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The Effect of Natural Disaster Risk and Socio-Demographic on Poverty in East Java: A Review of Panel Data 2015-2022

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Abstract

Poverty is a human condition that has difficulty meeting the needs of life and is an unsolved problem in Indonesia. East Java Province has the highest poverty compared to other provinces and has a moderate to high risk of natural disasters. The purpose of this study is to determine the influence of natural disaster risk factors on poverty in addition to socio-demographic factors of districts and cities in East Java Province in 2015-2022. This research method uses panel data regression analysis with data sources from the Central Statistics Agency and the National Disaster Management Agency. The results of the analysis with the Random Effect Model show that the risk of natural disasters is positively significant to poverty. Meanwhile, socio-demographic factors consisting of open unemployment rate and population number have a significant positive effect on poverty. However, the human development index and gross regional domestic product have a significant negative effect on poverty.

Keywords: Poverty, Natural Disaster Risk, Human Development Index, Open Unemployment Rate, Gross Regional Domestic Product, Population.

INTRODUCTION

In the future, from time to time society will experience changes due to the progress that has been achieved in the development process. Due to differences in natural resources and demographic conditions, there are differences in regional development, thus affecting community welfare (Ravi et al., 2023) . Poverty is a condition of low income

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or unfulfilled basic human needs, including food, shelter and clothing. The United Nations carries out human development efforts through the Sustainable Development Goals (SDGs) program. In accordance with the review of No Poverty or No Poverty, the existence of SDGs is able to end it through all development.

Natural disasters will result in social and economic losses such as economic loss, human psychology and environmental damage. Disasters will always have an impact on increasing the number of poor people, because a disaster will destroy some or all of a household's economic objects which will cause them to be trapped in a cycle of poverty and misery (Puja Ilham, 2023) The Regional Disaster Management Agency (BPBD) as the role of regional government in disaster management is sufficient in terms of budget, human resources and facilities and infrastructure (Heryati, S., 2020). The more the disaster risk is in the high category, the more likely it is to increase poverty rates and if the disaster risk decreases, the more likely it is to reduce poverty.

Social is always related to society and demographics is related to changes in population. Social demography factors such as the human development index, open unemployment rate, Gross Regional Domestic Product and population have an influence on poverty. The Human Development Index (HDI) is defined as the basic key to regional development (Sayifullah & Gandasari, 2016) . Efforts to improve the quality of human resources are useful in producing quality people, with various policies on 3 indicators such as education, health and income development (Andhykha et al., 2018) . Apart from human capital factors or the quality of human resources, there are other factors that influence poverty, namely the level of open unemployment.

Open unemployment is defined as the percentage of unemployed to the total workforce. Generally, the labor force can be defined as people of working age who have jobs, have not worked, or are looking for work. Unemployment can affect a decrease in per capita income which can reduce people's purchasing power and then influence a decrease in people's demand for goods or services. On the other hand, if the unemployment rate decreases, poverty will be reduced because people are able to work to meet life's needs.

Economic growth creates job opportunities, increases people's income and contributes to reducing poverty. If people's income decreases, it will be difficult to meet their daily needs. The increasing Gross Regional Domestic Product which increases a region is usually accompanied by higher community welfare.

Rapid and uncontrolled population growth is the cause of economic development not achieving its goals, resulting in lower people's welfare. If the population increases, the

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number of poor people will increase. In terms of income, continuous population growth will increase much of the workforce.

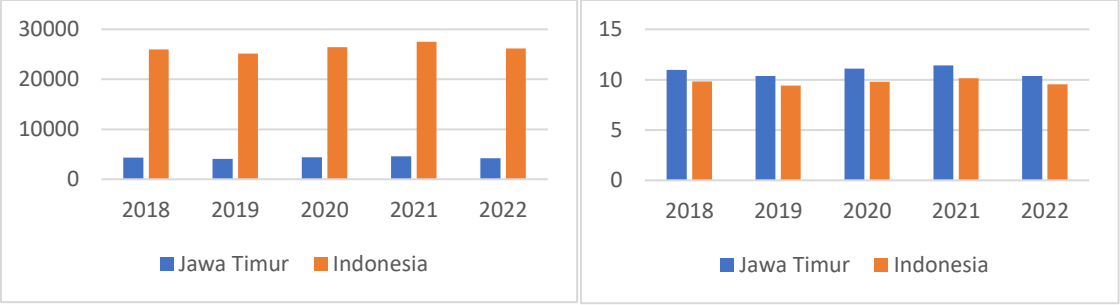


Figure 1 Poverty Development in East Java

Source : Central Statistical Agency (BPS)

In terms of poor population, East Java Province is superior to other provinces in Indonesia and the ratio of the poor percentage of East Java Province is higher than that of Indonesia. In 2022, East Java Province's poor population of 4.18 million people will decrease or 10.38% compared to Indonesia's 26.1 million people or 9.54%. So it can be concluded that the poor population and the percentage of poverty in East Java Province are relatively higher than in Indonesia. Poverty alleviation program East Java Annual Action Plan for Poverty Alleviation 2023, the community experienced a decline in income and an increase in the number of layoffs, which greatly hampered economic growth. East Java Province experiences poverty due to influencing factors natural disaster risk classified in the high and medium categories and social demoghrapy for poverty in East Java Province.

LITERATURE REVIEW

Poverty Theory

According to the World Bank "Poverty Measurement" states that poverty is depriving them of real prosperity, not having sufficient income or consumption for those above the minimum adequate threshold. According to Nurkse, poverty will continue to revolve in a circular vortex interacting with each other until poor countries are in a state of poverty. Dimensions of poverty according to Chambers in Jacobus, EH (2021) there are four different forms as follows: absolute poverty, relative poverty, cultural poverty and structural poverty. According to Armylia, M., & Wasino, W. (2021), there are several forms

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of poverty that are the cause, such as: natural poverty, cultural poverty and structural poverty. Basically humans are unable to maintain and develop the necessities of life such as food, education, work and others. Poverty arises because of differences in human quality and inequality of resources, giving rise to inability to manage.

Natural Disaster Risk Theory

In dealing with disasters, the Indonesian government has a big interest in building a disaster management system, namely the National Disaster Management Agency (BNBP) (Journal & Mea, 2021) . According to BNPB, defining a disaster means that an event or group of events can threaten or disrupt the course of life or community activities, this is caused by human factors, non-natural factors and natural factors that can potentially result in human casualties, loss of goods owned, environmental damage and impact on human psychology. Disasters generally have a relatively more sensitive impact on poor groups regarding disaster events. research supported by Dika Agustina (2020) said that natural disasters that occur can cause a loss of resources which will deepen making it difficult to get out of the cycle of poverty. The risk of adverse events (shock) will threaten individuals or society at large. Ravallion (1988) stated that the risks faced by individuals or households can be independent of each other.

Human Development Index Theory

According to BPS 2022, the Human Development Index (HDI) was introduced by the United Nations Development Program. The aim of human development is to create an environment for people to enjoy a long, healthy and productive life for the fulfillment of life. Basically, human development plays the most important role in creating quality and expertise in the development of a country. According to Todaro and Smith, HDI measures a country's development achievements in the areas of per capita income, education and health. If the Human Development Index increases, poverty will decrease and vice versa (Permatasari, 2019).

Open Unemployment Rate Theory

Unemployment is defined as a person or individual who has not found permanent work or someone who is looking for work and is categorized in the labor force. According to Sukirno in (Marini & Putri, 2019) states that unemployment is someone in the labor force category who is actively looking for work at various wage levels, but has not or does not get a job according to his wishes. Another research statement is also supported by

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Darsuandi (2020), stating that when the open unemployment rate increases, the population increases. Previous research by Dinda Desinta, et al (2021) stated that the needs of a high and diverse population require them to be able to meet their needs. If they do not work, it will be difficult to fulfill their needs properly and the impact will increase poverty.

Theory of Gross Regional Domestic Product

According to BPS, the meaning of Gross Regional Domestic Product is the total gross value added of goods and services produced from all sectors of the regional economy. Tambunan (2003), if economic growth is not balanced, job opportunities continue to increase, it can result in unequal distribution of income (cateris paribus), this has the impact of creating a situation of economic growth and increasing poverty. According to Kuznet, there is a strong connection between growth and poverty because during development the number of poor people slowly decreases.

Population Theory

With large population growth, it can provide benefits in economic development. According to Sukirno (2013), population growth can form a driving or inhibiting factor for development because more workers will expand, the market for goods and services will expand depending on people's income and population. Rapid population movements can cause problems that threaten prosperity. According to Nelson and Leibstein in Sadano (2012), there is an influence between population growth and population growth. That rapid growth in developing countries results in no change in the level of welfare so that if in the long term there is a decline in welfare it will increase the number of poor people.

RESEARCH METHODS

Research Location

The research location is in East Java Province. This research was conducted because poverty in East Java is ranked first compared to other provinces in Indonesia. East Java Province experiences poverty due to factors that influence.

Data and data sources

The data used is a type of secondary data. The existing secondary data are natural disaster risk data, human development index, open unemployment rate, GDP, and poverty. There is continuous data for 8 years and cross-time data for 29 districts and 9

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cities obtained through the Central Statistics Agency and the National Disaster Management Agency starting from 2015-2022.

Data Analysis

This research using panel data regression analysis. Following panel data analysis, there are three methods of estimating the panel data regression model according to (Gujarati and Porter, 2012), namely: Common Effect Model (CEM), Fixed Effect Model (FEM) and Random Effect Model. Testing model selection from panel data uses tests such as Chow Test, Hausman Test and Lagrange Multiplier Test. Then, use to determine the certainty of the model, the regression model is determined and tested using the classical assumption test, namely the multicollinearity test and the heteroscedasticity test. The application of panel data regression analysis is formulated according to the dependent variable and independent variables that have been used, so it is formulated as follows:

$$KMSKN = \alpha + \beta_1 RBAit + \beta_2 IPMit + \beta_3 TPTit + \beta_3 PDRBit + \beta_5 JPit + e_{it}$$

Where :
KMSKN = Poverty
RBA = Natural Disaster Risk
IPM = Human Development Index
TPT = Open Unemployment Rate
PDRB = Gross Regional Domestic Product
JP = Population
e = standard error (confounding variable)

RESULT

Model Selection

Table 1 Model Selection

Estimation Method	CEM	FEM	BRAKE
Chow Test (CEM-FEM)	0.0000		
Hausman Test (FEM-REM)		0.0000	
LM Test (CEM-REM)	0.0000		

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Based on the results of the model selection, in Chow Test a probability smaller than the significance level of 0.05 or 5% the model chosen is FEM. In Hausman Test a probability smaller than the significance level of 0.05 or 5% so the model chosen is FEM. In LM Test a probability of 0.0000 < 0.05 means that the probability value is smaller than the significance level of 0.05 or 5%. So the model chosen in the research is REM.

Classical Assumption Test
Multicollinearity Test

Table 2 Multicollinearity Test Result

	IRB	HDI	TPT	GDP	JP
RBA	1.000000	-0.516318	-0.444025	-0.022861	0.229723
HDI	-0.516318	1.000000	0.563669	0.392851	-0.089325
TPT	-0.444025	0.563669	1.000000	0.415646	0.211719
GDP	-0.022861	0.392851	0.415646	1.000000	0.653952
JP	0.229723	-0.089325	0.211719	0.653952	1.000000

The Multicollinearity Test carried out to detect whether there is a correlation or relationship between independent variables in the regression model. It is necessary to observe the Variance Inflation Factor value < 1. The result show that the independent variables have a VIF value < 1.00 it is not affected by multicollinearity.

Heteroscedasticity Test

Table 3 Heteroscedasticity Test Result

	CEM	FEM	BRAKE
Heteroscedasticity Test	9.330980 (0.000000)	28.06673 (0.00000)	1.760753 (0.120780)

The Heteroscedasticity test to see whether there is an inequality of residual variance from one observation to another in the regression model. One of these tests is the Glesjer test to see the regression of the absolute residual value on the independent variable. If probability value of more than > 0.05, it can be declared free of heteroscedasticity. The result CEM and FEM have a probability value of <0.05, so it can

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be concluded that heteroscedasticity has occurred. But result REM which has a probability value of 0.120780 > 0.05, which is concluded to be free from heteroscedasticity. The coefficient values for the FEM and REM variables are not much different. So the unbiased and efficient coefficient value is REM. The best model selection is the Random Effect Model.

Hypothesis Testing

Table 4 Hypothesis Testing

Estimation Method	CEM	FEM	REM
Adj R2	0.843911	0.992657	0.518342
F test	328.6402 (0.000000)	976.3097 (0.000000)	66.21535 (0.000000)

a) The coefficient of determination (R2) states that it measures the influence of the independent variable on the dependent variable. The assessment lies in the numbers 0 to 1. With R 2 equal to one or close to one, it is stated that the regression form of the independent variable on the dependent variable has a dominant or strong influence. The result R-squared value of FEM and REM leads to number one meaning that variable X is dominant or strong over variable Y. So the independent variables are Natural Disaster Risk, Human Development Index, Open Unemployment Rate, Gross Regional Domestic Product and Population can describe the dependent variable, namely Poverty (Y) with an R-Squared value. Meanwhile, the remaining R-Squares values are defined as variables outside the model.

b) The F test to see whether there is a relationship between all the independent variables contained in the regression model and have a joint influence on the dependent variable. The result FEM and REM with a prob f-statistic of 0.000000 <0.05 means that the probability value is smaller than the significance level of the independent variables. So that the independent variable in the test has an effect on the dependent variable simultaneously.

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Table 5 Model Estimation Results with Various Methods

Estimation Method	CEM	FEM	REM
Variable			
IRB	-172.7942*** (64.86712)	71.59515** (28.15432)	76.29011*** (26.08845)
HDI	7607.292*** (471.4590)	2561.639*** (543.1209)	-4272.169*** (471.5378)
TPT	2387,380* (1242,950)	1910.424*** (337.4373)	1866.019*** (336.6915)
GDP	-0.121066*** (0.042446)	-0.238490*** (0.059944)	-0.165329*** (0.051427)
JP	0.083955*** (0.003900)	-0.010536 (0.014619)	0.069167*** (0.006882)

) Significant Level 1%, **) Significant Level 5%, *) Significant Level 10%

c) The T-test in Tabel 5 to see the independent variable influences the attachment variable. So the following decisions can be made :

1. Natural Disaster Risk variables, the CEM method is at a significant level of 1%, the FEM method is at a significant level of 5% and the REM method is at a significant level of 1%. So it can be interpreted that all methods in the Natural Disaster Risk Variable are significant for Poverty.
2. Human Development Index variables, the CEM method is at a significant level of 1%, the FEM method is at a significant level of 1% and the REM method is at a significant level of 1%. So it can be interpreted that all methods in the Human Development Index Variable are significant for Poverty.
3. Variable Open Unemployment Rate, the CEM method is at a significant level of 5%, the FEM method is at a significant level of 1% and the REM method is at a significant level of 1%. So it can be interpreted that all methods in the Open Unemployment Rate Variable are significant for Poverty.
4. Gross Regional Domestic Product variables, the CEM method is at the 1% significant level, the FEM method is at the 1% significant level and the REM method is at the 1% significant level. So it can be interpreted that all methods in the Gross Regional Domestic Product variable are significant for poverty.
5. Population Variable , the CEM method is at the 1% significant level, the FEM method is not significant and the REM method is at the 1% significant level. So

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it can be seen from the regression results of the heteroscedasticity test that the REM used means that the Population variable are significant to poverty.

Data Analysis result

The results of the panel data regression equation in Tabel 1 Estimation Result is selected model REM as follows :

$$KMSKN = 336073.7+76.29011RBAit-4272.169IPMit + 1866.019TPTit – 0.165329PDRBit +0.069167JPit + e_{it}$$

The constant value is 336073.7, so without being influenced by the risk of natural disasters, human development index, open unemployment rate, gross regional domestic product and population, poverty is 336073.7. The natural disaster risk coefficient value (X1) is 76.29011. The coefficient value of the human development index (X2) is -4272.169. The coefficient value for the open unemployment rate (X3) is 1866.019. The gross regional domestic product coefficient value (X4) is -0.165329. The population coefficient value (X5) is 0.069167. If ranked, there are the largest to smallest influences on poverty, namely the human development index, open unemployment rate, risk of natural disasters, gross regional domestic product and population.

DISCUSSION

The Effect of Natural Disaster Risk on Poverty

The result regression show that natural disaster risk variable has a coefficient value of 76.29011 and a probability value of 0.0037 < 0.05 which means that the natural disaster risk variable has a significant positive influence on poverty in East Java Province. If the risk of natural disasters increases by 1 basis point, it will increase poverty by 76,29011 person units. This is in line with research by Rizka Putri Pranandari et al (2022) explaining that the natural disaster risk index is positive and significant for poverty. The magnitude of the potential disaster will increasingly result in the impact of potential large economic losses for society, the level of disaster risk will have an impact on poverty. This is also in line with Dika Agustina's (2020) research that total damage due to natural disasters had a positive and significant effect on poverty. With efforts to eradicate poverty due to natural disasters through the distribution of funds for post-disaster regional reconstruction, especially in districts/cities that have a high class disaster risk index. This is in accordance with the conditions in East Java Province, namely that basically the risk

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of natural disasters occurs, the vulnerability of a region and the geography of each region is different, but can be resolved well with a quick and appropriate response from the Regional Disaster Management Agency for each region in providing preventive capacity when a disaster occurs.

The Effect of Human Development Index on Poverty

The result regression show that human development index variable has a coefficient value of -4272.169 and a probability value of 0.0000 < 0.05 which means that the human development index variable has a significant negative influence on poverty in East Java Province. If the human development index increases by 1 basis point, it will reduce poverty by -4272,169 person units. The research results are in line with other research, Permatasari (2019) stated that the human development index variable had a significant negative effect on poverty. Research states that in urban areas the human development index is higher than in rural areas because one of the reasons is that health facilities, education facilities development of facilities is more adequate in urban areas than in rural areas. Unequal human development will result in increased poverty and can hamper economic development due to limited human development. Basically, according to conditions in East Java Province, an increase in the human development index is a potential increase in human resource development. Starting from the development of education, health and income. So that the formation of community excellence improves the economy of a region to reduce poverty.

The Effect of Open Unemployment Rate on Poverty

The result regression show that open unemployment rate variable has a coefficient value of 1866.019 and a probability value of 0.0000 < 0.05 which means that the open unemployment rate variable has a significant positive influence on poverty in East Java Province. If the open unemployment rate rises by 1 basis point, it will increase poverty by 1866,019 person units. This is in line with research (Kusumo, BH, 2022) that the open unemployment rate variable has a positive and significant effect on poverty, that as stated by Sukirno (2006:14), the continuous increase in unemployment found that more and more people had no income because they did not have a job. So that people are unable to meet their daily living needs and economic activity in the area is hampered. Other research is in line with this research, Darsuandi (2020) states that the open unemployment rate variable has a positive and significant effect on poverty, in accordance with what Sadano Sukirno (2005) stated: unemployment causes a negative

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impact on income earned and affects welfare to decline. A decline in welfare will result in unemployment so that people will be trapped in poverty. This is in accordance with conditions in East Java Province where unemployment occurs due to the workforce looking for work or not finding work. Basically, there is an imbalance in the workforce and employment opportunities and there is a mismatch in the desired fields of work. This has the potential that the workforce released will become unemployed, thereby increasing the poverty rate

The Effect of Gross Regional Domestic Product on Poverty

The result regression show that the gross regional domestic product variable has a coefficient value of -0.165329 and a probability value of 0.0014 < 0.05 which means that the gross regional domestic product variable has a significant negative influence on poverty in East Java Province. If gross regional domestic product increases by 1 basis point, it will reduce poverty by 0.165329 person units. There is similar research by Dio Refelindo Mandey et al (2023), findings result had a significant negative effect on poverty. In accordance with Kuznets growth theory, growth and poverty have a strong relationship, in the early stages of the development process the level of poverty tends to increase, but during the final stages of development the number of poor people gradually decreases. Other research, Fitria, S.F. (2021) Gross Regional Domestic Product has a negative and significant effect on poverty. This result is in accordance with conditions in East Java Province that if gross regional domestic product increases then economic growth will progress to reach every income group until it is spread slowly evenly. Economic growth is one of the effective conditions for reducing poverty.

The Effect of Population on Poverty

The result regression show that population variable product coefficient value of 0.069167 and a probability value of 0.0000 < 0.05 means that the population variable has a positive and significant influence on poverty in East Java Province. If the population rises by 1 basis point, it will increase poverty by 0.069167 person units. The regression results are in line with research Ilham (2019), that population size has a significant positive effect on poverty. The results are in line with Nelson and Leibstein's theory which states that rapid population growth in developing countries means that the level of people's welfare does not improve or change, so that in the long term it will reduce welfare and increase the number of poor people. The results of other research by Utami FP, et al (2022) had a positive and significant effect on poverty. These results are in accordance

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with the conditions in East Java Province, the increase in population from year to year, if not controlled, will lead to a catastrophic decline in welfare and impacting increasing poverty. Moreover, there is a demographic bonus in East Java Province where the productive age has a higher number than the unproductive age, if it is not accompanied by skills and lots of job opportunities, it will result in unemployment without wages to meet life's needs, which can increase the poverty rate.

CONCLUSION

Based on the analysis the impact of natural disaster risk, open unemployment rate, gross regional domestic product and population have on poverty in East Java Province 2015-2022 have different result. The natural disaster risk has a significant positive on poverty. Social demography factors consisting of open unemployment rate and population have a significant positive on poverty. The human development index and gross regional domestic product have a significant negative on poverty.

Suggestion

Based on this research suggestions can be useful for society, government, and academics. For society, needs to participate in understanding disasters and building collective awareness of disaster-prone areas and what mitigation is needed by the community when affected by a disaster. In social demography, there is a need for people to be aware improve the quality of life, skills in order to get suitable jobs, contribute in pursuing the potential region and awareness of participating in family planning programs. For government, efforts to eradicate poverty are carried out by improving disaster risk policies by the East Java Provincial Government by socializing disaster resilient village, providing funding allocations, strong building facilities and fast movement during pre-disaster and post-disaster times. The government also needs to improve policies to improve human quality as education, income, healthy facilities. The government increases this by providing employment opportunities according to the potential of each region. As well as boosting economic growth with the potential resources of each region that need to be supported by the society. In terms of population, the government emphasizes increasing public awareness with disaster family programs evenly as well as outreach to productive and non-productive ages. For academics, based on empirical results in East Java Province in research related to poverty, it is necessary to consider natural disaster risk factors apart from social demography factors. You can also use social

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demography factors to determine conditions and determine the relationship with poverty in East Java Province.

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