
THE INFLUENCE OF MACROECONOMIC VARIABLES ON THE HUMAN DEVELOPMENT INDEX: EVIDENCE FROM MADURA ISLAND

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Abstract

The Human Development Index (HDI) is an important parameter for assessing the extent to which inclusive and equitable development has been achieved, both at the national and regional levels. Madura, an archipelago consisting of four districts, namely Bangkalan, Sampang, Pamekasan, and Sumenep, is an integral part of East Java Province. This study analyzes economic variables, including economic growth, unemployment rates, and poverty, which affect the Human Development Index on Madura Island. The data in this study is panel data from four regencies on Madura Island from 2020 to 2024. The data analysis used in this study is panel analysis. The data used in this study is secondary data sourced from the Central Statistics Agency (BPS). The results of the analysis show that the variables of poverty and unemployment have a significant effect on the Human Development Index variable on Madura Island. Meanwhile, the economic growth variable has no significant effect on the Human Development Index on Madura Island. Therefore, the district governments in Madura must focus more on eradicating poverty and unemployment in order to improve the Human Development Index in their regions.

Introduction

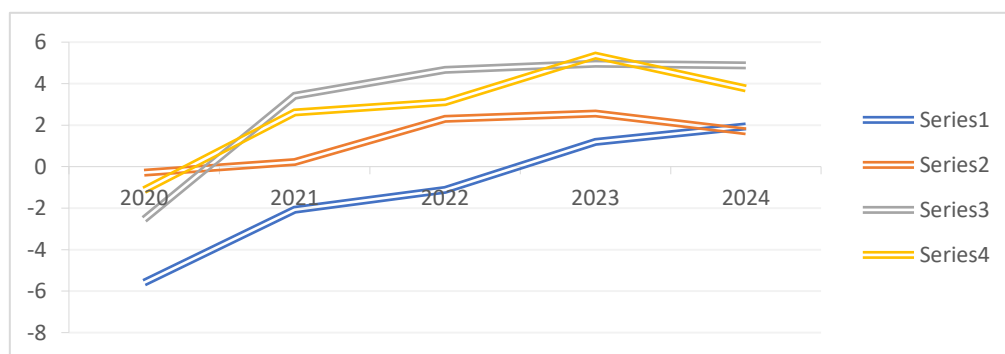
Human development is the main foundation in a country's national development process. It not only covers economic growth, but also emphasizes the importance of improving the overall quality of life of individuals. In this context, the Human Development Index (HDI) is used as a comprehensive indicator that reflects development achievements in three main dimensions: long and healthy life, knowledge, and decent living standards. The HDI is an important parameter for assessing the extent to which inclusive and equitable development has been achieved, both at the national and regional levels (Abdullah & Wibowo, 2024).

Madura, an archipelago consisting of four districts, Bangakalan, Sampang, Pamekasan, and Sumenep, is an integral part of East Java Province. Despite its relative proximity to the economic center of Surabaya, Madura Island still faces various challenges in terms of human development. Data from the Central Statistics Agency (BPS) shows that the HDI value on Madura Island tends to be below the average for East Java Province. This indicates that there is a significant gap in the quality of life of the Madurese people compared to other regions in East Java, and even Indonesia in general (Istiyani et al., 2024).

One important factor affecting the low HDI on Madura Island is uneven economic growth that has not yet had a fully positive impact on community welfare. Although several districts in Madura have shown an increase in Gross Regional Domestic Product (GRDP), the distribution of the results of this economic growth has not been able to drive an improvement in the overall quality of life of the community. Non-inclusive economic growth can cause the majority of the community to remain vulnerable, unable to access basic services such as education and health care, and unable to achieve a decent standard of living (Jaya Putra et al., 2024).

Economic growth on Madura Island has experienced high fluctuations in various districts. This has certainly had an impact on the overall economic condition of Madura Island (Febrihana, n.d., 2024). Madura Island's economic growth declined drastically in 2020. Then it gradually increased in the following year.

Graph 1. Economic Growth in Madura



Source: Badan Pusat Statistik (BPS)

In addition, high unemployment rates are also one of the main issues hampering human development on Madura Island. Limited job opportunities, minimal investment in the formal sector, and low levels of local workforce skills have resulted in relatively high unemployment rates, especially among the productive age group (Abdullah & Wibowo, 2024). Unemployment has a direct impact on the decline in people's purchasing power, increasing economic dependence, and hindering active community participation in the development process (Pamuji et al., 2025). This has negative implications for HDI achievement, especially in terms of living standards and access to health and education services. Poverty is another structural challenge that still plagues most areas of Madura Island. Based on BPS data, poverty rates in several districts in Madura are still relatively high compared to the provincial average (Istiyani et al., 2024). Poverty does not only mean a lack of sufficient income, but also reflects limited access to quality education, adequate health services, and basic facilities such as clean water and sanitation. Chronic and multidimensional poverty (Sukidin et al., 2023).

Furthermore, the interaction between economic growth, unemployment, and poverty is very complex and mutually influential. Economic growth that is not accompanied by adequate employment tends to cause high unemployment (Annis Syahzuni, 2018; Nada Sari, 2024). On the other hand, high unemployment increases the risk of poverty (Nasution et al., 2024). Meanwhile, high poverty can reduce the quality of human resources, thereby reducing productivity and hampering economic growth (Komariyah et al., 2023).

These three variables form a cycle that is interrelated and has a significant impact on human development achievements. In the context of regional development, it is important to understand how these variables interact and specifically influence the HDI in regions such as Madura Island. It cannot be denied that each region has different social, cultural, and economic characteristics. Therefore, the approach used in human development analysis must take local conditions into deep consideration. Madura, with its rich culture, marine and agricultural economic potential, and high social capital, actually has great opportunities to improve the quality of life of its people, as long as it is supported by targeted and data-driven development policies. However, effective development policies must be based on a strong understanding of empirical data and real conditions in the field. Therefore, this research is important to quantitatively analyze the influence of economic growth, unemployment rates, and poverty rates on the HDI on Madura Island. By analyzing the data statistically and comprehensively, it is hoped that the results of this study can provide a clearer picture of the factors that most influence the HDI and how the interaction between the three can hinder or encourage improvements in the quality of life of the Madurese people.

The main objective of this study is to provide scientific and practical contributions in supporting the formulation of more inclusive and sustainable regional development policies. By understanding the extent of each variable's influence on the HDI, local governments are expected to take strategic steps that focus not only on economic growth but also on creating quality jobs and effectively reducing poverty rates.

In addition, this study also aims to raise public and policy maker awareness of the importance of human development as the center of all forms of development. In the long term, increasing the HDI on Madura Island will not only have an impact on the welfare of the local community, but will also contribute significantly to the development of East Java Province as a whole. A healthy, educated, and productive community is a key asset in driving sustainable and equitable economic growth (Komariyah et al., 2023).

Therefore, a deeper understanding of the dynamics of economic growth, unemployment, and poverty in relation to the HDI is an important first step towards creating a more advanced and prosperous Madura.

Research Methods

This research is associative research, as it aims to determine the relationship or influence between variables. The results of this study are expected to provide an empirical description of the extent to which each independent variable contributes to the increase or decrease in HDI in the Madura Island region. This study uses a quantitative approach with a panel data econometric model, which is a combination of cross-section and time-series data from districts on Madura Island, including Bangkalan, Sampang, Pamekasan, and Sumenep, covering the period from 2020 to 2024. Data analysis in this study uses panel data regression.

The data in the study can be time-series data and cross-section data. In time-series data, one or more variables will be observed in a single observation unit within a certain period of time. The quantitative method is an approach in research that emphasizes objective measurement of social phenomena through numbers, statistical data, and mathematical analysis. Quantitative research is used to identify relationships between variables, test hypotheses, and produce conclusions that can be generalized based on data that has been systematically collected and processed. This method is based on the philosophy of positivism, which believes that social reality can be measured precisely and objectively using standardized instruments.

Meanwhile, cross-section data is an observation of several observation units at a single point in time. This study uses panel data analysis through several stages. The first stage is to select the best model. Panel data regression is data analysis with data specifications in the form of a combination of cross-sectional data and time series data, where the same cross-sectional units are measured at different times. If the number of time units is the same for each individual, the data is called a balanced panel. If, on the other hand, the number of time units differs for each individual, it is called an unbalanced panel. Panel data regression allows researchers to analyze several subject units in the same time series or within the same time period.

Panel regression shows the effect of various independent variables on the dependent variable over a certain period of time. The models in the simple linear regression test are as follows:

1. Fixed Effect Model

Using dummy variables to capture differences in intercepts. The concept of fixed effects is based on differences in intercepts between companies, but the intercepts between times are

the same (time in variant).

2. Common Effect Model

The simplest panel data assumes constant intercepts and slope coefficients between time and cross section (common effect). This approach does not consider individual or time dimensions and assumes that behavior between companies is the same over a given period.

3. Random Effect Model

Panel data with the assumption of slope coefficients with different intercepts between individuals and between times (random effect). This model will estimate panel data where disturbance variables may be interrelated between times and between individuals.

The best model selection is done with the following tests:

1. Chow Test

The Chow test is a data test used to determine whether the Common Effect (CE) or Fixed Effect (FE) model is most appropriate for estimating panel data.

2. Hausman Test

The Hausman test is a statistical test to select whether the Fixed Effect or Random Effect model is most appropriate.

3. Lagrange Multiplier (LM) Test

The Lagrange Multiplier (LM) test is used to determine whether the Random Effect model is better than the Common Effect (PLS) method.

Panel Data Regression Equation

Model estimation is performed using panel analysis methods, which are considered more effective in dealing with endogeneity, autocorrelation, and heteroscedasticity issues that often occur in dynamic panel data.

Panel Model Structure:

$$Y_{it} = a + \beta_1 X1_{it} + \beta_2 X2_{it} + \beta_3 X3_{it} + \epsilon_{it}$$

Where:

a = Constant

β = Regression coefficient

ϵ = Error term

Y_{it} = Dependent variable (HDI)

$X1_{it}$ = Independent variable Economic growth of district i in year t

$X2_{it}$ = Independent variable Unemployment in district i in year t

$X3_{it}$ = Independent variable Poverty in district i in year t

Result and Discussion

Data Analysis Results

Testing conducted using panel data analysis yielded the following results:

Table 1. Descriptive Statistics

Variables	Mean	Std. Dev.	Min	Max
HDI	67.4525	1.88913201	64.75	70.85
Growth	1.4975	2.91000972	-5.59	5.35
Unemploy	3.6415	2.35516292	1.36	8.77
Poverty	18.867	3.12607893	13.41	23.76

The first stage in data analysis using panel data analysis is model selection. At this stage, testing is carried out to obtain a robust model. The best model is selected through three tests, namely the Chow test, the Hausman test, and the LM test. Based on the results of the Chow test, the probability obtained is greater than 0.05, so the selected model is the Fixed Effect Model (FEM). The next test, the Hausman test, was conducted and obtained results that the selected model was the Fixed Effect Model (FEM).

The test results are as follows:

Table 2: Estimation Results

Variabel Independent	Coef.	P> t
Economic Growth	0.003	0.205
Unemployment	-0.333	0.047
Poverty	-0.643	0.001
_cons	80.797	0.000

Table 2 shows the estimation results of the model, where the independent variables that significantly affect the Human Development Index are the variables of Unemployment and Poverty with a probability value lower than 0.05. Meanwhile, the variable of Economic Growth has no significant effect on the Human Development Index.

The test results using Panel Analysis with the Fixed Effect Model (FEM) produced the following statistical equation:

$$Y_{it} = 80.797 + 0.003X1_{it} - 0.333X2_{it} - 0.643X3_{it} + \varepsilon$$

Where:

a = Constant

β = Regression coefficient

ε = Error term

Y_{it} = Human Development Index (HDI)

$X1_{it}$ = Economic growth of district i in year t

$X2_{it}$ = Unemployment in district i in year t

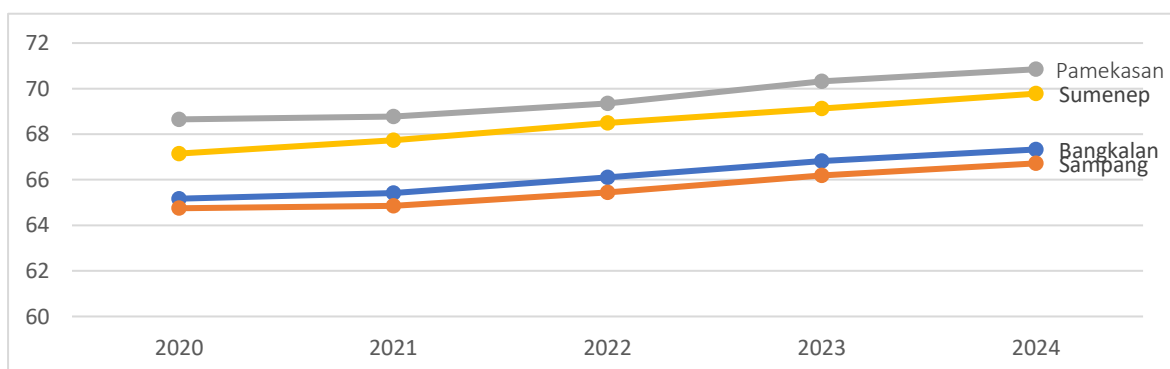
$X3_{it}$ = Poverty in district i in year t

The statistical equation above explains how the independent variables relate to the dependent variable. Economic growth has a positive but insignificant effect on the human development index. Meanwhile, unemployment and poverty have a negative effect on the human development index. An increase in unemployment and poverty will cause a significant decline in the human development index on Madura Island.

Economic growth on Madura Island is an interesting topic to analyze, given that this island has different social, economic, and geographical characteristics compared to other parts of Java. In general, Madura's economic growth is influenced by several factors such as natural resources, the industrial sector, infrastructure, and government policies. Madura is an island located east of the Java Sea and is administratively part of East Java Province. Despite its proximity to the more economically advanced island of Java, Madura still faces challenges in achieving economic growth on par with other regions in the province. One of the main factors affecting economic growth in Madura is its dependence on the agriculture and fisheries sectors. The majority of Madura's population depends on these sectors for their livelihoods, particularly in agriculture, livestock, and fisheries, which contribute significantly to the regional economy. The agricultural sector, especially rice, corn, and soybeans, as well as the livestock sector such as cattle and goats, are the main livelihoods of the Madurese people.

However, even though this sector is quite productive, problems with access to technology and capital often become obstacles for farmers and ranchers to increase their production. In addition, limited land availability and dependence on the rainy season make the agricultural sector in Madura vulnerable to climate change and natural disasters.

Graph 2. Human Development Index in Madura



Source: Badan Pusat Statistik (BPS)

The fisheries sector also plays an important role, given Madura's location surrounded by the sea. The island is known for its marine products, such as fish, shrimp, and shellfish, which

are widely traded in both domestic and international markets. However, this sector faces challenges related to overfishing and environmental damage, which can hamper its growth potential. In addition to the primary sector, home industries and handicrafts are also developing in Madura, such as the production of Madura batik and distinctive ceramic products.

These industries contribute to community income and create employment, although their scale is relatively small compared to other sectors. However, one of the biggest challenges facing Madura is its underdeveloped infrastructure (Purnama Sari et al., 2019). Although there are several infrastructure development projects, such as the Suramadu bridge connecting Madura with Surabaya, better infrastructure development is still needed to improve connectivity between regions, which in turn can facilitate the distribution of goods, accelerate trade, and increase investment. Better infrastructure will also open up access to other sectors such as manufacturing and tourism, which have great potential to drive further economic growth.

Government policies also play an important role in supporting economic growth in Madura. Several government programs focus on infrastructure development, education, and skills training to improve the quality of human resources. For example, training to improve the skills of farmers, fishermen, and local entrepreneurs so that they can access wider markets and increase their productivity. In addition, several policies also seek to improve financial access for productive sectors, such as agriculture and creative industries, to encourage investment and business development. However, poverty and high unemployment rates in Madura are major challenges in efforts to promote inclusive economic growth. Although there are several sectors that show potential, the uneven distribution of economic gains often exacerbates social and economic inequality on the island.

Overall, although economic growth in Madura is relatively stable, there are still major challenges that must be addressed, such as dependence on the agricultural sector, which is vulnerable to climate change, limited infrastructure, and education and skills that still need to be improved (Adhim et al., 2024).

Therefore, it is important for the government and the people of Madura to work together to overcome these problems so that economic growth in Madura can be more equitable and sustainable. The Human Development Index (HDI) is a comprehensive indicator used to measure the success of a region's development in improving the quality of life of its people. The HDI consists of three main dimensions, namely long life and healthy living (measured by life expectancy), knowledge (measured by average length of schooling and expected length of schooling), and decent living standards (measured by per capita income). These three components are closely interrelated and influenced by various social and economic factors. Among these factors, economic growth, unemployment rates, and poverty rates are aspects that greatly influence the dynamics of the HDI in a region. Economic growth is one of the main indicators in assessing a country's progress. Positive economic growth reflects an increase in output and community income.

In the context of the HDI, equitable economic growth can increase per capita income, thereby improving the community's ability to access quality education and health services. In

addition, healthy economic growth will open up more job opportunities and expand business opportunities, which in turn will encourage an improvement in the standard of living of the community. However, if economic growth is not inclusive—only enjoyed by a handful of groups—then social inequality will widen and HDI achievements may be hampered. On the other hand, high unemployment rates have a negative impact on human development. Unemployment not only reflects the low utilization of human resources, but also has an impact on declining purchasing power and increased social vulnerability. People who are unemployed or work in the informal sector with low incomes usually find it difficult to meet basic needs such as nutritious food, adequate housing, and access to education and health services. This results in low HDI scores because individual and family welfare is highly dependent on job and income stability.

Poverty, as a knock-on effect of unemployment and economic inequality, is a major obstacle to human development (Adhim et al., 2024). Poor communities tend to be trapped in a cycle of inability to meet their basic needs. Children from poor families are at greater risk of dropping out of school, suffering from malnutrition, and having limited access to health services. In the long term, this contributes to low average schooling, life expectancy, and individual productivity. High poverty rates in a region will lower the overall average HDI and potentially cause development disparities between regions.

Therefore, to improve the HDI, development policies are needed that not only target economic growth but also ensure equitable distribution of development outcomes and reduce unemployment and poverty rates. Improving access to education and health care needs to be a priority, especially for disadvantaged groups. Labor-intensive programs, skills training, local economic empowerment, and conditional social assistance are examples of interventions that can support comprehensive HDI improvement. The Human Development Index (HDI) is a comprehensive indicator used to measure the success of a region's development in improving the quality of life of its people.

Economic growth, unemployment, and poverty are macroeconomic variables that are interrelated in determining the quality of human development (Zulfikar Yusuf et al., n.d.). A significant reduction in unemployment and poverty can drive an increase in the HDI. Conversely, without proper management of these aspects, human development will be slow and uneven. Therefore, synergy between economic and social policies is essential to create a prosperous, equitable, and highly competitive society.

CONCLUSION

The Human Development Index (HDI) is a comprehensive indicator used to measure the success of a region's development in improving the quality of life of its people. Economic growth, unemployment, and poverty are macroeconomic variables that are interrelated in determining the quality of human development. A significant reduction in unemployment and poverty can drive an increase in the HDI. Conversely, without proper management of these aspects, human development will be slow and uneven. Therefore, synergy between economic and social policies is essential to create a prosperous, just, and highly competitive society.

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