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THE EFFECT OF POPULATION DENSITY ON INCOME INEQUALITY IN MALUKU AND PAPUA ISLAND

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PAPER INFO	ABSTRACT
	Population density is one of the parameters of population pressure in an area. Density in an area is expressed in terms of population per square kilometer and compared to the residential area. The uneven distribution of population that occurs in the Maluku and Papua islands can be seen in the differences in the level of GRDP per capita between regions. Rapid population growth not only has an impact on the problem of equitable distribution of living areas and opportunities in the world of work. This study will examine the effect of population density on income distribution through case studies in the Maluku and Papua islands. The research method uses Panel Data Testing with 13 years of data (2009 – 2021).
KEYWORDS	

INTRODUCTION

Problems that are often faced by developing countries such as Indonesia are the problem of inequality and economic inequality, this is due to the number of population who always increase every year. Indonesia is one of the countries that are considered unable to achieve economic stability. Inequality is growing significantly in the most populous countries in Asia, including China, India, Bangladesh, Indonesia and Pakistan (Wan, Wang, & Zhang, 2021), and as Wan points out, inequality has increased significantly for most populous countries like Indonesia.

Deutsch et al., (2020) state that the country with the highest income inequality in Southeast Asia occurs in Cambodia, the second highest is Indonesia and the third is the Philippines. The classification is a similar country classification found when calculating the multidimensional poverty index. (Deutsch, Silber, Wan, & Zhao, 2020). One way to measure the level of income inequality in a country is to use the Gini Ratio indicator. Inequality that occurred in Indonesia during 2009 – 2021 using the Gini ratio indicator is shown in Figure 1.

Fig 1. The graph of Gini ratio and poverty in Indonesia (%) in 2009-2021.

In general, development problems in developing countries must take into account not only the achievement of growth rates but also the distribution of development results and equitable distribution. The population that continues to increase and is not controlled will have an unfavorable impact, including rising poverty levels because rapid population growth is not matched by economic growth.

The Republic of Indonesia (NKRI) has 17,504 islands ranging from the largest to the smallest, with the largest islands such as Java, Sumatra, Kalimantan, Sulawesi, Papua, Maluku and Nusa Tenggara. According to the 2014 Medium Term Development Plan (RPJM), Indonesia's territory is divided into 6 corridors (table 1).

Table 1. Regional Division by RPJM 2014

Koridor Wilayah	Provinsi
1	Jakarta, West Java, Central Java, DI Yogyakarta, East Java dan Banten
2	Bali, West Nusa Tenggara dan East Nusa Tenggara
3	Nangroe Aceh Darussalam, North Sumatera, West Sumatera, Riau, Riau Islands, Jambi, South Sumatera, Bangka Belitung Islands, Bengkulu dan Lampung
4	West Kalimantan, Central Kalimantan, South Kalimantan, East Kalimantan dan North Kalimantan
5	North Sulawesi, Central Sulawesi, West Sulawesi, South Sulawesi, Southeast Sulawesi dan Gorontalo
6	Maluku, North Maluku, Papua dan West Papua

The results of development that are available fairly and proportionally in all levels of society, provinces and islands are development goals and include balanced progress between regions. However, looking at the data in Figure 2, it can be seen that there is an income inequality per island (according to the corridor) from 2009 to 2021 (Kementerian Perencanaan Pembangunan Nasional, 2015).
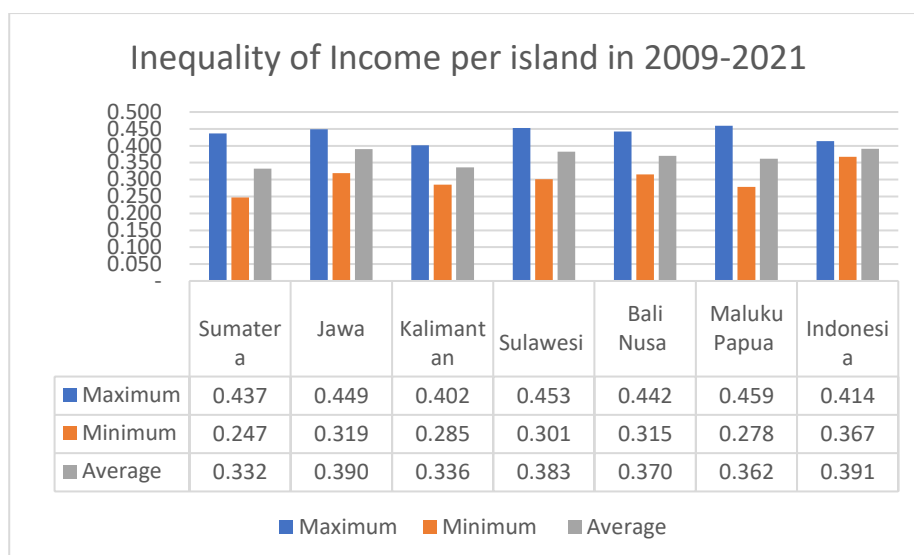
Fig 2. Inequality of income per island in 2009-2021

The highest income inequality is found in the Maluku and Papua corridors, this needs special attention considering the large economic potential of the region.

Literature Review

Income inequality has an impact on people's conditions, including affecting the level of poverty and slowing the rate of economic growth. There are eight factors that cause income inequality in a region: (1) If population growth increases significantly, it causes per capita income to decrease (2) Inflation where monetary income increases, which is not proportional to the increase in the production of goods. (3) uneven development between regions. (4) high capital-intensive project investment. (5) minimum social movement. (6) The implementation of the import policy has an impact on increasing the price of industrial goods in order to protect capitalist companies. (7) low currency exchange rates (8) Damage to the Home industry. One way to measure the level of income inequality in a country is to use the Gini Ratio indicator.

The Gini coefficient is a calculation method for measuring the degree of inequality in the distribution of income, wealth, and population of a country (Gini, 1921). In the calculation by dividing the ratio of the plane located between the diagonal line and the Lorenz curve divided by the area of the half plane where the curve is. Lorenz Curve Describing the vertical axis shows the share of the total amount of income earned by each percentage of the population while the horizontal axis shows the cumulative percentage of the population. Then there is the "perfect evenness line" shown on the diagonal line (Arifianto, 2013). At all points on the diagonal line, the percentage of acceptance of the opinion is the same as the percentage of the population. The level of evenness is shown in the Lorenz line from the diagonal line, the farther the distance from the diagonal line, the higher the level of inequality. On the other hand, the higher the level of income distribution distribution is shown, the closer the Lorenz curve is to the diagonal line. The value of the Gini coefficient is close to zero (0) then a more even distribution of income. On the other hand, if the Gini coefficient is closer to one, then an income distribution is said to be more unequal. In the Lorenz curve, the diagonal line represents perfect equality. Measurement of Income Inequality The Gini Ratio value has a number below 0.40 then Income Distribution with a Low Inequality Level, if between numbers 0.40-0.50 then the Inequality Level is Low, if the number is greater than 0.50 then the Inequality Level is High

Population density is a condition in which the total population within a certain space limit is increasing compared to the area of a room (Elviyanti & Aryanti, 2019). Population density is the ratio between the total population and the area of settlement. Population density is one of the parameters of population pressure in an area. Density in an area is expressed in terms of

population per square kilometer and compared to the residential area. In an area the population density is divided into four parts: (Purba et al., 2021)

a. Crude density of population can be called arithmetic population density which is indicated by the number of inhabitants per square kilometer of area.
b. Physiological density or density that shows the number of people per square kilometer of agricultural land (cultivable land).
c. Agricultural density is the number of farmers' population per square kilometer of cultivable land area.
d. Economical density of population is the ratio of the total population to the area of land carrying capacity.

The rapid population explosion has a negative impact on people's lives in the socio-economic field. In addition, there are impacts from the population explosion, namely (Christiani, Tedjo, & Martono, 2014)

a. Limited sources of basic needs so that it is not comparable between the sources of basic needs with population growth.
b. Inadequate health and social facilities (schools, hospitals, entertainment venues) and other supporting facilities.
c. Inadequate employment opportunities in the existing workforce have implications for increasing unemployment and social quality.

To get the population density figure, use the following formula: Population density is the number of people divided by the area. This population density measurement formula helps in finding the level of population density in an area. In addition, population density data is one of the references in the transmigration program. It can be concluded based on experts regarding population density is a situation where the population density of a residential area is increasing.

Research conducted by (Joshi, 2017), (Biswas, Chakraborty, & Hai, 2017) and (Niyimbanira, 2017) proves that population density is significant to income inequality and has a positive effect.

METHOD

The object of research is secondary data in the form of time series using data from 4 provinces in corridor 6, namely Maluku, North Maluku, Papua and West Papua Provinces. Data analysis and research methods use Panel Data Testing with a data year of 13 years (2009 – 2021) so that the amount of data in the study is 52 data for each variable. The descriptive approach is the method used to determine the value of the variable independently, namely the Population and Income Inequality variable in the province in corridor 6.

The research data were obtained from various agencies such as Bank Indonesia, office of population affairs and Statistics Indonesia (Statistik, 2020)

Table 2. Research data structure

Province in corridor 6	Year	X Population	Y Income Inequality
Maluku	2009 (1)	$\ln(X)_{i,2009}$	$\ln(Y)_{i,2009}$
Maluku	⋮	⋮	⋮
Maluku	2021 (13)	$\ln(X)_{i,2021}$	$\ln(Y)_{i,2021}$
Maluku Utara	2009 (1)	$\ln(X)_{i,2009}$	$\ln(Y)_{i,2009}$
Maluku Utara	⋮	⋮	⋮
Maluku Utara	2021 (13)	$\ln(X)_{i,2021}$	$\ln(Y)_{i,2021}$
Papua	2009 (1)	$\ln(X)_{i,2009}$	$\ln(Y)_{i,2009}$
Papua	⋮	⋮	⋮
Papua	2021 (13)	$\ln(X)_{i,2021}$	$\ln(Y)_{i,2021}$
Papua Barat	2009 (1)	$\ln(X)_{i,2009}$	$\ln(Y)_{i,2009}$

Papua Barat	⋮	⋮	⋮
Papua Barat	2021 (13)	$\ln(X)_{i,2021}$	$\ln(Y)_{i,2021}$

Research in general has an independent variable and a dependent variable, this research uses a causal relationship between the two variables. The relationship between variables in the research in the formulation is as follows:

$$Yit = \alpha_{it} + \beta X_{it} + \varepsilon_{it}$$
$$\text{Income Inequality}_{it} = \alpha_{it} + \beta \text{Population}_{it} + \varepsilon_{it}$$
$$\text{lnIncome Inequality}_{it} = \alpha_{it} + \beta_1 \text{Population}_{\text{PapuaMaluku } t}$$

There are three approaches to determining the estimation model using panel data, including: 1) PLS (Pooled Least Square) or CEM (Commond Effect Model), 2) FEM (Fix Effect Model) and 3) REM (Random Effect Model). There are three tests that can be done (Gujarati, 2003), namely by using:

The Chow test is the F statistical test with the Redundant Fixed effect - Likelihood ratio test, which is to choose the best between CEM and FEM (Baltagi & Baltagi, 2008). If the prob value. F < critical limit, choose FEM, however if the value of prob. F critical limit, then the choice is CEM.

Hausman test is a statistical test to choose between FEM and REM if the value of prob, chi square < significance level, then choose FEM, but if prob. Chi square > significance level, then choose REM.

RESULTS AND DISCUSSION
Variable Description Analysis Results

Research data on the population density variable (X) in corridor 6 is shown in the figure 3. It can be seen that from the 4 provinces located in corridor 6, the level of population density always increases from year to year. Population density in Maluku and North Maluku in 2009, 2011, 2012, 2013, 2015 and 2016 has the same level. In 2010 the population density in Maluku was higher than North Maluku, but from 2017 to 2021 the population density level in North Maluku was higher than Maluku.

The population density in West Papua and Papua in 2009 was at the same level, but in the following years the density in Papua is higher than West Papua. If we look at the data in West Papua, the population density is the same in 2010-2012, in 2013-2019 and in 2020-2021 (Dabrowski, 2019). The same thing happened in Papua, namely the same population density rate in 2010-2012, in 2013-2018 and then increasing steadily in the following year.
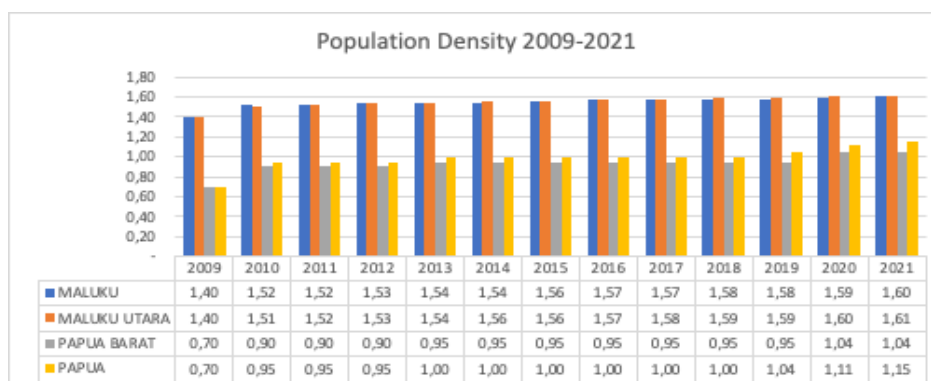

Fig 3. Population Density 2009-2021

Research data on income inequality variable (Y) in corridor 6 is shown in Figure 4 Maluku has the lowest income inequality level in 2009 which is 0.312 and the highest in 2012 is 0.382. North Maluku Province has the lowest level in 2021, which is 0.278 and the highest in 2011 is 0.343. West Papua Province had the lowest level in 2009 which was 0.353 and the highest level in 2015 was 0.428. The last province in corridor 6, namely Papua, had the lowest level in 2009 at 0.383 and the highest in 2014 at 0.459.

Fig 4. Income Inequality 2009-2021

Panel Analysis Results

Table 4. Results of CEM, FEM and REM Panel Data

Variable	CEM	FEM	REM
	Koefisien		
C	0.508079	0.346923	0.469016
POPDENSITY0921	-0.116617	0.011834	-0.085482
R-squared	0.663428	0.775304	0.211673
Adjusted R-squared	0.656697	0.756180	0.195907
Prob F-Statistik	0,000000	0,000000	0,000060

The results of the Chow test show that the probability number is < 0.05, so the model chosen is the Fixed Effect Model (FEM).

Table 5. Chow Test Result

Redundant Fixed Effects Tests			
Equation: Untitled			
Test cross-section fixed effects			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	7.800380	(3,47)	0.0003
Cross-section Chi-square	21.011215	3	0.0001

Hausman test results show a probability number <0.05, the model chosen is the Fixed Effect Model (FEM).

Table 6. Hausman Test Result

Correlated Random Effects - Hausman Test			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	7.982435	1	0.0047

The results of panel data estimation by testing the Chow test (table 5) and Hausman test (table 6) to see the best model concluded that the best model chosen was the Fixed Effect Model (FEM) model.

Based on table 4, it is known that the R-squared value of the FEM model is 0.775304, which means that in the corridor 6 the variables that affect the level of income inequality of 77.5% are population density and the remaining 22.5% is influenced by other variables. The equation formed from the results of the FEM model panel calculation is:

INCOMEINEQ0921 = 0.346923 + 0.011834 POPDENSITY0921 + e

This equation explains that when there is a one unit change in the population density level, inequality increases by 0.011834 one unit. The results of this study are in line with research conducted by Joshi, Biswas et al and Niyimbanira which proves that population density has a significant effect on income inequality and has a positive effect.

CONCLUSION

The conclusions obtained after conducting the analysis are: a) Income inequality variable in corridor 6, the lowest number is 0.278 is North Maluku in 2021;b) Income inequality variable in corridor 6, the highest number is at 0.459 is Papua in 2014; c) Variable population density in corridor 6, the lowest number at 0.70 are West Papua and Papua in 2009. d) The population density variable is in corridor 6, the highest number is at 1.610, is North Maluku in 2021. e) Selection of the best model based on the results of panel data using the Fixed Effect Model (FEM); f) The R-square figure based on the calculation results is 0.775304 or 77.5%

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