Forum Analisis Statistik
Desember 2024, 4 (2): 62-77

Analysis of the Effect of Population, Average Years of Schooling, and Per Capita Expenditure on Income Inequality among 14 Regencies/Cities in Kalimantan Barat Province

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ABSTRACT

In the implementation of economic development, Indonesia as a developing country is faced with complex problems in the process of economic development that is being carried out, namely the problem of income inequality among regions. In Kalimantan Barat Province itself, regional economic development still needs special attention, in order to narrow the opportunity for regional income inequality to occur. Raising the standard of living for the populace is an important part of economic development. Improvements from social, educational and economic aspects must be made. In this study, data variables representing these aspects will be used, namely population, average years of schooling, and per capita expenditure, which will then be used panel data regression analysis as an identification tool with the best estimation modeling to determine the effect of these variables on the Gini Ratio index as a measuring variable of income distribution inequality among 14 regencies/cities in Kalimantan Barat Province from 2012 to 2023. Panel data regression was employed as an analytical tool in this research utilizing the Fixed Effect Model (FEM), as the best estimation modeling. From the analysis conducted, the results indicated that the Gini Ratio index had a significant relationship with population. Meanwhile, the average years of schooling and per capita expenditure have a relationship but not significant to the Gini Ratio index or to the level of income inequality in Kalimantan Barat Province.

Keywords: income inequality, panel data regression, population, average years of schooling, per capita expenditure.

INTRODUCTION

In essence, enhancing people's welfare is the goal of the economic growth process. High economic growth and more fair income distribution will be required in order to improve community welfare. As a growing country, Indonesia is now dealing with a number of complicated issues related to the execution of economic development, one of which is the issue of regional income inequality. According to Dai et al. (2023), Indonesia is currently dealing with a number of issues, including rising and falling poverty rates, as well as income inequality across regions and between individuals with high and low incomes. Some of the factors that cause income inequality between regions to occur are such as different levels of development between regions, the caliber of human resources now in place, potential in natural resources, geographical location, and ethnicity can also be factors that cause income inequality. These factors can be an advantage but can also be a possible cause of inequality (Hariani, 2019).

Income inequality will decline when economic growth increases and vice versa. The level of income inequality in Indonesia can be measured using the Gini Ratio index. A value near 1 indicates a larger income inequality, whereas a value near 0 indicates a smaller income inequality. The Gini Ratio index ranges from 0 to 1. To demonstrate an equal distribution of income inequality across areas, the Gini Ratio index is aimed to be around 0 since a value near 1 implies a larger degree of income inequality (Amali & Syafri, 2023).

Indonesia's Gini Ratio index, according to data from the BPS-Statistics Indonesia, experienced changes that tended to decrease, but there were several times that caused Indonesia's Gini Ratio index to increase, such as during the Covid-19 pandemic, where Indonesia's Gini Ratio index figure from September 2019 to September 2020 increased by 0.005, from 0.380 to 0.385 (BPS, 2024). Seeing Indonesia's Gini Ratio index figure which illustrates the level of income inequality in Indonesia, of course, follow-up is needed from the Indonesian government to overcome this income inequality problem. However, before addressing the problem of income inequality in Indonesia, it would be more effective to start from a smaller level, such as the provincial level, and also by only looking at the level of income inequality nationally, it will make it less able to explain the condition of income inequality in detail in a regional area, one of which is in the Province of Kalimantan Barat.

Over the past 12 years, in Kalimantan Barat Province in 14 existing regencies/cities, from 2012 to 2023, each region experienced differences in changes in the Gini Ratio index each year. According to Badriah (2009), in the development process of a region that experiences income inequality, this is due to differences in terms of empowerment of natural resources and the quality of human resources, then differences in capital flows, and policies from the central government in the development process that pay less attention to certain regions, as well as inappropriate planning in the area. In Kalimantan Barat Province itself, regional economic development still needs special attention, although economic development is not the only important component in development efforts in a region, but at least economic development can be useful as a tool to reduce poverty, and narrow the possibility of regional income inequality (Duarsa & Wijaya, 2023). The human development index is an important aspect of an area's ability to promote economic development, which shows how well or poorly a region has done so based on how much its citizens' standard of living has increased. Raising the standard of living in the community will have a big effect on the human development index because of their interdependence (Zusanti et al., 2020).

In the human development index, there are several important aspects, one of which is the social aspect, where the indicator that can be used to measure the social aspect is population. According to Sukirno (2019), one of the things that can affect an area's income inequality is the rise and fall of population. In an area, if there is a high population growth, if it is not accompanied by an increased level of productivity, it will result in an increase in the unemployment rate, thus making the income inequality gap between communities wider. However, if the quality of the population is good, then the increase in population will lead to a decrease in the level of income inequality. In Kalimantan Barat Province in 2023, according to data from BPS-Statistics Kalimantan Barat Province, Kayong Utara Regency is the regency/city with the smallest population in Kalimantan Barat Province, totaling 132,855 people. Meanwhile, Pontianak City became the regency/city with the largest population in 2023, totaling 675,468 people. According on this data, it can be seen that there is a considerable difference in population in the regions in Kalimantan Barat Province so that there will be conjectures that state this is one of the causes of income inequality in Kalimantan Barat Province.

The education aspect is also an important aspect of the human development index, because it is considered in a region, the sustainability of its economic growth will be greatly influenced by the education aspect (Anwar, 2018). The indicator that can be used to measure this aspect of education is the Average Years of Schooling (RLS). According to Todaro (2015), the concept that can be seen from Human Capital theory is through investment in health and education that a person makes with the aim that the level of consumption in the future can increase. When a person has a high education, the mindset and decision-making of that person will be better and more mature. According to data from BPS-

Statistics Kalimantan Barat Province, during the last 12 years, from 2012 to 2023, 14 regencies/cities in Kalimantan Barat Province obtained the lowest average RLS value, namely in Kayong Utara Regency with an average RLS value of 5.74 years, while Pontianak City became the regency/city with the highest average RLS value of 9.91 years. From these data, it can be seen that there is a considerable difference in the average value of RLS in the regions in Kalimantan Barat Province so that there will be conjectures that state this is one of the causes of income inequality in Kalimantan Barat Province.

One aspect that will also be affected by the long-term human development process is per capita expenditure, where the occurrence of the human development process will result in an increase in people's per capita income, which will also be followed by an increase in people's per capita expenditure (Duarsa & Wijaya, 2023). This is based on the theory contained in Mankiw (2018), namely that when someone gets an increased income, it will make his consumption also increase, but the amount of consumption will not exceed the amount of additional income he gets. According to Patriotika (2015), in measuring the human development index or human living standards, people can use per capita expenditure as an indicator, and also in measuring people's purchasing power, per capita expenditure can be a measuring tool, where people's purchasing power is closely related to the achievement of welfare in an area. According to data from BPS-Statistics Kalimantan Barat Province, during the last 12 years, namely from 2012 to 2023, the 14 regencies/cities in Kalimantan Barat Province obtained the lowest average per capita expenditure value, namely in Kapuas Hulu Regency with an average per capita expenditure value of Rp 6,969,210. Meanwhile, Pontianak City became the regency/city with the highest average per capita expenditure value of Rp 14,247,220. From these data, it can be seen that there is a considerable difference in the average value of per capita expenditure in the regions in Kalimantan Barat Province, so there will be a conjecture that states that this is one of the causes of income inequality in Kalimantan Barat Province.

There is one type of statistical method, namely regression analysis, where this method is useful for examining the relationship between two or more variables. The results obtained from this regression analysis are mathematical equations that are useful for examining the relationship between variables, then conclusions are drawn from this relationship (Salsabila et al., 2022). The type of data that is usually analyzed when performing regression analysis is cross section data. However, there are some behavioral observation data from economic units such as companies or governments and households, where the observation data analyzed is not only within a certain unit of the behavior of these units, but also analyzed with a certain period of time (time series) of the behavior of these units. Therefore, a type of data was born from cross section data combined with time series data, where the data is panel data (Setiawan & Kusrini, 2010). In addition, cross section data also at the same time provides a description of various subjects about an information, while time series data focuses on one object to be observed in several time periods. Only panel data may be examined using this panel data regression analysis approach. Three different modeling types are employed to estimate the regression model in panel data regression, namely the Common Effect Model, Fixed Effect Model, and Random Effect Model (Carla et al., 2023).

Meanwhile, there are several previous studies that discuss income inequality modeling using panel data regression with independent variables such as population, average years of schooling, and per capita expenditure. These studies serve as literature references in this study. According to Bayhaqi (2018), the population is the variable that significantly affects income inequality, and FEM is the best model for panel data regression. The average years of schooling variable, while relevant, does not significantly affect income inequality, according to Dai et al. (2023), who also found that FEM is the optimal model. In the meantime, Duarsa & Wijaya (2023) demonstrate that CEM is the most effective model and that per capita spending significantly affects income inequality.

Finding the best estimated panel data regression model is the aim of this study, as previously stated. The next step is to ascertain whether the Gini Ratio index and independent variables are significantly correlated. Therefore, this study will examine income inequality in Kalimantan Barat Province from 14 regencies/cities between 2012 and 2023, using the panel data regression analysis approach. The population, average years of schooling (RLS), and per capita expenditure of each region are the independent variables used in this study, which is based on earlier research and variables that are expected to have an impact on the Gini Ratio as the dependent variable.

METHODOLOGY

Type and Source of Data

This research makes use of secondary data, which is a quantitative data type. Jabnabillah et al. (2023) define secondary data as information gathered from previously available sources rather than directly from the primary source. The BPS-Statistics Kalimantan Barat Province provided secondary data for this study. The study will then use panel data, which comprises cross section data from 14 regencies/cities in Kalimantan Barat Province, as well as time series data from 2012 to 2023. Three independent variables and one dependent variable will be the research variables. Then, the following Table 1 provides an overview of the research variables used.

Table 1. Research Variables

Research Variables	**Description**
(1)	**(2)**
Gini Ratio (Y)	Level of Income Inequality
P (X_1)	Population (People)
RLS (X_2)	Average Years of Schooling (Years)
PCE (X_3)	Per Capita Expenditure (Thousand Rupiah)

Source: Processed from BPS-Statistics Kalimantan Barat Province, 2023

Data Panel Regression Analysis

With data organized as panel data, this analysis is a statistical technique frequently employed in research to ascertain the independent and dependent variables relate to one another (Salsabila et al., 2022). The panel data regression model's equation formula is generally as follows:

$$Y_{it} = \alpha_{it} + \sum_{k=1}^{n} \beta_k X_{kit} + e_{it} \tag{1}$$

Description:

Y_{it} = The dependent variable's value for the *i*-th individual unit with the *t*-th period.
α_{it} = The intercept coefficient on the *i*-th individual unit with the *t*-th period.
β_k = The slope coefficient of the *k*-th independent variable.
X_{kit} = The value of the *k*-th independent variable in the *i*-th individual unit with the *t*-th period.
e_{it} = Error at the *i*-th individual unit with the *t*-th period.
k = Number of regression parameters estimated.
i = Number of individual units in the cross section (1, 2, 3, …, N).
t = Number of periods in the time series (1, 2, 3, …, T).

Panel Data Regression Model

Panel data regression modeling employs three different approaches the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). The CEM approach can be approached using the Ordinary Least Square (OLS) method, the FEM approach can be approached using the Least Square Dummy Variables (LSDV) method, and the REM approach can be approached using the Generalized Least Square (GLS) method (Lestari & Setyawan, 2017).

a. *Common Effect Model* (CEM)

Without taking into account the dimensions of time (time series) and individuals (cross section), the CEM technique aggregates all data. According to Istiqamah et al. (2018), this method assumes that every variable has the same intercept (α) value and the same slope (β) coefficient on all cross sections and time series units. Meanwhile, the CEM equation is generally stated as follows:

$$Y_{it} = \alpha + \sum_{k=1}^{n} \beta_k X_{kit} + e_{it} \quad (2)$$

b. *Fixed Effect Model* (FEM)

Individual differences in influence are the outcome of the FEM technique, which employs dummy variables in its analysis and assumes that the equation's intercept (α_i) has a fixed value for each time series data set (Winarno, 2015). Since each individual is an unknown parameter in this approach, the dummy variable technique method often known as Least Square Dummy Variables, or LSDV, is used to estimate it (Winarno, 2015). Meanwhile, the FEM equation is generally stated as follows:

$$Y_{it} = \alpha_i + \sum_{k=1}^{n} \beta_k X_{kit} + e_{it} \quad (3)$$

c. *Random Effect Model* (REM)

Panel data that is connected across individuals or between times on the error (μ_i) component is estimated using the REM technique. Reduced degrees of freedom are one of the issues that FEM might produce, therefore REM is introduced to address these issues (Salsabila et al., 2022). Meanwhile, the REM equation is generally stated as follows:

$$Y_{it} = \alpha + \sum_{k=1}^{n} \beta_k X_{kit} + \mu_i + e_{it} \quad (4)$$

Best Model Selection

To decide which regression model estimation is the most appropriate, suitable, and best among the three models, the best regression model is chosen. Ghozi & Hermansyah (2018) state that the Chow test, Hausman test, and Lagrange multiplier test are the three best model testing methods that may be used with panel data.

1. Chow Test

The purpose of this test is to decide which is better for estimating panel data regression CEM or FEM. The test statistics that were employed are as follows:

$$F_{count} = \frac{\frac{RSS_1 - RSS_2}{N-1}}{\frac{RSS_2}{NT-N-K}} \sim F_{(\alpha,(N-1),(NT-N-K))} \quad (5)$$

In this Chow test, N means the number of sectors, T means the time period of the study, K means the number of parameters in the FEM, RSS_1 is the residual sum of squares of the CEM, while RSS_2 is the residual sum of squares of the FEM.

Meanwhile, in this test there is hypothesis used which is a follow:

H_0: Panel data regression modeling with CEM is better than FEM

H_1: Panel data regression modeling with FEM is better than CEM

If the resulting p-value is smaller than α = 0.05 (significance level), then the decision is H_0 is rejected, or if the resulting F_{count} statistical value is greater than F_{table} ($F_{(\alpha,(N-1),(NT-N-K))}$) with a certain α, then the modeling chosen is FEM (Savitri et al., 2021).

2. Hausman Test

The purpose of this test is to decide which is better for estimating panel data regression REM or FEM. The test statistics that were employed are as follows:

$$W = X^2_{(P)} = [b - \beta]'^{\psi^{-1}}[b - \beta] \quad (6)$$

Where:

$$\psi = Var[b] - Var[\beta] \quad (7)$$

In this Hausman test, b refers to the REM parameters (without intercept), while β is the FEM parameter using LSDV. Then, Var[b] means the covariance matrix of REM parameters (without intercept), while Var[β] means the covariance matrix of FEM parameters.

Meanwhile, in this test there is hypothesis used which is a follow:

H_0: Panel data regression modeling with REM is better than FEM

H_1: Panel data regression modeling with FEM is better than REM

If the resulting p-value is smaller than α = 0.05 (significance level), then the decision is H_0 is rejected, or if the resulting value is $W > X^2_{(\alpha,P)}$ then the modeling chosen is FEM (Savitri et al., 2021).

The Lagrange Multiplier test is no longer required to identify the best model if the results of the two tests mentioned above indicate that the Fixed Effect Model (FEM) is the best estimated model (Prastiwi et al., 2020).

Classical Assumption Test

A regression model using FEM can be subjected to a classical assumption test. Two classical assumption tests that can be used to FEM are multicollinearity and heteroscedasticity (Napitupulu et al., 2021).

1. Multicollinearity Test

The purpose of a multicollinearity test, according to Ghozali (2017), is to determine whether or not there is a substantial level of correlation between the independent variables in the regression model. The regression model is said to have multicollinearity symptoms when the results of a multicollinearity test indicate that the regression model has a high degree of correlation in the independent variables, if these symptoms are present, the regression model is considered flawed.

If the multicollinearity test produces a tolerance value greater than 0.10 or a VIF value less than 10, it can be said that the independent variables in the regression model do not display multicollinearity symptoms. However, if the tolerance value is less than 0.10 or the resulting VIF value is greater than 10, it can be concluded that the independent variables in the regression model show evidence of multicollinearity (Mardiatmoko, 2020).

2. Heteroscedasticity Test

The heteroscedasticity test is used to determine whether the variance of one observation residual is different from that of other observations in the regression model. Heteroscedasticity results from the unequal variances of the regression model variables. On the other hand, homoscedasticity will appear when the regression model variables' variances are equal (Ghozali, 2017). The Breusch-Pagan-Godfrey test will be used in this study to ascertain whether heteroscedasticity in the regression model. The Breusch-Pagan-Godfrey test is an extension of the Goldfeld-Quandt test, which determines whether heteroskedasticity exists in a model. The Goldfeld-Quandt test works best with small samples, while the Breusch-Pagan-Godfrey test can work well with large samples.

It may deduce that the variance of each variable in the regression model is the same, that there is no heteroscedasticity, or that homoscedasticity occurs if the Prob. Chi-Squares value on Obs*R-Squared in the Breusch-Pagan-Godfrey test is greater than α = 0.05 (significance level) (Septiani & Oktaviani, 2022).

Statistical Test

To ascertain the degree of accuracy derived from the estimation of the employed regression model, this statistical test is conducted (Carla et al., 2023). In this test, there are three tests, namely:

1. Simultaneous Significance Test (F Test)

Finding the simultaneous impact of all independent variables on the dependent variable is the purpose of this simultaneous test, which is also sometimes referred to as the F test (Septiani & Oktaviani, 2022). The following are the test statistics used:

$$F_{count} = \frac{Mean\ Square\ Regression}{Mean\ Square\ Residual} \tag{8}$$

Meanwhile, in this test there is hypothesis used which is a follow:

H_0: Independent variables simultaneously have no significant effect on the dependent variable

H_1: Independent variables simultaneously have a significant effect on the dependent variable

It can be concluded that the independent variables have a substantial impact on the dependent variable at the same time if the resulting p-value is less than α = 0.05 (the significance level) or if the value of $|F_{count}| > F_{table}$ (Ghozali, 2018).

2. Partial Significance Test (t Test)

Finding the significant impact of each independent variable on the dependent variable is the purpose of this partial test, which is also sometimes referred to as the t test (Salsabila et al., 2022). The following are the test statistics used:

$$t_{count} = \frac{\widehat{\beta_k}}{SE(\widehat{\beta_k})} \tag{9}$$

$\widehat{\beta_k}$ is the *i*-th estimated parameter, and $SE(\widehat{\beta_k})$ is the standard deviation of the *i*-th estimated parameter value.

Meanwhile, in this test there is hypothesis used which is a follow:

H_0: Independent variable partially has no a significant effect on the dependent variable

H_1: Independent variable partially has a significant effect on the dependent variable

It can be concluded that the independent variable alone has a substantial impact on the dependent variable if the resulting p-value is less than α = 0.05 (the significance level) or if the value of $|t_{count}| > t_{table}$ (Septiani & Oktaviani, 2022).

3. Adjusted Coefficient of Determination Test (Adjusted R^2 Test)

To find out how much each independent variable may explain the dependent variable, apply this adjusted coefficient of determination test. (Mardiatmoko, 2020). The following are the test statistics used:

$$Adjusted\ R^2 = 1 - \left(\frac{(1-R^2)(n-1)}{n-k-1}\right) \tag{10}$$

Adjusted R^2 is the Adjusted Coefficient of Determination, and *n* is the Number of observations (sample size), and *k* is Number of independent variables.

The value used in this test is the Adjusted R^2 value, which falls between 0 and 1, is the value utilized in this test. It is assumed that the independent variables can account for the majority of the data required to estimate the dependent variable as the Adjusted R^2 value becomes closer to 1 (Ghozali, 2018).

RESULTS AND DISCUSSION

Descriptive Analysis

Based on 14 regencies/cities in Kalimantan Barat Province from 2012 and 2023, the data utilized in this study were further identified using descriptive statistics to extract features or information from the independent variables and dependent variables generally.

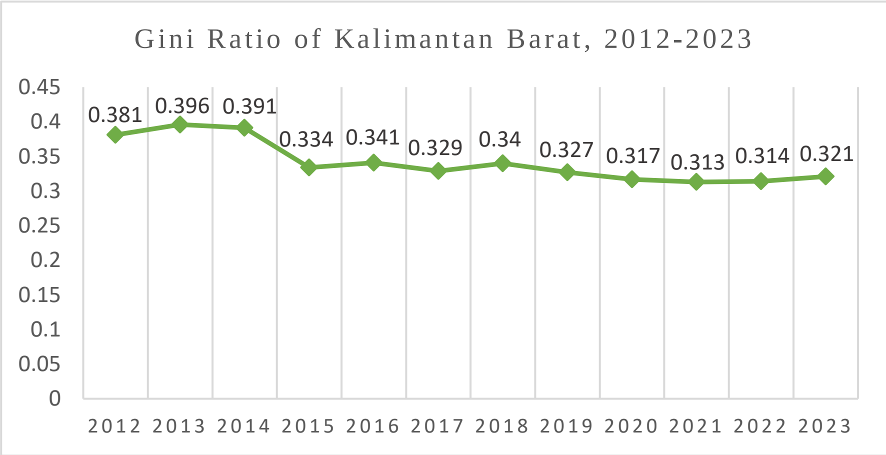

Figure 1. Gini Ratio Development Graph in Kalimantan Barat, 2012 – 2023
Source: Processed from BPS-Statistics Kalimantan Barat Province, 2023

From Figure 1, it can be observed the development of the Gini Ratio index in Kalimantan Barat Province from 2012 to 2023, where overall it tends to decrease. In 2012, the Gini Ratio index was 0.381, then in the following years it experienced changes that tended to decrease, until in 2023 the Gini Ratio index was 0.321. Then, in the 12-year span, the largest decrease in the Gini Ratio index occurred in 2014 to 2015, where in 2014 it had a Gini Ratio index of 0.391, then there was a decrease of 0.057 points in 2015 to 0.334. From the development of the Gini Ratio index in Figure 1, it can also be seen that in Kalimantan Barat Province, from 2012 to 2023, the Gini Ratio index was in the range of 0.3 which indicates that the value is close to the value of 0, or it can be stated that the distribution of regional income is in the almost even category, but it cannot yet be stated as being free from inequality.

Meanwhile, for other variables are fully included in the descriptive statistics in Table 2 as follows:

Table 2. Descriptive Statistics of Research Variables

Variable	**Description**	**Maximum**	**Minimum**	**Average**
(1)	**(2)**	**(3)**	**(4)**	**(5)**
Gini Ratio (Y)	Level of Income Inequality	0.421	0.156	0.308
P (X_1)	Population (People)	675,468	99,495	360,756
RLS (X_2)	Average Years of Schooling (Years)	10.45	5.07	6.95
PCE (X_3)	Per Capita Expenditure (Thousand Rupiah)	15,632	6,200.7	8,737.53

Source: Processed from BPS-Statistics Kalimantan Barat Province, 2023

From Table 2 above, it can be seen that the Gini Ratio in Kalimantan Barat Province in the last 12 years has the maximum value of 0.421, where the value occurred in 2014 in Kubu Raya Regency, while the minimum value occurred in 2016 in Kayong Utara Regency, which was 0.156, with an overall average value of 0.308 overall. As for the independent variables in the last 12 years, the population variable in Kalimantan Barat Province has the maximum value of 675,468 people, where the value occurred in 2023 in Pontianak City, while the minimum value occurred in 2012 in Kayong Utara Regency, which amounted to 99,495 people, with an overall average value of 360,756 people. For the average years of schooling in Kalimantan Barat Province has the maximum value of 10.45 years, where the value occurred in 2023 in Pontianak City, while the minimum value occurred in 2012 in Kayong Utara Regency, which was 5.07 years, with an overall average value of 6.95 years. Then, for per capita expenditure in Kalimantan Barat Province has the maximum value of Rp 15,632,000, where the value occurred in 2023 in Pontianak City, while the minimum value occurred in 2012 in Landak Regency, which amounted to Rp 6,200,700, with an overall average value of Rp 8,737,530.

In this study, further identification of the data used and analyzed to determine the best estimation model in panel data regression analysis. But before that, data transformation was first carried out into the form of Natural Log (Ln) on the P variable (X_1) and the PCE variable (X_3), this was done to facilitate the interpretation of the regression model (Rahman et al., 2015)

Best Model Selection

1. Chow Test

To decide whether to use the best CEM or FEM for estimating panel data, the Chow test is employed. This test utilizes the following hypothesis:

H_0: Panel data regression modeling with CEM is better than FEM

H_1: Panel data regression modeling with FEM is better than CEM

Table 3 displays the Chow test results.

Table 3. Chow Test Result

	Statistic	**d.f.**	**Prob. (P-Value)**
	(1)	**(2)**	**(3)**
Cross-section F	3.632603	(13.151)	0.0001

Source: Processed from Chow test.

According to the Chow test results, the p-value is 0.0001, which is less than the significance level of $\alpha = 0.05$. Consequently, it may be said that panel data regression modeling using FEM is better than CEM since H_0 is rejected.

2. Hausman Test

Panel data regression modeling using FEM is better to CEM, according to the Chow test results. Subsequently, the Hausman test was employed to decide whether of the REM or FEM is better for panel data estimation. This test utilizes the following hypothesis:

H_0: Panel data regression modeling with REM is better than FEM

H_1: Panel data regression modeling with FEM is better than REM

The results of the Hausman test are contained in Table 4.

Table 4. Hausman Test Result

	Chi-Sq. Statistic	**Chi-Sq. d.f.**	**Prob. random (P-Value)**
	(1)	**(2)**	**(3)**
Cross-section random	28.105552	3	0.0000

Source: Processed from Hausman test.

According to the Hausman test results, the p-value is 0.0000, which is less than the significance level of $\alpha = 0.05$. Consequently, it may be said that panel data regression modeling using FEM is better than REM since H_0 is rejected.

The Fixed Effect Model (FEM) is the best panel data regression modeling to use in this research, as demonstrated by the identical findings of the Chow and Hausman tests. This implies that finding the best model no longer requires the Lagrange Multiplier test.

Classical Assumption Test

The Least Square Dummy Variables (LSDV) technique will be used as an approach method after the Fixed Effect Model (FEM) has been identified as the optimal estimate model. Then, the multicollinearity and heteroscedasticity tests are examples of Classical Assumption tests that can be carried out.

1. Multicollinearity Test

Finding out if there was a significant degree of correlation between the independent variables in the regression model was the aim of this multicollinearity test. Table 5 displays the Multicollinearity test results.

Table 5. Multicollinearity Test Result

Variable	**VIF**
(1)	**(2)**
Ln_X_1	1.326586
X_2	2.422917
Ln_X_3	2.353249

Source: Processed from Multicollinearity Test

The results of the Multicollinearity test, which revealed that the three independent variables had a VIF value less than 10, indicate that the independent variables in the regression model do not display multicollinearity symptoms.

2. Heteroscedasticity Test

The heteroscedasticity test is used to determine whether the variance of the residual of one observation in the regression model is different from that of the residuals of other observations. Heteroscedasticity in the regression model will be assessed in this study using the Breusch-Pagan-Godfrey test. Table 6 displays the Heteroscedasticity test results.

Table 6. Heteroscedasticity Test Result

F-statistic	**Prob. Obs*R-Squared**
(1)	**(2)**
1.651595	0.1772

Source: Processed from Heteroscedasticity test

According to the results of the Heteroscedasticity test utilizing the Breusch-Pagan-Godfrey test, the Prob. Obs*R-Squared value is 0.1772 which exceeds than $\alpha = 0.05$ (significant level), then it can be stated that all variables in the regression model have the same variance or there is no heteroscedasticity or homoscedasticity occurs.

Statistical Test

The Fixed Effect Model (FEM) was used in this study to test the model hypothesis. The tests carried out are simultaneous significance test, partial significance test, and adjusted coefficient of determination test.

1. Simultaneous Significance Test (F Test)

Finding the simultaneous impact of all independent variables on the dependent variable is the purpose of this simultaneous test, which is also sometimes referred to as the F test. Meanwhile, in this test there is a hypothesis used, which is as follows:

H_0: The Gini Ratio is simultaneously unaffected by the Ln_P variable (Ln_X_1), RLS variable (X_2), and Ln_PCE variable (Ln_X_3)

H_1: The Gini Ratio is simultaneously affected by the Ln_P variable (Ln_X_1), RLS variable (X_2), and Ln_PCE variable (Ln_X_3)

The results of the test are in Table 7.

Table 7. Simultaneous Significance Test Results (F Test)

F-statistic	**Sig.**
(1)	**(2)**
3.417212	0.000036

Source: Processed from F test

According to the tests conducted, the F test results showed a F_{count} value of 3.417212, which is higher than the F_{table} value of 2.65972. Additionally, the Sig. value of 0.000036 was obtained, which is lower than $\alpha = 0.05$ (significant level). Since the judgment H_0 was rejected, it can be concluded that the Gini Ratio is simultaneously affected by the Ln_P variable ($Ln\_ X_1$), RLS variable (X_2), and Ln_PCE variable ($Ln\_ X_3$) all at the same time.

2. Partial Significance Test (t Test)

Finding the significant impact of each independent variable on the dependent variable is the purpose of this partial test, which is also sometimes referred to as the t test. Meanwhile, in this test there is hypothesis used, which is as follows:

H_{0a}: The Gini Ratio is partially unaffected by the Ln_P variable (Ln_X_1)

H_{1a}: The Gini Ratio is partially affected by the Ln_P variable (Ln_X_1)

H_{0b}: The Gini Ratio is partially unaffected by the RLS variable (X_2)

H_{1b}: The Gini Ratio is partially affected by the RLS variable (X_2)

H_{0c}: The Gini Ratio is partially unaffected by the Ln_PCE variable (Ln_X_3)

H_{1c}: The Gini Ratio is partially unaffected by the Ln_PCE variable (Ln_X_3)

The results of the test are in Table 8.

Table 8. Partial Significance Test Result (t Test)

Variable	**t-Statistic**	**Sig.**
(1)	**(2)**	**(3)**
Ln_X_1	-1.976472	0.0499
X_2	-0.328769	0.7428
Ln_X_3	0.465487	0.6423

Source: Processed from t Test

a. A t_{count} value of 1.976472, which is higher than the t_{table} value of 1.974358, and a Sig. value of 0.0499, which is lower than α = 0.05 (significant level), were obtained from the results of the t test based on the test performed on the Ln_P variable (Ln_X_1). It may be concluded that the Gini Ratio is partially affected by the Ln_P variable (Ln_X_1) so that the judgment H_{0a} is rejected.

b. As a result, the decision H_{0b} is accepted, indicating that The Gini Ratio is partially unaffected by the RLS variable (X_2). The t test results based on the test conducted on the RLS variable (X_2) obtained a t_{count} value of 0.328769, which is lower than the t_{table} value of 1.974358, and also obtained a Sig. value of 0.7428, which is higher than α = 0.05 (significant level).

c. As a result, the decision H_{0c} is accepted, indicating that The Gini Ratio is partially unaffected by the Ln_PCE variable (Ln_X_3). The t test results based on the test conducted on the Ln_PCE variable (X_3) obtained a t_{count} value of 0.465487, which is lower than the t_{table} value of 1.974358, and also obtained a Sig. value of 0.6423, which is higher than α = 0.05 (significant level).

3. Adjusted Coefficient of Determination Test (Adjusted R^2 Test)

To find out how much each independent variable may explain the dependent variable, apply this adjusted coefficient of determination test. Table 9 displays the test results.

Table 9. Adjusted Coefficient of Determination Test Result (Adjusted R^2 Test)

	Adjusted R-Squared
	(1)
Fixed Effect Model	0.188041

Source: Processed from Adjusted R^2 Test

According to the tests conducted, the Adjusted Coefficient of Determination test produced an Adjusted R-Squared value of 0.188041, or representing 18.8%. The results from the adjusted coefficient of determination test indicate that the independent variables Ln_P variable (Ln_X1), RLS variable (X2), and Ln_PCE variable (Ln_X3) can contribute to 18.8% of the variation in the dependent variable, which is the Gini Ratio. The other independent variables that are not included in this research model make up the remaining 81.2% (100 - adjusted R^2 value).

Panel Data Regression Model

According to the analysis' findings, the Fixed Effect Model (FEM) technique produced one independent variable the Ln_P variable (Ln_X_1) that partially have an effect on the Gini Ratio. The RLS variable (X_2) and the Ln_PCE variable (Ln_X_3), the other two independent variables, on the other hand, partially do not have an affect the Gini Ratio. The regression model is as follows:

$$\hat{Y} = 1{,}81956 - 0{,}14304 * \ln(X_1) - 0{,}00405805 * X2 + 0{,}036593 * \ln(X3) \quad (10)$$

The following is an explanation of the results of the regression model above:

1. The Gini Ratio variable (Y) has a constant value of 1.81956, meaning that without the influence of the Population or Ln_P variable (Ln_X_1), the Average Years of Schooling or RLS variable (X_2), and the Per Capita Expenditure or Ln_PCE variable (Ln_X_3), there will be an increase close to 1.81956 in the Gini Ratio variable (Y). However, this condition is not possible because the maximum value of the Gini Ratio is 1.

2. The Population or Ln_P variable (Ln_X_1) has a beta coefficient value of -0.14304, and also has a negative and significant relationship with the Gini Ratio variable (Y), which means that every 1% increase in population will cause a decrease in the Gini Ratio of 0.14304, assuming other variables are constant. Vice versa, every 1% decrease in population will cause an increase in the Gini Ratio of 0.14304. This negative relationship indicates that in Kalimantan Barat Province, an increase in population tends to reduce income inequality. These results are reinforced by research from Arif & Wicaksani (2017) which states that income distribution inequality has a negative and significant relationship with population in Jawa Timur Province in the period 2011 to 2015. Then, a statement based on Duarsa & Wijaya's research findings (2023) supports it as well, where the statement is that income inequality between regions in Jawa Barat Province is influenced by population which has a negative and significant relationship. An increase in population can have a good effect on the development of a region and increase economic growth because the increasing population certainly makes the amount of labor produced also increase, so that it will affect the expansion of the market (Mudrajad, 2022). Thus, it will provide benefits for all parties because of the formation of a broad economy of scale, the production costs incurred can be cut, and will affect the increase in yield due to the high amount of production (Duarsa & Wijaya, 2023). In other words, with the increase in population, in production activities, the amount of labor required will also increase, so that along with the increasing needs of the community can be balanced by encouraging an increase in the amount of consumption.
3. With a beta coefficient of -0.00405805, the Average Years of Schooling, or RLS variable (X_2), has a negative but insignificant relationship with the Gini Ratio variable (Y). This indicates that the Gini Ratio will reduce by 0.00405805 for every 1% rise in the average years of schooling, assuming all other variables remain constant. However, because the effect of the RLS variable (X_2) is not significant, the effect given to the Gini Ratio variable (Y) occurs insignificantly. Then, the RLS variable (X_2) also has a small coefficient value in reducing the Gini Ratio of 0.00405805, meaning that in this study, an increasing in education in a region does not have much impact on reducing income inequality in Kalimantan Barat Province. This is also reinforced by the statement of Dai et al. (2023) who obtained study results that the average years of schooling has an influence but not significant on income inequality.
4. With a beta coefficient of 0.036593, the Per Capita Expenditure, or Ln_PCE variable (Ln_X_3), has a positive but insignificant relationship with the Gini Ratio variable (Y). This indicates that the Gini Ratio will increase by 0.00405805 for every 1% rise in the per capita expenditure, assuming all other variables remain constant. However, because the effect of the Ln_PCE variable (Ln_X_3) is not significant, the effect given to the Gini Ratio variable (Y) occurs insignificantly. Then, the Ln_PCE variable (Ln_X_3) also has a small coefficient value in reducing the Gini Ratio of 0.036593, meaning that in this study, an increase or decrease in per capita expenditure in a region, which may reflect the economic prosperity of the region, has little impact on reducing income inequality in Kalimantan Barat Province. In this research, the results obtained are inversely proportional to the statement of Riyanto et al. (2022) who obtained research results that high per capita expenditure in a region will significantly affect income inequality.

CONCLUSION AND RECOMMENDATION

According to the results and discussion section, it is found that the Fixed Effect Model (FEM) is the best panel data regression modeling to gauge the level of income inequality in Kalimantan Barat Province. One of the independent variables in this research, the population variable, has a negative and significant relationship with the dependent variable, the Gini Ratio. This means that if the population grows, the Gini Ratio will decrease and the level of income inequality between Kalimantan Barat Province's regions will decrease. Meanwhile, there are two independent variables that have a relationship but are not significant to the dependent variable, namely the Gini Ratio. The average years of schooling and expenditure per capita variables have a relationship but are not significant to the Gini Ratio, meaning that this research still does not have sufficient evidence to support the statement that the average years of schooling and expenditure per capita of each region have a significant effect on the level of income inequality across Kalimantan Barat Province's regions.

Based on the explanation above, it is expected that the government, especially the government of Kalimantan Barat Province, can further develop programs or policies related to improving the quality of human resources, because from the research results obtained that an increase in population will result in a decrease in income inequality, and vice versa, so that the existing population must be accompanied by programs or policies that improve the quality of the population so that income inequality can decrease. This research is also expected to contribute to the study of related sciences and to be a source of information and reference for future research activities. Then, with the completion of this research, it is expected that it can be used as a basis for subsequent research that also discusses similar problems, namely income inequality between regions, and is also expected to increase the number of other variables so that the research results obtained become more varied by using the latest time period, and obtaining the latest discussion of income inequality between regions.

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