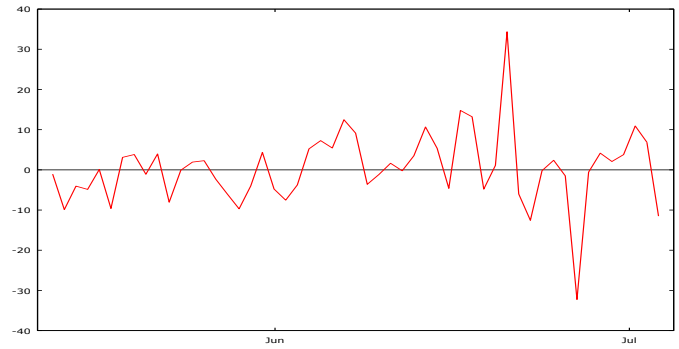

Figure 3. Time Series Plot of TO (1st diff.)

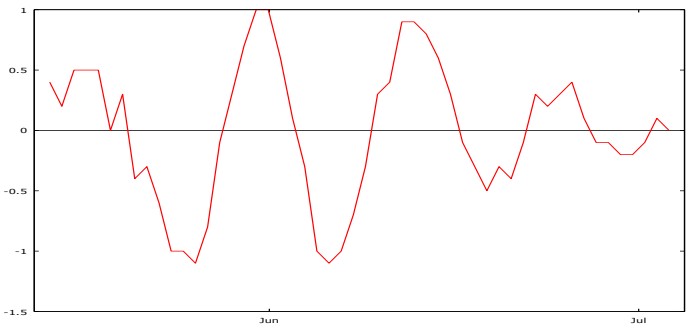

Figure 5. Time Series Plot of POV (2st diff.)

3.4 Results of Unit Root Tests

The two stationarity tests used in the study are the Augmented Dickey-Fuller test (ADF), and Kwiatkowski, Phillips, Schmidt and Shin (KPSS).

3.4.1: The ADF Test

The ADF test was used to examine the stationarity properties of the data. Table 4 indicate the results of the tests. The results of the test in levels and in difference form show that the variables

are non-stationary in levels. However, the variables attained stationarity on differenced. Poverty incidence is integrated of order two, I(2) whereas trade liberalisation is integrated of order one, I(1)The null hypothesis of stationarity was accepted for all the variables (in levels), however, the null hypothesis of stationarity was rejected on differenced.

Variables	t-observed	t-critical	ADF P-Value	Results	Lag length
POV(levels)	-0.0205	-2.1475	0.5186	Not stationary	10
TO (levels)	-0.1445	-2.1902	0.4945	Not stationary	10
POV (2st diff.)	-0.8576	-4.3167	0.0029	stationary	10
TO(1st Diff.)	-1.1241	-3.4015	0.0511	stationary	10

Table 4: ADF stationarity test results with a constant and trend

Source: Author's Computation January 2017

3.4.2 The KPSS Test

The KPSS test for examining the stationarity properties of the variables was used in addition used as a confirmatory test. The results are reported in Table 5. All the variables attained stationarity on differenced.

Variables	t-observed	Results	Lag length
POV-level	0.1597	Not stationary	3
POV-1st diff.	0.0418	Stationary	3
TO-level	0.2344	Not stationary	3
TO-1st diff.	0.1094	Stationary	3
	10% 5% 1%		
Critical values:	0.121 0.149 0.213		

Table 5: KPSS stationarity test results with a constant and trend

Source: Author's Computation January 2017

3.5 Regression Results

The OLS regression test was performed to examine the relationship between the variables in the model and the results are reported in Table 6. The results indicate significant negative relationship between trade liberalisation and poverty incidence. The results indicate that 1% increase in trade liberalisation leads to about 35.2% decrease in poverty incidence. The values of the R^2 (0.3645) and the adjusted R^2 (0.3522) show that the estimated model perform moderately well. The value indicates that trade liberalisation explains about 35.2% changes in poverty incidence.

OLS, using observations 1905/05/13-1905/07/05 (T = 54)					
Dependent variable: lnPOV					
	Coefficient	Std. Error	t-ratio	p-value	
Const	6.2534	0.4106	15.232	<0.0000	***
lnTO	-0.3516	0.1059	-3.3219	0.0016	***
Mean dependent var	4.9077	S.D. dependent var		0.3619	
Sum squared resid	4.4114	S.E. of regression		0.2913	
R-squared	0.3645	Adjusted R-squared		0.3522	
F(1, 52)	11.0349	P-value(F)		0.0016	
Log-likelihood	-8.9932	Akaike criterion		21.9864	
Schwarz criterion	25.9644	Hannan-Quinn		23.5206	
Rho	0.9557	Durbin-Watson		0.0714	

Table 6: OLS Regression Results of the link between Poverty incidence &Trade Liberalisation

Source: Author's Computation January 2017.

Note * denote 1% significance level**

3.5.1 Results of Diagnostic and Stability Tests

Table 7 shows the diagnostic tests results of the OLS regression on the estimated parameters. The estimated model passed the heteroskedasticity test and the normality test. However, the estimated model did not pass the autocorrelation test and specification test. The stability tests results using the CUSUM and CUSUMSQ as shown in figures 6 and 7 indicate that, the estimates and the variance as well as the residuals are not stable. The square residual is also not stable. This is so since the CUSUM and CUSUMSQ plots fall outside the 5% critical boundaries. The null assumptions of parameter stability are rejected in the tests.

Tests	Results
A. Reset Test for Specification	
Null hypothesis: specification is adequate Test statistic: F(2, 50) = 11.8701 P-value = P(F(2, 50) > 11.8701) = 0.0000	Specification of model is not adequate
B. Breusch-Pagan Test for Heteroskedasticity	Heteroskedasticity not present
Null hypothesis: heteroskedasticity not present Test statistic: LM = 0.962342 P-value = P(Chi-square(2) > 0.962342) = 0.6181	
C. Test for Normality of Residual	Error is normally distributed
Null hypothesis: error is normally distributed Test statistic: Chi-square(2) = 2.2515 P-value = 0.324412	
D. LM Test for Autocorrelation up to order 7	There is autocorrelation
Null hypothesis: no autocorrelation Test statistic: LMF = 43.5361 P-value = P(F(7,45) > 43.5361) = 0.0000	

Table 7: Diagnostic Test Results of OLS Regression

Source: Author's Calculation from data Collected from WDI, 2016

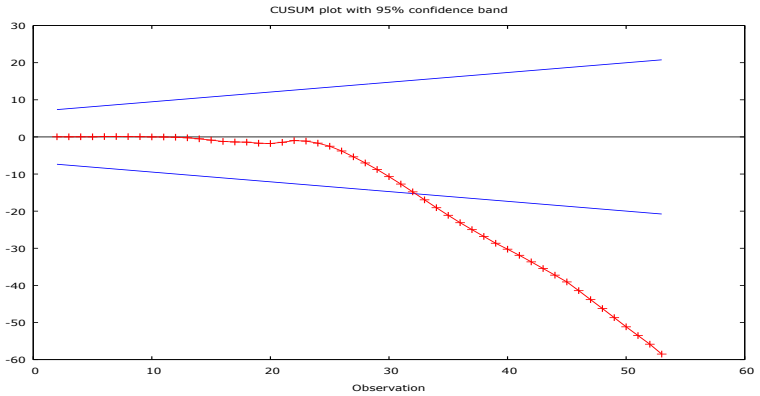

Figure 6. Plot of CUSUM

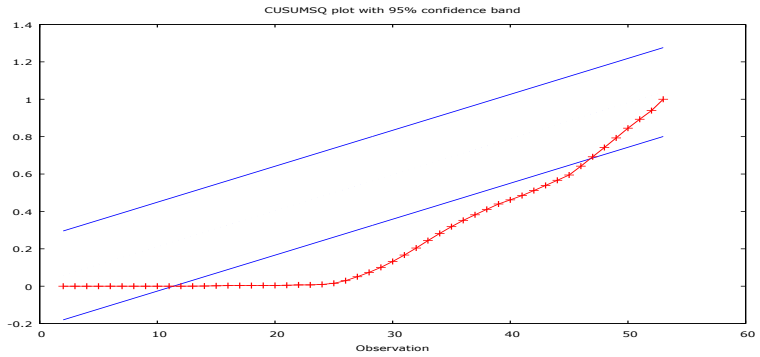

Figure 7. Plot of CUSUMSQ

3.5.2 Johansen Test Results of the Long-Run Relationship between Poverty Incidence and Trade Liberalisation

The results on the investigation of the long-run relationship among poverty incidence, trade liberalisation are reported in Table 8. The results indicate significant long-run relationship between the variables using the Johansen method. Both the trace test and the maximum Eigen value test passed the test of stability.

The error correction test (ECM) used to examine the short-run relationship among poverty, and trade liberalisation, there is still disequilibrium in the short-run since the error correction term (ECM-1=-0.0035; p=0.0062) is significant. The value does not have the expected a priori theoretical sign of negative. The value indicate that about 0.035% of errors generated in the previous period is corrected in the current period for the estimated model. The speed of adjustment is very slow.

Johansen test:				
Number of equations = 2 Lag order = 7 Estimation period: 1905/05/20 - 1905/07/05 (T = 47)				
Rank	**Eigenvalue**	**Trace test/p-value**		**Lmax test/p-value**
r=0	0.2652	14.8110[0.0619]		14.4840[0.0441]
r=1	0.0069	0.3264[0.5678]		0.3264[0.5678]
Variable	**Coefficient**	**Std. Error**	**T-Ratio**	**P-value**
EC-1	0.0035	0.0012	2.9250	0.0062 ***
Mean dependent var	-2.9021	S.D. dependent var		1.4612
Sum squared resid	0.8993	S.E. of regression		0.1651
R-squared	0.9908	Adjusted R-squared		0.9872
rho	0.0109	Durbin-Watson		1.9656

Table 8: Johansen Co-integration Test Results and the Vector Error Correction Results

Source: Author's Computation January 2017

Note *, ** denote 1%, and 5% significance level**

04. Conclusion

The present paper has investigated the poverty incidence-trade liberalisation nexus using the OLS, Johansen test, and the VECM for Ghana for the period 1960 to 2013. The results suggest stable long run and short run relationship between poverty incidence and trade liberalisation. The findings are in support of the previous findings of researchers such as Dollar and Kraay (2004); Winters et al. (2004); Harrison and McMillan (2006); Akmal et al. (2007); Cicowiez et al. (2010); Khan and Sattar (2010). However, the findings are inconsistent with that of Khan and Bashir (2012) and the short run effect of trade liberalisation on poverty with Akmal et al. (2007). The policy recommendation is that trade liberalisation should continue to be embarked upon in order to ensure growth and poverty reduction.

Future studies should consider other trade liberalisation proxies (import index, and export index) effect on poverty incidence since the literature indicate various proxies of trade liberalisation have different effect on poverty reduction. Future research should also take into account the effect of structural breaks, causality, and panel analysis, as well as other proxies of poverty. The findings of the study are limited by the use of secondary data in the empirical verification, which may be associated with various challenges. The findings are also limited by the limitations of the estimation methods (KPSS, ADF, OLS, VECM, and the Johansen tests).

Works Citation

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