JURNAL EQUILIBRIUM
Journal homepagehttps://e-journal.uniflor.ac.id/index.php/equilibrium
E-ISSN 2807-4106

Socio Economic Development Inequality and Its Impact on Poverty Levels in North Sumatra, 2019–2023: An Inter-District/City Study

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INFO ARTIKEL

Riwayat Artikel:
Received: 26 Jan 2026
Revised: 31 Jan 2026
Accepted: 02 Feb 2026

Keywords: *Poverty, Regional Inequality, Economic Development, Infrastructure*

ABSTRACT

This research analyses the effects of disparities in the socio-economic development of 33 districts and cities in the province of North Sumatra on the poverty rate from 2019 to 2023. Employing panel data analysis, the study combines important variables for the development of the province, including education infrastructure, life expectancy, access to electricity, GRDP per capita, and the Human Development Index (HDI). The disparity in inter-district differences in economic capacity is measured through the Coefficient of Variation (CV) and the Williamson Index (WI). The findings indicate the high inequality in economic capacity in the districts, as measured through the high CV and WI values. On the other hand, the panel regression results show that the poverty rate in North Sumatra is mainly influenced by the structural and long-run differences between the districts, measured by the incredibly high intraclass correlation (rho 0.99). The negative effects of life expectancy, access to electricity, and the Human Development Index on the poverty rate suggest that improvements in human development achievements and infrastructure are very important factors in overcoming poverty. Conversely, GRDP and the number of schools had only minor impacts, suggesting that economic growth and the development of educational infrastructure are not directly associated with poverty reduction unless they are accompanied by improvements in quality and inclusivity.

ABSTRAK

Penelitian ini menganalisis pengaruh kesenjangan pembangunan sosial-ekonomi di 33 kabupaten dan kota di provinsi Sumatera Utara terhadap angka kemiskinan dari tahun 2019 hingga 2023. Dengan menggunakan analisis data panel, penelitian ini menggabungkan variabel-variabel penting untuk pembangunan provinsi, termasuk infrastruktur pendidikan, angka harapan hidup, akses listrik, PDB per kapita, dan Indeks Pembangunan Manusia (IPM). Kesenjangan kapasitas ekonomi antar kabupaten diukur melalui Koefisien Variasi (CV) dan Indeks Williamson (WI). Hasil penelitian menunjukkan tingginya kesenjangan kapasitas ekonomi di kabupaten-kabupaten tersebut, yang diukur melalui nilai CV dan WI yang tinggi. Di sisi lain, hasil regresi panel menunjukkan bahwa angka kemiskinan di Sumatera Utara terutama dipengaruhi oleh perbedaan struktural dan jangka panjang antar kabupaten, yang diukur dengan korelasi intrakelas yang sangat tinggi (rho 0,99). Pengaruh negatif angka harapan hidup, akses listrik, dan PGB terhadap angka kemiskinan menunjukkan bahwa peningkatan prestasi pembangunan manusia dan infrastruktur merupakan faktor yang sangat penting dalam mengatasi kemiskinan. Sebaliknya, PDB dan jumlah sekolah hanya memiliki dampak kecil, menunjukkan bahwa pertumbuhan ekonomi dan pengembangan infrastruktur pendidikan tidak secara langsung terkait dengan pengurangan kemiskinan kecuali jika disertai dengan peningkatan kualitas dan inklusivitas.

INTRODUCTION

Regional growth plays a key role in fairer economies - especially in places like Indonesia. Outside big cities, say North Sumatra, gains are not shared equally among towns or districts. Though hubs like Medan enjoy stronger roads and jobs, plenty of rural spots still struggle to reach schools, clinics, or even clean water. This gap shows how tough it is to turn expansion into real benefits for everyone (Todaro & Smith, 2020).

Learning plays a big role in creating gaps between people because it builds skills, sparks new ideas, doesn't always move farming societies toward service or factory work evenly, yet still helps folks reach personal aims. The number and standard of places like colleges, classrooms, training hubs shape how well students do, how much workers produce, along with future money outcomes - according to MO John (2024). Even though the state sets aside 20% of its spending plan for schooling, guarantees it as everyone's basic need, unequal chances and differences in learning conditions continue. Where you live, your background, financial status makes these divides worse as stated by Putri D (2025).

In places across North Sumatera, how people live ties closely to where they're from - economic strength varies, seen through HDI numbers or income per person; meanwhile, things like how long folks tend to live give clues about health care quality. Electricity access hints at whether basics are covered - or missing entirely. Over time, gaps in these areas shape who stays poor, since uneven progress hits some communities harder than others (Fahmi, 2021). Though parts of the region have cut down on poverty, nearby districts haven't caught up yet, revealing a patchy picture of growth (BPS, 2023).

It is true that there are continues regional development programs and fiscal decentralization in Indonesia, the inequality in socioeconomic development still becomes the common issue across the regional areas and the cities. Previous research on inequality and poverty in Indonesia has been more concerned with national trends or cross provincial comparison (See, for example, Todaro & Smith 2020; Putri 2025). These studies confirm that disparities in education and infrastructure lead to poverty persistence. Yet they often treat provinces as homogeneous units and ignore the intra-district variations within them, which in some cases can exacerbate inequalities.

About North Sumatra region per se, the existing studies that include both education infrastructure, life expectancy, electricity access and GRDP per capita on poverty level at district or city level is very limited. Most extant studies individually and/or descriptively explore these variables without employing panel data econometric methodologies that control for both spatial and temporal variations.

This study responds to this gap and uses panel data econometric models (period 2019–2023) for a sample of 33 districts/cities throughout province of North Sumatra, based on multiple indicators of regional development—education, health, infrastructure and economy—to investigate the collective and individual impact toward poverty reduction. This perspective allows to have a more nuanced view of inequality and welfare differences, at the sub-provincial level.

THEORETICAL BACKGROUND

Regional Development Inequality and Poverty

Inequality in regional development and poverty has long been a core focus area within the topic of development economics. According to classical development theory, economic development fails to encompass the aim of reducing poverty if there is regional disparity in economic development limited to a few areas (Myrdal, 1957; Todaro and Smith, 2020). In the case of developing nations, regional disparities arise based on the primary endowment, and there can be a poverty trap in the other areas.

The idea of regional inequality focuses on the differences in the level of income as well as the availability of basic services in a region. According to the theory of cumulative causation, regions that have advanced economic development will be able to attract more capital, human capital in terms of skills, as well as infrastructure (Myrdal, 1957). This will widen the gap between regions since underdeveloped regions will be left marginalized (Capello & Cerisola, 2021). This leads to a situation where poverty becomes embedded in a region as opposed to being in cycles of change over time.

Decentralization policies in the Indonesian setting have led to greater district autonomy, yet disparities in fiscal ability and infrastructure between districts are contributing factors in diverse development patterns (Capello & Cerisola, 2021). These indicate that the mitigation of poverty is neither solely contingent on general economic growth nor solely on macroeconomic development patterns(BPS, 2023).

Human Development Theory and Poverty Reduction

The Human Development Theory proposed by Amartya Sen (1999) suggests that development is essentially the enhancement of capabilities that people enjoy. Poverty would then be understood as the lack of basic capabilities that relate to health, education, and living standards. The Human Development Index (HDI) takes all this into consideration and provides an overall Index that takes into account life expectancy, education, and income. The results have shown that enhancements in human development metrics have a significant correlation with a decrease in the levels of poverty.

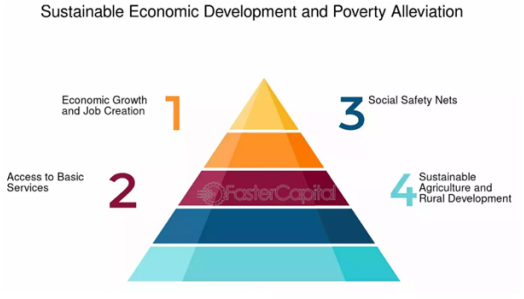


Figure 1. Conceptual Framework of Sustainable Economic Development and Poverty Alleviation

This picture highlights the interlinking aspects of economic growth, the availability of necessary services, social safety nets, as well as sustainable public-private development towards the eradication of poverty. Economic growth and employment are the base layer, but it has to be paired with equal opportunities for necessary services such as education, healthcare, and infrastructure. Social safety nets serve as a stabilizing factor, protecting the vulnerable sections during economic fluctuations, while sustained public-private development provides long-term economic stability. This approach holds the view that poverty reduction can be most successfully implemented when economic growth is supplemented by social protection strategies

along with sustainable development.

Good life expectancy indicates effective healthcare and nutrition conditions that contribute towards higher productivity and wages. Education raises competency levels and an ability to adapt to changes in the economy. Basic infrastructure promotes the well-being of families and contributes to effective economic engagement (UNDP, 2020; Jagódka & Snarska, 2023). By region, the differences in human development can often account for the seemingly disparate rates of poverty (Sen, 1999; Todaro & Smith, 2020), given that districts with comparable average incomes may vary considerably in the prevalence of poverty. This has led to the realization that poverty alleviation policies focusing on human capital and provision of basic services.

Infrastructure Development and Welfare Outcomes

These are more successful than policies focused purely on income. Infrastructures have an important intermediary role in the relationship between growth and poverty. Access to electricity, transport, water, and sanitation lowers production costs, improves the welfare of people, and helps in accessing education and health services. Infrastructures are viewed as public goods, resulting in positive externalities, especially in the rural and developing parts of the country (Bloom, Canning, & Sevilla, 2004).

The issue of access to electricity stands out particularly as a core element of modern economy functions. It enhances productivity in households, facilitates small businesses, and uplifts learning standards by providing better learning environments, as well as providing improved access to information technology. In areas that receive less investment in terms of infrastructural development, there tends to be high persistence of poverty. However, ensuring that this expansion contributes to a decrease in poverty levels might be a challenge if this expenditure is not well distributed and, for that matter, if it continues to be implemented in already developed areas.

Economic Growth, GRDP per Capita, and Inclusive Development

According to the theory on economic growth from a Neoclassical school, it can therefore be assumed that a higher Gross Regional Domestic Product per-capita measure represents a higher average living standard. However, it should be noted that there is mounting support for the reality that economic growth does not necessarily lead directly to poverty reduction, especially when the economic growth is capital intensive or sectoral driven (Ravallion, 2001).

In a region whose growth is fuelled by resource extraction industries or capital-intensive sectors, the benefits of improved income may accrue mostly to a small part of the population, while poverty may not have changed much. This highlights the difference between growth-induced poverty reduction and inclusive growth in trying to achieve poverty reduction (OECD, 2015). Thus, GRDP per capita by itself appears to be inadequate in accounting for changes in and situations of poverty without taking into account the regional economy structure and its ability to provide employment and earning opportunity for the poor.

Education Infrastructure and Poverty Dynamics

Education infrastructure, proxied by school access, is an important input within human

capital development (Becker, 1964). In theory, improved access to education infrastructure should lead to greater attainment of education, improved productivity in the labor market, and a decrease in intergenerational poverty. It is, however, important to note that education infrastructure is not necessarily a determinant of education quality (Hanushek & Woessmann, 2012; John & Aliyu, 2024).

In areas where there is no expansion of education infrastructure that is accompanied by an improvement in teaching quality and relevance and accessibility to the disadvantaged sections of the population, it could have ambiguous effects on poverty reduction efforts. This explains why some studies have found that there was no correlation between the number of schools and poverty levels. Hence, education infrastructure should be perceived more as an enabling factor that contributes to, but does not facilitate directly, poverty alleviation (Hanushek, 2003; Banerjee et al., 2020; World Bank, 2019).

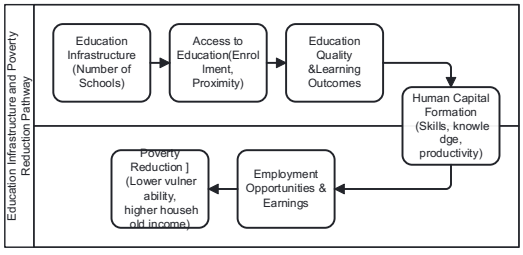


Figure 2. Conceptual Pathways Linking Education Infrastructure and Poverty Reduction

Figure above explains the conceptual framework through which infrastructure in education affects poverty alleviation. Even though better access to facilities means better availability of education, it is mainly through an indirect process such as quality, skills generation, and labor market performance that it affects poverty alleviation.

Conversely, poor quality and a lack of job opportunities may offset the effect of infrastructure in education on poverty alleviation**.**

Panel Data Perspective and Structural Poverty

From a methodological perspective, the analysis of panel data facilitates the distinction between time-varying and time-invariant effects on the regional level. Structural, district-specific factors, including territory, developmental dynamics, and the quality of institutions, typically have a dominant time-invariant influence on poverty outcomes (Sachs, 2005). The high intraclass correlation coefficient (rho) promotes the argument that poverty variability is determined by structural differences between districts, not fluctuations in time (Baltagi, 2008). This approach is also consistent with structural theories of poverty, according to which poverty is sustained by historical disadvantaged regions that cannot be fully remedied by policy actions limited in time horizons. For this reason, analysing dynamics of poverty requires an analytical framework able to account for spatial disparities and dynamics over time, like panel data models.

METHODOLOGY

For this research, the approach is quantitative and observational, using panel data analysis techniques in exploring the indicators of development and the degree of poverty experienced by the districts and cities in the Province of North Sumatra between 2019 and 2023. The choice of panel data is preferred because it encompasses both the cross-sectional, or geographical, dimension and the time series dimension, making it easier to model development using the panel approach because of its ability to provide superior results

or consistency in its results unlike other types of data structures (Gujarati & Porter, 2012).

The research includes 33 districts and municipalities in one of Indonesia's most socio-economically diverse provinces, North Sumatra. The province has high degree of income inequality, Human Development Index and access to basic infrastructure. Nehravnia et al (2007) argue that the measurement of Intra-provincial inequality and its impact on poverty can be an appealing case. The study period (2019–2023) was selected to reflect current trends following the reforms in decentralization, and to capture both pre- and post-pandemic changes in poverty and development indicators.

Table 1. Definition and Measurement of Variables

Variable	Definition	Indicator/ Proxy	Unit	Data Source
Poverty Rate (Y)	Percentage of the population whose per capita expenditure falls below the poverty line	Percentage of poor population	%	Statistics Indonesia (BPS), *Poverty and Inequality Statistics*
Number of Schools (X1)	Total number of formal educational facilities available in the region	Total number of schools (primary, junior high, senior high)	Units	Statistics Indonesia (BPS), *Education Statistics*
Life Expectancy (X2)	Average estimated lifespan of the population at birth	Life expectancy at birth	Years	Statistics Indonesia (BPS), *Human Development Index*
Electricity Access (X3)	Availability of electricity infrastructure for households	Percentage of households with electricity access	%	Statistics Indonesia (BPS), *Welfare Statistics / Susenas* (National Socio-Economic Survey)
GRDP per Capita (X4)	Value added of goods and services produced per capita	GRDP per capita at constant prices	Rupiah/person	Statistics Indonesia (BPS), *GRDP of Regencies/Municipalities by Industry*
Human Development Index (X5)	Composite measure of human development covering health, education, and standard of living	HDI score	Score (0–100)	Statistics Indonesia (BPS), *Human Development Index*

Data Analysis Techniques

a) Descriptive Statistical Analysis

The mean, dispersion and distribution of individual-level characteristics by district over time were described using descriptive statistics. This section presents a picture of the pattern of socio-economic development in North Sumatra and indicates differences between districts that are concerned.

b) Measurement of Inequality

Inter-district inequality was assessed using the Williamson Index (WI) and the Coefficient of Variation (CV).

$$W = \sqrt{\frac{\sum_{i=1}^{n} = \mathrm{fi}(\mathrm{Yi} - \tilde{Y})2}{n\tilde{Y}^2}}$$

where $Y_i$is the GRDP per capita of district *i*,

$f_i$is the population weight, $\bar{Y}$is the provincial average GRDP per capita, and *n* is the number of districts. The index ranges from 0 (perfect equality) to 1 (maximum inequality).

$$\mathrm{CV} = \frac{\sigma}{\mu}$$

where $\sigma$is the standard deviation and μ is the mean. A higher CV indicates greater inter-district disparity.

c) Panel Data Regression Analysis

The Econometric model is estimated using the FEM (Fixed Effect Model) and REM (Random Effect Model), these models are used to capture the relationship between poverty levels and development indicators.

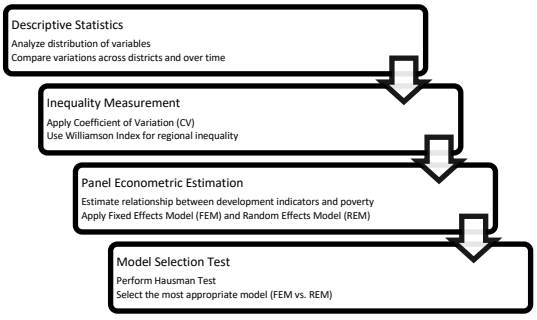


Figure 3 Empirical Analysis Framework

$$PS_i = \beta_0 + \beta_1 EO_i + \beta_3 SC_i + \varepsilon_i \quad \text{..... 1}$$

Dimana PS adalah *pricing strategy*; EO adalah *entrepreneurial orientation*; SC adalah *social capital*; β_1, β_2 dan β_3 adalah parameter estimat; ε adalah variable pengganggu; *i* adalah perusahaan ke *i.*

Econometric Models

The general econometric specification is expressed as follows:

$$POVit = \alpha + \beta_1 SCH_{it} + \beta_2 LE_{it} + \beta_3 ELEC_{it} + \beta_4 GRDP_{it} + \beta_5 HDI_{it} + \beta_6 Pop_{it} + \mu i + \epsilon_{it}$$

Where:

- POV_{it}: Poverty rate in district *i* at time *t*
- SCH_{it}: Number of schools
- LE_{it}: Life expectancy
- $ELEC_{it}$: Electricity access
- $GRDP_{it}$: GRDP per capita
- HDI_{it}: Human Development Index
- $\beta_6 Pop_{it}$: Population
- μ_i: Unobserved district-specific effect
- ϵ_{it}: Random error term

Model Selection and Diagnostic Tests

To identify the best and suitable panel data approach:

- The Chow Test was used to decide on either Pooled OLS or Fixed Effects models.
- The Breusch Pagan LM Test helped choose Pools OLS or Random Effects by assessing variance structure using statistical criteria rather than assumptions. In this situation, due to the presence of strong time-invariant effects and a large intraclass correlation coefficient, the Random Effects Model seems superior for managing structural heterogeneity.
- The Hausman Test was used to decide between FEM or REM - whichever fit better.
- A high Hausman value suggests FEM fits best - supported by test results.

- Tests for multicollinearity, along with heteroskedasticity and autocorrelation, were carried out to check the reliability of regression outcomes.

EMPIRICAL FINDINGS/RESULT

Descriptive Statistics

Table 1 presents the descriptive statistics of all variables that are used in the panel analysis from all 33 districts/cities in North Sumatra from 2019-2023 (165 observations)

Table 2. Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Poverty Rate (%)	10.87	5.64	3.12	32.45
Number of Schools (units)	402.3	215.6	89	1,124
Life Expectancy (years)	72.98	1.42	69.85	75.91
Electricity Access (%)	93.4	6.8	72.1	99.8
GRDP per Capita (Rp, constant)	52,310	41,275	12,944	243,118
GRDP per Capita (ln)	10.82	0.64	9.47	12.40
Human Development Index	71.24	4.93	60.85	82.31

the descriptive statistics show the substantial heterogeneity across districts. Poverty rates are disparate, implying the existence of great spatial inequality rather than time trends. Likewise, GRDP per capita and HDI display great disparagements, symbolizing divergent economic capabilities and human development accomplishment at the district level. On the other hand, life expectancy and electric access display moderate disparities, but minimum values emphasize gradual deprivation at the sub-national level.

Interdistrict Inequality Measures

For inter-district inequality, the Coefficient of Variation (CV) and Williamson Index (WI) were employed using GRDP per capita.

Table 3. Inter-District Inequality Measures

Measure	Value	Interpretation
Coefficient of Variation (CV)	0.452	High economic dispersion
Williamson Index (WI)	0.47	Severe regional inequality

Both inequality measures show wide disparities in economic capability between districts. With a CV of 0.452, it can be ascertained that there exists wide variation in GRDP per capita. Further, the Williamson Index of about 0.47 supports the fact that there exists substantial spatial inequality. This indicates that economic development in North Sumatra is extremely imbalanced, with few districts driving economic development.

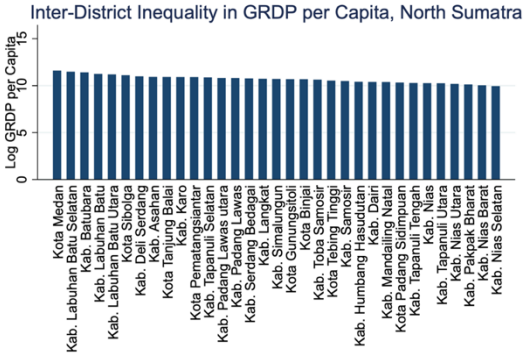


Figure 4. Inter-District Inequality in GRDP per Capita, North Sumatra (2019–2023)

The above graph shows the average natural logarithm of GRDP per capita for the period

2019–2023 for both districts and cities in North Sumatra. It clearly indicates a wide gap in the economic ability of the regions, which shows that economic activities are dominated by a few districts while the rest trail far behind. The graph further confirms the inequality observed by the Coefficient of Variation and Williamson Index.

Panel Data Regression Method

Table 4. Random Effect and Panel Regression Results

Variable	Coefficient	Std. Error	z-stat	Significance
Number of Schools	0.00002	0.00034	0.07	Not significant
Life Expectancy	−0.160	0.021	−7.45	***
Electricity Access	−0.436	0.083	−5.26	***
GRDP per Capita (ln)	−0.081	0.064	−1.27	Not significant
Human Development Index	−0.293	0.047	−6.23	***
Constant	45.72	—	—	—

The Panel Regression analysis was conducted employing both Fixed Effects and Random Effects models. On the criteria of models selection tests Chow Test, Breusch Pagan LM Test, and Hausman Test, it was revealed that the Random Effects Model was superior.

Diagnostics

- Observations: 165
- Groups: 33
- Wald Chi-Square: Significant ($p < 0.001$
- Intraclass correlation coefficient (ϱ): 0,99
- Sig: *** = $P < 0.01$

The regression analysis indicates that there are more substantial, negative connections between life expectancy, the availability of electricity, and the Human Development Index, and poverty. This suggests that, improved health, basic infrastructure, and levels of human development are associated with, and correspond to low poverty levels.

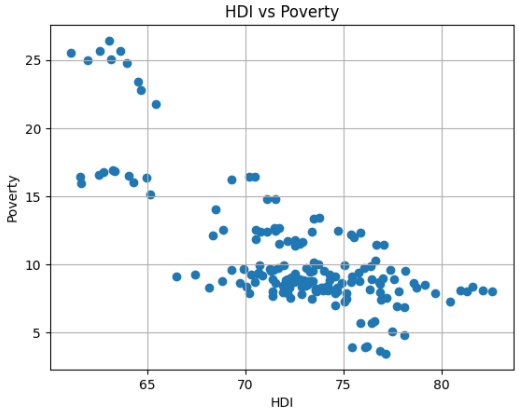


Figure 5. Relationship Between Human Development Index and Poverty Rate

On the other hand, the per capita GRDP data does not present a clear and statistically significant relationship to the levels of poverty. This indicates that economic development in North Sumatra may not be inclusive enough, likely due to the dominance of capital-intensive and enclave sectors, which do not generate much employment for the poor. Similarly, the schools data, by itself, does not help much in facilitating the poor, indicating that improvements to education infrastructure alone do not necessarily lead to a reduction in levels of poverty.

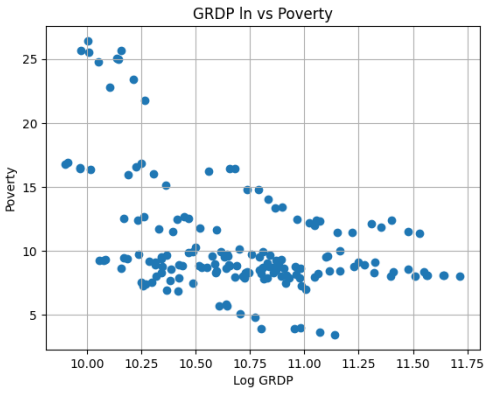


Figure 6. Relationship Between GRDP per Capita and Poverty Rate

What is most striking is the large intraclass correlation coefficient (ϱ of approximately 0.99), indicating that it is the differences in poverty that are attributable mainly to the underlying traits of the districts and not so much to any fluctuations along the way. What this suggests is indeed the structural nature of poverty in North Sumatra.

Discussion

The findings indicate that the study reveals an unmistakable trend: the poverty situation within North Sumatra is mostly influenced by very deep structural differences between districts and not by fleeting cyclical fluctuations of the economy. A nearly perfect intraclass correlation coefficient (ϱ=0.99) indicates that almost all fluctuations within the poverty situation can be attributed to time-invariant characteristics of districts, for instance, structural differences in terms of existing disparities in terms of infrastructures, the role of institutions, accessibility of different areas, and development trajectory. Structural theories of poverty would attribute this situation and its durability to structurally disadvantaged areas locking themselves onto the wrong growth paths.

Regional Inequality and Structural Poverty

It is clear from the figures that Coefficient of Variation and Williamson Index values are large, implying that economically stronger districts trap their might in few districts, while others, particularly rural ones, trail much behind (Myrdal, 1957; Sachs, 2005). This has been represented well in the process of cumulative causation, whereby richer districts continue to attract stronger flows of FDI, human capital, as well as infrastructure spending, hence increasing the developmental differences. It implies that, in terms of the development experience of Indonesia, administrative autonomy extended to districts has no direct role in equalizing development.

Despite the implementations of decentralization policies that aim to ensure a smooth growth process, the disparities in the budget capacity among the regions are enormous. This means that those regions which have a stronger economy are also able to utilize the funds allocated by the government, as well as attract investments, compared to the weaker ones that continue to face challenges. This confirms that the poverty condition in North Sumatra goes beyond having less income.

Human Development as Key Channel of Poverty Reduction

The existence of statistically significant and negative correlation values between life expectancy, the HDI, and poverty highlights the importance of human development in determining outcomes. The results match the human capability approach to poverty, which considers poverty a deprivation of basic capabilities rather than a lack of income (Sen, 1999). The results also show that a region with higher health and human development

performance has a lower poverty rate, even after considering income and infrastructure variables.

This implies that enhanced access to healthcare, better nutrition, as well as education quality, produce productivity multipliers and household welfare multipliers as stated by Ravallion (2016). On the other hand, it becomes clear that districts with similar incomes can still perform divergently on poverty rates. From the policy formulation literature, the above findings amplify the role of investing in human capital in programs addressing poverty, in accordance with development theories postulated by UNDP that are empirically valid in developing countries (UNDP, 2020).

Infrastructure Access and Welfare Outcomes

Electrical access is revealed as an important factor in the reduction of poverty, and this is an indication that infrastructure can act as an enabler in terms of economic participation (Calderón & Servén, 2010). Access to electricity improves productivity in homes and enables the establishment of micro-enterprises and SMEs. The fact that poverty can still prevail in regions in which the access rate for electricity is low indicates an important constraint in terms of infrastructure.

However, it is not sufficient to rely only on infrastructure development as far as distribution is considered whether it is uneven or channeled to an already developed area. This conclusion can be supported by World Bank evidence, which shows that infrastructure development must be balanced and in partnership with human development to make poverty reduction possible (World Bank, 2019).

Economic Growth, GRDP Per capita, and Non-Inclusive Development

It is contrary to the general paradigms in growth-poverty relationships, as GDP per capita does not have statistical significance in terms of alleviating poverty (Ravallion, 2001). It merely means that the growth process within the province has not been inclusive. There also appears to be a dominating growth orientation toward capital-intensive industries like natural resources as well as large-scale industries, most of which provide minimal employment opportunities for impoverished people.

As a result, an average income increase does not necessarily ensure overall growth in welfare. This supports the argument that growth-poverty reduction can be distinguished from inclusive growth by its emphasis on both the level of growth, but also the type of economic activities that are taking place (OECD, 2015). Without employment-intensive industries or improved income distribution, growth can occur alongside poverty.

Education Infrastructure and Limited Poverty Impact

The very low coefficient of the schools measure indicates that having a certain number of schools does not have any significant effect on poverty alleviation by itself. Though the presence of schools is a prerequisite for creating human capital, it will not have any bearing on their own on improving educational achievement or skill attainment or even relevance to the job market. When quality education or job market opportunities are not on offer in a particular area, opening more schools may not have any effect on poverty levels (Hanushek&Woessmann, 2012; Banerjee et al., 2020).

What this finding highlight is that solving the problem of exploding enrollment will require that policymakers shift their focus away from primarily extending size to improving quality and better meeting the needs of the labor market. There is also the need to integrate approaches that link education to employment and economic diversification (World Bank, 2019).

Policy Implications

Overall, the results suggest that a comprehensive and geographical approach is required for effectively addressing poverty in North Sumatra. An economic or infrastructure development-oriented approach by itself may result only in limited progress in poverty reduction without simultaneous efforts in human development and capability building. Upgrading health and education as well as equitable distribution of infrastructure in all districts is required to break the cycle of poverty trap.

In addition, the government can implement decentralization policies and, at the same time, facilitate measures that can improve the financial and administrative capability of the slower-performing regions. Otherwise, the gap between the regions may continue, which can affect the outcome of poverty reduction initiatives.

CONCLUSION

This research analyzed the factors that contribute to poverty in 33 districts and cities in North Sumatra from 2019 to 2023. The result supports the presumption that poverty trends in the province depend more on interdistrict variations than on interannual variations. This is since the intraclass correlation coefficient value from the Random Effects Model is very high, meaning that 99 percent of the poverty difference can be regarded as being between districts.

The results obtained from the descriptive analysis and the measures of inequality further support the above observation. The C.V. values for GRDP and the WI values indicate that there is considerable disparity between the economic conditions of the districts. The values denote that the development gap between economically sound districts and those with underdeveloped infrastructure and human capital is considerable.

From the results, it can be observed that the econometric relationships among life expectancy, HDI, access to electricity, and poverty are negative. This implies that enhancements in human development factors, especially health aspects, and extension in the realm of infrastructural facilities can play an important role in the alleviation of poverty. However, the results also reveal that the number of schools does not possess a strong association, proving that mere increments in the provision of sports facilities do not necessarily lower the levels of poverty. In addition, GRDP per capita does not influence poverty levels because the present structure of inclusivity is not optimal.

Based on model selection tests, the suitable model is the Random Effects Model, and robust estimation has proved the validity of key results. Overall, the conclusion of this study is that poverty reduction in the province of North Sumatra needs a holistic approach in improving human development areas, balanced development of infrastructure, and addressing structural gaps in districts.

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