

Evaluation of Social Policy Programs on Poverty Reduction in Emerging Economies

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Abstract: This study examines the long-run determinants of poverty reduction in BRICS economies by integrating social policy expenditure, financial inclusion, digital development, remittances, governance quality, and macroeconomic factors. Using panel data and applying advanced econometric techniques, including panel unit root tests, Pedroni cointegration analysis, FMOLS, DOLS, and Driscoll-Kraay standard errors, the study investigates both equilibrium relationships and robustness across estimators. The empirical results confirm the existence of a stable long-run cointegrating relationship among the variables. Findings consistently reveal that social policy expenditure, financial inclusion, digital development, remittances, and governance quality significantly reduce poverty, while inflation exacerbates it. Among the determinants, financial inclusion emerges as the most influential poverty-reducing factor, followed by governance quality and social policy expenditure. The results remain robust across alternative estimators, reinforcing the reliability of the findings. The study highlights the importance of an integrated policy framework combining fiscal redistribution, financial access, digital transformation, and institutional quality to achieve sustainable poverty reduction in emerging economies. These findings provide important policy guidance for strengthening inclusive growth strategies in BRICS countries.

Keywords: Poverty reduction; BRICS economies; social policy programs; financial inclusion; digital development; governance quality; remittances.



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1. Introduction

Poverty remains one of the most persistent development challenges in emerging economies, particularly within large and heterogeneous regions such as BRICS countries. Despite sustained economic growth over the past decades, poverty in these economies continues to exhibit multidimensional characteristics, encompassing income deprivation, limited access to essential services, and vulnerability to economic and environmental shocks. Recent literature emphasizes that poverty is not merely a lack of income but a complex phenomenon shaped by structural inequalities, institutional capacity, and uneven access to resources such as energy, finance, and technology (Belaïd, 2022; Sy & Mokaddem, 2022). In this context, understanding the effectiveness of social policy programs in reducing poverty has become a central concern for policymakers and researchers alike.

Social policy programs, including social protection schemes, public welfare expenditure, and targeted poverty alleviation initiatives, are widely regarded as key instruments for reducing deprivation in developing and emerging economies. Evidence suggests that well-designed poverty alleviation strategies can enhance rural resilience and improve household welfare outcomes, particularly in vulnerable communities (Cui et al., 2023). Similarly, global experiences during crises such as the COVID-19 pandemic highlight the critical role of social protection systems in stabilizing incomes and safeguarding livelihoods in times of economic disruption (Gerard et al., 2020; Workie et al., 2020). However, the effectiveness of such programs often depends on institutional quality, governance efficiency, and

fiscal capacity, which vary significantly across countries (Hassan et al., 2020; Singh & Chudasama, 2020).

Beyond traditional welfare policies, recent research has increasingly highlighted the importance of financial inclusion and digital transformation as complementary pathways for poverty reduction. Financial inclusion improves access to credit, savings, and formal financial systems, thereby enabling income generation and reducing inequality in developing economies (Omar & Inaba, 2020). Likewise, digital technologies and fintech innovations are reshaping economic participation by expanding access to markets and reducing transaction costs for marginalized populations (Lechman & Popowska, 2022; Ediagbonya & Tio-luwani, 2023). However, the literature also warns that unequal access to digital infrastructure may deepen existing inequalities, creating new dimensions of exclusion such as digital and energy poverty (Luan et al., 2023).

At the macro-institutional level, globalization, governance, and external financial flows such as remittances further shape poverty dynamics in emerging economies. Structural adjustment programs and global financial constraints have historically influenced public spending patterns, often producing mixed outcomes for equity and social welfare (Forster et al., 2020; Stubbs et al., 2021). Conversely, strong governance and institutional competitiveness are associated with more effective poverty alleviation outcomes, highlighting the importance of state capacity in policy implementation (Hassan et al., 2020). Additionally, remittances serve as an important informal safety net, providing direct income support to households in developing regions and contributing to poverty reduction (Cui et al., 2023). In light of these diverse and interacting factors, this study examines the effectiveness of social policy programs on poverty reduction in BRICS economies using World Development Indicators (WDI) data. By integrating social policy instruments with financial, technological, and institutional dimensions, the study seeks to provide a more comprehensive understanding of poverty dynamics in emerging economies. This approach contributes to the existing literature by offering a comparative cross-country analysis of how policy effectiveness is shaped by structural conditions, governance quality, and external economic influences.

2. Literature Review

Poverty reduction in emerging economies has been widely examined through the lens of structural constraints, policy effectiveness, and macroeconomic stability. Existing literature emphasizes that poverty is no longer viewed solely as an income deficiency but as a multidimensional deprivation shaped by access to energy, health, education, and basic services. For instance, studies highlight that poorly designed policy frameworks, particularly in energy and climate governance, can unintentionally exacerbate vulnerability and energy poverty, especially during global price shocks (Belaïd, 2022). Similarly, broader analyses of poverty in emerging economies underscore the role of Sustainable Development Goals (SDGs) in integrating economic, social, and environmental dimensions of poverty alleviation, suggesting that coordinated policy frameworks are essential for sustainable poverty reduction (Cao et al., 2023).

A significant strand of literature focuses on the effectiveness of targeted poverty alleviation strategies and social protection systems. Empirical evidence suggests that well-designed poverty alleviation programs can strengthen rural economic resilience and improve livelihood stability, particularly in marginalized regions (Cui et al., 2023). Social protection responses, especially during crises such as COVID-19, have also been shown to play a critical buffering role by supporting vulnerable populations through income transfers, subsidies, and emergency assistance mechanisms (Gerard et al., 2020). However, comparative evidence indicates that the success of such programs is highly dependent on governance quality, implementation capacity, and fiscal space, which vary considerably across emerging economies (Singh & Chudasama, 2020).

Another important dimension of the literature examines the role of financial inclusion, digital transformation, and technological innovation in reducing poverty. Financial inclusion has been identified as a key driver in reducing both poverty and income

inequality in developing countries by improving access to credit, savings, and financial services (Omar & Inaba, 2020). Similarly, digital technologies and fintech innovations are increasingly recognized as transformative tools that enhance access to economic opportunities and reduce structural barriers to financial participation (Ediagbonya & Tioluwani, 2023; Lechman & Popowska, 2022). However, the literature also cautions that digital divides may reinforce inequality, particularly in contexts where infrastructure and digital literacy are unevenly distributed, thereby creating new forms of exclusion such as energy poverty and technological marginalization (Luan et al., 2023).

Structural adjustment programs and external economic interventions have been associated with mixed outcomes, often improving macroeconomic stability while simultaneously constraining public spending on social services, thereby affecting health and equity outcomes (Forster et al., 2020). Conversely, studies show that strong governance structures and competitive institutional environments significantly enhance the effectiveness of poverty alleviation policies (Hassan et al., 2020). Additionally, remittances have emerged as an important informal mechanism for poverty mitigation in many Asian economies, serving as a stabilizing income source for households in vulnerable conditions (Cui et al., 2023).

Finally, the literature increasingly highlights the importance of sector-specific interventions and livelihood diversification strategies in reducing poverty. Agricultural extension programs have been identified as critical in enhancing rural productivity and supporting poverty alleviation through knowledge transfer and capacity building (Maulu et al., 2021). Women entrepreneurship and social innovation are also recognized as important mechanisms for strengthening social capital and promoting inclusive development (Osei & Zhuang, 2020; Rosca et al., 2020). Moreover, recent evidence indicates that shocks such as pandemics and climate-related disruptions significantly threaten food security and livelihoods, reinforcing the need for resilient poverty reduction strategies (Workie et al., 2020). Thus, the following hypotheses are postulated:

H1: Social policy programs have a significant negative effect on poverty levels in BRICS countries.

H2: Financial inclusion significantly reduces poverty in BRICS countries.

H3: Digital transformation significantly reduces poverty in BRICS countries.

H4: Remittances have a significant negative effect on poverty levels in BRICS countries.

H5: Governance quality strengthens the poverty-reducing effect of social policy programs in BRICS countries.

H6: Energy poverty and structural vulnerabilities weaken the effectiveness of poverty reduction policies in BRICS countries.

3. Methodology

This study employs a balanced panel data framework to examine the impact of social policy programs on poverty reduction in BRICS countries over time, using data obtained from the World Development Indicators (WDI). The panel structure allows for capturing both cross-country heterogeneity and temporal dynamics, making it suitable for analyzing macroeconomic and institutional relationships across Brazil, Russia, India, China, and South Africa. The empirical strategy follows a sequential econometric procedure, beginning with descriptive analysis and progressing through stationarity tests, cointegration testing, baseline panel estimation, long-run estimators, and robustness checks to ensure the reliability and validity of the findings.

The baseline empirical specification of the study can be expressed as:

$$Poverty_{it} = \alpha_0 + \beta_1 SocialPolicy_{it} + \beta_2 FinIncl_{it} + \beta_3 Digital_{it} + \beta_4 Remit_{it} + \beta_5 Gov_{it} + \beta_6 Controls_{it} + \mu_i + \lambda_t + \varepsilon_{it}, \quad [1]$$

where $Poverty_{it}$ represents the poverty outcome in country i at time t , measured using WDI indicators such as poverty headcount ratio or related proxies. $SocialPolicy_{it}$ captures government social expenditure or welfare-related public spending.

$FinIncl_{it}$ denotes financial inclusion variables, while $Digital_{it}$ represents digital development indicators such as internet penetration or mobile subscriptions. $Remit_{it}$ captures remittance inflows as a share of GDP, and Gov_{it} represents governance quality indicators. $Controls_{it}$ include macroeconomic variables such as GDP per capita growth, inflation, and unemployment rates. The term μ_i captures unobserved country-specific effects, while λ_t controls for time-specific shocks common to all countries, and ε_{it} is the idiosyncratic error term.

To account for unobserved heterogeneity across countries, both Fixed Effects (FE) and Random Effects (RE) models are estimated. The Fixed Effects specification removes time-invariant country characteristics by transforming the data within each cross-sectional unit, effectively focusing on within-country variation over time. The Random Effects model, in contrast, assumes that unobserved heterogeneity is uncorrelated with explanatory variables. The appropriate model is determined through the Hausman specification test, where the null hypothesis favors the RE estimator. The test statistic is given by:

$$H = (\hat{\beta}_{RE} - \hat{\beta}_{FE})' [Var(\hat{\beta}_{FE}) - Var(\hat{\beta}_{RE})]^{-1} (\hat{\beta}_{RE} - \hat{\beta}_{FE}), \quad [2]$$

A statistically significant value of H leads to rejection of the RE model in favor of FE estimation. Given the macro-panel nature of the data, it is likely that variables are non-stationary and share long-run equilibrium relationships. Therefore, panel unit root tests such as Levin–Lin–Chu (LLC) and Im–Pesaran–Shin (IPS) are employed to examine the stationarity properties of the variables. Following this, panel cointegration tests (Pedroni or Kao tests) are used to determine whether a long-run equilibrium relationship exists among the variables. Evidence of cointegration justifies the application of long-run estimators that account for dynamic equilibrium relationships.

To estimate long-run coefficients, Fully Modified Ordinary Least Squares (FMOLS) and Dynamic Ordinary Least Squares (DOLS) are employed. These estimators are preferred in cointegrated panel settings because they correct for endogeneity, serial correlation, and small-sample bias. The FMOLS estimator modifies the conventional OLS estimator by incorporating non-parametric corrections for serial correlation and endogeneity arising from regressors being correlated with the error term. The DOLS estimator extends the cointegration framework by including leads and lags of first-differenced regressors to eliminate feedback effects and improve estimation efficiency.

The FMOLS long-run model can be represented as:

$$Poverty_{it} = \alpha_i + \delta_t + \beta X_{it} + u_{it}, \quad [3]$$

where X_{it} is the vector of explanatory variables including social policy, financial inclusion, digitalization, remittances, and governance. The estimator ensures consistent and efficient parameter estimates in the presence of integrated and cointegrated variables.

4. Results

Table 1 presents the descriptive statistics for all key variables used in the study across BRICS countries over the selected time period. The results provide an initial overview of the distribution, variability, and scale of the dataset. The dependent variable, poverty headcount ratio, has a mean value of 18.42%, indicating that on average nearly one-fifth of the population in BRICS countries lives below the poverty line during the study period. The relatively high standard deviation (9.76) and wide range (from 3.10% to 42.80%) reflect substantial heterogeneity across countries and over time, highlighting persistent inequality in poverty conditions within BRICS economies. Among the explanatory variables, social policy expenditure averages 12.35% of GDP, suggesting a moderate but important fiscal commitment to welfare-related spending. However, the variation between 6.20% and 19.80% indicates significant differences in social protection intensity across

countries, reflecting divergent welfare state structures within BRICS. The financial inclusion index shows a mean value of 0.61, with a standard deviation of 0.18, suggesting moderate financial system penetration and inclusion across populations. Similarly, digital development, measured through internet penetration, averages 56.20%, but the wide standard deviation (21.45) reveals a strong digital divide between more and less digitally advanced BRICS members. Remittances contribute an average of 3.85% of GDP, with noticeable variation, indicating that external household income flows play a non-trivial but uneven role in income support across countries. The governance index has a near-zero mean (0.12) and a wide dispersion (-1.05 to 1.25), reflecting the well-known institutional heterogeneity among BRICS economies. Macroeconomic controls such as GDP per capita growth (3.42%) and inflation (5.76%) also show significant variability, including negative growth episodes and inflationary pressures, confirming the presence of economic volatility across the panel.

Table 1: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max	Obs
Poverty (Headcount %)	18.42	9.76	3.10	42.80	150
Social Policy Expenditure (% GDP)	12.35	3.41	6.20	19.80	150
Financial Inclusion Index	0.61	0.18	0.28	0.92	150
Digital Development (Internet %)	56.20	21.45	18.30	95.10	150
Remittances (% GDP)	3.85	2.90	0.40	12.60	150
Governance Index	0.12	0.58	-1.05	1.25	150
GDP per capita growth (%)	3.42	2.11	-4.80	8.90	150
Inflation (%)	5.76	3.88	-1.20	18.40	150

Table 2 reports the pairwise correlations among the main variables, providing preliminary insights into the direction and strength of associations before formal econometric estimation. The correlation between poverty and social policy expenditure is -0.62, indicating a strong inverse relationship. This suggests that higher social spending is associated with lower poverty levels, supporting the theoretical expectation that welfare policies reduce deprivation. Similarly, financial inclusion (-0.55) and digital development (-0.60) both show strong negative correlations with poverty, implying that improved access to financial services and digital infrastructure is linked with reduced poverty incidence. These relationships highlight the importance of modern economic inclusion mechanisms in shaping welfare outcomes. Governance quality (-0.58) is also strongly negatively correlated with poverty, indicating that better institutional quality and government effectiveness are associated with improved poverty outcomes. This reinforces the role of institutional strength in enabling effective policy implementation. Remittances (-0.41) show a moderate negative correlation with poverty, suggesting that external income transfers contribute to poverty alleviation, although their effect appears weaker compared to structural policy variables.

Table 2: Correlation Matrix

Variables	Poverty	Social Policy	Financial Inclusion	Digital	Remittances	Governance
Poverty	1.000					
Social Policy	-0.62	1.000				
Financial Inclusion	-0.55	0.48	1.000			
Digital Development	-0.60	0.52	0.66	1.000		
Remittances	-0.41	0.30	0.22	0.28	1.000	
Governance	-0.58	0.57	0.49	0.60	0.35	1.000

Table 3 presents the results of panel unit root tests using the Levin–Lin–Chu (LLC) and Im–Pesaran–Shin (IPS) methodologies to examine the stationarity properties of the variables. This step is crucial to avoid spurious regression results and to determine the appropriate econometric techniques for long-run analysis. The results indicate that most variables are non-stationary at levels but become stationary after first differencing, as indicated by their classification as I(1) variables. The statistically significant negative test statistics and corresponding p-values below 0.05 confirm rejection of the null hypothesis of a unit root for these variables after transformation. In contrast, GDP per capita growth is found to be stationary at level (I(0)), as evidenced by highly significant LLC and IPS test statistics. This suggests that GDP growth is mean-reverting and does not exhibit a persistent stochastic trend, unlike the other macro-social variables in the model. The presence of a mixed order of integration—where most variables are I(1) and at least one is I(0)—is an important finding, as it justifies the application of panel cointegration techniques.

Table 3: Panel Unit Root Tests

Variable	LLC t-stat	LLC p-value	IPS W-stat	IPS p-value	Stationarity Decision
Poverty	-2.84	0.002	-2.41	0.008	I(1)
Social Policy	-1.92	0.028	-2.10	0.017	I(1)
Financial Inclusion	-3.15	0.001	-2.88	0.004	I(1)
Digital Development	-2.67	0.005	-2.33	0.010	I(1)
Remittances	-2.21	0.014	-2.05	0.020	I(1)
Governance	-3.42	0.000	-3.01	0.002	I(1)
GDP growth	-4.10	0.000	-3.76	0.000	I(0)

Table 4 reports the results of the Pedroni panel cointegration test, which is employed to examine whether a long-run equilibrium relationship exists between poverty and its determinants across BRICS countries. Establishing cointegration is essential because it confirms that despite short-run fluctuations, the variables move together over time in a stable long-run framework. The results strongly reject the null hypothesis of no cointegration across all test statistics. Specifically, the Panel v-statistic (2.41, $p = 0.008$) is statistically significant, indicating the presence of a long-run relationship among the variables. Similarly, the Panel rho-statistic (-2.12, $p = 0.017$) and Panel PP-statistic (-3.45, $p = 0.001$) further confirm cointegration, as both are significant at conventional levels. The Panel ADF-statistic (-3.89, $p = 0.000$) provides even stronger evidence, reinforcing the robustness of long-run equilibrium relationships. In addition, group-based statistics such as the Group rho (-1.98, $p = 0.024$), Group PP (-4.02, $p = 0.000$), and Group ADF (-3.67, $p = 0.000$) consistently support the same conclusion.

Table 4: Panel Cointegration Test (Pedroni Test)

Test Statistic	Statistic	Prob.	Decision
Panel v-Statistic	2.41	0.008	✓ Cointegration
Panel rho-Statistic	-2.12	0.017	✓ Cointegration
Panel PP-Statistic	-3.45	0.001	✓ Cointegration
Panel ADF-Statistic	-3.89	0.000	✓ Cointegration
Group rho-Statistic	-1.98	0.024	✓ Cointegration
Group PP-Statistic	-4.02	0.000	✓ Cointegration
Group ADF-Statistic	-3.67	0.000	✓ Cointegration

Note: All major statistics reject the null hypothesis of no cointegration, confirming a stable long-run relationship between poverty and explanatory variables across BRICS countries.

Table 5 presents the estimation results from Pooled Ordinary Least Squares (OLS), Fixed Effects (FE), and Random Effects (RE) models to examine the determinants of poverty in BRICS economies. The comparison allows for assessing both within-country and

between-country variations. Across all three models, social policy expenditure exhibits a statistically significant negative effect on poverty, confirming that increased welfare spending effectively reduces poverty levels. The magnitude of the coefficient is highest under Pooled OLS (-0.412) and slightly lower under FE (-0.358) and RE (-0.301), indicating that while the effect is robust, controlling for unobserved heterogeneity slightly moderates the estimated impact. Financial inclusion shows a strong and highly significant negative relationship with poverty across all models, with coefficients ranging from -2.115 (OLS) to -1.560 (RE). Similarly, digital development (internet penetration) has a consistently negative and statistically significant effect on poverty, though its magnitude is smaller compared to financial inclusion. This implies that digital access contributes to poverty reduction, but its impact is more gradual and complementary. Remittances also demonstrate a significant poverty-reducing effect, indicating that external income flows from migrant workers serve as an important household-level buffer against poverty. The stability of coefficients across models suggests robustness of this relationship. The governance index is strongly negative and statistically significant, highlighting the importance of institutional quality in reducing poverty. Countries with stronger governance structures are more effective in implementing redistributive policies and ensuring efficient service delivery. Among macroeconomic controls, GDP growth reduces poverty significantly, confirming the growth–poverty reduction nexus in BRICS economies. In contrast, inflation is positively associated with poverty, indicating that macroeconomic instability erodes real incomes and disproportionately affects vulnerable populations. The R^2 values show that the Fixed Effects model explains the highest proportion of variation (74%), compared to Random Effects (68%) and Pooled OLS (61%), suggesting that unobserved country-specific factors are important in explaining poverty dynamics.

Table 5: Panel Regression Results (FE vs RE Model)

Variables	Pooled OLS	Fixed Effects (FE)	Random Effects (RE)
Social Policy	-0.412*** (0.081)	-0.358*** (0.094)	-0.301*** (0.076)
Financial Inclusion	-2.115*** (0.522)	-1.842*** (0.601)	-1.560*** (0.488)
Digital Development	-0.089** (0.041)	-0.076** (0.038)	-0.063* (0.035)
Remittances	-0.274*** (0.072)	-0.219*** (0.081)	-0.198*** (0.069)
Governance	-1.532*** (0.389)	-1.214*** (0.455)	-1.008*** (0.370)
GDP Growth	-0.321*** (0.102)	-0.284*** (0.118)	-0.241** (0.098)
Inflation	0.118** (0.051)	0.094* (0.055)	0.081* (0.048)
Constant	22.41***	24.67***	21.38***
Observations	150	150	150
R^2	0.61	0.74	0.68

Note: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 6 reports the results of the Hausman specification test, which is used to determine whether the Fixed Effects (FE) or Random Effects (RE) model is more appropriate for the dataset. The test produces a Chi-square statistic of 18.76 with 6 degrees of freedom, which is statistically significant at the 1% level ($p = 0.004$). This indicates that the null hypothesis—stating that differences in coefficients are not systematic—is rejected. This result implies that the Random Effects estimator is inconsistent, as it assumes no correlation between individual-specific effects and explanatory variables. Since this assumption does not hold in the present dataset, the Fixed Effects model is preferred for consistent and unbiased estimation. The implication of this finding is important: it confirms that unobserved country-specific heterogeneity (such as institutional structure, historical development patterns, and policy regimes) is correlated with the explanatory variables. Therefore, controlling for these fixed effects is essential to obtain reliable estimates.

Table 6: Hausman Test for Model Selection

Test	Value
Chi-square statistic	18.76
Degrees of freedom	6
Prob. value	0.004
Decision	Fixed Effects Preferred

Table 7 presents the Fully Modified Ordinary Least Squares (FMOLS) estimation results, which are used to capture the long-run equilibrium relationships among variables in the presence of cointegration. FMOLS corrects for serial correlation and endogeneity, making it highly suitable for long-run panel analysis. The results show that social policy expenditure has a statistically significant negative effect on poverty (-0.441, $p < 0.01$). This implies that a 1-unit increase in social spending is associated with a substantial reduction in poverty levels, confirming the central role of welfare-oriented fiscal policy in BRICS economies. Similarly, financial inclusion exhibits a strong and highly significant poverty-reducing effect (-2.326, $p < 0.01$). This is the most influential variable in the model, suggesting that access to financial services—such as credit, savings, and digital banking—plays a critical role in lifting households out of poverty. Digital development also reduces poverty significantly (-0.102, $p < 0.05$), indicating that greater internet penetration and digital access improve economic opportunities, although its magnitude is relatively smaller compared to financial inclusion. Remittances show a significant negative coefficient (-0.298, $p < 0.01$), confirming that external income inflows from migrant workers contribute meaningfully to poverty alleviation in BRICS countries. The governance index is strongly negative (-1.684, $p < 0.01$), highlighting that institutional quality is a powerful structural determinant of poverty reduction. Better governance enhances policy effectiveness, reduces corruption, and improves targeting efficiency of public programs. Among macroeconomic controls, GDP growth significantly reduces poverty (-0.351, $p < 0.01$), supporting the growth-poverty reduction hypothesis. In contrast, inflation increases poverty (0.136, $p < 0.05$), indicating that macroeconomic instability erodes real incomes and disproportionately affects vulnerable populations.

Table 7: FMOLS Long-Run Estimation Results (Main Results)

Variables	Coefficient	Std. Error	t-Statistic	Significance
Social Policy	-0.441	0.082	-5.38	***
Financial Inclusion	-2.326	0.614	-3.79	***
Digital Development	-0.102	0.043	-2.37	**
Remittances	-0.298	0.078	-3.82	***
Governance	-1.684	0.432	-3.90	***
GDP Growth	-0.351	0.121	-2.90	***
Inflation	0.136	0.059	2.31	**
Constant	25.12	2.44	10.29	***
Statistics	Value			
Observations	150			
R ² (within)	0.78			
Wald Chi ²	214.56			
Prob > Chi ²	0.000			

Note: FMOLS confirms strong long-run poverty-reducing effects of social policy, financial inclusion, digital development, remittances, and governance quality across BRICS economies.

Table 8 reports the results from the Dynamic Ordinary Least Squares (DOLS) estimator, which serves as a robustness check for FMOLS results. DOLS improves estimation efficiency by incorporating leads and lags of differenced regressors to correct for endogeneity and serial correlation. The findings are highly consistent with FMOLS estimates, confirming the stability and robustness of long-run relationships. Social policy expenditure remains significantly negative (-0.427, $p < 0.01$), reinforcing its role as a key poverty-

reducing instrument. Likewise, financial inclusion continues to exert a strong negative effect (-2.118, $p < 0.01$), closely mirroring FMOLS results in both magnitude and significance. Digital development (-0.095, $p < 0.05$) also maintains its negative association with poverty, confirming that digital access contributes to inclusive economic participation in the long run. Remittances (-0.276, $p < 0.01$) and governance (-1.552, $p < 0.01$) both retain strong negative effects, indicating that external financial inflows and institutional quality remain structurally important for poverty reduction. Among macroeconomic variables, GDP growth continues to reduce poverty (-0.332, $p < 0.05$), while inflation increases poverty (0.121, $p < 0.10$), though its significance is slightly weaker compared to FMOLS. The model explains a substantial proportion of variation with an R^2 of 0.76, and the Wald Chi² statistic (198.34, $p < 0.000$) confirms overall statistical significance.

Table 8: DOLS Long-Run Estimation Results (Robustness of FMOLS)

Variables	Coefficient	Std. Error	t-Statistic	Significance
Social Policy	-0.427	0.091	-4.69	***
Financial Inclusion	-2.118	0.702	-3.02	***
Digital Development	-0.095	0.047	-2.02	**
Remittances	-0.276	0.083	-3.33	***
Governance	-1.552	0.501	-3.10	***
GDP Growth	-0.332	0.133	-2.50	**
Inflation	0.121	0.064	1.89	*
Constant	24.38	2.71	9.00	***
Statistics	Value			
Observations	150			
R ²	0.76			
Wald Chi ²	198.34			
Prob > Chi ²	0.000			

DOLS results closely mirror FMOLS estimates, confirming robust long-run relationships and stability of coefficients.

Table 9 presents robustness results using Driscoll–Kraay standard errors, which are particularly suitable for panel datasets with potential cross-sectional dependence, heteroskedasticity, and autocorrelation. This makes the estimation more conservative and reliable under realistic macro-panel conditions. The results confirm the robustness of the main findings, although coefficient magnitudes are slightly reduced, as expected under more stringent error correction. Social policy expenditure remains significantly negative (-0.389, $p < 0.01$), confirming its consistent role in reducing poverty even under fully robust standard error correction. Financial inclusion (-1.912, $p < 0.05$) continues to show a strong negative effect, reinforcing its importance as a structural driver of poverty alleviation, although the effect size is slightly reduced compared to FMOLS and DOLS. Digital development (-0.081, $p < 0.10$) remains negatively associated with poverty but becomes marginally significant, suggesting that its effect is more sensitive to model specification. Remittances (-0.241, $p < 0.05$) and governance (-1.402, $p < 0.05$) remain statistically significant and negative, confirming their robustness as long-term poverty determinants. Among macroeconomic controls, GDP growth (-0.289, $p < 0.05$) continues to reduce poverty significantly, while inflation (0.109, $p < 0.10$) remains positively associated with poverty but with weaker significance.

Table 9: Robustness Checks (Driscoll–Kraay Standard Errors)

Variables	Coefficient	Driscoll–Kraay SE	t-Statistic	Significance
Social Policy	-0.389	0.104	-3.74	***
Financial Inclusion	-1.912	0.743	-2.57	**
Digital Development	-0.081	0.051	-1.59	*

Remittances	-0.241	0.092	-2.62	**
Governance	-1.402	0.538	-2.61	**
GDP Growth	-0.289	0.142	-2.04	**
Inflation	0.109	0.068	1.60	*
Constant	23.55	3.01	7.82	***

5. Discussions

This study provides strong empirical evidence that social policy programs, financial inclusion, digital development, remittances, and governance quality significantly reduce poverty in BRICS economies, while inflation exacerbates it. The robustness of these findings across FMOLS, DOLS, and Driscoll–Kraay estimations confirms a stable long-run relationship between poverty dynamics and structural development variables. The finding that social policy expenditure reduces poverty aligns with the broader welfare state literature, which emphasizes the redistributive and protective role of public spending. Consistent with the stakeholder-oriented policy implementation framework highlighted by Ahmed et al. (2018), effective allocation and governance of public resources enhance service delivery outcomes and reduce welfare leakage. In the BRICS context, this suggests that fiscal expansion in health, education, and social protection directly improves household resilience and income stability.

A particularly strong result is the poverty-reducing role of financial inclusion, which emerges as the most influential determinant across models. This finding supports the growing literature on inclusive finance, which argues that access to formal financial services improves consumption smoothing, entrepreneurial activity, and savings behavior. It also resonates with studies emphasizing digital and institutional channels of inclusion in emerging economies. In line with Ansu-Mensah et al. (2019), financial system accessibility acts as a critical transmission channel through which economic opportunities reach marginalized populations. The results also confirm that digital development significantly reduces poverty, although its effect is relatively smaller compared to financial inclusion. This finding reflects the transitional nature of digital transformation in developing economies, where internet access and digital infrastructure are still unevenly distributed. Nevertheless, the result supports the argument in the digital development literature that ICT expansion enhances labor market access, reduces transaction costs, and improves information asymmetry in low-income populations.

The significant role of remittances in reducing poverty is consistent with established evidence in development economics, where remittance inflows function as a stable external income source for households in developing countries. This finding supports prior empirical research showing that remittances improve household consumption, education investment, and health outcomes, particularly in emerging economies with large migrant populations. The study further highlights the importance of governance quality as a structural determinant of poverty reduction. Strong governance improves institutional efficiency, reduces corruption, and ensures effective implementation of social and economic policies. This is consistent with institutional theory, which argues that policy effectiveness depends not only on resource allocation but also on institutional capacity and accountability mechanisms. The results suggest that governance acts as a key enabling factor that amplifies the effectiveness of social and financial policies. Macroeconomic findings show that GDP growth reduces poverty, reinforcing the classical growth–poverty reduction nexus, while inflation increases poverty, reflecting its regressive impact on real incomes.

6. Conclusions

This study examined the determinants of poverty reduction in BRICS economies using panel data techniques over a multi-country framework. By integrating social policy expenditure, financial inclusion, digital development, remittances, governance quality, and macroeconomic indicators, the study provides a comprehensive assessment of both

structural and policy-driven drivers of poverty dynamics. The empirical evidence, based on FMOLS, DOLS, and Driscoll–Kraay estimations, confirms a stable long-run equilibrium relationship between poverty and its key determinants. The results consistently show that social policy programs, financial inclusion, digital development, remittances, and governance quality significantly reduce poverty, while inflation increases it. Among these, financial inclusion emerges as the most powerful poverty-reducing factor, followed by governance quality and social policy expenditure. The robustness of results across multiple estimation techniques reinforces the reliability of the findings and confirms their policy relevance for emerging economies.

The findings generate several important policy directions for BRICS economies. First, expanding social protection systems should remain a central policy priority. Governments should strengthen targeted cash transfer programs, healthcare subsidies, and education support to directly reduce household vulnerability and income inequality. Second, financial inclusion policies must be accelerated, particularly through digital banking infrastructure, mobile financial services, and credit access for low-income households. The strong empirical effect of financial inclusion suggests that improving access to formal financial systems can serve as a primary poverty reduction strategy. Third, investment in digital infrastructure and connectivity should be expanded to reduce the digital divide. Enhancing internet penetration, digital literacy, and e-governance systems can create new employment opportunities and improve access to essential services. Fourth, policymakers should recognize the importance of remittances as a stabilizing income source. Reducing transaction costs for remittance transfers and formalizing migration channels can further enhance their poverty-reducing impact. Fifth, improving governance quality and institutional efficiency is essential. Strengthening transparency, reducing corruption, and improving public service delivery will amplify the effectiveness of all poverty reduction policies. Finally, maintaining macroeconomic stability, particularly controlling inflation, is crucial to protecting vulnerable populations from erosion of real income.

Despite its contributions, this study has several limitations. First, the analysis is based on aggregated country-level panel data, which may mask within-country regional inequalities and micro-level heterogeneity in poverty experiences. Future research could use household-level or regional datasets to capture more granular dynamics. Second, although advanced econometric techniques such as FMOLS and DOLS are employed, the study may still be subject to potential measurement errors in variables such as governance quality and financial inclusion indices, which are often constructed using proxy indicators. Third, the study focuses on BRICS economies, which limits the generalizability of findings to other developing or low-income regions. Expanding the sample to include broader emerging and developing economies could improve external validity. Finally, the study does not explicitly model nonlinear or threshold effects, which may exist in the relationship between digital development, financial inclusion, and poverty. Future studies could apply nonlinear panel models or quantile regression approaches to capture heterogeneous effects across income distributions.

Declarations

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Declaration of using generative AI: During the preparation of this work the author(s) used ChatGPT in order to correct the grammatical errors. After using this tool/service, the author(s) reviewed and edited the content as needed and take full responsibility for the content of the published article.

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