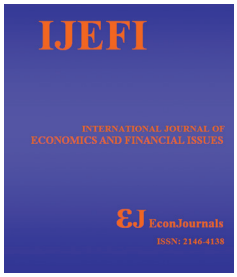

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Inequality of Interregional Development in Riau Indonesia; Panel Data Regression Approach

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ABSTRACT

This study aims to analyze the trends and factors of inequality of inter-regional development in Riau Province period 2011–2016. Analyzer used in the form of index Theil, Bonet index, and regression of panel data with fix effect model. The analysis result with Theil and Bonet index shows the decreasing trend of interregional development inequality, and the source of inequality comes from within the development area (within) with the percentage of 58–68%. The result of fixed effect model regression states that the variable of fiscal decentralization, government expenditure, Human Development Index, and economic growth have negative and significant relation to inequality. While the variables of natural resource differences have a positive and statistically insignificant relationship.

Keywords: Inequality Development, Data Panel Regression, Riau
JEL Classifications: D63, O53, R58

1. INTRODUCTION

The Agenda 2030 for Sustainable Development Goals or SDGs is a new development agreement that encourages shifting changes toward sustainable development based on human rights and equality to promote social, economic and environmental development. SDGs are enforced with universal, integration and inclusive principles to ensure that no one will be missed or "No-one Left Behind." SDGs consist of 17 Goals and 169 targets in order to continue the efforts and achievement of the Millennium Development Goals that ended late in 2015 ago. One of the global goals compiled in the 2030 sustainable development agenda is to reduce inequality within and among countries (SDGs Bappenas, 2017).

Riau Province is one of the areas that serve as the center of trade of western Indonesia and the region which is included in the main corridor of the Master Plan for the Acceleration of Economic Development of Indonesia (MP3EI) Sumatra region. In the process of regional development needs to be identified about the potentials and problems of the region. According to that then at least the existing problems can be anticipated and utilize its potential optimally.

The economy of Riau Province over the last 5 years with the use of GDP data including oil and gas, since 2011 has been growing positively with a fluctuating rate, with the growth rate in 2011 at 5.57% and in 2015 by 0.22% and the average growth of 2, 95%. Furthermore, with the use of data without oil and gas Riau economic growth rate in 2011 amounted to 7.76% and continued to fluctuate until 2015 to 2.01% with an average growth of 4.90%. Meanwhile, the distribution of Riau Province's revenue, based on Gini index data for 2011–2015 shows that in general in Riau Province there is a fluctuating change from 0.360 in 2011 to 0.400 in 2012, in 2013–2014 decreased by a value of 0.37 and 0.35, then in 2015 again increased from the previous year to 0.36. Changes from year to year still show the happening inequality between individuals because the index is still above 0.300 (>0.300).

Economic development is related to economic growth and is accompanied by changes in the distribution of output and economic structure (Nafziger, 2012). Ideally, economic development will

result in high economic growth while increasing prosperity and reducing the level of development inequality. This is in contrast to the general condition occurring in Riau Province where the growth of relatively high economic growth is accompanied by an increase in income inequality.

Based on this, it needs an indicator of development performance that has function and can be used to analyze the development in a region. Inequality also often occurs significantly between districts/cities within the province itself. It is further said that interregional inequality occurs as a consequence of concentrated development. By identifying the factors that cause inequality in development, it is expected to anticipate the inequality in order to synchronize the development of the region can be immediately created.

Theoretically, the relationship of economic growth with Inequality is known as the Kuznets hypothesis and the neo-classical hypothesis which states that at the beginning of development will be accompanied by an increase in income/development inequality. The research on this topic has grown constantly. Overseas research conducted by Barro (2000); Frank (2009); Halter et al. (2014); Benjamin et al. (2017) and domestic research by Sari and Pujiyono (2013); Dewi and Ida (2014); Bakri et al. (2016); Hidayat and Rahayu (2018) the findings indicate that the long-term relationship between inequality and growth is naturally positive in the hypothesis of Kuznet and driven primarily by concentrations at each income level.

Maslikhina (2016) states that the occurrence of interregional inequality in Russia during the period 1994–2014 using Theil index. Spatial inequality level, tendencies and structural features in Russia as a whole and in several Russian macro-regions (federal districts) were identified. The link between interregional inequality in Russia and economic growth was identified.

Research conducted by Bonet (2006) states that the effect of fiscal decentralization on development inequality. The similar findings also found in research by Apriesa and Miyasto (2013) which states that the effect of fiscal decentralization on income inequality has a positive and insignificant relationship. The research results in Bakri et al., (2016) declare that fiscal decentralization represented by balancing funds affects development inequality significantly and negatively.

Based on the research by Hidayat (2014); Mopangga (2014) stated that the influence of government expenditure and Human Development Index (HDI) on inequality, based on the first result states that government expenditure and HDI is a source of inequality, while the second result states that government expenditure of inequality and HDI can reduce inequality.

According to Sjafrizal (2012) there are several key factors that caused the inequality of development between regions: (1) The difference in the content of natural resources, (2) differences in demographic conditions, (3) lack of mobility goods and services, (4) concentration of economic region activities, (5) development funds allocation among regions.

2. METHODOLOGY

The research used is descriptive quantitative research. The study was conducted in Riau Province. The regions that are the unit of analysis are 12 regions in Riau Province consisting of 2 cities, Pekanbaru and Dumai and 10 districts of Kuantan Singingi, Indragiri Hulu, Indragiri Hilir, Pelalawan, Siak, Kampar, Rokan Hulu, Rokan Hilir, Bengkalis and Meranti Islands. The execution time of the research is conducted for 1 (1) year. The type of data used in this study is secondary data which means that publication data of Central Bureau of Statistics in the form of time series data Fiscal Decentralization, Government Expenditure, HDI, Natural Resources, economic growth and Inequality from 2011 to 2016.

2.1. Measurement of Regional Inequality Development

2.1.1. Bonet index

This index is a measurement made by Bonet (2006) to measure inequality among regions in Colombia. Bonet index in the province for period t ($IB_{i,t}$)

$$IB_{i,t} = \left| \frac{PDRB\ PC_{i,t}}{PDRB\ PC_{Prov,t}} - 1 \right| \quad (1)$$

According to Kuncoro (2013), the formula states that a perfect equality occurs when the per capita GDP per capita region is equal to the province per capita GRDP. Bonet index value approaching 0 (zero) can mean that the per capita GDP disparity is lower. If the value is higher, it can be interpreted that the per capita GDP per capita among high-rise regions or regional economic growth happens unevenly.

$IB_{i,t}$ = inequality of the district/city; $PDRB\ PC_{i,t}$ = GRDP per capita district/city; $PDRB\ PC_{Riau,t}$ = GRDP per capita Province.

2.1.2. Theil index

Theil index is useful for decomposing total disparities into Inequality between regions and within regions. The calculation of this index has the utility of analyzing geographic concentration trends over a given period and can examine a more detailed picture of Spatial Inequality. The Theil index equation is written as follows (Fujita and Hu, 2001; Hidayat, 2014; Maslikhina, 2016):

$$I = \sum_{i=1}^{n} y_i \log\left(\frac{y_i}{x_i}\right) \quad (2)$$

I = Inequality (Theil index); y_i = GRDP district/city i/GRDP Province; x_i adalah Population district/city i/Population Province, $y_i \log\left(\frac{y_i}{x_i}\right)$ = Partial Inequality.

The first Theil index values are non-negative; a Theil index of 0 indicates perfect equality. Decomposability of overall inequality into inequality between regions development and inequality within regions development allows us to research spatial structure of interregional inequality (Equations 3 and 4).

$$I = I_0 + \sum_{g=1}^{4} Y_g I_g \qquad I_g = \sum_{i \in Sg} \frac{y_i}{Y_g} \log \left(\frac{y_i / Y_g}{x_i / X_g} \right) \quad \text{.....(3)}$$

$$I_0 = \sum_{g=1}^{4} Y_g \log \left(\frac{Y_g}{X_g} \right) \qquad Y_g = \sum_{i \in Sg} y_i \qquad X_g = \sum_{i \in Sg} x_i \quad \text{.....(4)}$$

I_0 = Inequality between regions development (*Between*)

$\sum_{g=1}^{4} Y_g I_g$ = Inequality within regions development (*Within*)

y_i = GDP district i / GDP Province

x_i = Population district i/Population Province

2.2. The Definition of Operational Variables

Formulation of model analysis of the factors that influence Inequality of development between regions in Riau Province used several variables that can be defined as follows: (1) Inequality of development, calculated using Theil index and Bonet index. The Theil index is used to identify inequality between regions and the Bonet index is used in the equations of panel data regression model; (2) fiscal decentralization with the measurement of the degree of fiscal decentralization which is the amount of the Original Regional Revenue section of all total local revenue received. The unit of the fiscal decentralization variable is percent; (3) Government expenditure by measuring the ratio of government expenditure to GRDP; (4) HDI used in the publication of the Central Bureau of Statistics; (5) Natural Resource Difference (SDA) is calculated based on GDP share of mining sector by district/city; (6) Economic growth, this variable uses GDP data with constant 2010 prices during the period 2011–2016, the value of units used in the form of percentages.

2.3. The Determinants of Development Inequality

Analyzing the factors that influence the inequality between in Riau Province used regression of panel data. The function formed resembles the regression equation used by Cahyono et al. (2017); Hidayat (2014); Mopangga (2014) with inter-regional Inequality (Ineq) is allegedly influenced by the variables of fiscal decentralization (DF), government expenditure (PP), HDI (IPM), natural resource (SDA) and economic growth (LPE). The variables that have the greatest regression coefficient value, are considered to have an important role in influencing the fluctuation of inequality in Riau Province.

The general form of an equation:

$$Ineq = \{DF, PP, IPM, SDA, LPE\} \quad (5)$$

Linear equations of panel data regression model:

$$Ineq_{it} = \alpha_{it} + \beta_1 DF_{it} + \beta_2 PP_{it} + \beta_3 IPM_{it} + \beta_4 SDA_{it} + \beta_5 LPM_{it} \varepsilon_{it} \quad (6)$$

2.4. Regression Panel Data

Pooled data panel is a combination of cross section and series data. In other words panel data is the data from some of the same individuals observed in a certain period of time. If we have T time periods ($t = 1,2., T$) and N the number of individuals ($i = 1,2., N$), then with panel data will have total observation units as much as NT. If the number of time units is the same for each individual, then the data is called a balanced panel. If otherwise, the number of time units is different for each individual, then it is called the unbalanced panel (Baltagi, 2008).

In this research, the data used is a balanced panel. Because the data obtained from 12 districts/cities observed in the period of 6 years so obtained 72 observations.

In general, by using panel data, it will generate different intercepts and slope coefficients on each company and time period. Therefore, in estimating equation (6) it will be highly dependent on the assumptions we make about intercepts, slope coefficients, and disturbance variables.

In panel data model analysis there are three approaches: Pooled least square (PLS), fixed effect model (FEM), and random effect model (REM). In this study, the model used only the FEM.

2.5. FEM

Problems arising from the use of PLS method is the assumption that intercepts and coefficients of each variable are the same in each inter-area observed. To take into account, the individuality of each cross-section unit can be done by making a different intercept in each region. In the fixed effects method, dummy variables are added to change the intercept, but other coefficients remain the same for each observed region.

Based on the assumption of the structure of the residual variance-covariance matrix, in the fixed effects model, there are 3 estimation methods that can be used: (1) Ordinary least square (OLS/LSDV), if the residual variance-covariance matrix structure is assumed to be homoskedastic and no cross-sectional correlation; (2) weighted least square, if the structure of the residual variance-covariance matrix is assumed to be heteroskedastic and there is no cross-sectional correlation; (3) seemingly uncorrelated regression, if the structure of the residual variance-covariance matrix is assumed to be heteroskedastic and there is a cross-sectional correlation (Widarjono, 2013).

2.6. Hypothesis Testing

Before testing hypothesis (F-test, T-test, and R^2), then first the model is tested to fulfill best linear unbiased estimator requirement that is tested with classical assumption test, that is autocorrelation test, multicollinearity test and heteroskedasticity test (Widarjono, 2013).

3. RESULT AND DISCUSSION

3.1. Trends Inequality of Development

Theil index calculation results in Figure 1 show that there is inequality in the development of Riau Province, during the 2011–2016 which continues to fluctuate. From 2012 until 2016 there was a decrease (convergence) from 0.183 to 0.134, this indicates the occurrence of equitable regional development. Furthermore, the decline was due to the economic improvements

occurring in each region and the period of transition of emerging that has been running for more than 10 years. This phenomenon is in line with the neo-classical hypothesis which at the beginning of development will be followed by Inequality and if economic conditions have stabilized, then inequality will decrease.

The result of Theil index decomposition will give an overview of the main source of inequality. Based on Figure 2 in the period 2011–2016, the largest source of inequality in Riau Province comes from within regions development with the fluctuation trend in the year 2011 amounted to 58.46% and in 2016 to 68.62%. Whereas inequality that comes from between regions development only accounted for about 30–40%.

The used of the Bonet index provides an overview of inequality occurring in each region, the smallest or near-zero values indicating low inequality and a value close to one is indicating very high inequality. The calculation results are presented in Table 1. Based on the table, each region experiences fluctuations. The regions that have the greatest value of Siak Regency, Pelalawan, Rokan Hulu, Kampar, Dumai city, and Indragiri Hilir. Conversely, the area that has the smallest value is Pekanbaru City.

Moreover, the region where experiencing an increasing trend every year is Kuantan Singingi Regency, Bengkalis. Aside from those two areas, the inequality is experiencing a downward trend. The integration of both indexes concludes that the Inequalities in Riau Province has experienced a downward trend starting from 2012 to 2016.

3.2. Econometric Results - Panel Data Regression

To identify the factors influencing inequality of inter-regional development in Riau Province, it used regression data panel with FEM approach. Summary of results regression FEM presented in Table 2. Based on the research results obtained by the regression equation as follows:

$$Ineq_{it} = 1.378–0.0013\ DF-0.0055\ PP-0.0161\ IPM+0.0009\ SDA-0.0039\ LPE+\varepsilon_{it}$$

The result of regression FEM for the value of R^2 is 0.9841, it shows that 98.41% consisting of fiscal decentralization, government expenditure, HDI, natural resource difference, and economic growth influence the inequality of inter-regional development in Riau Province. Meanwhile, the value of adjusted R^2 is 0.9795, which is used to compare the model when there are additional variables and the use of other models. An f-statistic P = 0.0000 gives the meaning that simultaneously significant variables to the inequality of development that occurred.

Based on Table 2, it gives information about Inequality value of each region assuming another variable is considered zero (*Cateris-paribus*). The result of regression indicates that Siak, Pelalawan, Rokan Hulu, Kampar, Dumai, and Pekanbaru City have positive values with the meaning that this region has a share as the cause of Inequality to other regions.

Figure 1: Trend Theil index - Inequality in Riau Province, 2011–2016

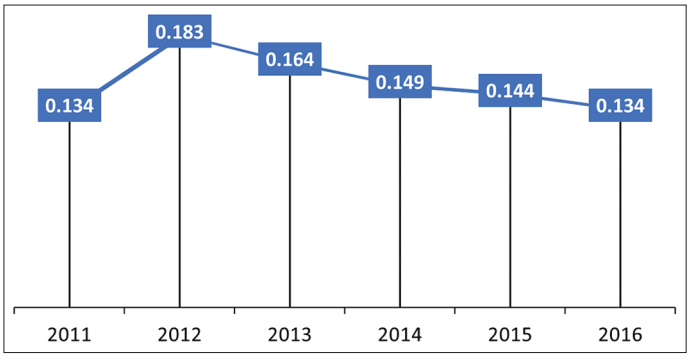

Figure 2: Percentage Source of Inequality in Riau Province, 2011–2016

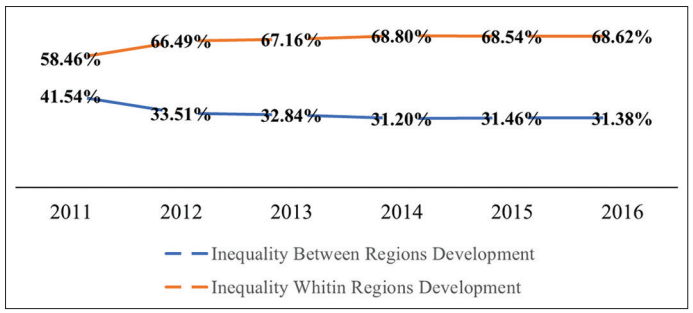

Table 1: Trend Bonet index value in Riau Province, 2011–2016

Kabupaten/Kota	2011	2012	2013	2014	2015	2016
Kuantan Singingi	0.070	0.132	0.146	0.153	0.120	0.136
Indragiri Hulu	0.058	0.124	0.138	0.140	0.088	0.093
Indragiri Hilir	0.180	0.104	0.078	0.058	0.047	0.026
Pelalawan	0.478	0.399	0.364	0.333	0.304	0.262
Siak	0.607	0.598	0.583	0.554	0.557	0.526
Kampar	0.218	0.187	0.176	0.185	0.189	0.190
Rokan Hulu	0.371	0.370	0.375	0.383	0.392	0.394
Bengkalis	0.080	0.152	0.163	0.179	0.206	0.213
Rokan Hilir	0.152	0.121	0.123	0.123	0.121	0.125
Meranti	0.269	0.179	0.142	0.114	0.076	0.051
Pekanbaru	0.098	0.057	0.057	0.050	0.018	0.002
Dumai	0.205	0.192	0.197	0.220	0.205	0.177

Based on the value of coefficient and probability T, fiscal decentralization has a negative and significant relation to Development Inequality. This suggests that the fiscal decentralization that has occurred may reduce the level of inequality that occurred in Riau Province. This situation is because the original revenue of each region has a total area of about 3–9% for the district and 10-40% for the City area. Thus, each region will be able to independently improve the economy.

The results of this study are in line with research by Bakri et al. (2016) which states that fiscal decentralization has a negative and significant relationship to development inequality. This research is also in agreement with the theory issued by Sjafrizal (2012), stating that fiscal balancing or decentralization funds are one of the factors to reduce the level of development inequality.

Government spending has a negative and significant relationship to development inequality, this is based on a negative coefficient

Table 2: Summary of regression results FEM

Method: Pooled EGLS (cross-section weights)				
Variable	**Coefficient**	**Standard error**	**t-statistic**	**P**
C	1.378860	0.135060	10.20927	0.0000
DF?	−0.001373	0.000336	−4.083323	0.0001
PP?	−0.005564	0.002148	−2.590325	0.0123
IPM?	−0.016189	0.001725	−9.386082	0.0000
SDA?	0.000991	0.000863	1.147854	0.2560
LPE?	−0.003993	0.000997	−4.006084	0.0002
Fixed effects (cross)				
_BENGKALIS--C	−0.031062	_MERANTI--C		−0.125537
_DUMAI--C	0.071854	_PELALAWAN--C		0.146533
_INHIL--C	−0.200736	_PKU--C		0.025818
_INHU--C	−0.134965	_ROHIL--C		−0.151723
_KAMPAR--C	−0.011359	_ROHUL--C		0.138546
_KUANSING--C	−0.111790	_SIAK--C		0.384421
R-squared	0.984135	Mean dependent var		0.296847
Adjusted R-squared	0.979520	S.D. dependent variable		0.282819
S.E. of regression	0.036486	Sum squared residual		0.073217
F-statistic	213.2405	Durbin-Watson statistic		1.077911
Prob (F-statistic)	0.000000			

Significant level 0.05, FEM: Fixed effect model

value and a small probability of T of 0.05. This result states that government spending is able to reduce the inequality of inter-regional development that occurred in Riau Province. This is because the ratio of Government Expenditure to GDP generated has a small value which means that ongoing Government Expenditure can increase the output of production value or GDP of each region, in other words, there is efficiency in government expenditure. In line with this, each region in order to be able to maintain the value of the existing ratio. However, the results of research are not in line with Mopangga research (2014) and Hidayat (2014) states that Government Expenditure is a source of inequality.

Based on the value of coefficient and T probability, the HDI has a negative and significant relationship to development inequality. The situation is caused by the HDI value of each region has no significant difference. This fact can not be separated from the performance of each region that prioritizes human development both in terms of planning and implementation at the stage of development.

This result is in line with research by Hidayat (2014) which resulted that the HDI has a negative effect on development inequality that occurred in Riau Province. Increasing the education of certain levels will improve the quality of human resources that will impact on the use of physical capital to be more efficient and labor will become more productive. Thus, the productivity of both physical capital and labor will increase, and will eventually increase economic growth and development gaps may decrease.

The different natural resources that exist in each region is one of the factors that can increase the inequality of development in Riau Province. This is based on the value of the coefficient is marked positive. This result is in accordance with the theory proposed by Sjafrizal (2012), that one of the factors affecting development inequality is the difference in the content of natural resources.

Furthermore, on the basis of the probability that T yields are insignificant, this suggests that the differences in natural resources have not had a great effect in the short term on increasing inequality in development. Additionally, to anticipate long-term events, local governments have a duty to continue to optimize the potential of the economy, so it is not entirely dependent on the results of mining both oil and gas and minerals.

According to Table 2, economic growth has a negative and significant relationship to development inequality. This state shows the convergent position of inequality. This phenomenon when synchronized with a neo-classical hypothesis or reversed U-curve, the current position is in the process of decreasing inequality or convergence conditions.

This result is in line with research by Barro (2008); Halter et al. (2014), that economic growth is negatively related to development inequality. Meanwhile, these results are not in line with research by Bakri et al. (2016); Dewi and Ida (2014); Frank (2009); Sari and Pujiyono (2013) that economic growth is positively related to development inequality, in other words, economic growth that occurs can increase the inequality of development.

4. CONCLUSION

The calculation results with Theil index during 2012–2016 began to decrease (convergence), and the source of inequality comes from within the development area (within) with the percentage of 58–68% of total inequality. The Bonet index also shows a downward trend (convergence). Inequality during the same period, and based on this index the region has the greatest value of Siak, Pelalawan, Rokan Hulu, Kampar, Dumai, and Indragiri Hilir. The result of FEM regression indicates that the variable of fiscal decentralization (DF), government expenditure (PP), HDI (IPM), and economic growth (LPE) have a negative and significant correlation. Meanwhile, the variable of Natural Resource Difference (SDA) has a positive and statistically insignificant relationship.

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