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POVERTY ALLEVIATION IN DEVELOPING AND UNDERDEVELOPED COUNTRIES. DO FOREIGN CAPITAL AND ECONOMIC FREEDOM MATTER?

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Abstract. Our study focuses on the role of foreign capital which includes foreign direct investment, foreign aid, and economic freedom in poverty alleviation in developing and underdeveloped countries by using panel data from 1995 to 2018 for 71 countries. In the pursuit of achieving our objective, we employed several econometric techniques such as dynamic ordinary least square, fully modified ordinary least square, dynamic fixed effect, and pooled mean group regression methods. Furthermore, we performed the Granger causality test, impulse response function, and variance decomposition analysis. In our long-run estimations, we found that foreign direct investment could significantly alleviate poverty but increases poverty in the short run. Instead, foreign aid plays no significant role in poverty alleviation. Moreover, economic growth and economic freedom are essential as our findings consistently exhibited that they play a crucial role in poverty alleviation. We also found bidirectional causality between poverty alleviation and population growth, while a unidirectional causal linkage was found from poverty alleviation to foreign aid. We conclude that policymakers should look at a new paradigm of developmental assistance, and governments should also create an aiding environment for foreign investment to support their growth plan.

Keywords: foreign aid, underdeveloped countries, foreign direct investment, economic freedom, poverty alleviation, developing countries.

JEL Classification: C43, C61, D81.

Introduction

Globally, it is estimated that about 10% of the world's population lives on less than $1.90 per day, thus living in extreme (abject) poverty. This figure doubles when health, nutrition, and education are considered, referred to as multidimensional Poverty (Sumner, 2020; Sethi et al.,

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2019). In 1969, the world reached an agreement at the Pearson Commission of the United Nations (UN), General Assembly, that the world's wealthiest countries should contribute 0.7% of their gross national income (GNI) towards international development assistance or aid. This resolution was against the backdrop that the southern world was getting poorer while the northern world was getting more prosperous (rich). The UN's 1969 resolution garnered towards ending global poverty because global poverty was at a higher pace during that era. In the pursuit to end global Poverty, Sumner (2020) contends that the world should effortlessly come together to curate new and scaled financial commitment to development.

In the past 50 years, the world has witnessed some transformation even though most developed countries couldn't meet the 0.7% of GNI target for international development aid. Nonetheless, many underdeveloped and developing countries have witnessed economic growth in the 2000s, not only in India and China but a couple of countries in Africa (Sumner et al., 2020). But for the emergence of the COVID-19 pandemic, all gains are in jeopardy coupled with the higher level of global ambitions aimed by the UN Sustainable Development Goals (SDGs), which commit countries to achieve no poverty by 2030. In 2015, the UN General Assembly consented to 17 SDGs that included 169 indicators (targets) set up to achieve by 2030. The first goal is to end poverty in every country at all levels. Actually, all the SDGs are connected such that achieving no poverty means achieving no hunger as SDG# 2 (Zhou et al., 2017).

In the developing world, several middle-income countries have emerged and are homes to much of the world's developing populace. However, these nations are recipients of a lower level of aid relative to non-public international flows and domestic resources. Moreover, about 30% of these countries are stagnant in terms of growth due to high aid dependency. These countries constitute about 10% of the developing world's populace. In contrast, middle-income countries are vulnerable to poverty even though they have escaped the poverty threshold. It is likely for them to fall back into it. These countries are home to about two-thirds of the world's developing population (Sumner et al., 2020; Jena & Sethi, 2019). The Global pandemic is likely to suppress the world's economic output by about $8.5 trillion over the next couple of years. The global economy would contract to 3.2% in 2020 and would be the worst after (World War II) in the 1930s (Wulfhorst, 2020). The pandemic could widen the poverty gap where about 37 million people would fall below the poverty threshold due to international cooperation wanes, economies shrinking, and public financing drying up, threatening the achievement of the global goals (Wulfhorst, 2020; Das & Sethi, 2019). Meanwhile, about 734 million of the world's populace live in extreme poverty (World Bank, 2020; Aguilar et al., 2019).

Many countries are still wallowing in poverty despite the enormous international development aid channelled to developing and underdeveloped countries. This phenomenon triggers the essence of foreign capital in these countries. Many scholarly works share that official development assistance (ODA) and FDI need increment (Rao et al., 2020). Moreover, they should be frequently flowed into less developed and developing countries to ensure extensive poverty alleviation (Mahembe & Odhiambo, 2019; Magombeyi & Odhiambo, 2018; Petrikova, 2015; Ben Slimane et al., 2015). Conversely, foreign capital, FDI, and foreign aid are highly considered antidotes to poverty alleviation. Despite aid channelled into develop-

ing and underdeveloped countries, they still lag in terms of development and are in abject Poverty (Mahembe & Odhiambo, 2019). However, from the Marxian economist's perspective, the scholar pinpointed that economic growth is considerably not the only measure of poverty alleviation. Socio-economic factors have a hand in poverty alleviation in that the rich will always benefit from the poor. Therefore, within a capitalist economic system, the implementation of minimum wage laws, enforcement of approaches to eradicate dual labor markets, and the enactment and implementation of anti-discrimination laws are widely seen as tools to reduce Poverty (Isaiah, 1967). Economic freedom is considered a critical ingredient for poverty alleviation. Sumner et al. (2020) propose that a new universal development commitment ought to be adopted to ensure equitable distribution of development assistance due to the previous trend of development aids, which has not been able to chance on its intended purposes. Based on this assertion, we pose this question; what part does foreign capital play in poverty alleviation by considering the dominant effect of economic freedom?

To understand this phenomenon, we intend to evaluate the role of foreign capital (FDI and official development assistance) in poverty alleviation with the intervening effect of economic freedom in 71 developing and underdeveloped countries by applying several econometric methodologies. This study's innovation stems from (i) no study has considered the role of economic freedom in understanding the relationship between foreign capital and poverty alleviation – nonetheless, economic freedom has been widely considered as the mechanism for poverty alleviation (Kloeppel, 2013; Sahoo & Sethi, 2017; Fraser Institute, 2020); (ii) we employed ARDL dynamic fixed-effect and Pooled Mean Group regression to estimate the short-run and long-run effects of foreign capital on poverty alleviation to ascertain the country heterogeneity of under-developed and developing countries. Also, Innovation Accounting Approach thus VECM impulse response function and variance decomposition analysis was utilized to estimate the innovation that poverty alleviation unitary function. Our study's objective is to provide insight into the never-ending arguments by introducing economic freedom into the nexus between foreign capital and poverty alleviation. Also, our study contributes to the theoretical and methodological knowledge in academic and policy-making realms.

Our study consists of sections. Introduction reviews the present scholarly work. Section one contains the theoretical underpinning and literature review. Section two consists of the methodological approaches. Section three presents the study's findings, and section four discusses the results. The last section concludes the study.

1. Theoretical background

In line with poverty, two primary schools of thought or theories exist; the individualistic (classical) theory (Spencer, 1851; Lewis, 1969; Schultz, 1961) and the structural (neo-classical) theory (Schiller, 1972; Brady, 2009) or school of thoughts. The classical theory positions poverty as a human responsibility as it believes that human beings choose to live in poverty as their destiny. The theory claims that a lack of role models and disassociation from people makes one poorer. In contrast, the neo-classical theory posits that poverty is beyond the control of an individual, and many factors affect an individual's ability to reduce poverty.

The causes neo-classical theory proposed includes lack of private assets acquisition, market disequilibrium, or inefficiency that disadvantaged the poor from credit facilities and makes their choice of certain things rationally biased. Other factors are barriers to education, challenges to immigration status, inadequate healthcare, barriers to employment, and many others (Pineda, 2018).

Many scholars have criticized the two theories, which are classical and neo-classical. They considered them more monetary and materialistic; other factors may also contribute to poverty reduction such as the sociological impact of "community" contribution. These scholars argue that an individual needs should not be overemphasized as material or monetary, emphasizing the connection between productivity and income alone. Recently, the theory that has gained much attention is the new Keynesian theory which focuses on monetary factors and considers governments' effectiveness to provide public goods to address inequality. Compared to the classical and neo-classical theories, the new Keynesian theory substantiates the neo-classical theories, which postulates an upsurge in income is a deliberate and effective measure to poverty reduction (Dollar & Kraay, 2002).

Human capital development, which is in the form of education plays a significant role in economic development pursuit. An educated person tends to occupy or take up employment opportunities with skills acquired. This is the neo-classical and new Keynesians theorists' assertion, unlike the classical theory, which sees unemployment as a voluntary decision as a cause of poverty. The neoclassical and new Keynesian theories posit that government plans to provide jobs for the citizens to earn for living and reduce poverty further. Moreover, governmental inefficiencies to address high inflation rates, huge sovereign debts, lack of foreign investments, domestic investment, etc., weaken the aggregate demand and thus, cause poverty in the long run (Dollar & Kraay, 2002). In addition to this, Timothy et al. (2015) argue that one major challenge to poverty is the burgeoning rise in population growth.

Dollar and Kraay (2002) posit that the elasticity of the poor person's income-earning is equal to 1. Hence, there is an econometric relationship between economic growth and poverty reduction. This assertion highlights and pushes down the consequence that "Economic growth is good for the poor". Poverty is the transition of thinking from monetary issues to broader perspectives such as political participants and social exclusion. However, institutions like World Bank, European Commission, and United Nations define poverty as insufficient physical will and voice, exclusion from social and cultural activities, and lack of participation in decision-making and social, civil, and cultural life.

1.1. Literature review on foreign capital and poverty alleviation

In 2016, about 40% of FDI, which is approximately $1.75 trillion, flowed into the under developed and developing countries. Undoubtedly, it reveals that developing countries are the largest recipients of external financing garnered for job creation, economic growth, and poverty alleviation (Guterres, 2018). With the human development index as a proxy of poverty alleviation, ASEAN countries have greatly improved due to a rise in FDI inflows. The estimated FDI inflows into this region increased by 143% to a whopping $114.11 billion between 2009 and 2012 (Guterres, 2018). Gohou and Soumaré (2012) aimed to assess the

influence of FDI on poverty decrease in African countries. They relied on data from 1990 to 2007 by using the Granger causality test to understand the impact. Their findings posit that FDI and poverty reduction have a strong and direct or positive causal relationship, but there is a heterogeneous impact among the selected countries. In line with their findings, Soumaré (2015) investigated the linkage between welfare and FDI in the region of Northern Africa. The study spanned from 1990 to 2011 and employed a Granger causality test and dynamic panel data regression. The scholar concluded that FDI could significantly reduce poverty in Northern Africa and subsequently improve people's welfare. That notwithstanding, Magombeyi and Odhiambo (2018) support the findings of Soumaré (2015) and Gohou and Soumaré (2012). With the utility of the autoregressive distributed lag approach (ARDL), the scholars focused on South Africa from 1980 to 2014. They contended that the consequence of FDI on poverty alleviation is quite subtle to the poverty alleviation proxy; also, the time is reliant either in short-run or long-run analysis.

Furthermore, they asserted that FDI could increase poverty in the short run but reduces poverty in the long run. Their study used the infant mortality rate as a proxy measure of poverty reduction. Khan et al. (2019) and Dhahri and Omri (2020) substantiate the findings of the above literature reviewed in that Khan et al. (2019) are of the view that FDI could reduce poverty by 1.11%, while Dhahri and Omri (2020) believe that FDI could reduce poverty by 5% annually. Table 1 below reports a few latest studies to summarize these relationships.

There are mixed results with regard to foreign aid and poverty alleviation nexus since the 1970s. However, aid is a useful tool to eradicate poverty in developing countries. The World Bank in the late 1990s documented the importance of poverty reduction and the aid was dubbed "the main aim of aid is to reduce poverty" (Anon, 1998). Subsequently, the millennium development goals (MDGs) positioned poverty as its first goal to reduce global poverty by 50%. McGillivray et al. (2006) reiterated the essence of foreign development assistance as being used to augment savings constraints and increase domestic investment level, which will increase the overall degree of growth in the economy to alleviate poverty eventually. For foreign aid to be effective and its benefits realized by reducing poverty, Easterly and Pfutze (2008) contended that improvement in governance, and increase in access to public services, thereby increasing economic growth, could ensure the realization of aid effectiveness. Foreign aid is an efficient shock absorber, and an imperative sort of social safety net for various underdeveloped and developing economies (Hunt, 2008).

Furthermore, Gates (2014) opined that foreign development assistance (aid) serves as shock absorbers and serves as the underpinning for sustainable economic progress in the long-run perspective. Also, Arndt et al. (2015) aver that foreign aid could also improve school enrolment, increase domestic investment, reduce infant mortality, and enhance life expectancy. Many scholarly works have produced mixed results to empirically understand the relationship between foreign aid and poverty alleviation. Some scholars argue that there is no significant relationship between foreign aid and poverty alleviation (Chong et al., 2009; Arvin et al., 2002). Contrary to these views, others share a different opinion, and they pronounced that several studies limited themselves to the aggregate impact of aid on poverty alleviation (Abiola & Olofin, 2008). Kaya et al. (2013) found that foreign aid channelled into agriculture production tremendously reduces poverty in developing countries. In a recent

Table 1. Variables description and data source

Indicator	Variable and measurement unit	Description	Source
LNPVT	Poverty Alleviation ($)	Cost of closing the poverty gap in int-$ 2011 ($)	World Bank – PovcalNet (2017)
	Foreign Capital ($)		
LNFDI	Foreign Direct Investment ($)	"Net official development assistance and official aid received (constant 2015 US$)". "Foreign aid or known as official development assistance (ODA), can be defined as a flow or transfer of payment, including grants and concessional loans, which are used for socio-economic development in developing countries. ODA can be a direct transaction between donor and recipient countries (bilateral aid), or it can be distributed via multilateral development organizations".	World Bank – World Development Indicators
LNAID	Foreign aid ($)	Foreign direct investment, thus net inflows (BoP, current US$). FDI is a flow leading to improved technology and know-how, management practices, and systems of the home countries of multinational enterprises (MNEs) to their host countries.	World Bank – World Development Indicators
LNY	Economic growth ($)	GDP per capita, PPP (constant 2011 international $).	World Bank – World Development Indicators
LNPOPG	Population growth (%)	Population growth (annual %).	World Bank – World Development Indicators
LNCPI	Consumer Price Index –Inflation (%)	Consumer price index (2010 = 100).	World Bank – World Development Indicators
EFIO	Economic freedom (%)	Economic freedom index - Property Rights, Judicial Effectiveness, Government Integrity, Tax Burden, Government Spending, Fiscal Health, Business Freedom, Labour Freedom, Monetary Freedom, Trade Freedom, Investment Freedom, Financial Freedom	Heritagefoundation.org

study, Dhahri and Omri (2020) concluded that foreign aid in the form of agricultural-fishing-forestry aid, investment aid, and social infrastructural aid is positively related to poverty alleviation, unlike the non-investment aid is insignificantly related to poverty. For a better understanding and overview, a compilation on recent literature that addresses the study variables is presented in Table 2.

Table 2. A compilation on recent literature that addresses the study variables

Author(s)	Methodology, Sample & Context	Findings
Gyeke-Dako et al. (2022)	• Panel study • Coverage: 44 African countries • Period: 1970–2012 • Topic: **Central Bank Independence, Inflation, and Poverty in Africa**	• Low CBI has a particularly powerful impact on poverty reduction since it helps keep inflation in check, which in turn lowers income inequality.
Topalli et al. (2021)	• Panel study using GMM with fixed effects • Coverage: West Balkans countries • Period: 2002–2021 • Topic: **The Impact of Foreign Direct Investments on Poverty Reduction in the Western Balkans**	• Foreign direct investment has made a substantial contribution to poverty reduction. • Poverty reduction requires policies and structures that support economic freedom and openness in a society.
Fauzel et al. (2016)	• Time series study using VAR/VECM methods • Coverage: Mauritius • Period: 1980–2016 • Topic: **A Dynamic Investigation of Foreign Direct Investment and Poverty Reduction in Mauritius**	• International investment has helped reduce poverty, although its impact is felt more slowly and to a lesser extent in the short term. • The fact that FDI alleviates poverty via employment is verified. Other significant elements leading to poverty reduction, according to the study, are increasing government spending and trade openness. Increased debt, on the other hand, has been demonstrated to exacerbate poverty.
Moczadlo (2013)	• Analytical review of developing countries • Topic: **Foreign Direct Investment: A Mean for Poverty Reduction**	• Through its beneficial economic consequences, FDI can help economies expand faster and contribute to poverty reduction. • Economic openness, economic freedom, and the quality of political and institutional frameworks all play a significant impact in the global battle for FDI.
Singh and Gal (2020)	• Panel study using ANOVA and stepwise multi regression method • Coverage: South Asia, East Asia, Latin America, Middle East, and North Africa, Northern Europe, Southern Europe, Western Europe, Eastern Europe, and Sub-Saharan Africa. • Period: 1999–2018 • Topic: **Economic freedom and its impact on Foreign Direct Investment: Global overview**	• The findings indicate that EF has a measurable beneficial effect across South Asia, Latin America, East Asia, North Europe, and Western Europe. However, for the economies of the Middle East and North Africa, East Europe, and South Europe, EF has a negligible effect on FDI inflows.
Anetor et al. (2020)	• Panel study using Feasible Generalized Least Square (FGLS) • Coverage: Sub-saharan Africa • Period: 1990–2017 • Topic: **The impact of foreign direct investment, foreign aid, and trade on poverty reduction: Evidence from Sub-Saharan African countries**	• The findings indicate that foreign direct investment and foreign aid had a detrimental influence on poverty alleviation in the countries analysed. These findings imply that the essential amount of FDI to alleviate poverty has not been reached, and that foreign aid has not been routed effectively.

End of Table 2

Author(s)	Methodology, Sample & Context	Findings
Kaidi et al. (2019)	• Panel study using three stage least square method • Coverage: 132 countries • Period: 1980–2014 • Topic: **Financial Development, Institutional Quality and Poverty Reduction: Worldwide Evidence**	• The authors demonstrated that financial development does not necessarily help the poor's status, and that the influence of institutional quality on poverty and financial development is dependent on the measures used. Their robustness study revealed that our findings are very sensitive to differences in financial development, institutional quality, and poverty indices.
Maruta et al. (2020)	• Panel study using two-stage least square method • Coverage: 74 countries • Period: 1980–2016 • Topic: **Foreign aid, institutional quality and economic growth: Evidence from the developing world**	• By improving the quality of institutions, foreign aid has a greater marginal impact. • As the quality of educational institutions rises, aid becomes more effective.
Ahmad et al. (2019)	• Panel study using pooled least square and two stage least square methods • Coverage: ASEAN and SAARC countries • Period: 1990–2014 • Topic: **Impact of FDI Inflows on Poverty Reduction in the ASEAN and SAARC Economies**	• In Asia, FDI net inflows have been found to have a positive and statistically significant impact on poverty alleviation. There are notable distinctions between South Asia and Southeast Asia, though. FDI has a stronger influence on wellbeing in SAARC countries than in ASEAN countries, on average. In terms of both HDI and real GDP, the findings are the same (GDP).
Abduvaliev and Bustillo (2020)	• Panel study using fixed effects, random effects and pooled OLS methdos • Coverage: 10 Commonwealth of Independent States countries • Period: 1998–2016 • Topic: **Impact of remittances on economic growth and poverty reduction amongst CIS countries**	• Remittances have a beneficial impact on economic growth and a negative impact on poverty in CIS countries, according to this study. • It appears that remittances have significantly reduced poverty by raising income and smoothing consumption.

1.2. Economic freedom and poverty alleviation

According to Kloeppel (2013), economic freedom is an essential ingredient for poverty alleviation. To buttress her assertion, she emphasized that India and China have become champions in their economic enterprises and have improved their respective countries' economic freedoms. These countries have lifted millions of their citizens out of poverty. However, countries categorised with higher economic autonomy grow exponentially. They generally have better durability and achieve higher per capita incomes as compared to low economic freedom countries Fraser Institute (2020). However, the report contends that income inequality is unrealized in economic freedom countries because when a country is freer, there is no way

that wealthy persons can live to detriment of the poor. Still, in the end, the poor gets more benefits and advantages. Also, economic freedom increases wealth and improves mortality rates and health, most especially among children and women in absolute terms. This report comprises five leading indicators in economic freedom computation, i.e., property rights and legal system, government size, sound and safe money, international trade freedom, and regulation comprising 141 countries. The country's population is key to poverty; however, equitable delivery of economic freedom significantly influences poverty alleviation than the redeployment of wealth (Kloeppel, 2013).

In the past 26 years, the index of economic freedom measured liberty and freedom of markets worldwide to assess their impact. Considering this, a positive relationship exists between economic development (poverty alleviation) and economic freedom. The catalogue of economic freedom covers nine indicators in gauging economic freedom, property rights, financial freedom, government spending (government size), investment freedom, monetary freedom, fiscal freedom (fiscal health), freedom from corruption (judicial effectiveness), and trade freedom (Heritage Foundation, 2020).

Based on this detailed literature retrieval, the current study proposes the following hypothesis:

H_1 – Economic freedom plays a significant role in poverty reduction of underdeveloped and developing countries.

H_2 – Foreign capital plays a significant role in poverty reduction of underdeveloped and developing countries.

2. Econometric methodology and empirical model

The econometric model for the study can be estimated as follows:

$$\ln pvt_{it} = \beta_0 + \beta_1 foreign\,capital_{it} \begin{bmatrix} \ln fdi \\ \ln aid \end{bmatrix} + \beta_2 \ln efio_{it} + \beta_3 \ln Y_{it} + \beta_4 \ln popg_{it} + \beta_5 \ln cpi_{it} + \varepsilon_{it}. \quad (1)$$

In Eq. (1), lnpvt represents poverty, β_0 represents the coefficient of the intercept or constant term of the model, β_1 denotes the elasticity coefficient of the independent variable thus foreign capital proxied by FDI (lnfdi) and foreign aid (lnaid) to be estimated, β_2 denotes the elasticity coefficient of economic freedom (lnefio) to be estimated, β_3 symbolizes the elasticity coefficient of economic growth (lnY), β_4 represents the elasticity coefficient of population growth (lnpopg) to be evaluated, β_5 means the elasticity coefficient of a consumer price index (lncpi), and ε defines the error term or stochastic disturbances that may occur in the model. However, foreign capital could significantly impact poverty alleviation depending on the level of macroeconomic stability and the environment. Even though there are inconclusive findings on the nexus between poverty and foreign capital, no study has considered the role of economic freedom.

We adopted some econometric approaches to achieve our objective, such as (i) estimation of cross-sectional dependence across the panel was executed to ascertain the existence of cross-sectional dependence; (ii) unit root test performed to cement the stationarity status of

the data series after cross-sectional dependence realized; (iii) subsequently, Johansen Fischer combined panel cointegration test executed to fish out the long-run equilibrium or relationship that exist among the study's variables; (iv) correlation matrix is computed at this stage as an approach to find out the correlation between the endogenous and the exogenous variables; also to check for the problem of multicollinearity (v) at this step. We utilized two regression methods to assess the long-run relationship among the study's variables. These methods include panel dynamic ordinary least square (Panel DOLS) and panel fully modified ordinary least square (Panel FMOLS). However, OLS gives inaccurate results when there exists cointegration among the study variables. Among FMOLS and DOLS, we prefer FMOLS when there is a problem cross sectional heterogeneity. These both approaches have a shortcoming that they do not estimate the short run relationships. Moreover, we used ARDL dynamic fixed effect (DFE) and mean group regression methods for estimation of both the short-run and long-run relationship among the study's variables. Alam and Quazi (2003), stated that panel ARDL is more suitable when there exists endogeneity problem, long term inconsistency and it also control residual correlations much efficiently The PMG approach is also preferred over other dynamic models when the variables are stationary at varied levels (Im, al 2003); (vi) we performed a granger causality test to ascertain the direction of causality among the study's variables; and (vii) the final step was to employ innovation accounting approach (IAA) to cement the robustness of the causal linkages among the variables by performing variance decomposition analysis and checking for impulse response functions.

The data used in the study spans from 1995 to 2018 for a panel of 71 developing and under developed countries consisting of 40 under developed countries and 31 developing countries. Details about the variables are presented in Table 3 below:

Table 3. Summary statistics

	LNPVT	LNFDI	LNAID	LNY	LNCPI	LNPOPG	EFIO
Mean	19.841	18.150	19.536	8.151	4.164	0.527	3.800
Median	20.335	19.318	19.808	8.130	4.427	0.700	4.009
Maximum	24.948	24.518	23.151	9.956	7.916	2.094	4.349
Minimum	11.830	0.000	0.000	6.301	–7.265	–4.564	0.000
Std. Dev.	2.295	4.843	1.975	0.858	1.145	0.669	0.871
Skewness	–0.763	–2.818	–6.255	–0.009	–3.312	–2.056	–3.981
Kurtosis	3.786	10.987	62.221	2.139	18.590	10.533	17.502
Jarque-Bera	208.968	6785.375	260117.800	52.601	20371.630	5229.607	19433.990
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sum	33808.39	30927.28	33289.85	13888.61	7095.803	898.1512	6475.805
Sum Sq. Dev.	8971.612	39950.71	6643.603	1254.306	2230.758	762.9525	1290.99
Observations	1704	1704	1704	1704	1704	1704	1704

Note: lnpvt – poverty alleviation, lnfdi – foreign direct investment, lnaid – foreign aid, lnY – gross domestic product per capita, lncpi – consumer price index, lnpopg – population growth, efio – economic freedom index. Ln represents the natural logarithm of the variables.

2.1. Unit root and Cross-sectional dependence tests

It is assumed that long-run parameters are most likely to exhibit cointegration associations amongst a set of I (1) variables (Asteriou, 2009). The anticipation is that the macroeconomic variables incorporated into the model could experience unit root hence show non-stationarity (Nelson & Plosser, 1982). Therefore, it is imperative to ascertain the variables' stationarity status to confirm their order of integration. However, the unit root tests of Levin, Lin, and Chu (2002), Im, Pesaran, and Shim (2003), ADF Fischer Chi-square (Maddala & Wu, 1999), and PP Fischer Chi-square (Maddala & Wu, 1999) tests employed in that regard. To avoid fluctuation in the data series, we transformed the data (variables) into their natural logarithm to save the regression results from spurious coefficients. Testing for cross-sectional dependence reveals the existence of contemporaneous correlation across the sampled countries. To be able to perform the cross-sectional dependence test, Pesaran's CD test approach was utilized. Pesaran (2004) proposed the equation below for CD statistics:

$$CD = \left[\frac{TN(1-N)}{2}\right]^{1/2} \bar{\hat{\rho}}. \tag{2}$$

In Eq. (2), $\bar{\hat{\rho}} = \left(\frac{2}{N(N-1)}\right)\sum_{i-1}^{N}\sum_{J-1+1}^{N}\hat{\rho}_{ij}$.

$\hat{\rho}_{ij}$ in the above equation denotes the pairwise cross-sectional correlation coefficients of residuals from the conventional ADF regression. Also, N and T are panel and sample sizes correspondingly.

Consequently, the cross-sectional dependence test specifies the existence of cross-sectional dependence in the panel. In essence, cross-sectional augmented Dickey-Fuller regression (CADF) was utilized hence the equation can be found as:

$$\Delta Y_{it} = a_{it} + K_i t + \beta_i Y_{it-1} + \gamma_i \bar{y}_{t-1} + \varnothing_i \Delta \bar{y}_t + \varepsilon_{it},\ t = 1....T \text{ and } i = 1.....N, \tag{3}$$

where, $\bar{y}_t = N^{-1}\sum_{i-1}^{N} Y_{it}$ is the cross-section mean of $y_{it.}$. The main objective of incorporating the cross-sectional mean in the equation above is to check for contemporaneous correlation among y_{it} (Pesaran, 2007).

2.2. Cointegration test and correlation matrix

After the test for unit root and cross-sectional dependence depicted significance, the next step was to test for cointegration. Testing for cointegration describes the long-run relationship between the variables selected; hence it is appropriate to assess the long-run parameters with the chosen regression methods. In the cointegration test, the null hypothesis I(O) assumes that there is no cointegration association among the selected variables. The alternate hypothesis I(1) assumes that there is an existence of a cointegration relationship among the variables. Therefore, at Ho: $\beta_1 = 0$ is expected to be rejected, and H_1: $\beta < 0$ is expected to be accepted at 5% significance level. The cointegration test performed is the Johansen Fischer cointegration test.

The computation of the correlation matrix is essential to purposefully find out the correlation between the endogenous and the exogenous variables and check for multicollinearity issues among the variables. The multicollinearity test assumes that not more than two exogenous variables should be highly correlated with endogenous variables exhibiting coefficients of –/+0.70 or more (Sun et al., 2002). Therefore, when two exogenous variables exhibit correlation coefficients of –/+0.70 with the exogenous variable, then the problem of multicollinearity could exist in the proposed model.

2.3. Panel cointegration regression methods

After the confirmation of the cointegration relationship among the variables, the next step is to estimate the variables' long-run parameters, thus the exogenous variables against the endogenous variable. The ordinary least square (OLS) method is not considered appropriate when there is a cointegration relationship among variables as it might lead to spurious coefficients. However, several econometric approaches are recommended, such as the dynamic ordinary least square (DOLS), as assumed to produce better results than the OLS for cointegrated panels. That notwithstanding, the dynamic ordinary least square has a major weakness: cross-sectional heterogeneity problem (Kao & Chiang, 2000). The estimator that solves the cross-sectional heterogeneity problem is the fully modified ordinary least square (FMOLS) method proposed by Pedroni (2001a, 2001b). Besides, the FMOLS reliably considered the problems of endogeneity, cross-sectional heterogeneity, and serial correlation.

2.4. Robust check: ARDL Pooled mean group (PMG) and dynamic fixed-effect models (DFE)

The fully modified ordinary least square (FMOLS) and dynamic ordinary least square (DOLS) also have one common shortcoming, thus the inability to estimate short-run coefficients or relationships of variables (Murthy, 2007). In that regard, the alternate approaches are mean group regression (M.G.), pooled mean group (PMG), and the DFE model; thus, dynamic fixed effect, etc., can be used to estimate the various level of heterogeneity across panels while estimating the long-run and short-run coefficient or effects concurrently. The dynamic fixed-effect model enforces homogeneity limitations on the short-run and long-run measurements, which permitting the intercept to differ. The homogeneous nature of macroeconomic foundations of developing and underdeveloped countries justifies the dynamic fixed-effect model's utilization. However, there are heterogeneous effects of temporal shocks existing in different economies under their domestic laws, structural adjustment programs, political dispensation, and regulatory quality. In light of this, the heterogeneity is apprehended by country-specific intercepts.

Practically, contemporaneous correlation through residuals ascends from omitted common dynamics. However, adjustment for time-specific influences in the estimated regressions is made by eliminating these common effects.

2.5. Granger Causality test

It is required statistically to perform further tests when it is established that variables are in first difference stationarity; thus [I(1)] perhaps assessing the causality of the relationship of the variables becomes appropriate (Granger, 1969). According to Shahbaz et al. (2012), getting to know the causal linkage's particular direction among the study variables enables more insight into the findings for policy implications.

2.6. Impulse response function and variance decomposition

Granger causality test has some limitations such that (i) it cannot provide reliable estimates with regards to the causal strength of linkage among variables more than the sample period under consideration; (ii) it only provides the path of the connection, but not the corresponding sign. We intend to apply the Innovation Accounting Approach (IAA) to solve these issues, thus generalized impulse response function, and variance decomposition. In particular, the generalized impulse response function is unresponsive to the vector error correction model (VECM). However, it is preferable more than the simple Choleski fractionalization impulse response function. In as much as the insensitivity of the generalized impulse response function to the vector error correction model (VECM), it also specifies the impacts of innovations, whether they have long-run or short-run effects and either they are positive or negative (Sims, 1986; Bernanke, 1986).

Despite the capability of impulse response function to ascertain the impact of one standard deviation shock on the future and current standards of all dependent variables (endogenous) through the dynamic composition of vector error correction model (VECM) probably, it is unable to provide the extent of that impact. Variance decomposition function estimates each innovation's contribution in terms of percentage to *h-step* ahead of the forecast error variance of the endogenous variable. It offers approaches to determine the absolute importance of shocks in explaining variation in the endogenous variable; hence, it is a reliable method in that context. On top of this, the variance decomposition function provides more consistent outcomes than the effects of other traditional procedures or approaches (Engle & Granger, 1987).

3. Results

Table 4 presents the summary statistics of the variables selected for the study. We report that the standard deviations depict that data series are symmetric and homogenous from the summary statistics. However, to account for the average performance of the variables, poverty increased at an annual average rate of 19.84%, FDI inflow increased at an average yearly rate of 18.15%, foreign aid inflows increased at an annual average of 19.54%, economic growth measured by gross domestic product per capita grew at an average yearly rate of 8.15%, consumer price index increased at annual average index points of 4.16, population growth stood at 0.53% per annum. Economic freedom increased at an average yearly rate of 3.8 index points during the sample period of 1995 to 2018. The Jarque-Bera test confirms that the data series is not in normal distribution; hence, using ordinary least square cannot produce reliable results.

Table 5 exhibits the unit root tests performed to unravel the stationarity status of the data series. We performed the tests at the level form and the first difference with individual intercepts considered. According to the results, at level form, all the variables showed stationarity except LNY (gross domestic product per capita) that had unit root for all the tests performed. Also, LNPOPG (population growth) failed to show stationarity in one of the four tests performed using LLC (Levin, Lin & Chu) test. Subsequently, we performed the tests at the first difference, and relatively all of them showed stationary. Therefore, at a 1% significance level at the first difference, the null hypothesis of unit root is rejected hence confirming the variables' stationarity in the data series.

Table 4. Panel unit root tests

	LNPVT	LNFDI	LNAID	LNPOPG	LNCPI	LNY	EFIO
Level							
LLC	–5.530***	–9.525***	–5.731***	–1.516	–14.302***	0.977	–177.205***
IMS	–2.055**	–9.780***	–5.619***	–5.380***	–9.224***	8.325	–106.780***
ADF	228.919***	384.673***	295.321***	524.552***	881.368***	90.009	3092.130***
PP	256.062***	422.321***	285.243***	246.331***	358.902***	73.769	3508.380***
First difference							
LLC	–31.080***	–38.696***	–37.685***	–8.379***	–25.142***	–28.273***	–465.831***
IMS	–2.8.819***	–41.110***	–38.298***	–15.720***	–21.210***	–21.876***	–201.203***
ADF	975.330***	1425.090***	1286.460***	636.647***	902.962***	916.771***	4068.640***
PP	1179.560***	4261.210***	3230.900***	398.180***	1036.480***	734.879***	4630.560***
CD	43.946***	69.903***	37.793***	19.452***	224.447***	145.920***	38.134***

Note: *** indicates 1% significance level, ** indicates 5% significance level. LLC – Levin, Lin & Chu test, IMS – Im, Pesaran & Shin test, ADF and PP test – Maddala & Wu tests. CD – Cross–sectional dependence. lnpvt – poverty alleviation, lnfdi – foreign direct investment, lnaid – foreign aid, lnY – gross domestic product per capita, lncpi – consumer price index, lnpopg – population growth, efio – economic freedom index.

Table 5. Johansen Fischer Cointegration test

Johansen Fisher Panel Cointegration Test Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)				
Hypothesised	Fisher Stat.*		Fisher Stat.*	
No. of CE(s)	(from trace test)	Prob.	(from max-eigen test)	Prob.
None	2718***	0.000	268.8***	0.000
At most 1	1189***	0.000	1189***	0.000
At most 2	4622***	0.000	2475***	0.000
At most 3	2871***	0.000	1526***	0.000
At most 4	1755***	0.000	985.5***	0.000
At most 5	1072***	0.000	695.4***	0.000
At most 6	586.3***	0.000	519.4***	0.000
At most 7	241.5***	0.000	241.5***	0.000

Note: *** indicates 1% significance level.

In relevance, the test for cross-sectional dependence of the variables confirmed that there is cross-sectional dependence of the variables at a 1% significance level.

Table 6 portrays the results from our cointegration test. From the results, it is evident that there is a long run cointegration or relationship among the variables. The Trace and Maximum Eigenvalue tests depicted that from None to at most 7, the variables are cointegrated at 1% significance level. Therefore, the null hypothesis that there is no cointegration relationship among the variables is rejected.

Table 7 exhibits the correlation matrix of the variables. As per the results, LNFDI, LNAID, LNPOPG, and EFIO showed a positive and statistically significant correlation with the alleviation of poverty, whiles LNY and LNCPI showed a negative and statistically significant correlation with poverty alleviation. On the other hand, no multicollinearity was witnessed between the endogenous and the exogenous variables. That notwithstanding, the variable with the highest coefficient can be reported as –0.588, followed by 0.543. These coefficients are below the coefficient of 0.70, which stipulates high correlation hence collinearity.

lnpvt – poverty alleviation, lnfdi – foreign direct investment, lnaid – foreign aid, lnY – gross domestic product per capita, lncpi – consumer price index, lnpopg – population growth, efio – economic freedom index. DOLS – Dynamic ordinary least square, FMOLS – Fully modified ordinary least square.

Table 8 presents the long-run estimates from dynamic ordinary least square (DOLS) and fully modified (FMOLS) regression methods. As per the results in our DOLS estimation, foreign capital, measured as FDI and foreign aid, relatively have an insignificant impact on poverty alleviation with negligible influence on economic freedom. Meanwhile, economic growth (lnY) plays a critical role in poverty alleviation; and thus, there an inverse and statistically significant relationship was found between economic growth and poverty alleviation. Moreover, in our FMOLS estimation, we observed a positive and statistically significant relationship between foreign aid and poverty alleviation. In contrast, FDI remained insignificant even because of the intervening role of economic freedom. Economic growth depicts the consistently negative and statistically significant relationship with poverty alleviation in both DOLS and FMOLS estimations as well as the consumer price index.

Table 6. Correlation Matrix

Correlation							
Probability	LNPVT	LNFDI	LNAID	LNY	LNCPI	LNPOPG	EFIO
LNPVT	1						
LNFDI	0.073**	1					
LNAID	0.420***	0.100***	1				
LNY	–0.588***	0.113***	–0.353***	1			
LNCPI	–0.095***	0.094***	0.035	0.124***	1		
LNPOPG	0.543***	–0.046*	0.264***	–0.444***	–0.045*	1	
EFIO	0.061**	0.134***	0.110***	0.121***	0.125***	–0.043*	1

Note: *** indicates 1% significance level, ** indicates 5% significance level, * indicates 10% significance level. lnpvt – poverty alleviation, lnfdi – foreign direct investment, lnaid – foreign aid, lnY – gross domestic product per capita, lncpi – consumer price index, lnpopg – population growth, efio – economic freedom index.

Table 7. Results from Dynamic ordinary least square (DOLS) and fully modified least square (FMOLS): All Sample

	DOLS			FMOLS		
LNFDI	0.004		0.013	–0.001		–0.001
	(0.586)		(1.266)	(–0.358)		(–0.341)
LNAID		0.015	–0.002		0.021	0.021
		(0.689)	(–0.047)		(1.982)**	(1.978)**
EFIO	0.023	0.026	–0.029	0.018	0.017	0.016
	(0.803)	(0.616)	(–0.489)	(0.674)	(0.610)	(0.607)
LNY	–1.631	–1.730	–1.635	–2.052	–2.052	–2.048
	(–13.497)***	(–14.151)***	(–8.510)***	(–20.445)***	(–20.721)***	(–20.435)***
LNPOPG	0.054	–0.009	0.152	0.035	0.037	0.037
	(0.956)	(–0.146)	(2.049)**	(0.726)	(0.764)	(0.763)
LNCPI	0.088	0.051	0.092	0.080	0.078	0.078
	(3.773)***	(2.151)**	(3.166)**	(3.897)***	(3.775)***	(3.783)***
R–Squared	0.998	0.996	0.999	0.969	0.969	0.969
Adjusted R-Squared	0.991	0.989	0.991	0.967	0.967	0.967
Obs.	1491	1491	1491	1633	1633	1633

Note: *** indicates 1% significance level, ** indicates 5% significance level, * indicates 10% significance level.

Table 9 displays the results of our estimation with dynamic fixed effect and pooled mean group regression methods. As per the results, it suggests that in the short-run, FDI positively and significantly affect poverty alleviation while foreign aid depicts an insignificant impact on poverty alleviation. Moreover, economic freedom showed insignificant influence between foreign capital (foreign aid and FDI) and poverty alleviation. The dynamic fixed-effect and pooled mean group estimations showed similar results affirming the relationship between the endogenous and the exogenous variables. In the long-run computations, we observed that FDI could negatively and significantly affect poverty alleviation. Economic freedom positively intervenes with foreign capital (foreign aid and FDI) and poverty alleviation. In essence, the economic growth, either short-run or long-run, consistently affect poverty alleviation negatively and significantly. Meanwhile, population growth and consumer price index (inflation) play an insignificant role in poverty alleviation in the long run. However, in the short run, they still affect poverty alleviation negatively and significantly.

Table 8. Results from dynamic fixed effect and Pooled mean group estimations (All sample)

	Dynamic fixed-effect						Pooled Mean Group					
	Long-run			Short-run			Long-run			Short-run		
Error correction				−0.132	−0.209	−0.206				−0.132	−0.209	−0.206
				(−5.395)***	(−6.811)***	(−6.729)***				(−5.395)***	(−6.811)***	(−6.729)***
ΔLNFDI				0.015		0.016				0.015		0.016
				(1.755)*		(2.128)**				(1.755)*		(2.128)**
ΔLNAID					0.021	0.011					0.021	0.011
					(1.067)	(0.701)					(1.067)	(0.701)
ΔEFIO				0.038	0.141	0.106				0.038	0.141	0.106
				(0.386)	(1.502)	(1.057)				(0.384)	(1.502)	(1.057)
ΔLNY				−0.866	−0.435	−0.503				−0.866	−0.435	−0.503
				(−3.310)***	(−1.522)	(−1.858)*				(−3.310)***	(−1.522)	(−1.858)*
ΔLNPOPG				−2.001	−1.733	−1.718				−2.001	−1.733	−1.718
				(−2.697)**	(−2.649)**	(−2.477)**				(−2.697)**	(−2.649)**	(−2.477)**
ΔLNCPI				−0.343	−0.381	−0.332				−0.343	−0.381	−0.332
				(−1.689)*	(−2.409)**	(−1.919)**				(−1.689)*	(−2.409)***	(−1.919)**
LNFDI	0.004		−0.006				0.004		−0.006			
	(0.977)		(−1.824)*				(0.977)		(−1.824)*			
LNAID		−0.005	−0.002					−0.005	−0.002			
		(−0.648)	(−0.234)					(−0.648)	(−0.234)			
EFIO	1.732	0.392	0.462				1.732	0.392	0.462			
	(7.818)***	(4.620)***	(5.308)***				(7.818)***	(4.620)***	(5.308)***			
LNY	−0.758	−1.957	−1.968				−0.758	−1.957	−1.968			
	(−6.522)***	(−43.818)***	(−41.906)***				(−6.522)***	(−43.818)***	(−41.906)***			
LNPOPG	0.817	−0.010	−0.003				0.817	−0.010	−0.003			
	(6.412)***	(−0.823)	(−0.299)				(6.412)***	(−0.823)	(−0.299)			
LNCPI	−0.011	0.017	0.015				−0.011	0.017	0.015			
	(−0.281)	(1.534)	(1.261)				(−0.281)	(1.534)	(1.261)			
constant				2.472	7.136	6.999				2.472	7.136	6.999
				(5.514)***	(6.899)***	(6.808)***				(5.514)***	(6.899)***	(6.808)***
Obs.	1633	1633		1633	1633	1633	1633	1633	1633	1633	1633	1633

Note: *** indicates 1% significance level, ** indicates 5% significance level, * indicates 10% significance level. lnpvt – poverty alleviation, lnfdi – foreign direct investment, lnaid – foreign aid, lnY – gross domestic product per capita, lncpi=consumer price index, lnpopg – population growth, efio – economic freedom index.

Table 9. Results from dynamic fixed effect and Poled mean group estimations (Least Developed Countries)

	Dynamic fixed effect						Pooled Mean Group					
	Long run			Short-run			Long run			Short-run		
Error correction				−0.163	−0.277	−0.223				−0.163	−0.277	−0.223
				(−3.383)***	(−6.038)***	(−4.334)***				(−3.383)***	(−6.038)***	(−4.334)***
ΔLNFDI				0.018		0.024				0.018		0.024
				(1.405)		(1.942)				(1.405)		(1.942)
ΔLNAID					0.009	0.016					0.009	0.016
					(0.411)	(0.747)					(0.411)	(0.747)
ΔEFIO				0.084	0.339	0.125				0.084	0.339	0.125
				(0.382)	(1.669)*	(0.548)				(0.382)	(1.669)*	(0.548)
ΔLNY				−0.073	−0.546	−0.467				−0.073	−0.546	−0.467
				(−1.486)	(−0.964)	(−0.930)				(−1.486)	(−0.964)	(−0.930)
ΔLNPOPG				−2.992	−2.012	−2.102				−2.992	−2.012	−2.102
				(−2.146)**	(−2.508)**	(−2.196)**				(−2.146)**	(−2.508)**	(−2.196)**
ΔLNCPI				0.126	−0.493	−0.351				0.126	−0.493	−0.351
				(2.736)**	(−1.511)	(−0.865)				(2.736)**	(−1.511)	(−0.865)
LNFDI	0.007		−0.028				0.007		−0.028			
	(1.888)**		(−3.882)***				(1.888)**		(−3.882)***			
LNAID		−0.000	0.010					−0.000	0.010			
		(−0.017)	(0.712)					(−0.017)	(0.712)			
EFIO	1.206	0.058	0.375				1.206	0.058	0.375			
	(4.899)***	(9.538)***	(3.614)***				(4.899)***	(9.538)***	(3.614)***			
LNY	−1.219	−1.692	−1.290				−1.219	−1.692	−1.290			
	(−7.380)***	(−15.596)***	(−11.030)***				(−7.380)***	(−15.596)***	(−11.030)***			
LNPOPG	1.295	−0.015	−0.033				1.295	−0.015	−0.033			
	(7.821)***	(−1.098)	(−3.681)***				(7.821)***	(−1.098)	(−3.681)***			
LNCPI	0.126	−0.070	−0.349				0.126	−0.070	−0.349			
	(2.736)**	(−1.435)	(−6.180)***				(2.736)**	(−1.435)	(−6.180)***			
constant				3.725	9.088	6.509				3.725	9.088	6.509
				(3.467)***	(6.236)***	(4.367)***				(3.467)***	(6.236)***	(4.367)***
Obs.	713	713	713	713	713	713	713	713	713	713	713	713

Note: *** indicates 1% significance level, ** indicates 5% significance level, * indicates 10% significance level. lnpvt – poverty alleviation, lnfdi – foreign direct investment, lnaid – foreign aid, lnY – gross domestic product per capita, lncpi – consumer price index, lnpopg – population growth, efio – economic freedom index.

Table 10. Results from dynamic fixed effect and Pooled mean group estimations (Least Developed Countries)

	Dynamic fixed effect						Mean Group					
	Long run			Short-run			Long run			Short-run		
Error correction				−0.094	−0.153	−0.110				−0.094	−0.153	−0.110
				(−3.276)***	(−4.391)***	(−3.222)***				(−3.276)***	(−4.391)***	(−3.222)***
ΔLNFDI				0.011		0.012				0.011		0.012
				(1.091)		(1.174)				(1.091)		(1.174)
ΔLNAID					0.027	0.008					0.027	0.008
					(0.858)	(0.327)					(0.858)	(0.327)
ΔEFIO				0.159	0.026	−0.076				0.159	0.026	−0.076
				(2.467)**	(0.600)	(−1.355)				(2.467)**	(0.600)	(−1.355)
ΔLNGDPPC				−1.126	−0.928	−0.629				−1.126	−0.928	−0.629
				(−4.618)***	(−3.197)**	(−2.665)**				(−4.618)***	(−3.197)**	(−2.665)**
ΔLNPOPG				−0.555	−0.981	−0.597				−0.555	−0.981	−0.597
				(−0.724)	(−1.382)	(−0.804)				(−0.724)	(−1.382)	(−0.804)
ΔLNCPI				−0.172	−0.242	−0.214				−0.172	−0.242	−0.214
				(−1.237)	(−1.783)*	(−1.409)				(−1.237)	(−1.783)*	(−1.409)
LNFDI	0.020		−0.058				0.020		−0.058			
	(1.432)		(−3.645)***				(1.432)		(−3.645)***			
LNAID		0.012	0.017					0.012	0.017			
		(0.993)	(0.520)					(0.993)	(0.520)			
EFIO	0.402	0.700	3.220				0.402	0.700	3.220			
	(2.817)**	(6.043)***	(6.202)***				(2.817)**	(6.043)***	(6.202)***			
LNGDPPC	−0.820	−0.709	−1.474				−0.820	−0.709	−1.474			
	(−4.536)***	(−12.768)***	(−14.727)***				(−4.536)***	(−12.768)***	(−14.727)***			
LNPOPG	0.011	−0.042	0.721				0.011	−0.042	0.721			
	(0.261)	(−0.543)	(5.013)***				(0.261)	(−0.543)	(5.013)***			
LNCPI	0.678	0.037	−0.023				0.678	0.037	−0.023			
	(9.964)***	(2.500)**	(−1.416)***				(9.964)***	(2.500)**	(−1.416)***			
constant				2.116	3.598	2.228				2.116	3.598	2.228
				(3.229)***	(4.494)***	(3.265)***				(3.229)***	(4.494)***	(3.265)***
Obs.	920	920	920	920	920	920	920	920	920	920	920	920

Note: *** indicates 1% significance level, ** indicates 5% significance level, * indicates 10% significance level. lnpvt – poverty alleviation, lnfdi – foreign direct investment, lnaid – foreign aid, lnY – gross domestic product per capita, lncpi – consumer price index, lnpopg – population growth, efio – economic freedom index.

Table 10 presents the results of our sub-sample study, i.e., developing countries. As per the results, we observed that in both the dynamic fixed-effect and pooled mean group estimations, foreign capital (FDI and foreign aid), economic growth, consumer price index, economic freedom insignificantly affects the cost of closing the poverty gap (poverty alleviation), even in the short-run. However, population growth seemingly affects poverty alleviation negatively. On the contrary, in the long-run estimations, we observed that FDI negatively and significantly affects the cost of closing the poverty gap (poverty alleviation) in developing countries. In an apparent way, economic growth exponentially rises to reduce poverty and economic freedom positively influences the relationship of FDI and poverty alleviation. In the long run, economic freedom and economic growth consistently affect the cost of closing the poverty gap (poverty alleviation). Moreover, consumer price index and population growth could negatively affect the cost of closing the poverty gap (poverty alleviation).

Table 11 presents the results of our sub–sample study, i.e., the under developed countries. As per the results, we observed that the characteristics of the variables under investigation present symmetric and homogenous coefficient signs as the results observed in the sub-sample of developing countries; and hence FDI could reduce the cost of closing the poverty gap in the long run through positive initiation from economic freedom and efforts channelled towards economic growth. Our test observed unidirectional granger causality linkages between poverty alleviation and foreign aid, economic growth and poverty alleviation, and consumer price index and poverty alleviation. In contrast, a bidirectional granger causality linkage was observed between population growth and poverty alleviation. The bidirectional granger causality linkage posits that any variation in population growth affects poverty alleviation

Table 11. Granger causality test

Pairwise Granger Causality Tests Null Hypothesis:	Obs	F-Statistic	Prob.	Sig.
POVERTY ALLEVIATION				
LNFDI does not Granger Cause LNPVT	1562	2.099	0.123	
LNPVT does not Granger Cause LNFDI		0.689	0.502	
LNAID does not Granger Cause LNPVT	1562	0.897	0.408	
LNPVT does not Granger Cause LNAID		36.416	0.000	***
EFIO does not Granger Cause LNPVT	1562	0.267	0.766	
LNPVT does not Granger Cause EFIO		0.274	0.761	
LNGDPPC does not Granger Cause LNPVT	1562	29.157	0.000	***
LNPVT does not Granger Cause LNGDPPC		1.044	0.352	
LNCPI does not Granger Cause LNPVT	1562	5.352	0.005	**
LNPVT does not Granger Cause LNCPI		0.968	0.381	
LNPOPG does not Granger Cause LNPVT	1562	4.135	0.016	**
LNPVT does not Granger Cause LNPOPG		11.034	0.000	***

Note: *** indicates 1% significance level, ** indicates 5% significance level. lnpvt – poverty alleviation, lnfdi – foreign direct investment, lnaid – foreign aid, lnY – gross domestic product per capita, lncpi – consumer price index, lnpopg – population growth, efio – economic freedom index.

and vice versa. The unidirectional granger causality linkage posits that a variation in only economic growth could affect poverty alleviation, consumer price index could only affect poverty alleviation, and poverty alleviation could only affect foreign aid but not vice versa.

In Figure 1, we present the impulse response function analysis. From the analysis, we observed that the standard deviation of the cost of closing the poverty gap (poverty alleviation) leads to a positive increase in the future cost of closing the poverty gap (poverty alleviation). The cost of closing the poverty gap (poverty alleviation) to the rise in FDI, foreign aid, economic growth, population growth, economic freedom, and consumer price index depicts positive and significant signs but with diverse magnitude. However, the accumulated responses of the cost of closing the poverty gap (poverty alleviation) to the exogenous variables demonstrated positive and significant responses.

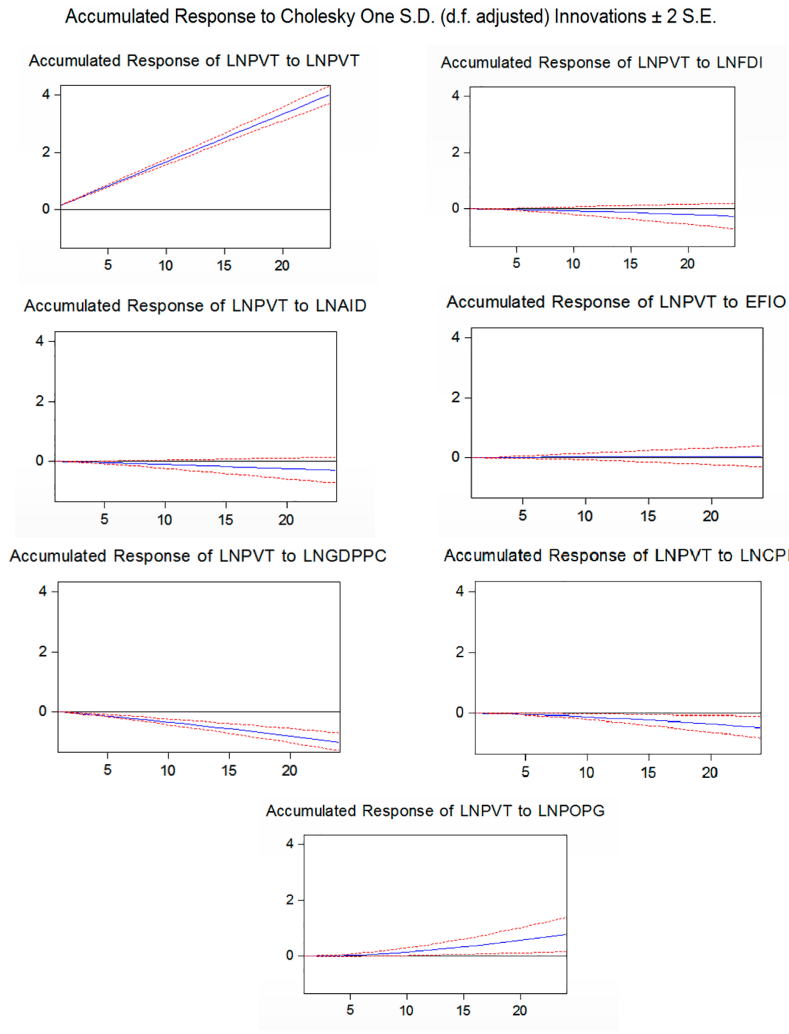

Figure 1. Impulse response function of poverty alleviation to the exogenous variables

Table 12. Variance decomposition of poverty alleviation

Variance Decomposition of poverty alleviation for developing and least developed countries: 1995–2018								
Period	S.E.	LNPVT	LNAID	LNFDI	LNY	LNCPI	LNPOPG	EFIO
1	0.164	100.000	0.000	0.000	0.000	0.000	0.000	0.000
2	0.234	98.658	0.045	0.030	1.225	0.012	0.017	0.012
3	0.289	97.593	0.098	0.037	2.143	0.043	0.054	0.031
4	0.336	96.772	0.159	0.057	2.748	0.091	0.128	0.046
5	0.378	96.100	0.214	0.076	3.169	0.149	0.237	0.055
6	0.416	95.508	0.262	0.098	3.482	0.214	0.376	0.060
7	0.451	94.963	0.302	0.121	3.729	0.284	0.541	0.061
8	0.484	94.448	0.334	0.143	3.933	0.355	0.726	0.061
9	0.515	93.953	0.361	0.165	4.108	0.426	0.927	0.058
10	0.544	93.474	0.383	0.186	4.263	0.497	1.141	0.056
11	0.573	93.006	0.401	0.207	4.403	0.567	1.364	0.052
12	0.600	92.549	0.417	0.227	4.532	0.633	1.593	0.049
13	0.626	92.102	0.429	0.245	4.654	0.698	1.826	0.045
14	0.651	91.665	0.440	0.263	4.769	0.759	2.061	0.042
15	0.676	91.237	0.450	0.281	4.879	0.817	2.297	0.039
16	0.700	90.818	0.458	0.297	4.986	0.872	2.532	0.037
17	0.723	90.408	0.465	0.313	5.091	0.924	2.765	0.034
18	0.745	90.006	0.471	0.329	5.193	0.973	2.995	0.032
19	0.768	89.614	0.477	0.344	5.295	1.019	3.221	0.031
20	0.789	89.230	0.482	0.358	5.395	1.063	3.444	0.029
21	0.811	88.855	0.486	0.372	5.494	1.103	3.662	0.028
22	0.831	88.488	0.490	0.386	5.593	1.141	3.875	0.027
23	0.852	88.129	0.494	0.399	5.691	1.177	4.083	0.026
24	0.872	87.778	0.497	0.412	5.790	1.210	4.287	0.026

Note: lnpvt – poverty alleviation, lnfdi – foreign direct investment, lnaid – foreign aid, lnY – gross domestic product per capita, lncpi – consumer price index, lnpopg – population growth, efio – economic freedom index.

In Table 12, we present the results of the variance decomposition analysis of poverty alleviation. The study outlines a 24-year forecasting horizon. In an account of the 5-year forecast horizon, we observed that its innovations constitute 96.1% of the one-step forecast variance in the cost of closing the poverty gap (poverty alleviation). Only 3.9% is accounted for by foreign capital (FDI and foreign aid), economic freedom, economic growth, population growth, and consumer price index. In the long run, the innovation shocks of cost of closing poverty gap (poverty alleviation) itself decline to about 87.78%, while the responses of foreign capital (foreign aid and FDI), economic freedom, economic growth, population growth, and consumer price index altogether are expected to increase to 12.22% in a 24-year forecast horizon from a five-year forecast horizon of 3.9%. In the account of the 12.22% variance,

5.79% of the variance is a result of shocks in economic growth, and 4.3% variations are due to shocks in population growth. Also, 1.21% variations are due to the shocks in the consumer price index, 0.497% variations are due to the shocks in FDI, 0.412% variations are due to the shocks in foreign aid, and 0.026% variations are due to the shocks in economic freedom. Our findings emphasize that economic growth is likely to strong and consistent forecasted impact on the cost of closing the poverty gap, the effects of population growth and consumer price index have the likelihood to be manifest in the future. Moreover, the forecasted effects of FDI, foreign aid, and economic freedom are considerably weak.

4. Discussion

Our objective to understand the role that foreign capital plays in poverty alleviation led us to perform numerous econometric methodologies. In the pursuit to statistically infer on our findings, robust estimations and approaches were utilized; hence we employed dynamic ordinary least square and fully modified ordinary under method in one step; dynamic fixed-effect and pooled mean group estimators in another step; granger causality test, impulse response function and variance decomposition analyses in the last step. Evidence from our findings posits that foreign capital could play a significant role in poverty alleviation when it is reliant on consistent economic growth. This evidence is consistent with the past literature (Do et al., 2021; Topalli et al., 2021; Magombeyi & Odhiambo, 2018). Like (Anetor et al., 2020) stated that there exists a significant negative association between economic growth and poverty alleviation. In our DOLS and FMOLS estimations, we realized that economic growth depicted a negative and statistically significant relationship with the cost of closing the poverty gap (poverty alleviation), whiles FDI was insignificant. Similar to the prepositions of (Mahembe & Odhiambo, 2019) who proved a positive association between foreign aid and poverty alleviation, the foreign aid had a positive and significant relationship with the cost of closing the poverty gap (poverty alleviation).

In furtherance, we employed dynamic fixed-effect and pooled mean group estimators to resolve the problems of heterogeneity and homogeneity that the fully modified ordinary least square may not solve in the panel. The results of both the dynamic fixed effect and the pooled mean group produced the same results throughout the analyses. We observed that estimation for all samples showed that FDI positively and significantly could affect the cost of closing the poverty gap (poverty alleviation) in the short run. However, foreign aid has no significant impact as well as the intervening role of economic freedom. Nevertheless, for the cost of closing the poverty gap to be reduced, economic growth should be consistently increased annually. Our results from both developing countries and under developed countries exhibited similar results as foreign capital plays an insignificant role in poverty alleviation in the short run in both sub-samples. Still, FDI plays a negative and significant role in poverty alleviation in the long run. Therefore, FDI inflows could significantly reduce the cost of closing the poverty gap in the long run.

Interestingly, economic growth reliably plays a significant role in poverty alleviation in all our samples. To this, it affirms the mantra "economic growth is good for the poor" (Dollar & Kraay, 2002). We emphasize that for foreign capital to play a significant role in developing and under developed countries, it must support their economic growth agenda. More-

over, economic freedom seems to play a substantial role in poverty alleviation in the long run. Kloeppel (2013) analyzed this phenomenon in China and India and elaborated on how these countries reaped the fruits of economic freedom that translated into poverty reduction. It also reaffirms governments' necessity to ensure judicial effectiveness, integrity, financial freedom, investment freedom, monetary freedom, labor freedom, property right, and fiscal health; most importantly, reducing the tax burden and spending judiciously.

The nexus between FDI and poverty alleviation has been asserted as not unimodal due to the contention that its manifestation is not an unchanging manner in all developing countries. Perhaps it is highly dependent on the host country's ability to frame and tool resilient and actionable policies (Mold, 2004). These policies should not be centred solely on attracting FDI but ensure the guidelines are regulated and its benefits channelled towards the poor (Ndikumana & Verick, 2008). To buttress this view, Dhahri and Omri (2020) concluded in their study that FDI significantly contributes to poverty alleviation in developing countries and is reliant on the host country's policy initiatives. Moreover, they contended that non-investment aid insignificantly contributes to poverty alleviation in developing countries. Similar with the findings of Chong et al. (2009), which also support our findings in context of foreign assistance (aid) insignificantly impact poverty alleviation both in the short-run and long run. However, Dhahri and Omri (2020) were of the contrary opinion in the context of foreign aid and poverty alleviation relationship when the aid is extended to agriculture sector.

Conclusions and policy implications

Conclusions

Our study focused on foreign capital's role in poverty alleviation in the under developed and developing countries. The study used 71 countries as its sample and categorized the model into developing and under developed countries to critically understand foreign capital's role in poverty alleviation. To achieve our objective, we employed some econometric methodologies such as the panel unit root test and cross-sectional dependence test. Also, cointegration test, correlation matrix, dynamic ordinary least square, fully modified under square, ARDL dynamic fixed effect and PMG regression methods, Granger causality test, impulse responses function, and variance decomposition analysis. We found that foreign capital proxies with FDI and foreign aid could reduce the cost of closing the poverty gap (poverty alleviation) when it is FDI. Still, as foreign aid, it insignificantly contributes to poverty alleviation. However, economic freedom positively influences the role of FDI to reducing the poverty gap, as well as economic growth significantly plays a critical role in the quest to reduce poverty.

Policy implications

The study has multiple implications including academic, practical, and policy implications. It extends the knowledge of the relationship between foreign capital and poverty reduction and between economic freedom and poverty alleviation from the perspective of neo-classical and the new Keynesians theories. Since the nexus between FDI and poverty alleviation is unimodal, policymakers and governments should create a conducive and enabling environ-

ment that could support businesses to flourish to propagate economic growth. Moreover, the political climate ought to be stabilized and ensure infrastructural availability. The effectiveness of foreign aid to poverty alleviation is dependent on policymakers and governments' distribution of developmental assistance (aid) to humanitarian and social sectors that urgently respond to that call other than sectors that do not support the poverty alleviation agenda. Social aid is effective development assistance that reliably supports poverty alleviation, thus aids such as health programs, educational aid, sanitation, and water. Most importantly, a new paradigm of foreign developmental assistance funds should be looked at, where all countries ought to contribute to that fund for equitable distribution to support the sustainable development goals. They propose for universal development commitment for all countries where developed countries contribute 0.7% of GNI, upper-middle-income countries contribute 0.3% of GNI, lower-middle-income countries contribute 0.2% of GNI, and under developed countries contribute 0.1% of GNI towards the achievement of the SDGs on time due to the ineffectiveness of development aid initiatives already in existence.

Limitations

Despite the contributions that our work has made, we still acknowledge some limitations to the study. We examined only the aggregate impact of FDI and foreign aid on the cost of closing the poverty gap without considering the disaggregate impact due to data availability of some of the countries under study. Also, data on the cost of closing the poverty gap was not consistent in terms of yearly provision as the data available was up to 2013 and were collated in 3-year periods. The economic freedom index had a lot of missing data in the computation of the overall index for some perspectives like fiscal health, judicial effectiveness, and financial freedom. Despite the limitations, we have unravelled the impact of foreign capital, i.e., FDI and foreign aid, on the cost of closing the poverty gap. However, we still believe that it should be further studied to include judicial effectiveness, fiscal health, and financial freedom in future studies due to data limitations for these perspectives.

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Conflicts of interest

There are no conflicts of interest to declare.

Availability of data and material

Data is available on request to the corresponding author.

Authors contributions

All authors contributed equally in this study.

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