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Education Inequality and Economic Growth: a Case Study in South Sumatra Province

Abstract. Introduction. This study was conducted to find out how education inequality and its relationship to economic growth in South Sumatra Province. The data used in this study are secondary data sourced from BPS Statistics Indonesia, the Directorate General of Finance and the publication of the results of previous studies that are relevant to this study. The data analysis method used is the analysis of Education Gini index, panel data regression analysis, Granger Causality Analysis. The results of are expected to be a reference material for further research and consideration in development planning in South Sumatra Province.

Purpose. The purpose of this study is to find the size of education inequality, the influence factors, and how it relates to economic growth in the Province of South Sumatra.

Results. The results of this study indicate that the inequality of education in South Sumatra Province is at a low level of inequality, which is an average of 0.239. The factors that significantly influence the inequality of education are gender gap and the mean years school, while the variable of government expenditure in education has no effect. While Granger causality analysis shows that there is only a one-way relationship between education inequality and economic growth in South Sumatra Province. Economic growth has a significant effect on the inequality of education and but not vice versa.

Conclusion. Based on the results, the government of South Sumatra can find out strategies to reduce inequality in education. Increasing awareness in accessing education and equalizing access to education for men and women are expected to reduce eduaction inequality. Furthermore, evenly distributed economic growth can also be influential in reducing education inequality.

Keywords: education inequality, gender gap, mean years school, government expenditure on education, economic growth.

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Нерівність в освіті та економічне зростання: приклад провінції Південна Суматра

Анотація. Дане дослідження спрямоване на встановлення взаємозв'язку між нерівністю в освіті та економічним зростанням у провінції Південна Суматра. Дані, що використовувалися у дослідженні, є вторинними даними, отриманими з BPS Statistics Indonesia, Генерального директорату з фінансів та відповідних публікацій результатів попередніх досліджень. Метод аналізу даних, що використовувався – це аналіз індексу Education Gini, регресійний аналіз даних, аналіз Granger Causality. Очікується, що результати даного дослідження стануть довідковим матеріалом для подальших досліджень та будуть використані при плануванні розвитку провінції Південна Суматра.

Метою дослідження є визначення масштабів нерівності в освіті, факторів впливу на неї, а також взаємозв'язку з економічним зростанням у провінції Південна Суматра.

Результати дослідження свідчать, що нерівність в освіті у провінції Південна Суматра перебуває на низькому рівні, що становить у середньому 0,239. Факторами, які суттєво впливають на нерівність в освіті, є гендерний розрив та середня тривалість навчання у школі, в той час як змінна державних витрат на освіту не має впливу. Хоча результати аналізу Granger Causality свідчать, що існує лише односторонній зв'язок між нерівністю в освіті та економічним зростанням у провінції Південна Суматра. Економічне зростання суттєво впливає на нерівність освіти, а не навпаки.

На основі отриманих результатів, уряд Південної Суматри може розробити стратегії щодо зменшення нерівності в освіті. Очікується, що підвищення поінформованості щодо доступу до освіти, а також вирівнювання доступу до навчання чоловіків і жінок сприятиме зменшенню нерівності в освіті. Крім того, рівномірно розподілене економічне зростання також може впливати на зменшення нерівності в освіті.

Ключові слова: нерівність в освіті; гендерний розрив; середня школа; державні витрати на освіту; економічне зростання.

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Statement of the problem. In addition to requiring physical capital and labor, the development of a country also requires the support of human capital to encourage economic growth. Schultz (1962) was one of the pioneers who emphasized the importance of human capital in development. Achievement of human development outcomes in Indonesia are measured by using indicators of the Human Development Index (HDI) which includes dimensions of education, health, and decent living. South Sumatra Province is one of those provinces in Indonesia with economic growth continues to improve. The economic growth of South Sumatra Province in 2017 reached 5.51 percent, higher than Indonesia's economic growth which only grew by 5.05 percent.

The increasing economic of South Sumatra Province which continues to improve is not in line with the attainment of human development. In 2017, South Sumatra is in 23rd out of 34 provinces with an HDI value of 68.86. The fact that value so low is closely related to the condition of health, education and regional economy. Unfortunately, these three things are the basic elements in the development process. The underlined is that education is one of the important indicators of HDI. Schultz (1961) views education as a form of investment in promoting economic growth.

Output of economic growth should be equitable in in order to reduce the occurrence of inequality between residents, both in terms of income and other welfare such as education and health (Ray, 1998). Those existing inequality might lead to social rigidity, hamper social mobility, and further weaken the social unity that threatens the sustainability of economic development and national unity. It was concluded that education inequality is closely related to the sustainability of economic development.

Based on the description, this study aims to analyze the level of education inequality, finding out influenced factors, and analyzing its relationship with economic growth in South Sumatra Province.

Economic growth illustrates the situation of increasing output from the real value of Gross Domestic Product (Dornbusch et al., 2008). The amount of Gross Domestic Product compared to the population in a country is a tool that can show what happens to the average population (Mankiw, 2006).

Human capital inequality is a dimension of other inequality (income inequality, health). Tsiddon and Galor (1997) explained that at the initial stage of economic development, a high imbalance of human capital was seen as a necessary condition for entering the next stage of development, namely the take-off stage. Inequality will encourage individuals in the educated community to continue to increase as human capital investment. This will affect the economic growth.

Some empirical studies fail to explain the theory that implies a strong relationship between human capital and growth because it ignores the imbalance of human capital (seen as omitted variable). Some studies that include the variables of education inequality actually make estimations more reliable (Thomas, Wang and Fan, 2001). Human capital inequality is one dimension of other inequality (income inequality, health) that is used as a measure of multi-dimensional inequality.

Research methods. The study is conducted from 2011 to 2017 which analysed data of 15 districts/cities in the South Sumatra Province. The data used in this study are secondary data sourced from the BPS Statistics of Indonesia, Ministry of Finance, and the publication of relevant previous studies. The analysis technique used in this study is descriptive analysis techniques and quantitative methods using panel data regression and Granger causality analysis. The following is the analysis model used:

1. Education Gini coefficient analysis

This method is used to calculate education inequality by using the education gini index equation developed by Thomas, et.al (2001), namely:

$$Ginieduc = \left(\frac{1}{\mu}\right)\sum_{i=2}^{n}\sum_{j=1}^{i-1} p_i \left|y_i - y_j\right| p_j \qquad (1)$$

The above equation can be expanded to:

$$Ginieduc = \left(\frac{1}{\mu}\right)[p_2(y_2 - y_1)p_1$$
$$+ p_3(y_3 - y_1)p_1 + p_3(y_3 - y_2)p_2 + p_4(y_4 - y_1)p_1 + p_4(y_4 - y_2)p_2 + p_4(y_4 - y_3)p_3 + p_5(y_5 - y_1)p_1 + p_5(y_5 - y_2)p_2 + p_5(y_5 - y_3)p_3 + p_5(y_5 - y_4) p_6(y_6 - y_1)p_1 + p_6(y_6 - y_2)p_2 + p_6(y_6 - y_3)p_3 + p_6(y_6 - y_4)$$
$$(2)$$

Where,

p_1= Proportion of the population who did not graduated from school

p_2= Proportion of the population who did not graduated from primary school

p_3 = Proportion of the population who did not graduated from junior high school

p_4 = Proportion of the population who did not fgraduated from high school

p_5 = Proportion of the population who did not graduated from College

p_6 = Proportion of the population graduated from College

y_1 = Years in school, residents who do not / have not completed school

y_2 = Years in school, residents who do not complete primary school

y_3 = Years in school, never graduated from junior high school population

y_4 = Years in school, residents who do not finish high school

y_5 = Years in school, residents did not graduate College

y_6 = Years in school, residents who graduated College

2. Panel data regression analysis

This method is used to look at the factors that influance education inequality in South Sumatra Province. The model used in this study are as follows:

$$GP_{i,t} = \alpha + \theta_1 PP_{i,t} + \theta_2 GG_{i,t} + \theta_3 MYS_{i,t} + \varepsilon_{i,t} \quad (3)$$

where :

$GP_{i,t}$ = Education Gini (index)

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$PP_{i,t}$ = Government Expenditure in Education (million)

$GG_{i,t}$ = Gender Gap (percent)

$MYS_{i,t}$ = Mean Years School (years)

α = constant

θ_1= Regression coefficient of government expenditure in education

θ_2 = Regression coefficient gender gap

θ_3 = Regression coefficient mean years school

3. Granger causality analysis

This method is used to see how the two-way relationship between the variables of education inequality and economic growth in South Sumatra Province. The model used in this study are as follows:

$$GP_{i,t} = \alpha + \theta_1 \, Laju\_Eko_{i,t} + \varepsilon_{i,t} \quad (4)$$
$$Laju\_Eko_{i,t} = \alpha + \beta_1 \, GP_{i,t} + \varepsilon_{i,t} \quad (5)$$

where :

Laju_Eko$_{i,t}$ = Economic growth (percent)

GP$_{i,t}$ = Education Gini (index)

α = constant

θ_1 = Regression coefficient Economic Growth

β_1 = Regression coefficient Education Gini

Independent Variable. Government expenditure in the education sector is the amount that has been budgeted by the government for development in the education sector in the APBN and APBD each year. Gender gap is a measure that measures the gap between women and men in obtaining the benefits of education, employment and service. The measure used in this study is the comparison between men and women in accessing education based on literacy rate variables. Mean Years School is the average number of years spent by residents aged 15 years and over in all levels of formal education that they have lived.

Results and Discussion. Education inequality in South Sumatra Province which is measured using the categorized index of education gini on low inequality. Education Gini in 2011 was 0.263, moving down to 0.239 in 2017. The following is a graph to see the trend of education inequality in South Sumatra Province from 2011 to 2017:
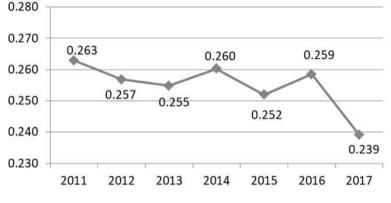

Figure 1. **Education Inequality in South Sumatra Province, 2011-2017**

Source: CBS, processed

In 2017, the districts / cities with the lowest education inequality were Palembang, and vice versa the highest was Musi Rawas District.
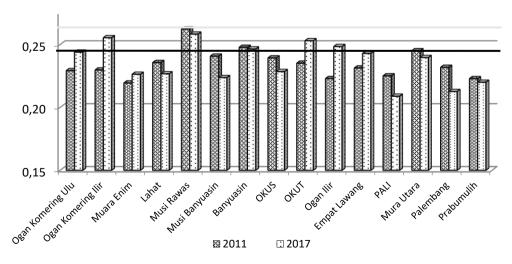

Figure 2. **Education Inequality by districts / cities in South Sumatra Province, 2011 and 2017**

Source: CBS, processed

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Palembang is the city with the lowest education inequality with a value 0,21 point. Palembang is the capital of the South Sumatra Province.
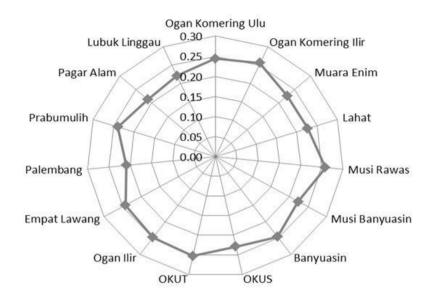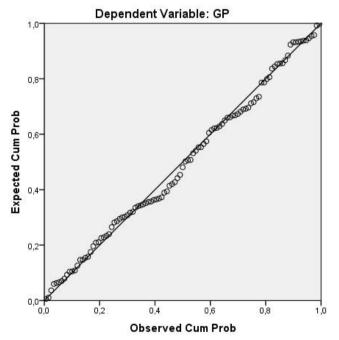

Figure 3. **Ranking of Education Inequality by districts / cities in South Sumatra Province, 2017**

Source: CBS, processed

Classic Assumption Test. From the result of the testing, the normality of probability plots data shows that line (dots) follow a diagonal line.

Figure 4. **Normality Test**

Using a tolerance amount = 10% or 0.10 then VIF = 10. Then from the table below it can be seen that the large VIF calculated Government Expenditure in Education (PPP) variable is 1.061, Gender Gap (GG) variable is 1.116, and Mean Years School (MYS) variable is 1.153 smaller than 10, it can be concluded that between independent variables and multicollineriy does not occur.

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Table 1 **Multocollinearity Test (Coefficients[a])**

Model		Collinearity Statistics	
		Tolerance	VIF
	(Constant)		
	PPP	0,943	1,061
	GG	0,896	1,116
	MYS	0,867	1,153

Source: Outcome Data

Panel Data Regression Analysis. Based on the testing of model specifications using Hausman and Chow test concluded that the best model to be applied in this study is the Random Effect Model. More over, this study has also fulfilled the classic assumption test.

Table 2 **Test Results of Hausman Test Model Panel Data**

Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random		6.529100	3	0.0885
Cross-section random effects test comparisons:				
Variable	Fixed	Random	Var(Diff.)	Prob.
PP?	0.008904	0.000505	0.000276	0.6133
GG?	0.379438	0.436094	0.008801	0.5459
MYS?	0.000514	-0.008858	0.000026	0.0652

Source: Outcome Data

The following are the results of panel data research with Random Effect Model:

Table 3 **Test Results of Random Effect Model Panel Data**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.116917	0.128737	-0.908182	0.3660
PP?	0.000505	0.006614	0.076387	0.9393
GG?	0.436094	0.135092	3.228130	0.0017
MYS?	-0.008858	0.001899	-4.664645	0.0000
R-squared	0.299066	Mean dependent var		0.238305
Sum squared resid	0.019979	Durbin-Watson stat		1.321268

Source: Outcome Data

Based on the results of the above research it is known only the significant Gender Gap (GG) and Mean Years School (MYS) towards Education Inequality (Gini_P) with a significance value of 0.0017 and 0,000; while the variable Government Expenditures in the Field of Education (PP) has no significant effect on education inequality with a significance value of 0.9393. The equations obtained based on the results of the study are as follows:

$$GINI_P = -0.12 + 0.44 \, GG - 0.01 \, MYS \qquad (6)$$

The results of the study using panel data revealed that there was a negative relationship between the mean years school and education inequality in districts / cities in South Sumatra. Based on the results of the study, it was concluded that if there was an increase in the mean years school as much as 1 (one) year, it would reduce the education level by 0.01 points. This result is in line with research that states that the mean years school variables negatively influences education inequality in an area (Rahayu, 2005).

This study also revealed that the gender gap seen from literacy inequality between men and women has a relationship with education inequality in districts / cities in South Sumatra. Based on the results of the study it can be concluded that if there is an increase in the gender gap of 1 (one) percent, it will increase the education gini by 0.44 points. This result is in line with research conducted by Thomas (2000), Digdowiseso (2010), Bustomi (2012). Based on research in 85 countries in the period between 1960 and 1990 it was revealed that there was an influence of the gender gap as measured by illiteracy inequality between gender towards education inequality (Thomas et al., 2001).

This means that gender inequality to access education contributes to the problem of education inequality. The higher the gender inequality in obtaining education, which is reflected in the level of literacy, will lead to higher levels of education inequality.

Gender gap is one of the variables that contributes to education inequality in South Sumatra Province. Steps are needed to reduce gender gaps by realizing equal access to education for both men and women. Gender equality and justice is characterized by the absence of intergender discrimination to have access, opportunities for participation, control over development, and obtain equal

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and fair benefits from development. Decreasing gender gaps is a step that impacts on decreasing education inequality.

Finally, this study reveals that there is no relationship between government expenditure in education and education inequality in districts and cities in South Sumatra Province. This is not in line with the research conducted by Bustomi (2012) in East Java Province during the range of 2007-2010 which found that there was a negative correlation between the variables of government expenditure in education and education inequality. This research is not in line with the theory of returning social benefits and costs of education (Todaro & Smith, 2011).

Granger Causality Analysis. Granger causality analysis is an analytical method to find out the relationship where an independent variable can be influenced by other variables (non-independent variables) and on the other hand independent variables can also occupy the position of non-independent variables. Such relationships are called reciprocal relationships or two-way relationships. This research was conducted to see how the reciprocal relationship between the variables of education inequality and economic growth in the Province of South Sumatra.

This following tables show test results of tationary test and cointegration test, before granger casality test was then carried out.

Table 4 **Test Result of Root Test Education Gini**

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.42939	0.0003	6	30
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.12229	0.5487	6	30
ADF - Fisher Chi-square	10.4076	0.5802	6	30
PP - Fisher Chi-square	30.8128	0.0021	6	36
** Probabilities for Fisher tests are computed using an asymptotic Chi				
-square distribution. All other tests assume asymptotic normality.				

Table 5 **Test Result of Root Test Economic Growth**

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.30317	0.0000	6	30
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.45194	0.0733	6	30
ADF - Fisher Chi-square	19.9060	0.0689	6	30
PP - Fisher Chi-square	11.5308	0.4841	6	36

Table 6 **Test Result of Cointegration Test**

		Statistic	Prob.	Weighted Statistic	Prob.
Alternative hypothesis: common AR coefs. (within-dimension)					
Panel v-Statistic		-55219.08	1.0000	-0.661213	0.7458
Panel rho-Statistic		0.025311	0.5101	-0.102280	0.4593
Panel PP-Statistic		-1.451819	0.0733	-2.580730	0.0049
Panel ADF-Statistic		-0.725133	0.2342	-1.122821	0.1308
Alternative hypothesis: individual AR coefs. (between-dimension)					
		Statistic	Prob.		
Group rho-Statistic		0.998778	0.8410		
Group PP-Statistic		-2.362861	0.0091		
Group ADF-Statistic		0.455923	0.6758		

The following table shows the relationships that occur between the variables of education inequality and economic growth in the Province of South Sumatra. The relationship between the two variables is a one-way causality relationship, namely economic growth influences education inequality. This is indicated by the probability of economic growth (kurs_eko) affecting education inequality (gini_p) of 0.045 and smaller than 0.05.

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Table 7 **Granger Causality Test Result Variable Education Inequality and Economic Growth in South Sumatra Province**

Pairwise Granger Causality Tests			
Date: 12/05/19 Time: 09:36			
Sample: 2011 2017			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
LAJU_EKO does not Granger Cause GINI_P_1	75	3.22794	0.0456
GINI_P does not Granger Cause LAJU_EKO		1.10961	0.3354

This research concluded that there is only one-way relationship between education inequality and economic growth in South Sumatra Province during the period 2011-2017. This means economic growth affects education inequality in South Sumatra Province, but education inequality does not affect the economic growth in South Sumatra Province.

Conclusion. Education inequality in South Sumatra Province categorized categorized index of education gini on low inequality. Education Gini in 2011 was 0.263, moving down to 0.239 in 2017. In 2017, the districts / cities with the lowest education inequality were Palembang, and vice versa the highest was Musi Rawas District.

Education inequality in South Sumatra Province is affected by the Gender Gap (GG) and Mean Years School (MYS), while Government Expenditures in Education (PP) does not have a significant effect on education inequality.

The result of the Granger causality test show that there is only one-way relationship between education inequality and economic growth in South Sumatra Province during the period 2011-2017. This means economic growth affects education inequality in South Sumatra Province, but education inequality does not affect the economic growth in South Sumatra Province.

Based on the results of this study, it is expected the government can find out a strategies to reduce education inequality in South Sumatra Province. Government can equalize access to education for men and women so that it can suppress the gender gap and can reduce the education inequality of in South Sumatra Province. Moreover, the government policy is needed to increase public awareness to education to increase human capital investment in South Sumatra Province.

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