

Financial Inclusion, Education, and Poverty in Indonesia: Evidence from Provincial Panel Data

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ABSTRACT

This study examines whether financial inclusion and education reduce poverty and whether education strengthens the poverty-reducing effect of financial inclusion across 34 Indonesian provinces. A balanced provincial panel of 170 observations for 2020–2024 was analyzed using fixed-effects regression. Financial inclusion was measured through a multidimensional index of accessibility, availability, and usage. Financial inclusion and mean years of schooling had significant negative associations with poverty, whereas their interaction was negative but not significant. Unemployment was not significant, while economic growth showed a positive association with poverty, indicating unevenly distributed growth. The findings support integrated financial-access and human-capital policies but show that formal education alone does not ensure productive financial capability.

INTRODUCTION

Poverty remains a central development challenge in Indonesia because aggregate progress has not eliminated pronounced differences in living standards across provinces (Haile et al., 2023; Melaku, 2026; Morris et al., 2022). The national poverty rate declined over the 2020–2024 period, yet the burden remained considerably higher in rural, eastern, and structurally disadvantaged regions. Poverty is not only a shortfall in current income; it also reflects limited capabilities, restricted access to productive assets, fragile employment, and exposure to shocks (Haile et al., 2023; Melaku, 2026; Morris et al., 2022). From the capability perspective, development should therefore be evaluated by the substantive freedoms people possess to pursue valued ways of living, including access to education, decent work, and economic institutions .

Financial inclusion has become one of the principal policy instruments used to widen those freedoms. It refers to affordable and effective access to formal savings, payments, credit, insurance, and other financial services for individuals and firms that have traditionally been underserved (Anakpo et al., 2023; Hasan et al., 2021; Mpofu & Mhlanga, 2022). A bank account can support secure saving and government transfers; affordable credit can finance microenterprise and smooth consumption; and digital payments can reduce transaction costs (Haile et al., 2023; Melaku, 2026; Morris et al., 2022). These mechanisms may help low-income households accumulate productive assets and withstand income shocks. Cross-country and regional evidence generally indicates that wider financial access is associated with lower poverty and inequality (Mbona, 2022).

Indonesia has made substantial progress in extending formal and digital financial services. Nevertheless, broader access does not automatically imply intensive, informed, or productive use. Dormant accounts, consumer-oriented borrowing, limited business capability, and uneven financial infrastructure can weaken the welfare effect of headline inclusion figures (Mbona, 2022; Paidi, 2026). The provincial evidence in this study displays this concern sharply: the average financial inclusion index is low, and the gap between DKI Jakarta and most other provinces is exceptionally wide (Kadir et al., 2025). Thus, the relevant policy question is no longer merely whether an account or service exists, but whether households possess the capability to convert financial access into income, resilience, and economic mobility (Jalili et al., 2025; Katnic et al., 2024).

Education may be decisive in that conversion process. Human capital theory predicts that schooling improves knowledge, skills, productivity, and earnings, thereby directly reducing poverty (Attanasio et al., 2022). Education can also improve the ability to evaluate financial products, compare costs, manage debt, recognize risk, and deploy credit for productive purposes (Hamzat, 2025; Moreno-Menéndez et al., 2025). Financial literacy research similarly suggests that knowledge and decision-making capacity influence whether inclusive finance contributes to sustainable enterprise and household resilience (Minarni, 2025). Yet formal schooling and practical financial literacy are not identical. An individual may complete more years of education without acquiring the applied skills required to use savings, credit, or digital finance effectively (Czech et al., 2024; Kyeyune & Ntayi, 2024).

Prior studies have largely assessed the direct effect of financial inclusion on poverty, often using national aggregates, single regions, or cross-country samples. Fewer studies have tested whether formal education conditions this relationship using recent Indonesian provincial data. This distinction matters because it separates two policy propositions: education may independently lower poverty, or it may specifically amplify the effectiveness of financial inclusion. Evidence that schooling moderates the relationship would support tightly integrated education–finance interventions; a null interaction would imply that formal schooling alone is insufficient and that targeted financial capability programs are required.

This study contributes by constructing a multidimensional financial inclusion index for 34 provinces and combining it with poverty, mean years of schooling, unemployment, and economic growth data for 2020–2024. It estimates both a direct-effects model and an interaction model with province fixed effects. The study asks whether financial inclusion and education reduce poverty, whether education strengthens the association between financial inclusion and poverty, and how unemployment and economic growth relate to provincial poverty after time-invariant provincial heterogeneity is controlled.

LITERATURE REVIEW

Capability Approach and the Poverty Trap

The capability approach views poverty as deprivation of real opportunities rather than income deficiency alone. Access to education and finance can enlarge a household's opportunity set, but only when those resources are usable and convertible into valued outcomes (Hamada & Ellen, 2026; Molla & Gale, 2024). Financial exclusion can reinforce a poverty trap: low income constrains saving and collateral, limited capital depresses productivity, and low productivity perpetuates low income (Tingini & Eniowo, 2026). Inclusive financial institutions may interrupt this cycle by enabling secure saving, risk management, and productive investment.

Financial Intermediation and Poverty

Financial intermediation theory explains how financial institutions mobilize surplus funds, evaluate borrowers, manage risk, and allocate capital toward productive activities (Konstantakopoulou, 2023; Rejekiingsih et al., 2022). When intermediation reaches low-income households and microenterprises, it may relax liquidity constraints created by imperfect credit markets (Ashari et al., 2024; Gosztonyi, 2023). Empirical studies report that inclusion can reduce poverty through credit access, digital payments, entrepreneurship, consumption smoothing, and greater financial resilience (Chen et al., 2022). However, the benefits can remain concentrated when infrastructure, product suitability, affordability, or usage quality is uneven.

Education and Human Capital

Education raises the productive capacity of workers and improves access to formal occupations and higher wages. It also supports information processing and adaptive behavior, which are increasingly important in digitized labor and

financial markets. Studies in developing economies consistently identify education as a durable pathway out of poverty, although its impact depends on labor demand and the quality and relevance of schooling (Dang et al., 2024; Feng et al., 2024). In the present model, mean years of schooling captures the broad stock of formal education at the provincial level.

Education as a Moderator

Education could strengthen the poverty-reducing effect of financial inclusion if better-educated individuals use financial services more strategically (Park & Yi, 2025). They may understand interest, repayment obligations, diversification, digital security, and the distinction between productive and consumptive credit. Conversely, a weak or insignificant interaction may arise when formal schooling does not include practical financial literacy, when labor markets do not reward acquired skills, or when access is measured without considering active usage. Mishra et al (2024) emphasize that education can operate through financial inclusion, but country conditions and capability gaps shape the magnitude of that channel.

Unemployment, Growth, and Poverty

Standard labor-market reasoning predicts that unemployment increases poverty by eliminating labor income and weakening household purchasing power. In Indonesia, however, open unemployment may incompletely represent labor-market distress because many vulnerable individuals cannot afford to remain openly unemployed and instead enter low-productivity informal work. The working poor can therefore remain statistically employed while living below the poverty line. Economic growth is generally expected to reduce poverty, but its effect depends on sectoral composition, employment intensity, and distribution. Capital-intensive or geographically concentrated growth may coexist with increasing poverty in some provinces when gains do not reach disadvantaged households (Wang et al., 2025).

Based on these arguments, the study proposes that financial inclusion and education have negative effects on poverty; that education strengthens the negative effect of financial inclusion; that unemployment has a positive effect on poverty; and that economic growth reduces poverty. The last two expectations are tested as controls, while the interaction between financial inclusion and education represents the study's central extension.

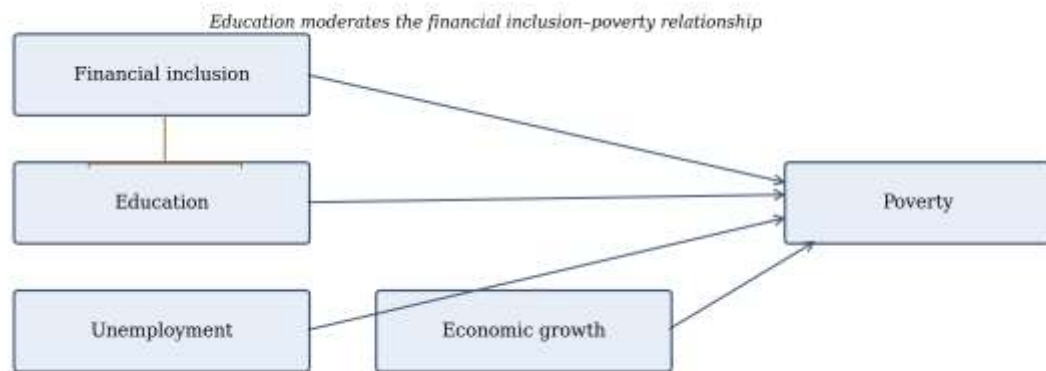


Figure 1. Conceptual Framework

METHODOLOGY

This explanatory quantitative study used a balanced provincial panel covering 34 Indonesian provinces over five years (2020–2024), yielding 170 province-year observations. The period was selected to capture recent changes in poverty and financial access, including the acceleration of digital financial services during and after the COVID-19 disruption. Secondary data were compiled from official publications and statistical series of Statistics Indonesia (BPS), the Financial Services Authority (OJK), Bank Indonesia, and related official sources. The province was the cross-sectional unit and the year was the time unit.

Poverty (POV) was measured as the percentage of the provincial population living below the official poverty line. Education (EDUC) was represented by mean years of schooling. Unemployment (UNEMP) was measured using the provincial unemployment rate, and economic growth (GROWTH) was the annual percentage change in real regional gross domestic product. These indicators permit direct interpretation in percentage points or years while retaining comparability across provinces.

Financial inclusion (INK) was operationalized through a multidimensional index following Sarma's distance-to-ideal approach (Sarma, 2008). The index incorporated accessibility, availability, and usage. Accessibility was represented by accounts per 1,000 adults; availability by bank offices and automated teller machines per 100,000 adults; and usage by deposits and credit relative to real GRDP. Each indicator was min–max normalized across all province-year observations. Availability and usage indicators were combined within their respective dimensions, after which the dimensions were aggregated by normalized Euclidean distance from the ideal point. The resulting index ranges from 0 to 1, with higher values indicating greater financial inclusion.

Two regression specifications were estimated. Model 1 assessed the direct effects: $POV_{it} = \beta_0 + \beta_1 INK_{it} + \beta_2 EDUC_{it} + \beta_3 UNEMP_{it} + \beta_4 GROWTH_{it} + \mu_{it}$. Model 2 added mean-centered financial inclusion, mean-centered education, and their product: $POV_{it} = \beta_0 + \beta_1 INK_{c_{it}} + \beta_2 EDUC_{c_{it}} + \beta_3 (INK_{c_{it}} \times EDUC_{c_{it}}) + \beta_4 UNEMP_{it} + \beta_5 GROWTH_{it} + \mu_{it}$. Mean-centering reduced nonessential multicollinearity and made the main-effect coefficients interpretable at the average level of the interacting variable.

Model selection followed a staged panel procedure. The Chow test compared pooled common effects with fixed effects, while the Hausman test compared fixed and random effects. Both tests selected the fixed-effects model for the direct and interaction specifications. Province fixed effects control for time-invariant differences such as geography, institutional history, long-standing infrastructure, and persistent regional economic structure. Statistical inference used a 5% significance threshold. Residual normality, pairwise multicollinearity, heteroskedasticity, and serial correlation were also evaluated.

Table 1. Variables and Operational Measures

Variable	Operational measure	Scale / source
Poverty (POV)	Population below the official poverty line	Percent; BPS
Financial inclusion (INK)	Composite accessibility, availability, and usage index	0–1 index; OJK/BI/BPS
Education (EDUC)	Mean years of schooling	Years; BPS
Unemployment (UNEMP)	Provincial unemployment rate	Percent; BPS
Economic growth (GROWTH)	Annual change in real provincial GRDP	Percent; BPS

RESEARCH RESULT

Descriptive Results

The descriptive statistics reveal substantial heterogeneity across Indonesian provinces. Average poverty was 10.217%, ranging from 3.780% to 26.860%. Mean years of schooling averaged 8.844 years, while unemployment averaged 5.114%. Economic growth was the most volatile variable, ranging from a 9.34% contraction to 22.94% growth, reflecting the uneven provincial impact of the pandemic and subsequent recovery.

The mean financial inclusion index was only 0.160, with a minimum of 0.053 and a maximum of 0.850. DKI Jakarta recorded the highest value and was the only province classified in the high-inclusion category when provincial means were considered. Thirty-three provinces, or 97.06% of the sample provinces, remained in the low category. The contrast demonstrates that national expansion of formal finance has not translated into spatially balanced access, infrastructure, and usage.

Table 2. Descriptive Statistics (170 Province-Year Observations)

Variable	Mean	Median	Maximum	Minimum	Std. dev.
POV	10.2175	8.6650	26.8600	3.7800	5.1314
INK	0.1602	0.1322	0.8503	0.0531	0.1280
EDUC	8.8443	8.8700	11.4900	6.6900	0.9120
UNEMP	5.1142	4.7550	10.9500	1.7900	1.7340
GROWTH	3.9554	4.4950	22.9400	-9.3400	4.1980

Model Selection and Diagnostic Tests

The Chow test rejected the common-effects specification in both models (cross-section F probabilities = 0.0000), indicating significant province-specific intercepts. The Hausman test then rejected random effects for Model 1 ($\chi^2 = 12.516$, $p = 0.0139$) and Model 2 ($\chi^2 = 13.566$, $p = 0.0186$). Fixed effects were therefore used throughout.

Pairwise correlations were below the 0.90 criterion. In the direct model, the largest correlation was 0.588 between financial inclusion and education. After centering and creating the interaction term, the largest correlation was 0.883 between centered inclusion and the interaction, still below the adopted threshold. Glejser probabilities exceeded 0.05 for every predictor in both specifications, while Durbin-Watson statistics of 1.884 and 1.874 fell within the non-autocorrelation interval. Jarque-Bera probabilities were 0.782 and 0.773, supporting residual normality.

Fixed-Effects Regression

Table 3 reports the core estimates. In Model 1, financial inclusion was negatively associated with poverty ($\beta = -3.274$, $p = 0.0191$). Education displayed a larger and highly significant negative coefficient ($\beta = -2.494$, $p < 0.001$). Unemployment was positive but not significant ($\beta = 0.017$, $p = 0.4665$), whereas economic growth was positive and significant ($\beta = 0.057$, $p < 0.001$). The model was jointly significant and explained 99.51% of within-sample variation after adjustment.

Model 2 produced nearly identical main effects. Centered financial inclusion remained negative and significant ($\beta = -3.289$, $p = 0.0192$), and centered education remained negative and significant ($\beta = -2.481$, $p < 0.001$). The interaction coefficient was negative but statistically insignificant ($\beta = -0.146$, $p = 0.8377$). Thus, the data do not support the proposition that formal education strengthens or weakens the poverty effect of financial inclusion. The adjusted R^2 declined marginally from 0.995144 to 0.995108 after the interaction was added, confirming that it contributed no explanatory improvement.

Table 3. Fixed-Effects Estimates for Provincial Poverty

Variable	Model 1 β	t	p	Model 2 β	t	p
Constant	32.42397	18.29882	0.0000	9.854970	40.58113	0.0000
INK / INK-centered	- 3.273921	- 2.371905	0.0191	- 3.289391	- 2.370941	0.0192
EDUC / EDUC-centered	- 2.493836	- 11.76726	0.0000	- 2.480799	- 11.17531	0.0000
INK $\times$ EDUC	—	—	—	- 0.146287	- 0.205191	0.8377
UNEMP	0.017370	0.730383	0.4665	0.017370	0.727723	0.4681
GROWTH	0.056849	5.132918	0.0000	0.056458	5.006006	0.0000
Adjusted R ²	0.995144			0.995108		
F-statistic	936.9983		0.0000	905.7209		0.0000
Durbin-Watson	1.884498			1.873896		

Note: Dependent variable = provincial poverty rate. INK and EDUC were mean-centered in Model 2. Province fixed effects are included. p = probability value.

DISCUSSION

The negative financial inclusion coefficient supports the argument that broader and more intensive formal finance can reduce poverty. A one-unit increase in the index is associated with a 3.27–3.29 percentage-point decline in poverty, holding observed covariates and province fixed effects constant. Because a full-unit change is large on a 0–1 index, policy interpretation should focus on incremental improvements across accessibility, availability, and usage rather than a literal one-unit shift. The direction is consistent with financial intermediation and liquidity-constraint theories: accounts, affordable credit, and digital transactions can help households save securely, finance productive activity, receive transfers, and manage shocks.

This result accords with evidence from developing Asia and broader developing-country samples. It also complements findings from eastern Indonesia showing that financial inclusion can interact with regional growth and poverty alleviation (Mishra et al., 2024). The provincial index adds an important qualification: inclusion is extremely uneven. DKI Jakarta's exceptional position suggests that national averages can conceal the limited physical and functional access experienced by most provinces. Expansion must therefore prioritize underserved regions and usage quality, not only aggregate account ownership.

Education had the most statistically robust association with poverty. Each additional year in provincial mean schooling was associated with an

approximately 2.48–2.49 percentage-point decline in poverty. This finding is consistent with human capital theory and prior evidence that schooling improves employability, productivity, earnings, and adaptive capacity (Congna & Saad, 2025; Leoni, 2025). It also aligns with the capability approach: education is both intrinsically valuable and instrumental in expanding the choices available to individuals.

The magnitude should be interpreted cautiously because fixed-effects estimates capture within-province changes over a short period and the models include strong province-specific intercepts. Nevertheless, the stability of the education coefficient across both specifications indicates that schooling is not merely a proxy for the observed level of financial inclusion. Education appears to operate through multiple channels—labor productivity, occupational mobility, information processing, and access to formal employment—beyond financial-service use alone.

The study's central finding is that the interaction between financial inclusion and education was not significant. Although the coefficient was negative, its probability value of 0.8377 provides no evidence that provinces with higher mean years of schooling obtain a stronger poverty-reduction benefit from financial inclusion. Formal education therefore acts as an independent poverty-reducing factor rather than a moderator in this sample.

Several mechanisms can explain this result. First, years of schooling measure educational attainment, not practical financial literacy. Curricula may not systematically teach budgeting, interest, risk, digital security, credit appraisal, or microenterprise finance. Second, access indicators may include accounts or infrastructure that are not actively used for productive purposes. Third, structural constraints—including product costs, collateral requirements, digital connectivity, local labor demand, and business ecosystems—may prevent educated individuals from converting financial services into income. Finally, a five-year panel may be too short to identify slow-moving complementary effects.

The policy implication is precise: expanding schooling and expanding finance are both valuable, but their coexistence does not automatically generate synergy. OJK, Bank Indonesia, educational institutions, and local governments should connect financial access with applied capability. Programs can combine transaction accounts with mentoring, consumer protection, enterprise bookkeeping, credit-use planning, and digital-risk awareness. Such interventions would target the missing mechanism more directly than assuming that formal education produces financial competence.

The positive but insignificant unemployment coefficient contradicts a simple expectation that open unemployment immediately raises measured poverty. Indonesia's labor-market structure offers a plausible explanation. Many low-income workers cannot remain openly unemployed; they enter informal, casual, or self-employed work with low and unstable earnings. Poverty can therefore persist among employed households, while the official unemployment rate captures a different margin of labor-market adjustment. Underemployment, job quality, hours worked, informality, and real wages may be more informative controls in future work (Barra & Papaccio, 2024; Håkansta et al., 2025).

Economic growth showed a positive and significant association with poverty in both models. This does not mean that growth inherently causes poverty. Rather, conditional on province fixed effects and the included variables during a highly unusual 2020–2024 period, faster growth was not distributed in a way that reduced poverty. Provinces experiencing rebounds in capital-intensive sectors, mining, or modern services may record high GRDP growth without commensurate employment or income gains among poor households. Pandemic base effects may also contribute to the positive coefficient.

The result is consistent with the broader proposition that poverty responsiveness depends on the inclusiveness, employment intensity, and distribution of growth. Hu & Xu (2025) similarly identify settings in which growth and poverty move together. The contrast underscores that aggregate growth targets should be accompanied by measures of sectoral employment, wage distribution, small-enterprise participation, and regional benefit sharing.

The adjusted R^2 above 0.995 is unusually high. Province fixed effects can account for a large share of persistent differences in poverty, especially when the outcome varies slowly and the panel is short. The high fit should not be interpreted as proof that the observed predictors causally explain virtually all poverty. It indicates strong in-sample explanatory power after province-specific intercepts are included. Potential reverse causality, omitted time-varying factors, common shocks, and measurement error remain. Accordingly, the results are best described as conditional associations consistent with the proposed mechanisms rather than definitive causal effects.

CONCLUSIONS AND RECOMMENDATIONS

Using 170 observations from 34 Indonesian provinces during 2020–2024, this study finds that financial inclusion and education are independently associated with lower poverty. Financial inclusion remains significant after province-specific heterogeneity and macroeconomic controls are considered, while education shows the strongest and most stable negative relationship. However, education does not significantly moderate the financial inclusion–poverty relationship. Unemployment is not significant, and economic growth is positively associated with poverty during the observation period, pointing to informal employment and unevenly distributed growth.

Policy should therefore pursue three connected priorities. First, financial authorities should reduce spatial disparities by extending reliable digital infrastructure, agent networks, suitable savings products, and affordable productive credit in underserved provinces. Second, education policy should continue increasing school participation and completion while embedding practical financial capability in secondary, vocational, and community education. Third, provincial growth strategies should evaluate who participates in and benefits from expansion, prioritizing labor-intensive sectors, micro and small enterprises, formalization, and social protection for informal workers.

The insignificant interaction cautions against treating educational attainment as a substitute for financial literacy. Financial inclusion programs should include product-specific guidance, debt and risk management, enterprise mentoring, and

consumer protection. Monitoring should move beyond account-opening targets toward active usage, suitability, business outcomes, resilience, and poverty reduction.

ADVANCED RESEARCH

The study is limited by its short post-2020 period, aggregate provincial measures, and reliance on observational secondary data. The fixed-effects design controls for time-invariant heterogeneity but does not remove all time-varying confounding or reverse causality. The financial inclusion index captures access, availability, and usage but not service quality, affordability, consumer protection, digital capability, or the productive purpose of credit. Mean years of schooling also does not directly measure financial literacy.

Future research should extend the time horizon, incorporate newly formed provinces where consistent series are available, and test spatial dependence between neighboring provinces. Dynamic panel estimators, instrumental variables, policy discontinuities, or staggered program designs could strengthen causal identification. Household-level studies should distinguish account ownership from active and productive use and examine whether financial literacy, gender, rurality, digital connectivity, informality, and enterprise status condition the inclusion-poverty relationship.

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