SPATIAL ANALYSIS OF THE EFFECT OF HDI AND NET WAGES OF INFORMAL WORKERS ON POVERTY IN CENTRAL JAVA

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ABSTRACT

This study analyzes the spatial influence of the Human Development Index (HDI) and net wages of informal workers on poverty rates in Central Java. Informal workers in Central Java have high poverty potential, so this study investigates the correlation between informal workers' net income and poverty rates in Central Java. Spatial analysis was also conducted to understand the spatial effects on the regression of HDI and informal workers' income on poverty. The theoretical framework includes the concepts of poverty, HDI, and informal workers. The data used in this study is data from 2022 with the dependent variable being the percentage of poverty, and the independent variables being HDI and the average monthly income of informal workers in each district/city in Central Java. The analysis method uses classical regression and spatial regression, each using Microsoft Excel and GeoDa applications. The results of the analysis show that HDI and the average net income of informal workers have a significant effect on the poverty rate in Central Java. Spatial analysis showed the existence of spatial clustering of poverty, and spatial regression confirmed the absence of spatial autoregression or spatial error in the model.

| KEYWORDS | *Poverty, Informal Workers, HDI* |

INTRODUCTION

Central Java, as a province that continues to grow from year to year, has complex challenges in achieving sustainable development. One of them is in overcoming the problem of poverty. Central Java's position as one of the largest provinces in Indonesia is the focus of attention because it has a strategic role in the growth of the national economic sector.

There are factors that contribute to the poverty rate in a region, one of which can be analyzed from the Human Development Index (HDI). HDI as a holistic indicator that includes dimensions of health, education, and living standards, can provide a complete picture of the condition of human development in a region (Isnaini et al., 2023).

The Human Development Index is calculated based on three main dimensions, namely life expectancy, average years of schooling, and per capita expenditure per year. The results of the study (Isnaini et al., 2023) show that an increase in HDI value and the number of workers has a significant positive effect on economic growth. The results of the study (Lestari & Imaningsih, 2022) show that partially, HDI has a significant effect on the poverty rate in Java, with the relationship between HDI and the poverty rate being inversely proportional.

Poverty is dominated by informal workers, so it is suspected that there is a correlation between the average monthly net income of informal workers and the poverty rate in Central Java. This is in line with the results of the study, which concluded that informal workers tend to have low incomes and are more likely to be in poverty. In addition, research also found that the high poverty rate in East Java is partly due to the existence of the informal sector. (Nariswari, 2020)

In previous research, Arriani & Chotib found that there is a spatial effect of HDI in Central Java (Arriani & Chotib, 2021). This study will also analyze the spatial effect on the poverty rate in Central Java and whether there is a spatial effect on the regression analysis of the effect of HDI and the average income of informal workers on the poverty rate in Central Java. An in-depth understanding of the linkages between HDI, informal workers' income, and poverty can also contribute to the academic literature on human development and the informal economy in Indonesia. Therefore, it is hoped that this research is not only relevant for the local interests of Central Java, but also has broader implications in the context of national development.

Theoretical Framework
Poverty

The Central Bureau of Statistics (BPS) defines poverty as the inability to meet basic food and non-food needs from an economic perspective measured in terms of expenditure. This approach categorizes people as poor when they have an average monthly per capita expenditure below the poverty line. The poverty line is the minimum value of expenditure to meet food and non-food needs in each month. (Badan Pusat Statistik Indonesia, 2023)

HDI

The Human Development Index (HDI) can be used as a reflection of the quality of human resources in a region. HDI can support the reduction of poverty. With a better HDI, human quality also improves and is expected to improve welfare and quality of life. This is supported by research that shows that HDI has a positive effect on the value of the Regency / City Minimum Wage (UMK) in a region. (Japany & Firnanda, 2022)

Informal Worker Income

Informal workers are workers who work in informal sector relationships and receive wages and/or compensation. The Manpower Law explains that businesses in the informal sector are activities of people or groups that carry out joint businesses for economic activities on the basis of trust, agreement, and are not legal entities (Law number 25 of 1997). The results of research (Ikawati & Wahyuni, 2016) show that poverty in urban or rural areas has several similarities, and one of them is having a job in the informal sector.

RESEARCH METHOD

Data Sources and Variables

The data used in this study are data on the HDI of regencies/municipalities in Central Java, the average net monthly income of informal workers in regencies/municipalities in Central Java, and data on the percentage of poor people in regencies/municipalities in Central Java, which are openly provided by the Central Java Statistics Agency (BPS). The data is limited to the year 2022.

This study uses the poverty rate in percent as the dependent variable, while the independent variables consist of the average net monthly income of informal workers in million rupiah and the HDI of districts/cities in Central Java. The applications for processing data are Microsoft Excel and GeoDa.

Analysis Method

The method of analysis in this research is quantitative with a descriptive approach. Data analysis using classical regression with Microsoft Excel was used to see how HDI (as X1) and Average Net Monthly Income of Informal Workers (as X2) affect the poverty rate (as Y) in Central Java. Furthermore, spatial regression analysis was conducted with the same variables to see if there is a spatial effect that affects the poverty rate in districts/cities in Central Java.
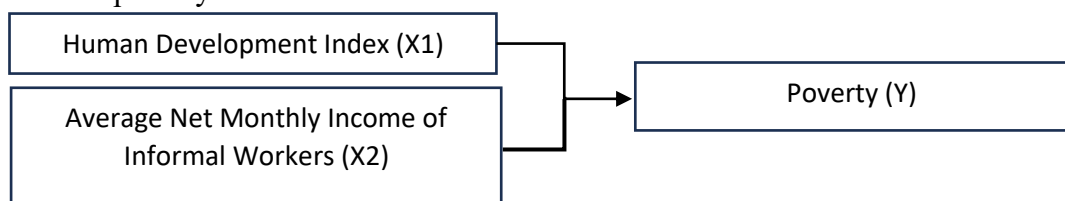
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┌─────────────────────────────────────┐
│  Human Development Index (X1)        │───────┐
└─────────────────────────────────────┘       │      ┌──────────────────────┐
┌─────────────────────────────────────┐       ├────▶ │   Poverty (Y)        │
│  Average Net Monthly Income of       │───────┘      └──────────────────────┘
│  Informal Workers (X2)               │
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Figure 1. Variables used in the study

RESULT AND DISCUSSION

Data Exploration

This study begins with a data correlation test with classical regression using Microsoft Excel. The regression results show that poverty is influenced by several factors such as HDI and the average net income of informal workers. The correlation test results show that the R value^2 = 0.52 and all probability values are less than 0.1. This means that with a significance threshold of 10%, the data can be

considered that the HDI variable and the average net income of informal workers affect the poverty rate in Central Java significantly.

Table 1. Data Correlation Test Results with Microsoft Excel

Variables	Coefficient	Std. Eror	p-value
Intercept	47,78501	6,880727	7.26774E-08 (cluster*)
HDI	-0,44371	0,103408	0,000153688(klaster*)
pdpt_inf	-3,54287	2,054842	0,09432923(*)
R squared	0,520509		

Source: Author's data

The table results show that HDI is negatively correlated with the poverty rate. This means that the higher the HDI, the lower the poverty rate. This result is in line with research (Handayani, 2023) which states that HDI is related to productivity. So that the better the HDI will increase the power to work and increase income and reduce poverty. The average income variable of informal workers also shows a negative correlation with the poverty rate. The smaller the average net income of informal workers will increase the poverty rate in Central Java, and vice versa.

Regression Analysis

Regression analysis is carried out to analyze the relationship between the independent variable and the dependent variable. In this study, the regression analysis was completed with a scatter plot graph. Thus, regression was performed twice for two independent variables, namely HDI and average net income of informal workers.

The scatter plot graph in regression analysis can be used to visualize the relationship between the independent variable and the dependent variable by placing the data points on the x-axis (for the independent variable) and the y-axis (for the dependent variable). The results of the regression analysis for the HDI variables and the percentage of poor in Central Java are shown in Graph 1 below.

HDI on Poverty
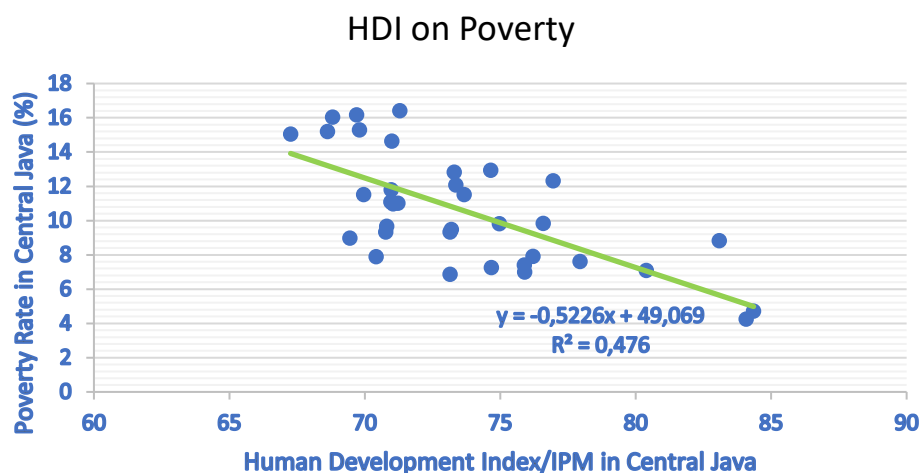
$y = -0,5226x + 49,069$
$R^2 = 0,476$

Figure 2. Regression results of HDI variables on poverty in Central Java

The resulting regression equation on the HDI and poverty relationship graph is

y = -0.5226x + 49.069.

This shows a linear relationship between the dependent variable of the percentage of poor people and the independent variable of HDI. The coefficient of -0.5226 on HDI indicates that every one unit increase in HDI equates to a decrease of 0.5226 percent in the poor population. The constant 49.069 shows the value of the percentage of poor people if HDI is zero. The coefficient of determination (R^2) of 0.476 indicates that about 47.6% of the variation in the percentage of poor people can be explained by the variation in HDI. This is a measure of how well the regression model fits the data. The higher the R² value, the better the model can explain variations in the data.
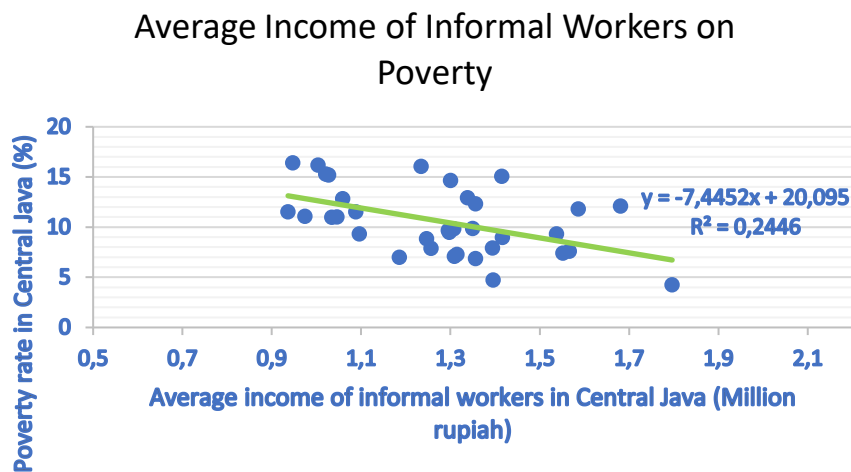

Figure 3. Regression results of average informal workers' income variable on poverty in Central Java
Source: Author's data

The resulting regression equation on the HDI and poverty relationship graph is

y = -7.4452x + 20.095.

This shows a linear relationship between the independent variable (HDI) and the dependent variable (percentage of poor people). The coefficient of -7.4452 on HDI indicates that every one unit increase in HDI equates to a decrease of 7.4452% in the poor population in Central Java. Meanwhile, the coefficient of determination (R^2) of 0.2446 indicates that about 24.46% of the variation in the percentage of poor people can be explained by the variation in HDI. The low R2 value indicates that there are other factors beyond the average income of informal workers that have a large contribution to the poverty rate.

Spatial Linkage Analysis

The spatial distribution of the percentage of poor people in Central Java is shown in Figure 2 below. This figure illustrates how poverty in Central Java is quite clustered. To calculate the level of spatial linkage of the percentage of poor people in districts/cities in Central Java, researchers utilized the *Univariate Morran's Index* feature in the GeoDa application.
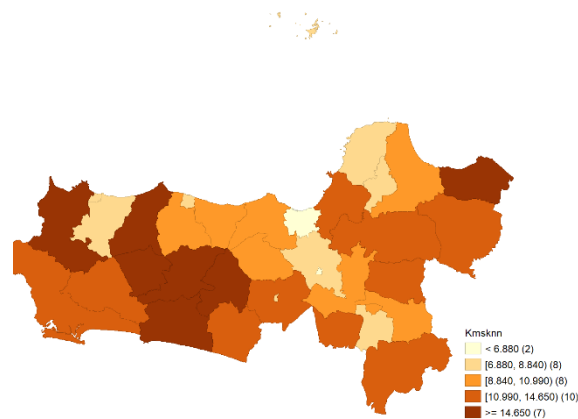

Figure 4. Percentage distribution of the poor population in Central Java in 2022

The results of the *Morran's I Scatterplot* test are shown in Figure 3 below. It appears that Morran's I: 0.230 is positive. The positive spatial autocorrelation indicates the similarity of values and areas that are close together and tend to cluster.
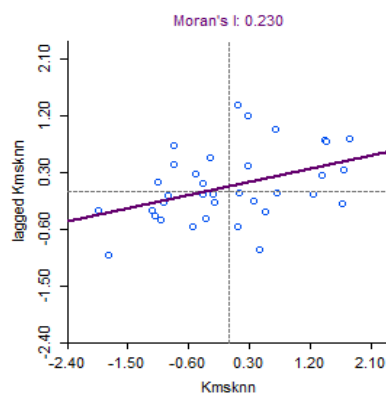

Figure 5. Morran's I Scatterplot of the variable percentage of poor people in Central Java 2022
Source: Author's data

Next, we visualize the spatial pattern of clusters in the data using the *Univariate Local Morran's Index* method. Before using this feature, it is necessary to create a *weight* to produce a spatial weighting matrix first. The type of weighting

chosen is *queen contiguity*. *Queen contiguity* refers to the spatial relationship between a unit and its neighbors. In this context, "queen" refers to the movement of the queen in chess, where the queen can move freely in any direction (up, down, right, left, and diagonal). In the Weight Queen method, units that share boundaries or corners with a particular unit are considered neighbors. This map is used to identify regions that form spatial clusters and indicate whether the clusters are statistically significant.
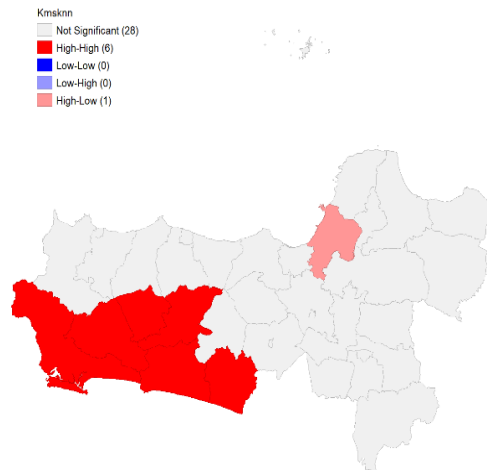

Figure 6. Results of LISA *Cluster Map of* poverty variables in Central Java in 2022

Source: Author's data

The results shown in Figure 4 show that the spatial pattern of poverty variable clusters formed in Central Java for the 2022 data. There are six regencies that are categorized as *High-high* (HH), namely Cilacap Regency, Banyumas Regency, Purbalingga Regency, Banjarnegara Regency, Kebumen Regency, and Purworejo Regency. The meaning of HH is that areas with high values are closely surrounded by areas with high values and form a High-High spatial cluster. Then there is one district that is categorized as *High-Low* (HL), namely Demak District. This means that the percentage of poor people in this region is high and is surrounded by areas that have low values of the percentage of poor people. In addition, there are 27 districts/municipalities. This means that there is not enough statistical evidence to conclude that there are significant spatial clusters in the data. In this context, the spatial patterns seen may be random or have no statistical significance.

Spatial Regression Analysis

Spatial regression analysis is conducted to model the spatial relationship between dependent data variables and independent variables in the data. In this study, the author uses data on the percentage of poor people in 2022 for each district/city in Central Java as the dependent variable, while the independent variables consist of the average net monthly income of informal workers in million

rupiah and the HDI of districts/cities in Central Java. Spatial regression analysis uses the *regression* feature in the GeoDa application. The classical regression results are shown in Table 2 below.

Table 2. Classical Regression Results with GeoDa

TEST	MI/DF	VALUE	PROB
Moran's I (error)	-0.0167	0.2878	0.77352
Lagrange Multiplier (lag)	1	0.0033	0.95444
Robust LM (lag)	1	0.0078	0.92952
Lagrange Multiplier (error)	1	0.0180	0.89336
Robust LM (error)	1	0.0225	0.88068
Lagrange Multiplier (SARMA)	2	0.0258	0.98719

Source: Author's data

The p-value of Morran's I (error) is high as it is greater than 0.1. It indicates that there is not enough statistical evidence to conclude that there is significant spatial autocorrelation in the model errors. In this context, the result indicates that there is not enough evidence to suggest that there is a significant spatial pattern in the model errors.

The p-value in the Lagrange Multiplier (lag) test is high as it is greater than 0.1. It indicates that there is not enough statistical evidence to support the existence of spatial autoregression with lag in the dependent variable. In this context, the result indicates that there is not enough evidence to conclude that there is a significant spatial relationship with lag in the dependent variable.

The p-value in the Lagrange Multiplier (error) test is high as it is greater than 0.1. This indicates that there is not enough statistical evidence to support the existence of spatial autoregression in the model errors. In this context, the results indicate that there is insufficient evidence to conclude that there is a significant spatial relationship in the model errors.

Based on the manual written by (Ansellin, 2005), if the LM (lag) and LM (error) values are not significant, then there is no need to continue with *spatial lag* or *spatial error* regression.

CONCLUSION

This study found that the Human Development Index (HDI) and net wages of informal workers have a significant effect on the poverty rate in Central Java. The results of the analysis show that an increase in HDI is negatively related to the poverty rate, signaling that an increase in the quality of human resources can contribute to a decrease in the poverty rate. In addition, the net income of informal workers also has a significant effect on the poverty rate, with a decrease in income potentially increasing the poverty rate.

Spatial analysis shows the existence of spatial clusters of poverty in some districts, however, spatial regression does not show any spatial autoregression or

spatial error. This suggests that factors other than the variables studied could have a significant contribution to the poverty rate.

Policy Recommendations:

Increased Investment in Human Resource Development (HRD): Human development policies, such as increasing access to education and improving health, can be prioritized to increase HDI and subsequently reduce poverty.

Supporting Informal Workers: Policies that support informal workers, such as skills training and access to formal labor markets, can help increase informal workers' incomes and reduce poverty levels among informal workers.

Spatial-based Regional Development Planning: Regional governments need to consider the spatial pattern of poverty in planning development. Focusing on spatial cluster areas can be an effective strategy in addressing poverty.

Through the implementation of targeted, data-based, and sustainable policies, Central Java is expected to face the challenges of poverty holistically and sustainably, achieve better human development, and make a positive contribution to inclusive or equitable economic growth.

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