Harmony Management: International Journal of Management Science and Business

E-ISSN: 3063-6248
P-ISSN: 3048-4189

Research Article

Analysis of the Effect of Unemployment Rate, Economic Growth, and Human Development Index on Poverty in Districts/Cities of North Sumatra Province

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Abstract: Poverty is a complex and multidimensional problem. It can be characterized as a condition in which there is a lack of aspects related to the quality of life. North Sumatra Province is known as one of the richest provinces in Indonesia with abundant natural resources and agricultural products such as petroleum, natural gas, palm oil, rubber, and forest products used as industrial materials. However, it still ranks among the provinces with the highest poverty rates in Indonesia. This study aims to analyze the effect of unemployment rate, economic growth, and Human Development Index (HDI) on poverty in 14 districts/cities of North Sumatra Province during the 2016–2023 period. The analytical method used is panel data regression with the Fixed Effect Model (FEM) approach. The results of this study indicate that simultaneously, the three independent variables have a significant effect on poverty. Partially, unemployment has a positive and significant effect, while economic growth and HDI have no significant effect on poverty.

Keywords: Unemployment; economic growth; human development index; Poverty; Panel Data Regression.

1. Introduction

Indonesia is a country that is still classified as a developing nation, and poverty remains a major issue that attracts significant attention (Vincent, 2009). As a developing country, poverty represents a low standard of living, characterized by a lack among certain groups when compared to a general standard of life. Poverty, on the other hand, can be defined as the scarcity of basic human needs or the inability of individuals or communities to obtain the basic necessities required for survival (Abdullahi, 2011)).

Furthermore, the problem of poverty directly affects the level of health, quality of life, morality, and self-esteem of those categorized as poor. This issue is complex because it is not only related to low income and consumption but also to limited access to education, healthcare services, and participation in development. Development is expected to bring improvement in various aspects social, economic, and institutional. A country's development is considered successful when poverty decreases (Setiyorini, 2017).

As a multidimensional issue, poverty requires comprehensive handling that encompasses various aspects of community life. Poverty alleviation efforts are carried out to realize the national goal of creating a just and prosperous society (Royat, 2015). There are two main strategies for poverty reduction: protecting poor families and groups through the fulfillment of needs in various sectors, and providing training to the poor to enable them to prevent the emergence of new poverty. One of the persistent causes of poverty is the low quality of human resources. Efforts to reduce poverty and inequality include improving human resources and increasing income levels (Yusuf and Sumner, 2015).

Poverty can be characterized as a condition in which there is a deficiency related to the quality of life (Jayanti & Sutrisna, 2021). The term poverty arises when an individual or group is unable to meet the minimum standard of economic welfare required for a certain level of living (Estrada & Wenagama, 2020). The causes of poverty can be divided into three types: natural poverty, structural poverty, and cultural poverty. Natural poverty is caused by

Received: October 16, 2025;
Revised: October 28, 2025;
Accepted: October 31, 2025;
Available: November 03, 2025;
Curr. Ver.: November 03, 2025;

inadequate resources, either natural or human resources. As a result, with low human resource capabilities, communities are unable to explore natural resources to meet their living needs. Furthermore, the availability of natural resources may not support development for the purpose of improving living conditions.

Structural poverty occurs due to institutional arrangements or social status within a community that bind individuals and limit their opportunities due to weak access to power. The last factor is cultural poverty, which arises from local lifestyles, habits, and traditions. Excessive spending on traditional ceremonies that reach irrational levels should instead be invested or saved for future needs. Nationally, the number of poor people in Indonesia has fluctuated from 2018 to 2023. The following figure shows the data on the number of poor people in Indonesia:

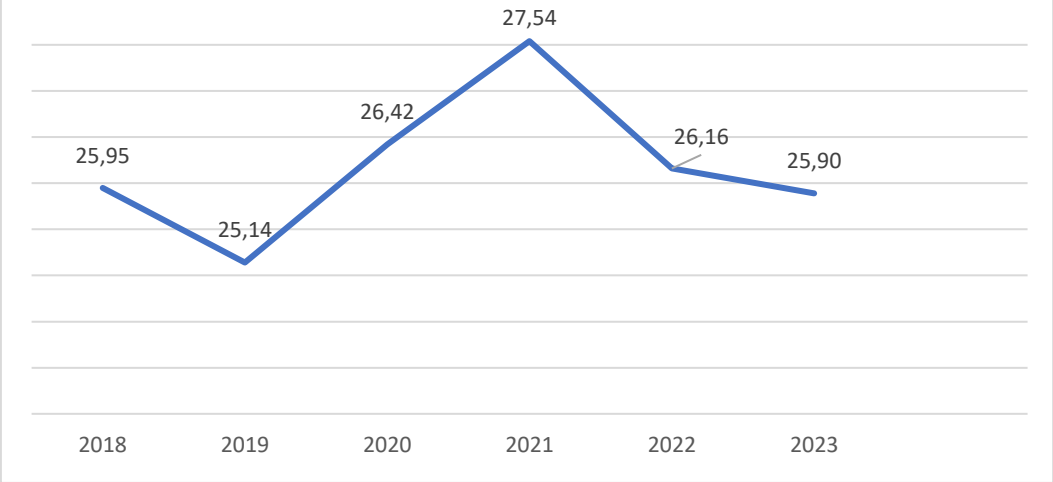

Figure 1. Number of Poor People in Indonesia, 2018–2023 (in Millions).
Source: Central Statistics Agency (BPS), 2023.

Based on data from the Central Bureau of Statistics (BPS), the number of poor people in Indonesia in September 2021 was recorded at 27.54 million people. The BPS data show that the number of poor people increased by approximately 200 thousand. However, compared to the same period in September 2021, the number of poor people decreased by around 140 thousand individuals.

Poor people are defined as individuals whose average monthly per capita expenditure is below the poverty line (GK), obtained from survey samples. The poverty rate released by BPS represents macro-level data derived from the National Socio-Economic Survey (Susenas), showing the percentage of poor people relative to the total population within a region. The following figure presents data on the provinces with the largest number of poor people in Indonesia in 2024:

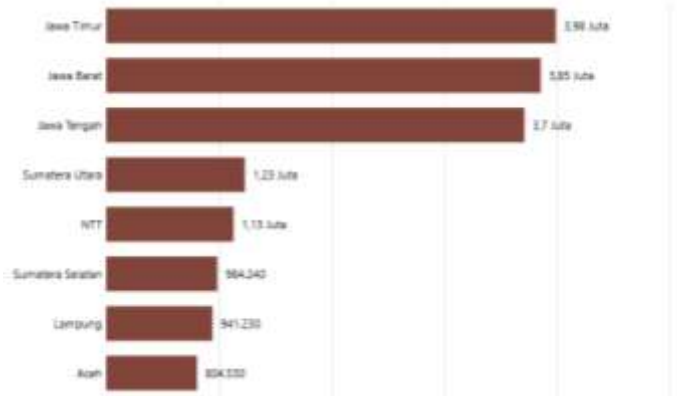

Figure 2. Eight Provinces with the Highest Number of Poor People.
Source: Central Statistics Agency (BPS), 2024.

By province, East Java ranks first as the province with the highest number of poor people in Indonesia, amounting to 3.98269 million in March 2024. West Java ranks second with 3.84867 million, followed by Central Java with 3.70433 million. The top three provinces with the highest poverty numbers are all located on Java Island. North Sumatra and East Nusa Tenggara (NTT) rank fourth and fifth, with 1.228010 million and 1.12757 million poor people, respectively, as of March 2024. Subsequently, South Sumatra (984.24 thousand), Lampung (941.23 thousand), and Aceh (804.53 thousand) occupy the sixth to eighth positions.

North Sumatra Province is known as one of Indonesia's richest provinces, with abundant natural resources and agricultural products such as petroleum, natural gas, palm oil, rubber, and forest products used as industrial raw materials. However, North Sumatra is also the fourth province with the highest number of poor people in Indonesia, totaling 1.228010 million (BPS, 2024). Although this percentage is not the highest and remains below the national rate, based on BPS data in March 2024, North Sumatra still ranks among the top eight provinces with the largest poor population in Indonesia and has the highest poverty level among provinces on Sumatra Island. The following figure presents data on the number of poor people in North Sumatra Province:

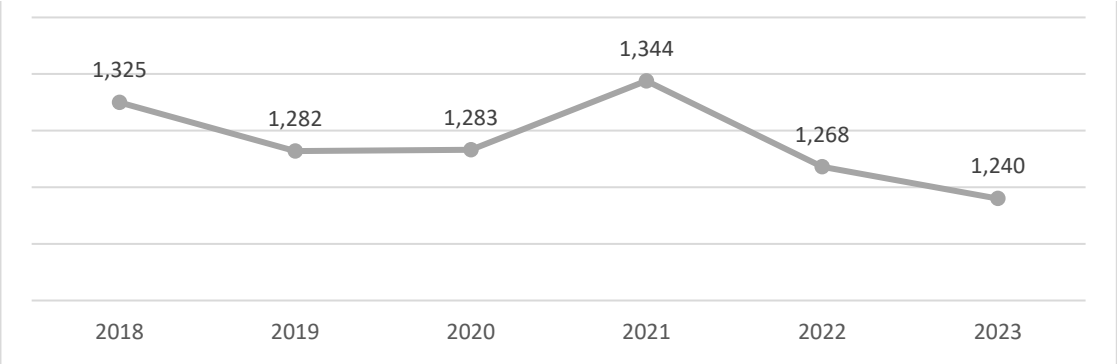

Figure 3. Number of Poor People in North Sumatra, 2018–2023 (in Thousands).
Source: Central Statistics Agency (BPS), 2023.

Based on data from the National Socio-Economic Survey (Susenas) conducted by BPS, the number of poor people in North Sumatra in 2018 was 1.325 thousand individuals, which decreased to 1.282 thousand in 2019. However, this figure slightly increased to 1.283 thousand in 2020. The number of poor people then declined to 1.268 thousand in 2022 and further decreased to 1.240 thousand in 2023, indicating a consistent downward trend despite the remaining challenges in poverty reduction.

One of the key indicators of development success that can serve as a macro benchmark is economic growth, which is reflected in changes in Gross Regional Domestic Product (GRDP) per capita within a region. GRDP is defined as the total value of final goods and services produced by all economic units in a region. The higher the economic growth, the better the regional economic activity. Regional economic growth is reflected in the GRDP growth rate at constant prices (Todaro & Smith, 2011).

The GRDP of North Sumatra Province is used to observe economic growth trends over time, providing a clear direction of regional economic development. Generally, GRDP is calculated based on two approaches by industry and by expenditure using constant prices. The total GRDP represents the sum of all value added generated by residents within a specific period (Kuncoro, 2001). According to BPS data, the GRDP of North Sumatra Province can be seen in the following table:

Table 1. Gross Regional Domestic Product (GRDP) per Capita at Constant 2010 Prices in North Sumatra Province (Percent).

Year	GRDP (Percent)
2018	5.18
2019	5.22
2020	-1.07
2021	2.61
2022	4.73
2023	5.01

Source: Central Bureau of Statistics (BPS)

From Table 1, it can be seen that the economic growth of North Sumatra tends to decline, and in 2020 the province experienced an economic contraction of -1.07 percent compared to the 2019 achievement of 5.22 percent. This occurred due to the outbreak of the Covid-19 pandemic that year, which caused many companies to shut down their operations to implement social distancing policies aimed at avoiding mass gatherings. Consequently, economic growth decreased sharply, and many workers became unemployed, leading to an increase in poverty during that period.

The higher the number and percentage of poor people in a region, the greater the development burden becomes. Therefore, development is considered successful when the number and percentage of poor people decrease. For this reason, the government has implemented various programs to reduce poverty; however, it is recognized that poverty alleviation efforts have not yet achieved optimal results and remain below expectations. The complexity of poverty issues is caused by many factors that affect its persistence. There are various factors that are believed to have a significant effect on poverty conditions, although the poverty rate has shown a gradual decline from year to year (BPS, 2009).

Table 2. Comparison of Poverty Rates in Districts/Cities of North Sumatra Province in 2018–2023 (Percent).

Regency /City	2018	2019	2020	2021	2022	2023	Average
North Nias	25.56	24.99	25.07	25.66	23.40	21.79	24.41
West Nias	26.72	26.72	25.69	26.42	24.75	22.81	25.32
Gunungsitoli	18.44	16.23	16.41	16.45	14.81	14.78	16.19
Nias	16.37	15.94	16.60	16.82	16.00	15.10	16.14
South Tapanuli	9.16	8.60	8.47	8.80	8.07	7.01	8.35
Padang Lawas	8.41	8.28	8.37	8.69	8.05	7.89	8.28
Simalungun	9.31	8.81	8.46	8.81	8.26	7.87	8.59
South Labuhanbatu	10.00	8.94	8.34	8.53	8.09	8.06	8.66
North Tapanuli	9.75	9.48	9.37	9.72	8.93	8.54	9.30
North Labuan Batu	10.12	9.57	9.53	10.02	9.09	9.08	9.57
Sharpening	10.25	9.68	9.04	9.35	8.64	7.21	9.20
North Padang Lawas	10.06	9.60	9.70	9.92	8.94	8.79	9.50
Labuhan Batu	8.61	8.44	8.44	8.74	8.26	7.99	8.41
Deli Serdang	4.13	3.89	3.88	4.01	3.62	3.44	3.83

Source: Central Bureau of Statistics (BPS) of North Sumatra Province

Table 2 shows that the highest average poverty rate is found in West Nias District, at 25.32%. This condition occurs because the region still faces challenges in accessing infrastructure, education, and healthcare, all of which affect community welfare (BPS, 2022). Therefore, poverty alleviation strategies in the area are focused on infrastructure development, improving access to education, and promoting local-based economic empowerment to achieve sustainable economic growth. Meanwhile, the lowest poverty rate is found in Deli Serdang District, at 3.83%. This is due to the government's active efforts to develop the plantation, agriculture, and industrial sectors, which have created more employment opportunities for local residents (BPS Deli Serdang, 2021).

Another factor that has an effect on the poverty rate is unemployment, which is a highly complex and crucial issue, as it is linked to several economic indicators such as economic growth, inflation rate, and poverty. Unemployment is considered an obstacle to social progress and can lead to undesirable consequences such as poverty. This makes reducing unemployment one of the main objectives of development in developing countries (Aiyedogbon and Ohwofasa, 2012). Unemployment is a serious problem faced in the ongoing process of human resource development. A high unemployment rate leads to decreased prosperity and welfare of the community. Indicators such as poverty and unemployment are

often used to measure the level of public welfare. Achieving prosperity and well-being for all citizens remains one of the nation's primary goals.

Table 3. Comparison of Unemployment Rates in Regencies/Cities of North Sumatra Province in 2018–2023 (percent).

Regency /City	2018	2019	2020	2021	2022	2023	Average
North Nias	2.40	3.07	4.54	3.00	2.59	2.57	3.03
West Nias	1.23	1.63	1.71	0.74	0.53	0.80	1.11
Gunungsitoli	5.92	5.59	5.94	4.80	3.65	3.67	4.93
Nias	1.62	1.09	3.49	3.12	2.81	2.31	2.41
South Tapanuli	5.28	4.17	4.42	4.00	3.65	3.49	4.17
Padang Lawas	4.10	4.24	4.11	4.07	5.90	5.57	4.67
Simalungun	5.10	4.39	4.58	4.17	5.51	5.35	4.85
South Labuhanbatu	4.79	4.80	4.90	4.71	3.15	3.43	4.30
North Tapanuli	1.42	1.33	2.94	1.54	1.07	1.03	1.56
North Labuan Batu	5.67	5.84	6.82	5.71	3.75	4.84	5.44
Sharpening	5.26	6.86	7.24	6.39	6.26	6.12	6.36
North Padang Lawas	3.15	3.21	3.11	3.19	4.31	4.42	3.57
Labuhan Batu	6.90	5.70	6.05	5.66	6.90	5.99	6.20
Deli Serdang	7.06	5.74	9.50	9.13	8.79	8.62	8.14

Source: Central Bureau of Statistics (BPS) of North Sumatra Province.

Table 3 shows that the highest unemployment rate, based on the Open Unemployment Rate (TPT) for individuals aged 15 years and above, was recorded in Asahan Regency at 6.36%. This was caused by the imbalance between the number of job seekers and the available employment opportunities. The high unemployment rate especially in certain years such as 2020 during the COVID-19 pandemic worsened the economic conditions and increased poverty levels. Meanwhile, the lowest unemployment rate was found in West Nias Regency at 1.11%. This is because the majority of residents in West Nias work in the informal sector, such as agriculture and plantations. Employment in these sectors generally does not require a high level of education or specific qualifications, making it easier for residents to find work. As a result, the unemployment rate in West Nias tends to be relatively low.

The success of economic development can be seen from the rate of economic growth and the ability to reduce poverty in a country (Agustiani et al., 2022). Economic growth is often considered a key indicator of a nation's progress, measuring increases in production capacity and productivity (Saefulloh et al., 2023). Economic growth reflects the ability of an economy to produce goods and services. The economic growth of a region indicates how far economic activities can generate community income within a certain period (Yanthi & Sutrisna, 2021). The higher the level of economic growth, the better the level of community welfare (Ramadhan & Sulistyono, 2021). If a country fails to achieve continuous economic growth, problems such as poverty may arise (Ningsih & Andiny, 2021).

Table 4. Comparison of Economic Growth in Regencies/Cities of North Sumatra Province Based on Constant Prices in 2018–2023 (percent).

Regency /City	2018	2019	2020	2021	2022	2023	Average
North Nias	4.42	4.65	1.58	2.02	3.03	3.79	3.25
West Nias	4.77	4.82	1.66	2.26	3.01	3.72	3.37
Gunungsitoli	6.03	6.05	0.38	2.25	3.11	3.69	3.59
Nias	4.95	5.04	1.80	2.21	3.06	3.82	3.48
South Tapanuli	5.19	5.23	0.39	3.24	4.78	5.11	3.99
Padang Lawas	5.96	5.64	1.18	3.83	4.61	5.14	4.39
Simalungun	5.18	5.20	1.01	3.70	4.68	5.07	4.14
South Labuhanbatu	5.27	5.35	0.80	3.82	4.74	4.94	4.15
North Tapanuli	4.35	4.62	1.50	3.54	4.25	4.75	3.84
North Labuan Batu	5.20	5.15	0.27	3.83	4.62	4.76	3.97
Sharpening	5.61	5.64	0.21	3.73	4.66	4.87	4.12
North Padang Lawas	5.58	5.61	1.14	3.26	4.12	4.92	4.11
Labuhan Batu	5.06	5.07	0.09	3.85	4.80	5.03	3.98
Deli Serdang	5.15	5.18	-1.78	2.23	4.70	5.34	3.47

Source: Central Bureau of Statistics (BPS) of North Sumatra Province

Table 4 shows that the highest average economic growth occurred in Padang Lawas Regency at 4.39%. This is due to its strong advantages in the tourism, agriculture, plantation, and trade sectors. Historical tourism potential such as Bahal Temple, as well as agricultural and plantation commodities such as palm oil and rubber, serve as the main drivers of the regional economy. Active local trade and adequate road infrastructure also support the economic activities of the community.

One factor considered to contribute to poverty is the quality of human resources, which is reflected in the Human Development Index (HDI) (Ristika et al., 2021). Human resource development can be achieved by improving access to social services, particularly education, as a government strategy to reduce unemployment and enhance welfare. Therefore, an increase in HDI affects the unemployment rate, since humans are not only the object of development but are also expected to become active subjects who contribute to regional progress. Improving the quality of human resources can also influence the unemployment rate (Hidayat, 2020).

The Human Development Index (HDI) is used to measure the level of development in a country by considering three key dimensions: health, education, and a decent standard of living (Simanjuntak et al., 2024). HDI serves as an important indicator for determining how successfully human development has progressed in a particular area (Bhagaskara, 2023). According to Adi Widodo (2011), an increase in HDI suggests an improvement in community welfare. Conversely, a low HDI leads to low labor productivity, which in turn results in lower income levels and a higher number of poor people (Ramadanisa & Triwahyuningtyas, 2022).

Table 5. Comparison of Human Development Index (HDI) in Regencies/Cities of North Sumatra Province in 2018–2023.

Regency /City	2018	2019	2020	2021	2022	2023	Average
North Nias	61.08	61.98	62.36	62.82	63.75	64.64	62.77
West Nias	60.42	61.14	61.51	61.99	62.93	63.70	61.95
Gunungsitoli	68.33	69.30	69.31	69.61	70.23	60.68	67.91
Nias	60.82	61.65	61.93	62.74	63.69	64.56	62.57
South Tapanuli	69.10	69.75	70.12	70.33	70.92	71.55	70.30
Padang Lawas	67.59	68.16	68.25	68.64	69.58	70.34	68.76
Simalungun	72.49	72.98	73.25	73.40	73.77	74.29	73.36
South Labuhanbatu	70.98	71.39	71.40	71.69	72.16	72.82	71.74
North Tapanuli	72.91	73.33	73.47	73.76	74.14	74.65	73.71
North Labuan Batu	71.08	71.43	71.61	71.87	72.77	73.63	72.07
Sharpening	69.49	69.92	70.29	70.49	71.13	71.56	70.48
North Padang Lawas	68.77	69.29	69.85	70.11	70.93	71.63	70.10
Labuhan Batu	71.39	71.94	72.01	72.09	72.92	73.69	72.34
Deli Serdang	74.92	75.43	75.44	75.53	76.19	76.52	75.67

Source: Central Bureau of Statistics (BPS) of North Sumatra Province, 2023.

Table 5 shows that the highest average Human Development Index (HDI) was found in Deli Serdang Regency, amounting to 75.67%, while the lowest HDI was recorded in West Nias Regency at 61.95%. The annual increase in HDI leads to higher individual work productivity. Increased productivity has a positive effect on income, which in turn tends to reduce the level of poverty. When HDI increases, it can be inferred that community welfare also improves. As welfare rises, the poverty rate tends to decline (Adi Widodo, 2011).

The Human Development Index (HDI) has a significant effect on poverty reduction. Life expectancy, education, and per capita consumption are used as indicators in calculating HDI. In regions with a high level of population quality, the number of poor people tends to be lower. Conversely, a low HDI results in low labor productivity, which leads to lower income levels and consequently an increase in poverty (Sukmaraga, 2011).

Based on the above phenomenon, research focusing on the interaction between unemployment, economic growth, and HDI in relation to poverty is highly relevant. These variables are interrelated and influence poverty in a complex manner. Therefore, a deeper analysis of how the combination of these factors affects poverty can provide valuable insights for the government in formulating more effective policies to reduce poverty.

2. Materials and Method

This study employs an associative quantitative approach aimed at identifying the relationship and influence between independent variables unemployment rate (X_1), economic growth (X_2), and Human Development Index (X_3) on the dependent variable, namely the poverty rate (Y) in districts/cities of North Sumatra Province during the 2016–2023 period. This approach was chosen because it allows researchers to objectively test hypotheses using numerical data and statistical analysis. The research area covers 14 districts/cities in North Sumatra, selected for their significant variation in poverty levels, economic growth, and HDI, making them relevant for illustrating regional development dynamics (Sugiyono, 2019).

The research objects include data on poverty, unemployment, economic growth, and HDI obtained from the Central Bureau of Statistics (BPS) of North Sumatra Province. The type of data used is secondary quantitative data, consisting of numerical figures officially published by government institutions. Data collection was carried out through non-participant observation and documentation of annual statistical reports. The operational definitions of each variable were adapted from economic theory and BPS indicators, in which poverty is measured by the percentage of the population living below the poverty line,

unemployment by the open unemployment rate, economic growth by GRDP, and HDI as a composite index of human development (Kasmir, 2022; BPS, 2020).

The analytical technique used is panel data regression, which combines cross-sectional and time-series data over eight years, resulting in 112 observations. The analysis was conducted using three approaches: the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The best model was determined using the Chow test, Hausman test, and Lagrange Multiplier test. Prior to the regression, classical assumption tests were conducted to ensure model validity, including multicollinearity, heteroskedasticity, and autocorrelation tests. Furthermore, an F-test was performed to examine the simultaneous effect of all independent variables on poverty, while a t-test was conducted to assess the partial effect of each independent variable (Winarno, 2017; Ghozali, 2018; Basuki & Prawoto, 2023).

3. RESULTS

Hypothesis Testing Results

Panel Data Estimation Model Approach

This study employs panel data analysis using EViews 13 software. Panel data is a combination of time series and cross-sectional data. Three estimation model approaches are used in this research, namely the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The independent variables in this study are Unemployment, Economic Growth, and Human Development Index (HDI), while the dependent variable is Poverty (Y). To determine the most appropriate estimation model, three types of tests were conducted: the Chow Test, the Lagrange Multiplier (LM) Test, and the Hausman Test.

Panel Data Model Selection

The combination of time series and cross-sectional data produces three types of regression models in panel data analysis: the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The estimation results using the Common Effect Model are presented in Table 6.

Table 6. Panel Data Regression Results – Common Effect Model.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	19.63345	1,899,486	10.33619	0.0000
X1	-1.440748	0.259059	-5.561464	0.0000
X2	-0.161034	0.350262	-0.459754	0.6466
X3	-1.35E-05	0.000287	-0.047142	0.9625
R-squared	0.231499	F-statistic		10.84445
Adjusted R-squared	0.210152	Prob(F-statistic)		0.000003

Source: PSource: Processed by the author, (2025)

Notes:
X_1 = Unemployment
X_2 = Economic Growth
X_3 = Human Development Index

Table 6 presents the estimation results of the Common Effect Model. The F-statistic value of 10.844 with a probability of 0.000 indicates that the model as a whole is not statistically significant at the 5% significance level. Therefore, the analysis is continued using the Fixed Effect Model approach.

Table 7. Panel Data Regression Results – Fixed Effect Model.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.987105	0.659409	13.62903	0.0000
X1	0.500224	0.118814	4.210147	0.0001
X2	0.262844	0.080308	3.272965	0.0015
X3	0.000117	6.73E-05	1.740470	0.0850
R-squared	0.965913		F-statistic	168.2484
Adjusted R-squared	0.960172		Prob(F-statistic)	0.000000

Source: Source: Processed by the author, (2025)

Notes:

X_1 = Unemployment

X_2 = Economic Growth

X_3 = Human Development Index

Table 7 shows the estimation results of the Fixed Effect Model, where the F-statistic value of 168.248 with a probability of 0.000 indicates that this model is statistically significant at the 5% significance level.

To determine the most appropriate model between the Common Effect Model and the Fixed Effect Model, a panel data model validity test was conducted in two stages: the Chow Test and the Hausman Test.

1) Chow Test

This test aims to compare the feasibility of using the Common Effect Model (CEM) and the Fixed Effect Model (FEM) in the study. If the test results show that the null hypothesis (H_0) is rejected, the next step is to perform the Hausman Test. The hypotheses used in the Chow Test are as follows:

H_0: If the probability value (p-value) for the cross-section F is greater than 0.05 ($\alpha > 0.05$), then H_0 is accepted, and the most appropriate model is the Common Effect Model (CEM).

H_1: If the probability value (p-value) for the cross-section F is less than 0.05 ($\alpha < 0.05$), then H_0 is rejected, and the most appropriate model is the Fixed Effect Model (FEM).

Table 8. Chow Test Results.

Effects Test	Statistics	df	Prob.
Cross-section F	157.445553	(13.95)	0.0000
Cross-section Chi-square	348.938390	13	0.0000

Source: Processed by the author, (2025)

Based on the results presented in Table 8, the probability value obtained is $0.000 < \alpha = 0.05$ (5%), indicating that the selected model is the Fixed Effect Model (FEM).

2) Hausman test

The Hausman Test is used to determine the most appropriate model between the Fixed Effect Model (FEM) and the Random Effect Model (REM). This test is conducted after the Fixed Effect Model is found to be superior to the Common Effect Model based on the Chow Test results. The hypotheses used in the Hausman Test are as follows:

H_0: If the probability value (p-value) for the cross-section is greater than 0.05 ($\alpha > 0.05$), then H_0 is accepted, and the most appropriate model is the Random Effect Model (REM).

H_1: If the probability value (p-value) for the cross-section is less than 0.05 ($\alpha < 0.05$), then H_0 is rejected, and the most appropriate model is the Fixed Effect Model (FEM).

Table 9. Hausman Test Results.

Test Summary	Chi-Sq. Statistic	Chi-Sq. df	Prob.
Random cross-section	21.011089	3	0.0001

Source: Processed by the author, (2025)

Based on the results shown in Table 9, the probability value is 0.001 < α = 0.05 (5%), indicating that the appropriate model for this study is the Fixed Effect Model (FEM).

Fixed Effect Model Regression Equation

Based on the estimation results of the panel data regression using the Fixed Effect Model (FEM) approach, the regression equation is as follows:

$\hat{Y}$ = 8.987105 + 0.500224X1 + 0.262844X2 + 0.000117X3

The interpretation of the regression equation is as follows:

1) The constant value of 8.987105 indicates that if unemployment, economic growth, and HDI are assumed to be zero, the poverty rate will be 8.987105.
2) The coefficient of the unemployment variable (X_1) is 0.500224, meaning that every 1% increase in unemployment will increase the poverty rate by 0.500224%, assuming other independent variables remain constant.
3) The coefficient of the economic growth variable (X_2) is 0.262844, meaning that every 1% increase in economic growth will increase the poverty rate by 0.262844%, assuming other independent variables remain constant.
4) The coefficient of the human development index (HDI) variable (X_3) is 0.000117, meaning that every 1% increase in HDI will increase the poverty rate by 0.000117%, assuming other independent variables remain constant.

Classical Assumption Test

The initial step in this analysis is the classical assumption test, which serves as a prerequisite before proceeding to the regression analysis stage. This test aims to ensure that the regression model used meets the BLUE (Best Linear Unbiased Estimator) criteria meaning that the model is unbiased, consistent, efficient, and normally distributed. A model that satisfies these criteria can be considered a valid and reliable estimator. Since this study utilizes panel data, the classical assumption tests focus on autocorrelation, multicollinearity, and heteroscedasticity tests. Meanwhile, the normality test is generally not a strict requirement for fulfilling the BLUE assumption, as several econometric scholars argue that normality is not mandatory for ensuring unbiased and consistent estimates (Basuki & Prawoto, 2023).

1) Multicollinearity Test

The multicollinearity test is conducted to identify the degree of correlation among independent variables in the regression model. In a good regression model, there should be no high correlation among the independent variables, as strong multicollinearity can cause regression coefficients to become unstable and difficult to interpret economically, thereby reducing the model's validity in explaining the relationships between variables. If the correlation coefficient between two independent variables is less than 0.8, it can be concluded that multicollinearity does not occur. However, if the coefficient exceeds 0.8, this indicates the presence of multicollinearity among the independent variables. The results of the multicollinearity test based on the correlation matrix analysis are presented in Table 10.

Table 10. Multicollinearity Test Results.

	X1	X2	X3
X_1	1,000,000	0.052775	0.175601
X_2	0.052775	1,000,000	0.187559
X_3	0.175601	0.187559	1,000,000

Source: Processed by the author, (2025)

Note:
X_1 = Unemployment
X_2 = Economic Growth
X_3 = Human Development Index

Based on Table 10, all independent variables in the model show low correlation levels, with coefficients below 0.8. The variable X_1 has a correlation value of 0.052775 with X_2 and 0.175601 with X_3, both of which are below the 0.8 threshold. Similarly, the correlation between X_2 and X_3 is also relatively low at 0.187559. Therefore, it can be concluded that there is no strong linear relationship among the independent variables, indicating that the regression model in this study is free from multicollinearity problems.

2) Heteroscedasticity Test

This test aims to determine whether the regression model has a constant variance of residuals (homoscedasticity). An ideal regression model is one that is free from heteroscedasticity symptoms, as the presence of heteroscedasticity can cause biased or inaccurate prediction results. One of the methods used to detect the presence of heteroscedasticity is the Glejser Test (Utama, 2016). If the significance value (p-value) > 0.05, the model is considered free from heteroscedasticity symptoms.

Table 11. Heteroscedasticity Test Results.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.013572	0.382280	-0.035504	0.9718
X1	0.118293	0.068880	1.717377	0.0892
X2	0.088351	0.046557	1.897697	0.0608
X3	-3.30E-05	3.90E-05	-0.847488	0.3989
R-squared	0.298900	F-statistic		2.531338
Adjusted R-squared	0.180820	Prob(F-statistic)		0.002793

Source: Processed by the author, (2025)

Note:
X1 = Unemployment
X2 = Economic Growth
X3 = Human Development Index

Based on the test results presented in Table 11, all independent variables show probability values above 0.05. Therefore, it can be concluded that the regression model does not contain heteroscedasticity symptoms and meets the assumption of homoscedasticity.

3) Autocorrelation Test

The autocorrelation test is used to detect the relationship between residuals in the current period and those in the previous period. If such a relationship exists, it indicates the presence of autocorrelation. To conduct the autocorrelation test, the Durbin–Watson (DW) statistic is used. A DW value between -2 and +2 indicates the absence of autocorrelation. The results of the autocorrelation test using the Durbin–Watson statistic are presented in Table 12.

Table 12. Results of Autocorrelation Test.

R-squared	0.307028	Mean dependent variable	-0.509082
Adjusted R-squared	0.170145	SD dependent var	0.792286
SE of regression	0.721744	Akaike info criterion	2.342129
Sum squared residual	42.19410	Schwarz criterion	2.790541
Log likelihood	-97.76431	Hannan-Quinn criter.	2.523502
F-statistic	2.242991	Durbin-Watson stat	2.008136
Prob(F-statistic)	0.009550		

Source: Processed by the author, (2025)

Based on Table 12, the Durbin–Watson value of 2.008136 falls within the range of -2 to +2. This value is close to 2, indicating that the regression model does not experience autocorrelation either positive or negative.

Model Feasibility and Accuracy Testing

Simultaneous Effect Test (F Test)

The simultaneous effect test aims to assess the feasibility of the multiple linear regression model in analyzing the collective influence of independent variables on the dependent variable. In this study, the F-test was conducted to determine whether the variables unemployment, economic growth, and the Human Development Index (HDI) simultaneously have a significant effect on poverty.

The decision-making process is based on a significance level (α) of 0.05, with the following hypotheses:

H_0: Unemployment, economic growth, and HDI simultaneously have no significant effect on poverty.

H_1: Unemployment, economic growth, and HDI simultaneously have a significant effect on poverty.

Table 13. Results of the F-Test (Simultaneous Test).

R-squared	0.965190	F-statistic	168.2484
Adjusted R-squared	0.959257	Prob(F-statistic)	0.000000

Source: Processed by the author, (2025)

Notes:
X_1 = Unemployment
X_2 = Economic Growth
X_3 = Human Development Index

At a 95% confidence level (α = 0.05), the F-table value with degrees of freedom df = (4–1), (240–4) is 2.689. Based on the analysis results in Table 13, the calculated F-statistic value of 168.25 is greater than the F-table value (168.25 > 2.689). Furthermore, the probability value (p-value) of 0.0000 is smaller than the significance level of 0.05 (0.000 < 0.05). Thus, H_0 is rejected, indicating that unemployment, economic growth, and the Human Development Index collectively (simultaneously) have a significant effect on poverty in the districts/cities of North Sumatra Province.

Partial Effect Test (t-Test)

The partial test (t-test) is conducted to determine the extent of the influence of each independent variable on the dependent variable. The regression results were tested using the t-test at a 95% confidence level (α = 0.05), with degrees of freedom (df) = (240 – 4), resulting in a t-table value of 1.982. The partial test was performed based on the estimation results of the previously selected model.

Table 14. Results of the t-Test (Partial Test).

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.987105	0.659409	13.62903	0.0000
X1	0.500224	0.118814	4.210147	0.0001
X2	0.262844	0.080308	3.272965	0.0015
X3	0.000117	6.73E-05	1.740470	0.0850
R-squared	0.965913		F-statistic	168.2484
Adjusted R-squared	0.960172		Prob(F-statistic)	0.000000

Source: Processed by the author, (2025).

Notes:
X_1 = Unemployment
X_2 = Economic Growth
X_3 = Human Development Index

1) Testing the hypothesis of unemployment (X_1) against poverty (Y)
   a) Hypothesis Formulation
      H_0: $\beta_1 = 0$, meaning that unemployment partially has no effect on poverty in the regencies/cities of North Sumatra Province.
      H_1: $\beta_1 \neq 0$, meaning that unemployment partially has a positive effect on poverty in the regencies/cities of North Sumatra Province.
   b) The test was conducted at a significance level of $\alpha = 0.05$ or a 95% confidence level.
   c) Testing Criteria
      H0 is accepted if the significance value > 0.05
      H0 is rejected if the significance value ≤ 0.05.
   d) Statistical Test
      The calculated t-value obtained from the regression analysis using EViews is 4.210147, while the t-table value at $\alpha = 0.05$ is 1.982.
   e) Conclusion
      The partial test result for the effect of unemployment on poverty shows that the t-statistic value of 4.210147 is greater than the t-table value of 1.982. Furthermore, the obtained probability value (significance) of $0.0001 < \alpha = 0.05$ indicates that H_0 is rejected and H_1 is accepted. Therefore, it can be concluded that the unemployment variable (X_1) has a positive and significant effect on poverty in the regencies/cities of North Sumatra Province.
2) Testing the hypothesis of economic growth (X2) on poverty (Y)
   a) Hypothesis Formulation
      H_0: $\beta_2 = 0$, meaning that economic growth partially has no effect on poverty.
      H_1: $\beta_2 < 0$, meaning that economic growth partially has a negative effect on poverty.
   b) The test is conducted at a significance level of $\alpha = 0.05$ or a 95 percent confidence level.
   c) Testing Criteria
      H_0 is accepted if the significance value > 0.05.
      H_0 is rejected if the significance value ≤ 0.05.
   d) Statistical Test
      The t-statistic value obtained from the regression result using the EViews application is 1.740470. Meanwhile, the t-table value at $\alpha = 0.05$ is 1.982.
   e) Conclusion
      The partial test result on the effect of economic growth on poverty shows that the t-statistic value of 3.272965 > t-table value of 1.982. In addition, the obtained probability (significance) value is 0.0015 < 0.05. Based on these results, it can be concluded that H_0 is accepted and H_1 is rejected, indicating that the variable of economic growth (X_2) does not have a significant effect on poverty in the districts/cities of North Sumatra Province.
3) Testing the Hypothesis of Human Development Index (X_3) on Poverty (Y)
   a) Hypothesis Formulation
      H_0: $\beta_3 = 0$, meaning that the Human Development Index (HDI) partially has no effect on poverty.
      H_1: $\beta_3 < 0$, meaning that the Human Development Index (HDI) partially has a negative effect on poverty.
   b) The test is conducted at a significance level of $\alpha = 0.05$ or a 95 percent confidence level.
   c) Testing Criteria
      H0 is accepted if the significance value > 0.05
      H0 is rejected if the significance value ≤ 0.05.
   d) Statistical Test
      The calculated t value was obtained from the regression results using the EViews application, which was 1.740470. The t Table value at $\alpha = 0.05$ was 1.982.
   e) Conclusion
      The partial test result on the effect of the Human Development Index (HDI) on poverty shows that the t-statistic value of 1.740470 < t-table value of 1.982. In addition, the obtained probability (significance) value is 0.0850 > 0.05. Based on

these results, it can be concluded that H_0 is accepted and H_1 is rejected, indicating that the variable of Human Development Index (X_3) does not have a significant effect on poverty in the districts/cities of North Sumatra Province)

Discussion of Results

The Simultaneous Effect of Unemployment, Economic Growth, and the Human Development Index on Poverty in Regencies/Cities of North Sumatra Province from 2016–2023.

Based on the results of the F-test in the multiple regression model, the calculated F-value was 162.668 with a significance level of 0.000. Since the significance value is smaller than 0.05, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. This means that, simultaneously, the variables of unemployment, economic growth, and the Human Development Index (HDI) have a significant effect on poverty in the regencies/cities of North Sumatra Province. This result indicates that the three variables are interrelated in explaining the variations in poverty within the study area.

This finding shows that poverty is a complex phenomenon that cannot be explained by a single variable but rather results from the interaction between unemployment, economic growth, and the HDI. These three variables complement one another in explaining the regional disparities in poverty across the province. Theoretically, this finding is supported by the theory of human development and the theory of economic growth. According to the theory of human development, improving the quality of human resources through education and health can reduce poverty. Meanwhile, sustainable economic growth can create employment opportunities and increase people's income, thereby contributing to poverty reduction.

This result is also reinforced by empirical findings from several previous studies. Research by Firmansyah and Muchtolifah (2023) found that unemployment and economic growth simultaneously affect poverty levels in the Special Region of Yogyakarta. Similar findings were reported by Lala et al. (2023), who stated that the combination of economic growth and the HDI significantly affects poverty reduction. In addition, a study by Aprilianti and Harkeni (2021) showed that unemployment, economic growth, and the HDI jointly influence poverty levels. Likewise, Yoertiara and Feriyanto (2022) emphasized the importance of the interaction between these three variables in explaining the dynamics of poverty in a region.

The Partial Effect of Unemployment on Poverty.

The t-test results show that the unemployment variable has a positive effect on poverty, with a regression coefficient value of $0.0001 < 0.05$. Thus, statistically, this variable significantly affects poverty in the regencies/cities of North Sumatra Province. This means that when unemployment increases, the poverty rate also tends to increase. This occurs due to the loss of income sources among individuals who are unemployed, which directly affects their ability to meet basic needs such as food, education, and health.

This finding is consistent with the statement by Mohammed et al. (2015), who stated that unemployment has a positive effect on poverty. Kristin and Darsana (2019) also confirmed in their research that unemployment positively affects poverty. Similarly, Yacoub (2012) found that high unemployment rates lead to low income, which in turn triggers poverty. This study is also in line with Arsyad (1997), who stated that there is a very close relationship between high unemployment and poverty. Research conducted by Fitriani and Pratama (2022) in West Java Province found that the open unemployment rate has a positive and significant effect on poverty. This indicates that the higher the unemployment rate, the greater the likelihood of people falling into poverty due to the loss of their main source of income.

The Partial Effect of Economic Growth on Poverty.

Based on the partial test results, it was found that economic growth has no effect on poverty in the regencies/cities of North Sumatra Province. The hypothesis "Economic growth is presumed to have a negative effect on poverty levels" in this study cannot be accepted. This finding is inconsistent with the theory proposed by Son (2006), which states that poverty alleviation can be achieved through economic growth. The absence of a significant effect between economic growth and poverty in this study is supported by data on poverty and economic growth in North Sumatra, which show an inconsistent correlation. In some years, economic growth increased while poverty declined, but in other years, economic growth decreased while poverty also declined. The lack of influence between economic

growth and poverty in North Sumatra also reflects a broader pattern found in many developing countries that experience high economic growth but fail to provide benefits for the poor (Todaro, 2006; Kuncoro, 2006).

When economic growth rises but poverty also increases, this indicates the presence of non-inclusive growth, where the benefits of growth are enjoyed only by certain groups, such as capital-intensive sectors or high-income individuals, while the poor—who generally work in the informal and agricultural sectors—do not experience significant improvement. Empirically, this condition may occur in North Sumatra because the regional economy still relies heavily on the primary sector and lacks equitable development distribution, causing GDP growth not to automatically reduce poverty levels.

The insignificance of the effect of economic growth on poverty can be explained through the weak trickle-down effect, where the benefits of growth fail to reach the lower layers of society. The Kuznets Curve Theory also explains that in the early stages of development, inequality tends to increase, so poverty may remain high even when the economy grows. Previous studies, such as Todaro and Smith (2015), also emphasized that economic growth does not always directly correspond with poverty reduction unless accompanied by equitable policies and the creation of quality employment opportunities.

The Partial Effect of the Human Development Index on Poverty.

Based on the t-test results, the obtained probability value > 0.05 is 0.0850, so H_0 is accepted and H_1 is rejected. This means that the Human Development Index (HDI) variable does not have a significant effect on poverty in the regencies/cities of North Sumatra Province. This finding is consistent with the research by Ahmad Briezy Bihaqi and Maria Puspita Sari (2020), which showed that the Human Development Index has no significant effect on poverty. However, it is inconsistent with the studies conducted by Nurmainah (2013) and Noor Zuhdiyaty (2017), which stated that the Human Development Index has a negative and significant effect on poverty levels.

Furthermore, this result contradicts Amartya Sen's theory of human development, which posits that human development is a process of improving people's quality of life through enhanced education, health, and income, ultimately leading to poverty reduction. Ideally, an increase in the HDI should reduce poverty by improving income, health, and educational quality.

When the HDI increases while poverty also rises, this indicates a mismatch between improvements in human quality and the distribution of economic welfare in a region. This may occur due to disparities in access to education and healthcare, where certain economic groups benefit more from HDI improvements. Moreover, graduates may face difficulties finding employment due to a mismatch between acquired skills and labor market demands. An increase in HDI that is not accompanied by sufficient job creation may lead to higher unemployment rates and, consequently, increased poverty.

4. Conclusion

Based on the results of the discussion, the following conclusions can be drawn:

1) Unemployment, economic growth, and the Human Development Index (HDI) have a simultaneous effect on poverty in the regencies/cities of North Sumatra Province.
2) Unemployment has a positive and significant effect on poverty in the regencies/cities of North Sumatra Province, while economic growth and the Human Development Index (HDI) do not have a significant partial effect on poverty in the regencies/cities of North Sumatra Province.

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