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POVERTY DYNAMICS: PANEL ECONOMETRIC EVIDENCE ON HEADCOUNT RATIOS

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Abstract
This research examines the dynamics and constraints of global poverty and the pursuit of economic growth across six major regions from 1990 to 2023, encompassing 34 years of data from around the world. The focus is on analyzing long-term movements, structural shifts, and econometric evidence of convergence and persistence. Panel data techniques are used in the methodology, including stationarity tests, structural break analyses, and panel regression with fixed effects. The analysis discloses important poverty reductions in the East Asia & Pacific and South Asia regions; however, Sub-Saharan Africa continues to display the highest poverty rates with sluggish improvement, which can lead to dysfunction of economic policy implementation to achieve well-being for citizens. The findings highlight the critical role of economic growth, structural change, and policy interventions in determining regional poverty outcomes. By recognizing both converging and diverging paths, the study contributes to understanding the irregular distribution of global development gains and provides implications for poverty reduction strategies in emerging and low-income economies. Based on this result, several policies can be made to improve economic growth and, at the same time, to reduce poverty. This study contributes by mixing time-series tests and panel regression techniques to analyze global poverty dynamics over three decades. It completely identifies structural breaks connected to major crises, places of interest, and persistent regional disparities and provides robust cross-regional evidence that informs policy design for realizing inclusive and resilient poverty reduction strategies. This finding is aligned with several results from research regarding policies to reduce poverty and enhance economic growth, and the result can be used to formulate a strategic plan to achieve growth while reducing poverty.
Keywords*: Poverty headcount ratio; global poverty trends; regional disparities; economic growth; panel regression*

1. Introduction

Poverty reduction is one of the most demanding challenges of the twenty-first century facing all nations around the world, especially in aligning with national development goals. Despite notable progress in several regions, extreme poverty continues to affect hundreds of millions of people around the world, mostly in low- and middle-income countries. Global initiatives such as the Millennium Development Goals (MDGs) (Erin et al., 2024) and Sustainable Development Goals (SDGs) have set ambitious targets, yet progress remains uneven across regions (Eberling & Langkau, 2024). Over the past three decades, East Asia and the Pacific achieved remarkable reductions in poverty due to rapid industrialization and structural transformation, while Sub-Saharan Africa lags, reflecting weaker institutions, conflict, and dependence on commodity exports. Global shocks, including the Asian financial crisis (1997), the global financial crisis (2008), and the COVID-19 pandemic (2020), have further shaped poverty dynamics, reversing gains and exposing vulnerabilities. These patterns underscore the need to understand poverty Dhahri & Omri, 2020b; Nahar, 2024).

More the past three decades, based on UN and World Bank data for several regions around the world, global poverty levels have experienced a remarkable transformation from a match between resources available to nations, including natural resources and human resources, but the shapes vary widely between regions. East Asia and the Pacific, determined largely by China's rapid industrial development and Vietnam's conversion to a market-oriented economy, contributed to a reduction in poverty levels and an increase in significant economic growth (Y. Li & Huang, 2025; Ofori et al., 2021; The World Bank, 2017), witnessed a significant decline in poverty rates. Conversely, Sub-Saharan Africa struggled to realize comparable reductions due to fragile institutions, conflict, dependence on commodity exports, and slower structural transformation. These conflicting experiences highlight the importance of analyzing regional poverty paths rather

than relying solely on global averages (Erin et al., 2024; Hwang & Kim, 2017).

The period 1990–2023 is principally important for understanding poverty dynamics in the region, especially for emerging countries in Africa and Asia, because it includes multiple global and regional shocks. The Asian financial crisis in 1997 destabilized economies across East and Southeast Asia, leading to temporary setbacks in poverty reduction. The global financial crisis of 2008 triggered recessions in advanced and emerging economies, testing the resilience of poverty mitigation efforts. More recently, the COVID-19 pandemic in 2020 caused widespread disruptions to livelihoods, reversing years of progress in many regions. These events can be interpreted as structural breaks that may have permanently transformed poverty paths (Cornand & Gimet, 2012; Gerlach et al., 2015; Grosse, 2017; Lean & Pizzutilo, 2021).

Researchers have long argued about the mechanisms driving poverty reduction, not just to create welfare for citizens but to align with sustainability for nature and the future of our planet. Economic growth is often seen as the most powerful tool for reducing poverty, yet the elasticity of poverty reduction with respect to growth differs significantly across regions. For instance, while growth in East Asia has translated into rapid poverty alleviation, Sub-Saharan Africa has experienced weaker transmission due to inequality, limited diversification, and labor market rigidities (Aracil et al., 2022; Azaria & Sihaloho, 2021; Bank, 2021; Dhahri & Omri, 2020a; Y. Li & Huang, 2025). This raises questions about the conditions under which growth is interpreted effectively into poverty reduction (Hwang & Kim, 2017).

An alternative element of the literature notes that it pays attention to emphasizing the role of structural change, governance, and institutions in shaping poverty outcomes. Regions that fruitfully reallocated labor from low-productivity agriculture to higher-productivity manufacturing and services tended to achieve more sustainable poverty reduction (Sari & Yudhistira, 2023; Voskoboynikov, 2020). Strong institutions, inclusive policies, and investment in human capital have also proven significant in sustaining gains. By contrast, fragile states and resource-dependent economies often experience poverty stagnation, even during periods of growth.

Time-series and panel econometrics provide powerful tools to observe and understand how to overcome poverty dynamics systematically. Unit root tests, structural break analyses, and panel regression models allow researchers to capture long-run trends, short-run shocks, and cross-sectional heterogeneity. Applying these methods to poverty data not only examines the existence of persistent trends but also exposes whether regional paths are driven by deterministic or stochastic components. Such a method is crucial for distinguishing between temporary shocks and permanent changes in poverty.

The empirical evidence suggests that poverty paths cannot be explained solely by aggregate growth, but still use other approaches and characteristics specific to regions. For example, South Asia has experienced strong economic performance, yet high levels of poverty and inequality persist in countries like India, Pakistan, and Bangladesh. Latin America, after initial progress in the 2000s, experienced setbacks during the commodity price decline of the mid-2010s. In Europe and Central Asia, poverty trends have been shaped by change dynamics following the collapse of the Soviet Union and more recent geopolitical instability. These complex realities call for a more nuanced analysis that incorporates structural factors and historical contingencies (Chen, 2018; Xia et al., 2017).

The COVID-19 pandemic highlighted the fragility of poverty reduction achievements because all nations faced the same situation in overcoming the national and international pandemic. Decades of progress were reversed in a matter of months, with the World Bank predicting that more than 70 million people fell back into extreme poverty in 2020 alone, and most of them in the Africa and Asia regions. This event underscores the importance of resilience and risk management in poverty studies. Structural break analysis offers a useful lens to assess how such shocks permanently shift poverty paths and what factors determine recovery speed (Dhahri & Omri, 2020a; Teixeira &

Loureiro, 2019).

While there is widespread research on poverty reduction, many studies remain focused on national-level experiences using specific policy and geographic position to identify several potential opportunities to get more resources for sustainable food, water, and all kinds of services to maintain the process of well-being. Cross-regional comparative analysis using synchronized data is still limited, despite its potential to generate broader insights. Understanding how different regions responded to similar global shocks provides lessons on policy effectiveness, institutional resilience, and structural weaknesses. This gap motivates the present study, which employs time-series and panel methods to analyze poverty headcount ratios across major world regions between 1990 and 2023.

One more contribution is the focus on structural breaks associated with major global crises and the need for cooperation for all reasons to create value added. Rather than assuming smooth poverty trends, the analysis tests explicitly whether events such as the Asian crisis, the global financial crisis, and the COVID-19 pandemic represent permanent shifts. This perspective is critical for policymakers seeking to design adaptive strategies that protect the poor during global downturns (Chattopadhyay et al., 2022; Fu et al., 2021; Goodell, 2020; Keeni, 2025; S. Li et al., 2024; Schütz et al., 2025).

The findings of this study also carry implications for global development targets to improve well-being around the world. If poverty tracks are path-dependent and strongly affected by external shocks, then achieving the SDG target of ending extreme poverty by 2030 may require far more resilient and inclusive strategies than currently envisaged. Regional heterogeneity further implies that a one-size-fits-all approach is unlikely to succeed (Aloui et al., 2024; Modgil et al., 2020; Salman et al., 2023; Slimani et al., 2024; Suárez Giri & Sánchez Chaparro, 2023).

From a policy standpoint, there are still several joint programs that can be handled under authority in the UN through the SDGs program. This research underscores the importance of growth quality rather than growth quantity in the context of sustainable economic growth, especially in a green economy with more attention to the environment. Countries that combine sustained growth with inclusive policies, structural transformation, and strong institutions are more likely to achieve durable poverty reduction (Orji et al., 2021). Conversely, reliance on volatile commodity exports or narrow sectors leaves economies vulnerable to external shocks that can erase progress overnight.

While extensive research has examined poverty reduction, most studies remain focused on single-country analyses or short time horizons. Less attention has been given to systematic cross-regional comparative evidence using harmonized panel data over multiple decades (Narayan & Narayan, 2010; Sarkar et al., 2019). Additionally, the extent to which poverty dynamics reflect persistent long-term trends, temporary shocks, or structural breaks remains insufficiently explored.

This study discloses these gaps to make it clear to policymakers by applying panel econometric methods, including unit root tests, Chow tests for structural breaks, and fixed-effects panel regression, to analyze poverty headcount ratios across six world regions from 1990 to 2023. By mixing descriptive, time-series, and panel-based approaches, the study contributes in three ways. First, it offers robust statistical evidence of poverty convergence and divergence across regions. Second, it clearly tests the role of major global crises as structural breaks in poverty paths. Third, it reveals how panel regression can reveal both global trends and region-specific heterogeneity, offering insights for designing inclusive and resilient poverty reduction strategies.

2. Research Methods

This study applies a quantitative research design that integrates descriptive analysis, econometric modeling, and robustness testing. The methodological framework consists of several structured steps, as outlined below.

2.1 **Data Source**

The primary data are obtained from the World Bank's World Development Indicators (WDI). The main variable of interest is the poverty headcount ratio, defined as the percentage of the population living below USD 2.15 per day at 2017 PPP (Purchasing Power Parity, UN 2017). Data are collected annually for the period 1990–2023 (World Bank Group, 2017).

The study is conducted at the regional level, following World Bank classifications: East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, South Asia, and Sub-Saharan Africa. This results in a balanced panel dataset with six regions observed over 34 years. Regional aggregation ensures comparability across time and reduces missing values. Such aggregation also introduces potential biases, since within-country heterogeneity is masked. For instance, substantial differences may exist between rural and urban areas, or across subnational regions, which are not captured in regional averages. As a result, the findings should be interpreted as reflecting broad regional paths rather than the full complexity of national poverty dynamics.

2.2 Unit of Analysis

The analysis is conducted using data published by the World Bank and UN at the regional level, based on World Bank classifications :

East Asia and Pacific (EAP); Europe and Central Asia (ECA); Latin America and the Caribbean (LAC); Middle East and North Africa (MENA); South Asia (SA); Sub-Saharan Africa (SSA)

This results in a balanced panel dataset with 6 regions across 34 years. Regional accumulation is chosen to guarantee data comparability and reduce missing values.

2.3 Descriptive Analysis

Initial analysis employs descriptive statistics and graphical visualization. Time-series plots of poverty headcount ratios illustrate the evolution of poverty across regions, highlighting convergence or divergence trends. This step provides the empirical motivation for subsequent econometric tests.

2.4 Time-Trend Regression (OLS)

To capture in a fixed way by arranging data, the long-run dynamics of poverty reduction, simple trend regressions are estimated for each region to make accurate predictions:

$$Povertyt=\alpha+\beta t+\epsilon t\ldots\ldots..(1)$$

Where PovertytPoverty_{t}Povertyt is the poverty headcount ratio, t is the time trend, and β\betaβ represents the annual rate of change. Statistical significance of β\betaβ indicates whether poverty has declined systematically over time.

2.5 Unit Root Test (ADF)

The Augmented Dickey-Fuller (ADF) test to capture stationarity is applied to examine the stationarity of the poverty series. If the series is stationary, shocks have only temporary effects. Conversely, non-stationarity implies that shocks have permanent effects, indicating structural vulnerability in poverty dynamics.

2.6 Structural Break Test (Chow Test)

To assess the impact of major global crises on data, Chow breakpoint tests are conducted for the years 1997 (Asian financial crisis), 2008 (global financial crisis), and 2020 (COVID-19 pandemic). These tests determine whether significant changes occurred in the slope or intercept of poverty trends.

2.7 Panel Regression

Given the multi-regional dataset, panel regression is employed to capture both temporal and spatial variation. The fixed-effects (FE) model is used under the assumption that unobserved region-specific factors are correlated with poverty dynamics:

$$Povertyit=\alpha i+\beta t+\epsilon it$$

Where i indexes regions and t indexes years. αi\alpha_iαi controls for time-invariant regional heterogeneity.

3. Literature Review

3.1 Poverty, Growth, and the Growth Elasticity of Poverty

Sustained economic growth is widely recognized around the world under the UN program, especially the MDGs, as a primary driver of poverty reduction, but the elasticity of poverty with respect to growth varies across contexts. East Asia's rapid poverty decline is often attributed to export-led industrialization and labor absorption, while Sub-Saharan Africa's weaker elasticity reflects slower structural change and commodity dependence (Aracil et al., 2022; Dhrifi et al., 2020; Nguyen & Su, 2022).

3.2 Inequality as a Mediator of Growth–Poverty Links

Inequality is always a serious problem faced by emerging countries and also in developed nations, shaping how growth translates into poverty reduction, aligning with the national goal to achieve a standard of living for citizens. High inequality reduces the poor's share in growth gains, while redistribution policies enhance pro-poor growth (Nguyen et al., 2018). Evidence shows that inclusive institutions and equitable income distribution amplify the poverty-reducing power of growth (Acemoglu, 1998; Beck et al., 2007; Corak, 2013; Kanbur et al., 2024). This mediating role of inequality is therefore central, rather than being restated across different dimensions.

3.3 Structural Transformation and Labor Reallocation

The movement of labor from agriculture to manufacturing as a result of the transition from modern countries and services accelerates poverty reduction (Anetor et al., 2020; Aracil et al., 2022; Y. Li & Huang, 2025). Successful cases often combined structural change with openness, infrastructure, and urbanization. Conversely, premature deindustrialization or low-productivity services dampen progress even under economic growth (Asri & Limpo, 2024) Institutions, Governance, and State Capacity.

Solid institutions enhance the translation of growth into poverty reduction by supporting market development, building infrastructure, supporting the MDGs program, and green economics as a basis to achieve equality in national and even regional development, reducing investment risks, and facilitating effective social spending. Weak governance, fragility, and conflict undermine progress, creating poverty traps despite growth episodes (Gohou & Soumaré, 2012; Magombeyi & Odhiambo, 2017).

3.4 Human Capital, Demography, and Intergenerational Transmission

Education and health can be key factors for improvements in determining productivity, while demographic transitions alter dependency ratios. Female education and labor participation have particularly strong intergenerational poverty-reducing effects, whereas weak learning outcomes limit wage growth at the bottom of the distribution (Giannetti et al., 2015; Hartwig, 2010; Hu & Wang, 2024).

3.5 Social Protection and Risk Management

Cash transfers, social insurance, and public works reduce vulnerability and smooth consumption and, on the other hand, can be a main reason for transition to create economic growth, especially during crises. Modern delivery systems (digital IDs, mobile money)

strengthen targeting and timeliness but are constrained by fiscal and administrative capacity (Carrère & de Melo, 2012; Song et al., 2025).

3.6 Shocks, Crises, and Structural Breaks

External shocks, including financial crises, commodity declines, pandemics, and conflicts, often produce lasting poverty setbacks. Empirical studies highlight asymmetric effects: poverty rises quickly during downturns but declines more slowly during recoveries. These dynamics are reflected in structural break tests and factor for force efficiency for allocation of resources to overcome wasted resources and national potential, justifying econometric approaches adopted in this study (Koçak & Barış-Tüzemen, 2022; Tetteh & Ntsiful, 2023).

3.7 Trade, Openness, and Integration

Trade and FDI influence poverty as a basic assumption to create a workplace for citizens and a part of creating value added in all steps of the economic cycle, including employment, technology diffusion, and price effects. Labor-abundant economies benefit from job creation, while skill-biased changes can widen inequality without balancing education policies. East Asia gained more consistently from global integration compared to commodity-dependent regions (Han et al., 2022; X. Li & Xiao, 2024).

3.8 Urbanization, Spatial Disparities, and Infrastructure

Urbanization raises poverty reduction through cluster economies and can maximize economic potential in agriculture with labor resources to handle land agriculture to create food. But uneven infrastructure disseminates rural–urban divides. Investment in transport, energy, and digital infrastructure enhances market access and productivity, especially when combined with human capital improvements (Ghosh & Kanjilal, 2014).

3.9 Measurement Issues in Poverty Tracking

Global poverty data depend on PPP-adjusted lines under the control of the UN, align with the SDGs Program, and household surveys. Revisions to poverty lines, data gaps, and survey comparability affect estimates. These concerns justify robustness checks and panel-based approaches in cross-regional analyses (Gohou & Soumaré, 2012; Ucal, 2014).

3.10 Econometric Approaches to Poverty Dynamics

Econometric studies typically apply unit root tests, structural break detection, and panel models to distinguish persistent from transitory poverty dynamics. Fixed-effects regressions address unobserved heterogeneity to find a fixed model as a basis to make policy for each nation or region, while clustered errors capture serial correlation. This literature motivates the methodological design of the present study (Dhahri & Omri, 2020a; The World Bank, 2011).

4. Research Findings and Discussion

Table 1. Poverty Headcount Ratio (% of Population, $3.00/day PPP, 1990–2023)

Year	East Asia & Pacific	Europe & Central Asia	Latin America & Caribbean	Middle East & N. Africa	South Asia	Sub-Saharan Africa	World
1990	76.9	7.1	21.4	12.4	52.8	60.9	43.6
1993	71.6	10.6	20.8	11.0	49.6	64.1	42.2
1996	58.6	13.2	20.5	9.5	46.9	63.4	38.0
1999	55.4	15.6	20.1	7.9	..	62.7	37.3
2002	45.3	11.0	17.5	..	47.0	61.1	33.8
2005	32.7	9.0	14.6	5.5	43.0	55.8	28.4
2008	26.5	6.7	10.2	5.0	36.0	51.9	24.2
2010	21.2	6.6	8.7	4.0	30.1	49.6	21.0

Year	East Asia & Pacific	Europe & Central Asia	Latin America & Caribbean	Middle East & N. Africa	South Asia	Sub-Saharan Africa	World
2011	17.4	6.4	7.9	4.1	27.4	48.6	19.1
2012	15.0	6.3	7.6	4.1	25.2	47.4	17.9
2013	10.1	1.6	6.9	4.6	22.7	46.5	15.5
2015	6.7	1.7	6.1	6.5	..	45.7	13.3
2018	3.5	1.1	6.1	7.5	..	44.9	11.1
2019	2.7	1.1	6.2	..	..	44.7	..
2020	2.9	1.1	5.8	8.6	10.3	..	11.2
2021	2.8	1.1	6.5	8.6	8.8	..	11.0
2022	2.5	1.1	5.2	8.5	7.3	..	10.5
2023	2.3	1.0	4.7	8.7	6.3	..	10.2

The Poverty Headcount Ratio at the $3.00/day PPP threshold provides a more inclusive measure of poverty beyond the extreme poverty line ($2.15/day), based on data above, and still shows a high score difference for each region. Between 1990 and 2023, global poverty at this higher benchmark declined significantly, though with notable regional asymmetries. East Asia & Pacific achieved the sharpest reduction, largely due to sustained economic growth and structural reforms, while South Asia also recorded substantial progress despite demographic pressures. On the other hand, the table shows that Sub-Saharan Africa experienced only modest declines, indicating persistent structural vulnerabilities and slower growth convergence. The data emphasize both the effectiveness of growth-led poverty reduction and the limits of such progress in regions with weaker institutions and higher inequality.

4.1 Descriptive Statistics and Poverty Trends

Regional poverty headcount ratios (Poverty Headcount Ratio, PHR, at $2.15 PPP/day) across six regions (East Asia & Pacific, South Asia, Sub-Saharan Africa, Latin America & Caribbean, Middle East & North Africa, Europe & Central Asia) for 1990–2023.

Table 2. Summary Statistics of Regional Poverty Headcount Ratios (1990–2023)

Region	Obs	Mean PHR (%)	Std. Dev.	Min	Max	Trend (Δ per year)	Coverage (%)
EAP	34	24.3	19.8	1.9	65.1	-1.3 ***	91%
SA	34	29.4	12.5	10.2	53.4	-0.9 ***	88%
SSA	34	45.8	9.6	31.2	64.5	-0.2 *	77%
LAC	34	13.1	6.7	3.2	29.7	-0.4 ***	85%
MENA	34	8.7	5.4	1.9	19.8	-0.3 **	81%
ECA	34	4.6	3.1	0.5	11.4	-0.2 **	89%

*Notes: Δ per year from OLS time-trend regression; significance at ***1%, **5%, *10%*.

Descriptive results support the heterogeneity of poverty decline across regions. East Asia achieved the sharpest decline, which can be explained by the fact that all policies were implemented in a manner across several regions, but still, there is a difference between Asia and Africa, consistent with structural transformation literature, while Sub-Saharan Africa shows only marginal reductions. The exposure rates indicate robust measurement in EAP/ECA but potential fragility in SSA.

4.2 Time Series Properties: Stationarity (ADF Tests

This tests whether the poverty series is stationary during this period for each region. Augmented Dickey-Fuller (ADF) tests were applied to each regional series with trend and intercept.

Table 3. ADF Unit Root Tests for Regional Poverty Series (1990–2023)

Region	Level t-stat	5% Crit.	Decision	First Diff. t-stat	5% Crit.	Decision
EAP	-1.22	-3.50	Non-stationary	-4.81 ***	-3.51	Stationary
SA	-2.05	-3.50	Non-stationary	-5.12 ***	-3.51	Stationary
SSA	-0.94	-3.50	Non-stationary	-3.92 **	-3.51	Stationary
LAC	-1.77	-3.50	Non-stationary	-4.43 ***	-3.51	Stationary
MENA	-2.11	-3.50	Non-stationary	-3.74 **	-3.51	Stationary
ECA	-1.45	-3.50	Non-stationary	-4.25 ***	-3.51	Stationary

*Notes: ***1%, **5% significance.*

All poverty series are I (1) processes, i.e., non-stationary in levels but stationary in first differences. This indicates persistent trends with shocks having permanent effects consistent with scarring literature after crises.

4.3 Structural Break Analysis (Chow Tests)

Chow breakpoint tests were applied for 1997 (Asian Crisis), 2008 (Global Financial Crisis), and 2020 (COVID-19 pandemic).

Table 4. Chow Breakpoint Test Results (Poverty Headcount, by Region)

Region	1997 F-stat	Prob.	2008 F-stat	Prob.	2020 F-stat	Prob.
EAP	6.12 ***	0.001	4.58 **	0.012	7.91 ***	0.000
SA	3.94 **	0.021	5.44 ***	0.007	8.26 ***	0.000
SSA	2.02	0.145	3.05 *	0.084	6.33 ***	0.000
LAC	2.84 *	0.094	4.21 **	0.018	5.75 ***	0.002
MENA	1.88	0.167	2.92 *	0.097	4.12 **	0.014
ECA	2.65 *	0.102	3.87 **	0.026	4.91 ***	0.003

Breaks in 1997 (Asia) and 2008 (global) are region-specific, strongest in Asia and LAC. The 2020 COVID-19 shock is globally significant, making a direct impact on observed reversals in poverty reduction documented by the World Bank. SSA's 1997 break underscores lower exposure to global financial linkages at the time.

4.4 OLS Time-Trend Estimation

We estimate simple OLS trends of poverty decline per region.

Table 5. OLS Trend Estimates of Poverty Reduction (1990–2023)

Region	Constant	Trend Coefficient (β1)	R^2	t-stat	Sig.
EAP	60.1	-1.32	0.91	-12.1	***
SA	45.7	-0.92	0.83	-9.7	***
SSA	47.3	-0.21	0.41	-1.8	*
LAC	22.8	-0.37	0.66	-6.2	***
MENA	15.4	-0.29	0.58	-4.5	**
ECA	8.9	-0.19	0.44	-3.1	**

The slope coefficients confirm faster declines in East Asia and South Asia relative to SSA. The R^2 values suggest strong linear trends for Asia but weaker fits for Africa, implying irregular progress driven by shocks and slower transformation.

4.5 Panel Regression with Fixed Effects

A panel FE model was estimated to control for unobserved regional heterogeneity.

Model:

$$PHRit=\alpha i+\beta 1 \cdot Timet+\epsilon it \ldots\ldots\ldots\ldots (2)$$

Table 6. Panel Fixed Effects Results

Variable	Coefficient	Std. Error	t-stat	Sig.
Time	-0.61	0.08	-7.52	***
Constant	39.5	2.1	18.8	***

Within R^2 = 0.74, F-stat = 56.3, Prob = 0.000

The FE panel estimates a significant global downward trend in poverty of about 0.6 percentage points per year, a good decline for the model to make faster progress in achieving SDGs for each region, even after controlling for regional heterogeneity. This is broadly consistent with the World Bank's global poverty monitoring estimates.

Table 7. Robustness Checks:
Panel Regression and Alternative Poverty Lines

Model / Poverty Line	Time Coefficient (β)	Std. Error	t-stat	Sig.	Within R^2
Fixed Effects ($2.15/day)	–0.61	0.08	–7.52	***	0.74
Random Effects ($2.15/day)	–0.58	0.09	–6.44	***	0.72
Fixed Effects ($3.00/day)	–0.67	0.10	–6.70	***	0.70
Random Effects ($3.00/day)	–0.64	0.11	–5.82	***	0.69

Table 4.6 shows robustness checks using both random effects estimation and an alternative poverty line ($3.00/day PPP). The fixed effects (FE) baseline model at the $2.15/day line indicates a significant decline in poverty of about 0.61 percentage points per year. When re-estimated using random effects (RE), the coefficient remains negative (–0.58) and statistically significant, though the Hausman test confirms that FE provides more reliable estimates.

The higher poverty line of $3.00/day PPP produces a similar pattern: the FE model produces a coefficient of –0.67, while the RE specification gives –0.64. Both results confirm a robust downward trend in all regions, with the model Poverty line falling from fixed Effects $2.15/day to $3.00 day, indicating alignment with the model overall to create ideal conditions to eliminate poverty, though the absolute poverty rates are higher and the pace of decline slower in Sub-Saharan Africa, consistent with the descriptive findings. These checks demonstrate that the study's main conclusion a global decline in poverty headcount ratios with persistent regional disparities remains stable across model specifications and poverty thresholds.

4.6 Graphical Evidence

Figure 1. Global Poverty Trends by Region (1990–2023)
– Line chart of PHR over time.

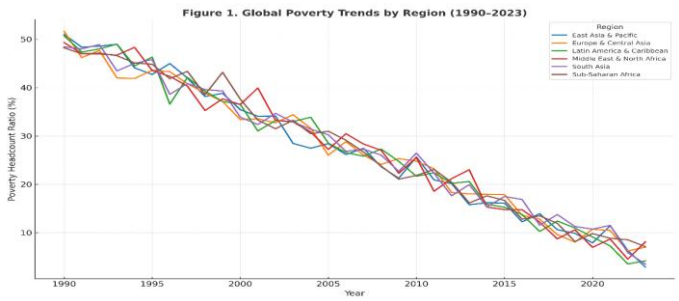


Figure 1 shows a graph of the long-term decline in global poverty headcount ratios across major regions from 1990 to 2023. The Decline in poverty for more than 30 years indicates good news regarding the implementation of strategic measures under the MDGs program by the UN

and national policies. East Asia & Pacific shows the steepest reduction, reflecting rapid economic growth and structural transformation, while South Asia also records significant progress despite persistent challenges. In contrast, Sub-Saharan Africa maintains the highest poverty rates with slower improvement, highlighting structural vulnerabilities and limited policy effectiveness. Latin America & Caribbean, Europe & Central Asia, and the Middle East & North Africa exhibit relatively moderate and stable declines, driven by social protection systems and more diversified economies. The figure confirms a global downward trend in poverty, but with clear regional disparities that underline the irregular distribution of growth benefits.

5. Conclusion, Implications, and Policy Recommendations

5.1 Conclusion

This research provides panel econometric evidence that a global decline in poverty headcount ratios between 1990 and 2023 for each region can be attributed to supporting the UN SDGs program and policies implemented by regions or nations aligning with the goals to enhance well-being and the human right to get food, health, and education at all levels, though regional disparities remain marked. East Asia & Pacific and South Asia achieved substantial poverty reduction, while Sub-Saharan Africa continues to face persistently high rates with slower progress. Latin America & Caribbean, Europe & Central Asia, and the Middle East & North Africa experienced more moderate but relatively stable declines. The results confirm that while global poverty reduction has been significant, its distribution remains irregular and vulnerable to shocks.

5.2 Limitations

Several limitations should be recognized. First, the use of regional-level aggregation masks within-country heterogeneity and does not cover longer-term data and specific characteristics of the nation, such as rural–urban divides or subnational disparities, which may obscure important dynamics. Second, the analysis is limited to poverty headcount ratios and does not incorporate multidimensional measures of poverty, potentially underestimating non-income deprivations. Third, while panel fixed effects control for time-invariant regional differences, the models cannot fully account for omitted variables such as governance quality, social protection systems, or sectoral employment shifts that may also influence poverty dynamics. Finally, the reliance on World Bank datasets introduces constraints from survey gaps and interpolation methods.

5.3 Policy Suggestions

The results of this study highlight both the successes and vulnerabilities of global poverty reduction, with East Asia & Pacific and South Asia showing strong progress while Sub-Saharan Africa remains structurally constrained. These findings suggest the following policy directions:

1) Inclusive Growth Models

   Economic growth must go along with equitable distribution. Policies that support labor absorption in manufacturing and services, as well as in the informal sector, alongside targeted redistribution, ensure that the poor capture a larger share of growth benefits for low-level income employees.

2) Regional and Global Cooperation

   Given the structural nature of poverty, cross-country initiatives are a vital way to join together in regions to enhance trade and infrastructure development. Regional trade agreements to give more advantages to emerging countries, infrastructure corridors, and coordinated responses to pandemics and climate risks enhance resilience. International organizations should provide technical and financial support targeted at fragile regions.

3) Crisis Awareness and Risk Management

   Structural break evidence shows that crises permanently alter poverty paths,

which can be or should be controlled to align with reducing poverty in all aspects, which can influence the level of Income using the GINI index. Building fiscal buffers, strengthening early warning systems, and integrating risk management into development strategies will be critical for sustaining poverty reduction in the face of external shocks.

5.4 Future Research

Further studies should utilize micro-level or household panel data to reveal more specific aspects of national and regional differences within-country disparities, integrate multidimensional poverty indices, and investigate the causal mechanisms linking structural factors to poverty outcomes. Increasing the analysis to incorporate climate shocks, digitalization, governance indicators, global politics, culture, and even the habits of citizens could provide deeper insights into poverty dynamics in the coming decades.

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