



## **Heterogeneity of Rural Poverty in Indonesia: An Analysis Using the Moment Panel Quantile Approach**

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**Abstract**

**Background:** Rural poverty in Indonesia remains consistently higher than urban poverty; mean-based regression methods are heavily used but conceal strong spatial and distributional heterogeneity across provinces. A methodological gap exists in understanding how provinces experience the effects of policy variables across different points in the poverty distribution.

**Objective:** This study employs a quantile-sensitive approach to investigate the heterogeneous determinants of rural poverty growth in 33 Indonesian provinces from 2015 to 2023.

**Methods:** Data from 33 provinces (2015–2023,  $n = 297$  observations) are analyzed using the Method of Moments Quantile Regression (MMQR) with fixed effects, following cross-sectional dependence (CSD) and CIPS panel unit root tests.

**Results:** The effects of development variables on rural poverty vary considerably across quantiles. The capitalization of village funds appears to correlate negatively with rural poverty prevalence in provinces experiencing extreme deprivation and positively elsewhere, suggesting there is inefficiency and/or misallocation at play. Land use change can alleviate poverty in semi-urbanizing regions but harms deeply agrarian, poor communities. Migration tends to reduce poverty only in wealthier areas. Agricultural growth reduces rural poverty mainly in middle-quantile regions, while unemployment consistently exacerbates poverty across all quantiles.

**Conclusion:** The study contributes novel heterogeneity evidence to the rural poverty literature and recommends quantile-differentiated policy targeting for Indonesian rural development.

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### **INTRODUCTION**

Poverty has become a very important issue in every country (Todaro & Smith, 2012). Poverty will always be an important issue that is difficult to resolve due to the low standard of living of the population, which reinforces the problem (Prasetyoningrum, 2018). In some cases, poverty is measured by considering various aspects other than income levels, such as education levels (Ivani & Auwalin, 2024). Poverty in rural areas of Indonesia shows a gradual downward trend from 2015 to 2024, but it is still higher than in urban areas (BPS, 2025). This indicates that rural communities still face more complex economic problems, such as limited access to education, health services, infrastructure, and decent employment. The disparity in poverty between rural and urban areas indicates that rural development policies and economic structures face fundamental problems that require special attention. Therefore, in order to create more targeted policy interventions, it is important to understand how poverty deepens in rural areas.

Many villages that were previously considered poor and underdeveloped have transformed into developing and advanced villages that are able to improve the welfare of their

communities as a result of the village development process (Diah, 2020). With the enactment of the Village Law, village development and progress have increased in many existing regions (Herdiana, 2022). Much of the progress achieved by villages empirically has not been able to overcome rural poverty as a whole; there are still villages with pockets of poverty even in more advanced and developed villages (Rahman et al., 2020). This is one of the remaining problems of the ongoing village development process. As explained earlier, the condition of community poverty shows that poverty in villages is still an issue that needs to be addressed by various villages in Indonesia. This is because poverty affects many aspects of community life and governance in villages (Alfons et al., 2024; Widiyanto et al., 2021).

To overcome this, the government is trying to improve the economic performance of villages through policies that focus on rural development. The Village Fund program is one of the government policies currently in use. Therefore, it is hoped that the implementation of the Village Fund program will help improve development in rural areas and significantly reduce poverty levels. Village funds have the ability to improve the economy of rural communities, influence the welfare of rural communities, and support rural economic growth and reduce poverty rates (Artino et al., 2019; Dwiyantri et al., 2020; Hartojo et al., 2022; Yusuf & Khoirunurrofik, 2022). However, research conducted by Arham and Payu (2020) found that village fund transfers do not have a significant effect on overcoming poverty in rural areas, so that in order to reduce poverty levels in all villages in Indonesia, the amount of funds allocated for this programme must be increased (Arham & Payu, 2020).

Economic development in rural areas is expanding, which encourages an increase in the types of economic activities and land-use change. As its function has shifted to residential and industrial uses, agricultural land, which is the main source of livelihood for rural communities, has decreased. This fact is in line with the structural transformation theory proposed by Brady & Prior (2020), which states that due to the current expansion of industry and services, the role of agriculture as the main sector and primary driver of the rural economy has shifted to other sectors. Furthermore, the conversion of agricultural land in rural areas tends to cause an increase in unemployment and poverty in rural areas, especially for farmers who lose their land due to this conversion (Brady & Prior, 2020). Wu et al. (2025) state that land conversion in rural areas has a dual effect on poverty levels. Converting land into developed land can drive economic growth and reduce poverty, while degradation or conversion of agricultural land into unproductive land can actually exacerbate poverty. Therefore, appropriate land management policies are very important in determining the direction of sustainable rural development (Wu et al., 2025).

Poverty levels in rural areas attract residents to leave their areas for better areas, namely urban areas, or to migrate (Pratomo, 2018). Poor communities migrate as a way to increase their income in the hope of obtaining higher wages or income in the city and overcoming various socio-economic problems faced in their place of origin (Pradana et al., 2022). Meilvidiri & Siman (2023) argue that the migration of rural communities to urban areas has negative impacts, such as increased population density in cities, high unemployment rates, imbalances between rural and urban areas, and the emergence of slums (Meilvidir & Siman, 2023). However, this will ultimately reduce the poverty rate in rural communities, as they will have better job opportunities and economic alternatives. This is reinforced by Resaski & Marta (2024), who show that population migration does reduce poverty in rural areas but increases poverty in urban areas. This is because the migration of people to cities increases the poor population in urban areas (Resaski & Marta, 2024).

This study offers a new method for understanding the dynamics of rural poverty in Indonesia by using the panel quantile method, which has not been widely used in previous studies. This approach differs from previous studies, which mostly relied on classical linear regression or spatial analysis. This method is able to capture the differential effects of explanatory variables on poverty at different quantiles of the distribution, not just at the mean. In other words, the objective of this study is to investigate how economic and social attributes have different impacts on rural areas with low, medium, and high poverty levels. This method is particularly important given Indonesia's highly diverse socioeconomic and geographical context. This is because overly general policies are often ineffective for certain groups.

Furthermore, this study uses a quantitative analysis framework based on panel quantile data to further examine the relationship between rural development dynamics, economic structural changes, and components such as migration and land-use change. Multiple studies

Artino et al. (2019), Hartojo et al. (2022), and Yusuf & Khoirunurrofik (2022) underscore the impact of Village Funds and village development programs on poverty alleviation. However, so far no study has explicitly examined how this impact varies across village groups at different poverty levels. Hence, this study not only contributes empirical evidence on the effects of poverty reduction policies, but also critical methodological information for development economics.

This research aims to determine and analyze factors that affect poverty levels in rural areas of Indonesia. The moment panel quantile method is applied to this goal on the basis of heterogeneity characteristics. This study specifically aims to examine how different villages with poverty levels ranging from low to high are affected differently by village development variables such as economic structure, migration dynamics, and land-use change.

Another aim of this article is to give a more detailed account of village characteristics depending on their position in the poverty quantile. This can help create more appropriate and flexible policies. Therefore, it is expected that the government and other related stakeholders can develop more efficient, equitable, and targeted rural area development plans to address poverty in a sustainable way.

To empirically test how key factors affect poverty in rural Indonesia, this study formulates several hypotheses based on theory and previous research findings. The hypotheses are designed to explain the relationship between the dependent variable, namely the poverty rate in rural areas, and a number of independent variables such as Village Funds, land-use change, economic sector growth, and migration, as well as one control variable, namely unemployment. Each hypothesis is formulated by considering the expected direction of influence and the underlying theoretical basis, as summarized in Table 1 below.

**Table 1.** Formulation of research Hypotheses

<b>Hypothesis Code</b>	<b>Examined Relationship</b>	<b>Expected Direction</b>	<b>Justification</b>
$H_1$	Village Fund	Negative	Village funds encourage infrastructure and local economic development, which in turn reduce poverty levels (Artino et al., 2019; Dwiyantri et al., 2020; Yusuf & Khoirunurrofik, 2022)
$H_2$	Land Conversion	Positive	The reduction of agricultural land due to land conversion decreases access to primary sources of rural livelihoods (Brady & Prior, 2020; Wu et al., 2025).
$H_3$	Agricultural Sector Growth	Negative	Growth in the rural economy creates employment opportunities and increases household income (Diah, 2020; Hartojo et al., 2022).
$H_4$	Migration	Negative	Out-migration from rural areas reduces poverty in the countryside but may increase socio-economic burdens in urban regions (Meilvidir & Siman, 2023).
$H_5$	Unemployment	Positive	A high unemployment rate indicates limited job opportunities and reduces community income (Widiyanto et al., 2021).

## METHOD

This study employed panel data, where the cross-sectional units consisted of 33 provinces in Indonesia (excluding DKI Jakarta and the four new autonomous regions in Papua and Papua Barat), combined with a time series dimension covering nine years (2015–2023). The dependent variable was rural poverty growth, and the independent variables comprised village fund allocation, agricultural sector growth, land-use conversion, migration, and unemployment rate. Table 2 provides a detailed description of the variables.

**Table 2.** Variables Used

Variables Used	Variable Symbol	Variable Description	Data Source
Dependent Variable	POV	Percentage of rural poverty (percent)	BPS
	DN	Amount of Village Funds Disbursed (Million Rupiah)	Ministry of Villages
Independent Variable	SPT	Agricultural sector growth rate (percent)	BPS
	AL	Land-use conversion (hectares)	Ministry of Agrarian Affairs
	MG	Number of migrants (persons)	BPS
	PNG	Open unemployment rate (percent)	BPS

This research was examined empirically in three major stages. The first stage detected potential cross-sectional dependency (CSD) across units. In the second stage, unit root testing was conducted to analyze the stationarity of variables. In the final stage, the characteristics of both variable relationships were analyzed in order to detect heterogeneity by means of panel quantile regression.

To address this issue, three kinds of tests were implemented in the first stage, as CSD can induce distortions in the findings. Following Polcyn et al. (2023), the first test was conducted to check whether CSD occurrences were present in the data. The second test employed the Scaled Lagrange Multiplier for CSD detection, while upon finding the presence of CSD, the Breusch–Pagan LM test was applied for confirmation. The forms of the CSD tests utilized in the initial assessment Polcyn et al. (2023) are denoted as equations (1) and (2).

$$CSD = T \sum_{i=1}^{N-1} \sum_{j=i+1}^N \rho_{ij} \quad (1)$$

$$CSD = \sqrt{\frac{3T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \rho_{ij} \quad (2)$$

Subsequently, this study implemented the CIPS test (Cross-Sectionally Augmented Panel Unit Root Test). CIPS was calculated using the Cross-Sectionally Augmented Dickey–Fuller (CADF) model to test for cross-sectional dependence and whether unit roots existed. As can be seen in Equation (3), the CIPS test guaranteed robust and accurate analysis, overcoming issues related to CSD (Paddu et al., 2024).

$$CIPS = N^{-1} \sum_{i=1}^n CADF \quad (3)$$

Quantile Regression was used in this study to capture the heterogeneity of the effects of explanatory variables on rural poverty growth. It offered a more complete picture of the distributional relationships for rural poverty than an analysis at the mean level alone. The baseline model was specified as follows, within a general panel data framework:

$$y_{it} = x_{it}\beta + \alpha_i + u_{it}, i = 1, 2, \dots, N; t = 1, 2, \dots, T \quad (4)$$

Where  $i$  represents the cross-sectional unit,  $t$  indicates the time period,  $\beta$  is the coefficient vector of independent variables, and  $u_{it}$  shows unobserved individual effects. We then specified the quantile regression for parameter estimation as follows:

$$Q_{y_{it}}(\tau_j | x_{it}, \alpha_i) = x'_{it}\beta(\tau_j) + \alpha_i, i = 1, 2, \dots, N; t = 1, 2, \dots, T \quad (5)$$

Therefore, Equation (5) makes an assumption of fixed individual effects. Koenker (2004) demonstrates that appropriate shrinkage of individual effects can dramatically decrease the variance via estimation when  $N$  is large but  $n_i$  is small. The quantile regression model was constructed based on the variables listed in Table 2 as follows:

$$Q_{\tau}(POV)_{it}|X_{it}) = \beta_0(\tau) + \beta_1(\tau)LnDN_{it} + \beta_2(\tau)SPT_{it} + \beta_3(\tau)LnAL_{it} + \beta_4(\tau)LnMG_{it} + \beta_5(\tau)PNG_{it} + \varepsilon_{it}(\tau) \tag{6}$$

The above equation (6) constituted the basic analytical framework of this study, investigating the nexus between the growth of rural poverty and the independent variables within the panel. Furthermore, it also tested which model fit better through POV models. This specification provided useful information about how the variables of interest interacted with each other.

### RESULT AND DISCUSSION

#### Result

Descriptive analysis of data from 33 provinces in Indonesia (with the exclusion of DKI Jakarta and four new provinces formed in Papua/Papua Barat), during the years 2015–2023, is shown in Table 3. It demonstrates great heterogeneity in rural poverty dynamics at the provincial level. The rural poverty rate of various provinces fluctuates over time in a right-skewed (positive) distribution; the general level is, however, low for most provinces, with few exceptions showing significantly larger rural populations with disproportionate rural socio-economic inequality. The skewness and kurtosis values further confirm the non-normal distribution and the presence of extreme values for certain provinces or years.

Unlike the other independent variables, Village Funds are more normally and evenly spread across regions. In contrast, noticeably strong agricultural growth and highly intense land-use conversion display significant variation at the subnational level, suggesting that provinces do not exhibit similar trajectories of agricultural development or comparable intensities of land transformation. Migration and unemployment levels, which are unevenly distributed among the provinces—with certain provinces experiencing significant flooding could further propagate rural poverty as well. These interregional disparities emphasize the need for more specific and regionally relevant policy responses to counteract the rise in rural poverty.

**Table 3.** Descriptive Statistics

Statistic	POV	DN	SPT	AL	MG	PNG
Mean	3.714	9052.119	3.092	5046.929	4886.331	13.671
Variance	3.003	167112.436	4.596	601046.313	16900.763	59.358
Std. Dev	1.733	408.794	2.144	775.272	411.097	7.704
Skewness	1.245	0.0056	-0.173	-1.119	0.527	1.521
Kurtosis	1.941	-0.292	0.263	2.155	-0.285	1.912
Minimum	0.71	7899	-4.39	2293	4033	4.86
Maximum	10.53	9912	9.07	6333	5951	37.94

Source: Processed, (2024)

A summary of the correlation matrix among different variables is given in Table 4. Results show heterogeneous relationships between rural poverty dynamics and their determinants. Village Funds and the growth of the agricultural sector both negatively correlate with rural poverty; hence, improving fiscal transfers and agricultural performance are associated with lower rural poverty. This is a finding that aligns with the role of development funds for rural areas and agriculture as dominant forces of local growth.

On the other hand, land-use conversion and unemployment are positively associated with rural poverty, meaning that both higher land-use conversion levels and unemployment rates lead to more severe rural poverty. This illustrates how the loss of productive agricultural land translates into diminished livelihoods in rural settings and emphasizes unemployment as a structural impediment that compounds poverty. Migration, on the other hand, negatively correlates with rural poverty, suggesting that out-migration could relieve economic pressure in rural contexts (this relationship merits investigation through qualitative research).

**Table 4.** Correlation Maxrix

Variables	POV	DN	SPT	AL	MG	PNG
POV	1.00000					
LnDN	-0.380691	1.000000				
SPT	-0.357642	-0.138155	1.00000			
LnAL	0.261437	0.54419	-0.147461	1.00000		
LnMG	-0.240900	0.521240	-0.199691	0.449756	1.00000	
PNG	0.120684	0.232129	-0.15021	-0.158180	-0.245248	1.00000

Source: Processed, (2024)

Before investigating heterogeneity in rural poverty growth by employing the Panel Quantile Regression Model, an initial diagnostic analysis was carried out. This was important in order to detect possible cross-sectional error dependence across provinces, as rural poverty is usually conditioned by spatial interdependence and joint dynamics. If not appropriately addressed, cross-sectional dependency (CSD) might bias the estimators.

Results of the CSD test are tabulated in Table 5, showing strong evidence of dependency among all variables. The results of the Breusch–Pagan LM, Pesaran Scaled LM, and Pesaran CD tests also show very significant statistics with probabilities equal to 0.0000, rejecting the null hypothesis of no cross-sectional dependency. This indicates a strong interdependency among the dependent and independent variables across provinces.

**Table 5.** Cross-Sectional Dependency Test

Variable		Breusch-Pagan LM	Pesaran Scaled LM	Pesaran CD
POV	Statistic	848.0224	9.848008	7.823086
	Prob.	0.0000	0.0000	0.0000
LnDN	Statistic	4705.029	128.5392	68.59223
	Prob.	0.0000	0.0000	0.0000
SPT	Statistic	1057.460	16.29301	12.93144
	Prob.	0.0000	0.0000	0.0000
LnAL	Statistic	2298.218	54.47470	12.51823
	Prob.	0.0000	0.0000	0.0000
LnMG	Statistic	1761.660	37.96328	27.10321
	Prob.	0.0000	0.0000	0.0000
PNG	Statistic	1877.215	41.51921	28.87977
	Prob.	0.0000	0.0000	0.0000

These observations have profound implications for the analysis of panel data, especially when a dataset covers 33 provinces over nearly a decade. Interprovincial dependency implies structural or regional determinants impacting every unit in the model. As a result, ordinary estimation methods based on independence across units fall short. Rather, second-generation panel data methods are needed to adequately account for CSD. Thus, this paper implements the CIPS unit root test proposed by Polcyn et al. (2023), and results are given in Table 6.

**Table 6.** CIPS Unit Root Test Results

Variables	No Trend	Constant	Constant and Trend
POV	-3.90036***	-6.98135***	0.0000
LnDN	-2.94097***	-56.63670***	-0.02662
SPT	-2.80394***	-19.19753***	0.0000
LnAL	-10.11424***	-17.40712***	-0.09131
LnMG	-11.43966***	-15.13622***	0.00000
PNG	-3.26655***	-12.11036***	0.0000

Source: Processed, (2024)

In the second evaluation stage, the stationarity of the panel variables was validated. The outputs of the CIPS test showed that all variables are level stationary, especially under the "constant" and "no trend" specifications. This means that rural poverty growth, village fund,

agriculture growth, land-use conversion, and migration and unemployment have no unit root or have long-run mean stability. Therefore, these variables are directly used in the following panel analysis.

In summary, the "constant and trend" column indicates that no further transformations (e.g., differencing) are necessary. The implication of this characteristic is that, as also shown in the second point, stationarity at level is an essential requirement for avoiding estimation bias when working with interdependencies in specific panel data models (i.e., not accounting for the economic structure created by unit roots). The non-normal distribution of variables in Table 4 supports Paddu et al. (2024), which argues that the panel quantile regression approach is most appropriate for this study. Therefore, this study applies the Method of Moments Quantile Regression (MMQR) with Fixed Effects (FE).

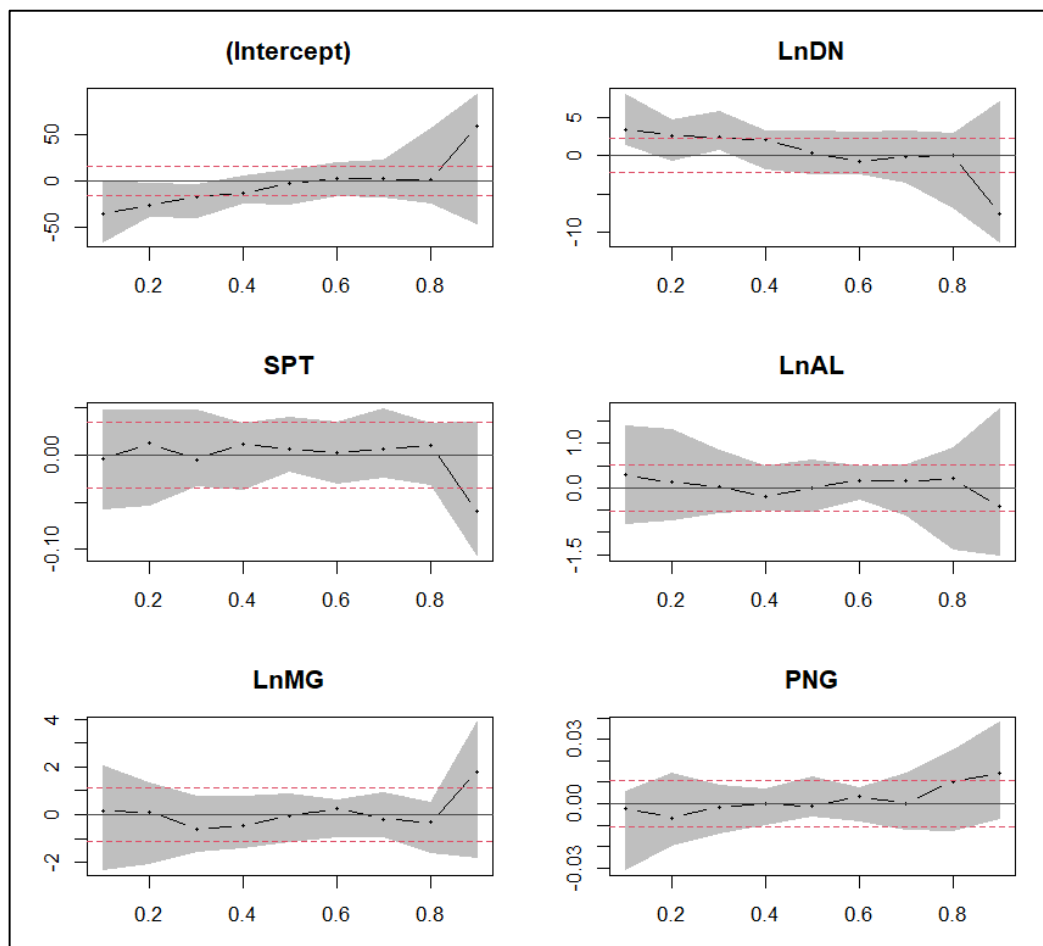
The estimation results are shown in Table 7 and Figure 3. The preliminary results indicate that independent variables have heterogeneous impacts on rural poverty growth across its distribution levels. In particular, Village Funds have variable effects: in rural poor provinces (Q0.7–Q0.9), a much larger share of the funds is allocated, leading to significantly lower poverty growth; in provinces with low levels of poverty (Q0.1–Q0.3), rising poverty growth is, in fact, associated with an increase in funds, as described below. This could be an indication of weak governance or structural bottlenecks that hinder the ability of fiscal transfers to effectively address poverty in less poor regions.

Migration and land-use conversion also show mixed results. In more developed provinces, land-use conversion negatively correlates with poverty, suggesting that, if appropriate, land-use conversion creates new economic opportunities. In poorer provinces, however, conversion deepens poverty.

**Table 7.** Estimation Results of the Moment Quantile Regression Model

		<i>LnDN</i>	<i>SPT</i>	<i>LnAL</i>	<i>LnMG</i>	<i>PNG</i>
0.1QR	<i>Coeff</i>	2.51075	-0.048567	1.779387	-1.199931	0.040099
	<i>P&gt;z</i>	0.0000***	0.2658	0.0013***	0.5750	0.0000***
0.2QR	<i>Coeff</i>	1.40034	-0.062651	2.342730	-0.309703	0.04354
	<i>P&gt;z</i>	0.0000***	0.1391	0.0020***	0.8716	0.0002***
0.3QR	<i>Coeff</i>	0.38063	-0.072261	2.586593	-1.750987	0.045760
	<i>P&gt;z</i>	0.0018***	0.1075	0.0000***	0.3355	0.0009***
0.4QR	<i>Coeff</i>	3.468620	-0.050444	-1.691255	-3.591136	0.028502
	<i>P&gt;z</i>	0.4845	0.0862*	0.0327**	0.0722*	0.0791*
0.5QR	<i>Coeff</i>	1.562315	-0.095181	-1.277739	-4.421175	0.024931
	<i>P&gt;z</i>	0.7551	0.0613*	0.1029	0.0128**	0.0793*
0.6QR	<i>Coeff</i>	-2.276813	-0.100574	2.794553	-6.13742	0.011179
	<i>P&gt;z</i>	0.0012***	0.0886*	0.1279	0.0474**	0.0929*
0.7QR	<i>Coeff</i>	-3.149244	-0.020680	0.789700	-0.108299	0.464025
	<i>P&gt;z</i>	0.0009***	0.5567	0.0000***	0.0000***	0.0000***
0.8QR	<i>Coeff</i>	-4.044042	-0.082619	0.872998	-10.30276	0.005616
	<i>P&gt;z</i>	0.0008***	0.29955	0.0791*	0.0002***	0.0017***
0.9QR	<i>Coeff</i>	-9.112081	-0.036212	0.612786	-11.87469	0.006014
	<i>P&gt;z</i>	0.0000***	0.67771	0.08226*	0.0002***	0.0059***

Source: Processed, (2024)



**Figure 1.** Moment Panel Quantile Model  
Source: Processed, (2024)

## Discussion

### *Rural Development and Poverty in Indonesia: Insights from Panel Quantile Regression*

#### A. Village Funds: Fiscal Transfers and the Elite Capture Paradox

One of the most surprising findings from this work is that the story of Village Fund (Dana Desa) allocations is not one single clear narrative. In provinces where poverty runs deepest those in the Q0.7 to Q0.9 range real fund allocations do change things. The coefficients ( $\beta$  from  $-3.15$  to  $-9.11$ ) indicate that even relatively modest fiscal transfers can make a difference: roads get constructed, local employment options are created, and basic services become more accessible. This is precisely what fiscal decentralization theory Oates (1972) would suggest, and it aligns with Hartojo et al. (2022), who also find substantial multiplier effects in lagging regions. The message is clear for extremely resource-scarce provinces money directed at structural deficits does alleviate poverty.

In provinces that are relatively better off, however, the picture is much more complicated. At lower quantiles (Q0.1–Q0.3), the coefficients actually turn positive suggesting that larger Village Fund allocations tend to be associated with rising poverty rates. It would be easy to dismiss this as mere mismanagement, but the theoretical literature indicates something deeper at work. The problem of soft budget constraints is exacerbated as these same provinces become more developed: more local fiscal effort and investment may in fact be displaced by unconditional grants (Persson & Tabellini, 1996). Another well-documented problem is elite capture: when local power structures are more deeply entrenched, wealthier households tend to absorb a disproportionately large share of fund flows, creating a statistical paradox where poverty appears to worsen even in the presence of increasing funds (Bardhan & Mookherjee, 2000; Ferraz & Finan, 2011). A similar conclusion was reached for the Indonesian context by Arham & Payu (2020) governance transfers, in isolation and without complementary reforms, hardly moved the poverty needle.

What this means in practice is that the Village Fund program is not a catch-all it is an instrument sensitive to context, and we should have limited expectations that it will produce uniform outcomes everywhere. Its effectiveness is constrained by the quality of local institutions, the degree of elite capture, and the structural conditions of each province. Previous studies using mean-based estimates completely overlooked this point. The policy implication here is clear: in the richest provinces, fund disbursements must come with strict oversight mechanisms and conditionality; in the very poorest, the priority should be to ensure funds are directed toward structural bottlenecks rather than being absorbed by existing networks of power.

### *B. Understanding Land-Use Conversion (Structural Transformation or Rural Dispossession?)*

Another ought-to-be-consistent variable, land-use conversion, simply will not play along with the even-poverty hypothesis. The data show a non-monotonic relationship between land conversion and poverty: at Q0.1–Q0.3, the relationship is positive, flips to negative at Q0.4–Q0.5, and drifts back toward positive albeit weakening at Q0.7–Q0.9. Such sign reversals are theoretically significant because they provide a test for both sides of a time-honored debate. Optimists of structural transformation Lewis claim that it is natural and desirable for agricultural land to be transformed into industrial or commercial uses as part of the economic development process. Dispossession pessimists Borrás & Franco (2010) argue that such conversions deprive rural households of their livelihoods. It turns out there is truth to be found in both camps, but about different sets of provinces.

In middle-poverty provinces (Q0.4–Q0.5), the evidence bears out the transformation narrative: land is being allocated toward high-productivity activities manufacturing, commercial agriculture, services and the income diversification effects seem to be poverty-reducing. Wu et al. (2025) observed similar dynamics in Inner Mongolia. However, in the provinces with the lowest poverty (Q0.1–Q0.3), something more troubling may be afoot. Agriculture is the economic mainstay, and residual poverty in these provinces tends to remain entrenched among households that are still heavily reliant on agriculture. For them, land conversion is not an opportunity; it is a displacement. They have the most to lose from conversion and are least prepared to take on alternative livelihoods. Borrás & Franco (2010) call this adverse incorporation: people are not so much excluded from development as included in it on deeply unfavorable terms.

Conversion takes on a damaging character again at the highest poverty quantiles stripping away the agricultural base that poor rural households depend on to survive consistent with Brady (2019) and Wu et al. (2025). A useful lesson here is that land-use policies cannot be a blunt, one-size-fits-all instrument. Who pays the costs and who collects the benefits of conversion is highly dependent on local economic structure and getting that wrong has material consequences for people at the bottom.

### *C. Migration: Selective Poverty Relief and the Labor-Drain Risk*

Migration is a popular poverty-reduction strategy discussed in the rural development literature, yet this study's findings reveal a more complex reality. In the poorest provinces (Q0.7–Q0.9), out-migration does work as advertised: the coefficients are strongly negative ( $\beta = -10.30$  to  $-11.87$ ) and signal that it does matter when people leave for greener pastures, because wages at destination coupled with remittances sent back home do make a real difference. Such a mechanism is in line with the wage arbitrage context of Stark & Bloom (1985) and the remittance multiplier shown by Todaro & Smith (2012). Where poverty is acute and local economic opportunities are limited, migration can serve as one of the few exits from the poverty trap.

But in provinces with low levels of poverty to start with (Q0.1–Q0.3), the picture looks very different migration seems to have a negligible effect on poverty. Their near-zero and statistically insignificant coefficients indicate that any remittance-related increases in income may be outweighed by what Dustmann & Görlach (2016) term "labor thinning" with productive working-age members draining away, the potential workforce of rural communities becomes thinner, which will undermine agricultural output and local economic activity. In already-prosperous rural provinces, the marginal benefit of yet another migrant's remittances might simply not be worth the cost of losing them as a productive worker. This is worth emphasizing because it flies in the face of the intuition that migration is always good for the poor and also contradicts Hypothesis H4, which posited that out-migration would always shrink rural poverty. Neither blanket optimism nor blanket pessimism about migration passes muster under

distributional scrutiny.

We would argue that migration has not yet fully developed into an efficient adaptation strategy in many parts of rural Indonesia exactly as suggested here (Meilvidiri & Siman, 2023). In destination areas, migration may increase the supply of low-skilled labor and therefore lower wages for individuals unable to migrate (the so-called "migrant reserve army"). Context, again, is everything.

#### *D. Agricultural Growth: A Window of Opportunity, Not a Universal Lever*

The agricultural sector's relationship with poverty follows what might be described as a transformation threshold pattern and it is one of the more theoretically interesting findings in this study. Agricultural growth reduces poverty most consistently in the middle poverty quantiles (Q0.4–Q0.6), while effects at both extremes are largely insignificant. This middle-quantile concentration aligns with Timmer's (1988) transformation threshold hypothesis and more recent work by Diao et al. (2010): agricultural productivity gains reduce poverty only once basic food security has been established (clearing the lower bound), but before widespread sectoral diversification into services and manufacturing has made agriculture a relatively small share of household income (the upper bound).

In the poorest provinces, agriculture remains stuck in subsistence mode. Productivity improvements are stymied by inadequate infrastructure, poor market access, and the near-absence of agricultural credit. Under these conditions, even successful yield improvements tend to improve household caloric intake rather than generate marketable surpluses and the poverty-reduction effect simply does not materialize. This is consistent with Diah (2020) and Hartojo et al. (2022), who both emphasize that agriculture only becomes a poverty-fighting sector when basic enabling conditions are in place. In richer and more rural provinces, the picture is quite different: agriculture has largely been replaced by non-farm work in many areas because the latter tend to be far more profitable, so income generation through agricultural production is already at a level where further productivity gains within the agricultural sector make very little difference at the household level.

The corollary is that investments in agricultural productivity irrigation, fertilizer subsidies, extension services, market linkages will yield the highest returns in provinces at a middle stage of development where enabling conditions are in place but transformation is not complete. Indiscriminately targeting these investments regardless of provincial context risks misallocating resources to places where agriculture either cannot or no longer needs to be the major poverty-reduction vehicle.

#### *E. Unemployment: The One Variable That Cuts Across Everything*

If there is one finding in this study that stands without qualification or nuance across every poverty quantile, it is this: unemployment makes poverty worse, always and by a substantial amount ( $\beta$  positive and significant from Q0.1 to Q0.9). Where every other variable considered here has heterogeneous effects sometimes positive, sometimes negative, sometimes insignificant depending on provincial context unemployment is the only structural predictor that refuses to bend to context. This is in line with Hypothesis H5, and confirms what mainstream development economics has long argued: labor market failure to absorb workers provides a basic mechanism through which inequality is reproduced and poverty perpetuates.

Does this finding's universality extend beyond academic validation? It tells us that labor-market failures are not just an issue of poor regions they are a structural challenge that exists across the entire distribution of provincial wealth. Even in relatively affluent rural provinces, high unemployment goes hand in hand with increasing poverty. This engages with and strengthens Mincer's (1974) human capital framework and the findings of Widiyanto et al. (2021) that employment generation is the fundamental lever for poverty reduction. The bottom line: no amount of fiscal transfers, land policies, or agricultural investments can sustainably cut poverty in a world with too few jobs.

#### *F. Policy Implications and Conclusion*

Collectively, the results of this study provide substantial justification to abandon Indonesia's average-based poverty policies. The country's villages are incredibly heterogeneous socially, geographically, economically and the evidence we present here reveals that while the

very same policy instrument can reduce poverty in one province, it can deepen it in another depending on where that province exists along the poverty distribution. The Village Funds, land-use conversion, migration, and agricultural investment are not intrinsically good or bad interventions the consequences they yield depend substantially on the local quality of institutions, structures of labor markets, and frameworks for land tenure and on the prevailing level of poverty in a place.

These implications directly influence rural development planning on the part of both the central government and regions. Macro-level poverty statistics national averages, provincial headcounts are not sufficient to guide policy design. What is required instead is more granular, distributional analysis: determining what part of the poverty distribution a given province finds itself in, what structural constraints are binding, and which policy instruments will likely work within that context. This type of differentiated evidence can be generated using one practical tool panel quantile regression, as demonstrated in this study.

The larger message is one of epistemic humility in designing policies. Poverty in rural areas of Indonesia is not just one problem with one solution. It is a constellation of varying, overlapping, but distinct challenges that present differently across provinces and require the capacity to step outside aggregate data, listen to local realities, and design interventions calibrated to the actual conditions on the ground. The strongest finding that unemployment worsens poverty regardless of the circumstances implies that labor market development should be the foundation of any serious anti-poverty agenda, creating a common base upon which other, more context-specific strategies can be built.

### CONCLUSION

Using Method of Moments Quantile Regression (MMQR) fixed effects, this study is the first to analyze rural poverty determinants distributionally in Indonesia, covering 33 provinces during the 2015–2023 period ( $n = 297$ ). The results show pronounced quantile heterogeneity: the most substantial declines in poverty occur in high-poverty provinces (Q0.7–Q0.9) but paradoxically raise it in low-poverty provinces (Q0.1–Q0.3), an effect driven by moral hazard and elite-capture mechanisms highlighted in the fiscal decentralization literature. Conversion of land use reduces poverty in middle-quantile provinces via the diversification of economic sectors but increases it in the poorest agrarian provinces through dispossession. This poverty-reducing migration occurs selectively only through remittance channels and is completely absent in low-poverty provinces. Agricultural growth works only at the middle quantiles, confirming a structural transformation threshold effect. The consistent exacerbation of poverty due to unemployment across all quantiles confirms the structural, cross-cutting nature of this phenomenon. These findings contribute to the rural poverty literature by showing that mean-based estimates systematically misrepresent policy effects across the population's poverty distribution, and that MMQR is a methodologically superior framework for heterogeneity-sensitive policy analysis.

The policy implication is, therefore, straightforward: poverty alleviation programs in Indonesia must be province-poverty-quantile-specific. Village Fund allocation should therefore be increased in high-poverty provinces and monitored under good governance to avoid elite capture. In middle-poverty provinces, land-use conversion toward the modernization of agriculture can be an engine for poverty reduction if smallholders have secure land rights. In lower-poverty provinces, labor-market deepening and productivity diversification should be prioritized over additional fiscal transfers. This study has two important limitations: (1) an endogeneity problem related to Village Fund allocation cannot be addressed given that no valid instrumental variable is available in this dataset; and (2) provincial-level aggregation does not capture within-province heterogeneities. Future research can further adopt IV-MMQR approaches to address endogeneity, extend the analysis to sub-provincial (district/village) data sources, and include governance quality indicators as moderating variables to empirically test the elite-capture mechanism.

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### AUTHOR CONTRIBUTION STATEMENT

Syaiful conceptualized the research and was responsible for the methodology, data analysis, and interpretation of the results. Muhamad Halilintar contributed to the literature review, data collection, and provided critical feedback on the manuscript. Both authors reviewed and approved the final manuscript.

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