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15

SUB THEME
AGRIBUSINESS AND ENTREPRENEURSHIPTHURSDAY, OCTOBER 10th 2013

ROOM : MELATI

TIME : 08.00-10.00 AM

MODERATOR

Dr. Netti Tinaprila

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88. RELATIONSHIP BETWEEN INNOVATION, COMPETITIVENESS, RISK, POLICIES AND ECONOMIC GROWTH IN BROILER FARM
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**THE ANALYSIS ON EDUCATION INEQUALITY AND ITS IMPACT ON THE ECONOMIC
GROWTH OF RIAU PROVINCE**

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Abstract

This paper analyzes education inequality and determines its impact on economic growth in Riau Province. The analytical methods used are Gini index to measure education inequality and static panel data regression analysis. The result of the study shows that education inequality of Riau Province belongs to low inequality category over the period of 2005-2011 because Gini index for education is always below 0.3. Based on static panel data regression, it can be concluded that education inequality has negative impact on economic growth. Therefore, this study suggests that government policy is not only concern in educational attainment but also education inequality.

Keywords: Education inequality, economic growth, static panel data

JEL Codes : I240, O15

INTRODUCTION

Augmented Solow neoclassical growth theory determines human capital as an additional input from the source of economic growth. Todaro and Smith (2006) explain human capital as a stock of competence, knowledge, expertise, skills, goal, and health as the results of expenditure or spending in education sector and healthcare maintenance program. The progress of science has made education as one of the important factors in creating human capital. Hence, human capital investment can improve the quality of human resources in order to become a potential asset in development (Galor and Moav, 2004).

Development is considered to be successful based not only on high economic growth, but also on how the economic growth can bring benefits to the whole society. The problem in Indonesia's development is, among others, inequality. The source of inequality is not only from income distribution but also from education (Todaro and Smith, 2006). Tilak (1989) states that education is the core of human capital that can accelerate the productivity of labour force and consequently affect economic growth.

Human capital stock variable uses the proxy data of mean years of schooling, participation rate at certain educational level and literacy rate. The variable reflects educational attainment, but the increase of that educational attainment does not necessarily imply that education has been distributed equally. Thomas et al. (2001) states that absolute education indicator is not really effective in describing education inequality. Hence, a more effective measure is needed to complement the existed educational attainment indicator, namely education inequality measure as one of the indicators that can reflect educational attainment equality.

Riau Province is one of provinces in Indonesia which has natural resources such as petroleum. The GDP (Gross Domestic Product) per capita of Riau Province ranks third in Sumatera Island in 2011 at Rp 9.123 million and ranks sixth in Indonesia.

During the period of 2007-2011, the economic growth of Riau Province is below national level. In 2011, the economic growth of Riau Province is the lowest in Sumatera at 5.01%.

Besides the economic attainment, the development in Riau Province should also aim at human capital equality which is conducted through education equality. Mean years of schooling as one of educational attainment reflections displays an increasing trend each year, where in 2011 the mean years of schooling is 8.6 years. This figure indicates that until 2011 Riau Province has yet to reach the government's target in completing the nine-year compulsory education. Although mean years of schooling at provincial level is 8.6 years, district/city attainment highly varies from 7.16 to 10.9 years. This can be used as the early indication that education inequality occurs in Riau Province.

Education inequality as the proxy of human capital inequality has an influence on economic growth. The study result, in general, points out that education inequality (human capital) has negative impact on growth (Lopez et al. 1998; Thomas et al. 2001; Hasan and Shahzad, 2005; Digdowiseiso, 2009; Sauer and Martin, 2011). The study conducted by Park (2006) shows different result in that education inequality can improve growth. Studies that link human capital inequality to growth are rarely done in regional (provincial) scope; most researches analyze at state or between states level. In connection with the above explanation, this study aims to measure education inequality with Gini coefficient of education for 11 districts/cities in Riau Province during the period of 2005 to 2011 in order to obtain a description on education inequality and also to determine the impact of education inequality on the economic growth in Riau Province.

This paper consists of five sections. It begins from the Introduction and Literature Review presented in Section 1 and 2. Then, it proceeds to Section 3,

Research Methods, which describes data sources and research models. Section 4 displays the Results and Discussion of the study. Section 5 is the concluding part of the paper that contains the conclusions of this study.

LITERATURE REVIEW

This section presents the literature on economic growth, especially the supporting literature that turns education (a proxy of human capital stock) into one of the sources of economic growth. It also displays reviews about economic and educational attainment of Riau Province in 2005-2011.

The Role of Education in Economic Growth

Endogenous growth theory pioneered by Romer and Lucas stresses the importance of human capital in the economy. Romer declares that knowledge stock is the main source of productivity increase in economy since knowledge stock has become a production factor that has increasing return scale. Then, Lucas endogenous growth model states that human capital accumulation is the accumulation of education and training. New discoveries originated from the process of learning by doing can bring other new discoveries that will improve production efficiency. This efficiency can increase productivity, which in turn can boost growth. So in this case, the quality of human resources is a factor that affects economic growth.

The human capital augmented Solow model includes human capital as a variable that affects growth (Mankiw et al. 1992). Human capital plays a role similar to physical capital. The human capital augmented Solow model suggests that the rate of physical capital investment, population growth and human capital will affect output growth rate per worker.

Thomas et al. (2001) states that the use of education inequality variable can provide a more reliable estimation on economic growth compared to the human capital stock variable. Most of the studies on the relationship between education inequality and economic growth illustrate the existence of negative relationship. Gungor (2006) concludes that education inequality influences the provincial growth in Turkey through resource allocation inefficiency channel. Adelaide Duarte and Marta Simoes (2010) discover that economic growth is more affected by education inequality than income inequality. Park (2006) finds out that education inequality has positive impact on growth that, among others, is caused by the difference of sample scope and education inequality measure used.

The Dynamics of Economy and Education of Riau Province, 2005-2011

The economic growth of Riau Province with oil and gas shows an increasing trend since 2009. The economic growth in 2011 is 5.01% where this increase is driven more by the growth in construction and mining sectors. GDP per capita in 2005 amounted to 29.8 million per year and has gradually increased to 72 million by 2011. This value is equivalent to 17 million (in 2005) and 17.9 million (in 2011) per year based on the constant price of year 2000. The share of manufacturing sector shows varied percentage during the period of 2005-2011. This is partly due to the contribution of oil and gas sector which is heavily influenced by world oil price fluctuation and production resulted.

Development is not oriented only on economic growth but also on the improvement of human quality as one of the important factors of production. Education is one of the efforts in improving human capital. Human development index (HDI) is one of the indicators that can reflect the attainment of human resources development progress. HDI improvement means an increase in education, health and

income sectors. This shows the existence of quality improvement every year. The HDI of Riau Province ranks third at the national level. Literacy rate has also increased in 2011, meaning that in 2011 98.42 percent of the population are literate. Mean years of schooling in 2011 is 8.63 years, which means that the education of the population aged 15 years and above is equal to the second year of middle school.

Table 1. Several Economic and Educational Indicators of Riau Province, 2008-2011

Indicator	2005	2008	2011
Economic growth (%)	5.41	5.65	5.01
GDP per capita (Million rupiah)	17.0	17.6	17.9
Manufacturing Industry Share in GDP (%)	20.6	18.15	19.36
Literate Rate (Percent)	97.8	97.81	98.42
Mean years of schooling (Year)	8.04	8.51	8.63
HDI	72.2	75.09	76.53

Source: Statistics Indonesia (BPS)

RESEARCH METHODS

Based on the background in the previous section, this section will discuss education inequality measure method and econometric model specification to see the effect of education inequality on economic growth. The scope of the study covers 11 districts/cities in Riau province with the study period of 2005-2011. This study only encompasses 11 districts/cities of 12 districts/cities in Riau province because Meranti Islands Regency, a new district that was established in 2009, is merged with its parent district, Bengkalis. Data source used in the calculation of Gini of education is individual data resulted from the National Socio-Economic Survey (*Susenas*) conducted by Statistics Indonesia (BPS). Supporting data are GDP of districts/cities, road

infrastructure, and the number of people referred from publications published by BPS in various years.

Gini Coefficient of Education Analysis

The measures for inequality that can be used are, among others, Gini index of education (Thomas et al. 2002; Hassan and Shahzad, 2005; Digdowiseiso, 2009; Sauer and Zagler, 2011); standard deviation of education (Birdsall and Londono, 1997; Park, 2006); coefficient of variation of education (Lopez et al. 1998); Theil index, Atkinson index and percentile ratios (Duarte and Simoes 2010).

The first study aiming at measuring education inequality uses Gini index measure adopted from the formulation of Thomas et al. (2001). Several reasons in choosing Gini of education are: it is a measure that is more commonly used to measure inequality in many studies, it is more easily analyzed because it has a scale of 0 to 1, it can be used on both ordinal and non ordinal clustered data. The formulation of Gini of education is:

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

Mean years of schooling based on educational attainment is calculated below

$$\mu = \sum_{i=1}^n p_i y_i \quad (2)$$

By expanding the equation (2), the GE formula is described in detail as follows:

$$\begin{aligned} GE = & \left(\frac{1}{\mu}\right) [p_2(y_2 - y_1)p_1 \\ & + p_3(y_3 - y_1)p_1 + p_3(y_3 - y_2)p_2 \\ & + \dots \\ & + p_n(y_n - y_1)p_1 + p_n(y_n - y_2)p_2 + \dots + p_n(y_n - y_{n-1})p_{n-1}] \quad (3) \end{aligned}$$

where,

GE = Gini of education

p_1 = proportion of the population aged 15 years or above with years of schooling
0 year

p_2 = proportion of the population aged 15 years or above with years of schooling
1 year,

i

p_n = proportion of the population aged 15 years or above with years of schooling
n-1 year

y_1 = years of schooling 0 year

y_2 = years of schooling 1 year

i

y_n = years of schooling n-1 year

The calculation of Gini index of education is modified from the formulation by Thomas et al. (2001) where this study does not group population based on years of schooling into several categories.

The Analysis on the Impact of Education Inequality on Economic Growth

To answer the second objective of this study, static panel data regression analysis is used. Panel data is data that has space (individual) and time dimensions (Gujarati, 2004). In panel data, the same cross section data are observed according to time. Panel data estimation models can be grouped into common effects and individual effects models (fixed effects and random effects). The right selection of panel data regression model can also be done formally by using F statistic test or Chow Test to choose between common effects and fixed effects models; Hausman test is used to determine between fixed effects and random effects models.

To find out the effect of Gini of education variable as the proxy of human capital inequality on economic growth, the variable is turned into exogenous variable. However, considering that economic growth is not only influenced by Gini of education, this study also uses the number of population, road length and industrial share variables as exogenous variables. This study's model refers to Sauer and Zagler (2011) with additional variables of industrial share and road length ratio. The model of this study is:

$$GROWTH_{it} = \alpha + \beta_1 \ln_Pop_{it} + \beta_2 \ln_MYS_{it} + \beta_3 GE_{it} + \beta_4 \ln_Ratio_pjg_jln_{it} + \beta_5 SHARE_Industri_{it} + \epsilon_{it}$$

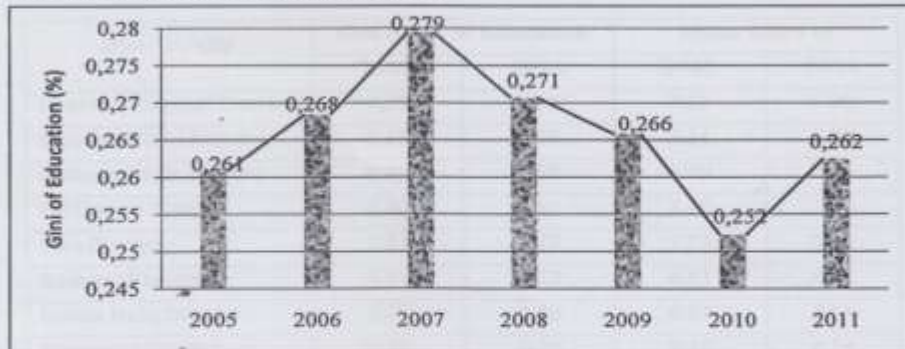
where $GROWTH_{it}$ is the growth of GDP per capita (%), Pop_{it} is the number of population (people), MYS_{it} is mean years of schooling (year), $Ratio_pjg_jln_{it}$ is road length ratio against area width, $SHARE_Industri_{it}$ is the contribution of industrial sector to GDP (%).

RESULTS AND DISCUSSION

The Education Inequality Dynamics in Riau Province

One of the measures to calculate inequality is Gini coefficient. Gini coefficient ranges between 0 and 1 where zero represents perfect distribution and one shows maximum inequality. The Gini of education of Riau Province is categorized as low inequality during the period of 2005-2011. During that period, Gini of education displayed a decreasing trend since 2007, but in 2011 the Gini of education of Riau escalates compared to the previous year (Figure 1). The increase of education inequality of Riau Province in 2011 is not too high. This is due to the shifting of people's working age proportion. The number of working age population with years of schooling less than six years (equivalent to the incompleteness of primary school) in 2010 was 13.7%, whereas

in 2011 it becomes 15.8%. Population proportion increase is not comparable to the increase of higher years of schooling level.



Source: Statistics Indonesia/BPS, processed

Figure 1. Gini Coefficient of Education Riau Province Year 2005-2011

The development of education inequality patterns based on the districts/cities in Riau province during the period of 2005-2011 varies (Table 2). The value of Gini of education in all districts/cities is less than 0.4. This shows that even though the Gini index of education at provincial level is in low inequality category, there are still districts in Riau Province that are categorized as moderate inequality. In general, education inequality in city area is lower compared to district area and there is even a higher inequality trend in several districts.

At the initial condition in 2005, there were two districts that had the highest inequality index rating, namely Kuantan Singingi District and Pelalawan District, with equal Gini index of education at 0.30. Both districts are part of moderate inequality category. Pekanbaru and Dumai are the area with the lowest education inequality at 0.18 and 0.21, respectively.

Table 2. Gini Index of Education and Mean Years of Schooling of Districts/Cities and Riau Province Year 2005 and 2011

District/city	Gini Index of Education		Mean Years of	
	2005	2011	2005	2011
Kuantan Singingi District	0.30	0.29	7.32	7.99
Indragiri Hulu District	0.28	0.28	7.44	7.80
Indragiri Hilir District	0.25	0.29	6.70	7.16
Pelalawan District	0.30	0.30	7.10	7.76
Siak District	0.27	0.22	7.74	9.10
Kampar District	0.24	0.23	8.41	8.87
Rokan Hulu District	0.29	0.28	6.87	7.64
Bengkalis District	0.25	0.28	8.45	8.24
Rokan Hilir District	0.23	0.27	6.59	7.61
Pekanbaru	0.18	0.18	10.49	10.96
Dumai	0.21	0.23	9.12	9.47
Riau Province	0.26	0.26	8.05	8.58

Source: Susenas, processed

There is a slight shift in 2011 condition. Kuantan Singingi District manages to reduce education inequality in its region. However, until 2011, Pelalawan District has not come up with a satisfying result to reduce its education inequality. This is related to the fact that 59.77% of population aged 15 years and above work in the agriculture sector, where agriculture sector is a sector that can absorb workers with low educational level.

Pekanbaru has always been a region with the highest education equality. In 2005 and 2011, its Gini of education value has reached 0.18. This condition is equal to the years of schooling attainment of Pekanbaru that in average has achieved the first year of high school.

From the lowest to the highest rank attainment of Gini of education, it can be concluded that Pekanbaru occupies the first rank with the most equal condition in years of schooling and is the only district/city with Gini of education below 0.2. This is

due to the status of Pekanbaru as the capital city of Riau Province. Education equality in Pekanbaru is related to several factors such as many available and easy-to-access infrastructures as well as sufficient quantity and quality of teachers. Siak District and Dumai are at number 2 and 3 with Gini of education values at respectively 0.23 and 0.22 in 2011. This indicates human development success in both districts/cities. This is also supported by the Human Development Index value and mean years of schooling attainment in both districts/cities that are in the top three in 2011. The next districts in the top five are Kampar and Rokan Hilir Districts with Gini of education at 0.23 and 0.72, respectively.

Compared to mean years of schooling attainment, there is a difference between ranks and the result of Gini of education. Pelalawan District is a district with moderate inequality, but based on its mean years of schooling attainment, Pelalawan District is still better than Indragiri Hilir District in 2011. The mean years of schooling of Pelalawan District is 7.76 years, while Indragiri Hilir District has 7.16 years of mean years of schooling. The high score of Gini of education of Pelalawan District is an indication that the proportion of population with low category years of schooling is more than the proportion of population with high category years of schooling. Aside from mean years of schooling attainment, Indragiri Hilir also has APS aged 13-15 and the age of 16-18 is also low in 2011. Thus, it demonstrates that mean years of schooling attainment has not been able to absolutely describe inequality.

The Determinants of Economic Growth of Riau Province

Economic growth model is used to identify variables that influence economic growth. Estimation result of this model uses panel data regression analysis with EGLS panel approach summarized in table 2. Based on Hausman test result, the economic

growth model of Riau Province uses Fixed Effect Model. Variables used in the model are the number of population (LOG JUMLAH_PDDK), road length with good and moderate condition ratios against area width (LOG RASIO_JLN_WILAYAH), Gini of education (GE), mean years of schooling (LN_MYS) and industrial sector contribution to GDP (SHARE_INDUSTRI).

Variables that influence economic growth are road length with good and moderate condition ratios against area width, Gini of education and industrial share in GDP, whereas the number of population and mean years of schooling variables do not affect the economic growth of Riau Province during the period of 2005-2011. Gini of education as the proxy of human resources (human capital) has a negative effect of Gini of education on economic growth. This is in line with the initial hypothesis before.

Table 1. Estimation Result on the Variables That Influence Economic Growth

Variable	Coefficient	Probability
C	10.46536	0.7978
LOG(JUMLAH_PDDK)	0.786002	0.8395
LOG(RASIO_JLN_WILAYAH)	-1.723865	0.0324**
GE	-21.60530	0.0573*
LN_MYS	-6.224948	0.4462
SHARE_INDUSTRI	-0.114488	0.0916*
R-squared	0.795603	
Adjusted R-squared	0.745342	
Prob(F-statistic)	0.000000	

***) significant at level 5%

*) significant at level 10%

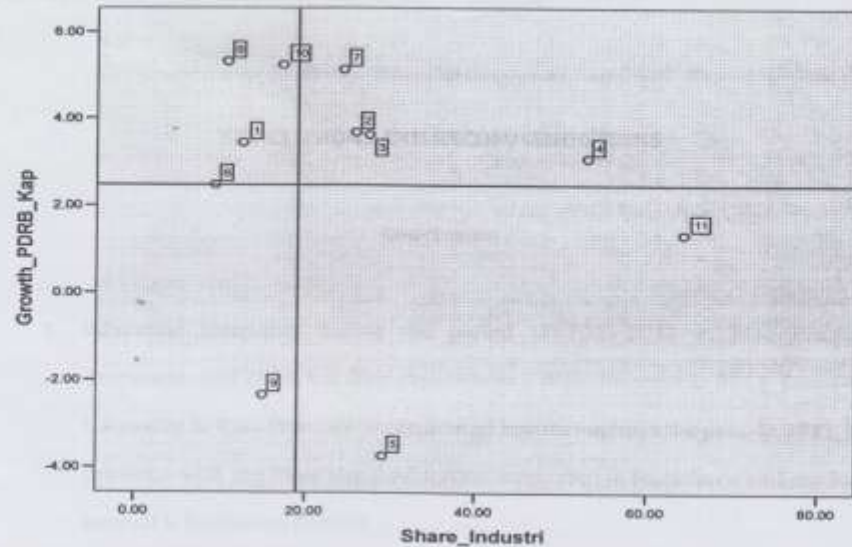
Several other studies generate the same result as this study. Castello (2010) that study the impact of education inequality on economic growth of the world during the

period of 1960-1985 conclude that globally, and among developing countries, Gini of education has significant negative impact on economic growth. In OECD countries, Gini of education has significant impact on economic growth. As for developed and European countries, the Gini of education is no longer significant in affecting economic growth. This condition shows that education inequality has no effect on the developed countries category.

The value of Gini of education variable is 21.6. It means that if Gini index increases by 0.1 unit, *ceteris paribus*, then the economic growth will decelerate by 2.16%. Gungor (2006) discovers the negative impact of Gini of education on economic growth in 1975-2000 in Turkey, whereas the increase in education attainment (mean years of schooling) does not have significant impact on economic growth. Therefore, it is not yet capable to explain economic growth performance.

Industrial share in GDP has negative impact on economic growth with 0.11 coefficient. This means that the increase of industrial share by 1%, *ceteris paribus*, will decelerate economic growth by 0.11%. This is a specific case in Riau Province which related to the fact that region with high industrial share tends to have low growth because the region is at levelling off stage.

Quadrant analysis in Figure 6 uses the growth of GDP per capita and mean industrial share from all districts/cities in Riau Province as the benchmark. This analysis describes district/city positions that are spreading in four quadrants.



Note: 1 = Kuantan Singingi 2 = Indragiri Hulu 3 = Indragiri Hilir 4 = Pelalawan
 5 = Siak 6 = Kampar 7 = Rokan Hulu 8 = Bengkalis
 9 = Rokan Hilir 10 = Pekanbaru 11 = Dumai

Figure 4 Quadrant Analysis on Industrial Share and GDP Growth of Districts/Cities in 2011

Quadrant analysis describes that most districts/cities display negative relationship between GDP per capita and industrial share. The characteristic of those districts/cities is districts with mining or oil and gas manufacturing.

The road length with good condition ratio against area width has negative effect on economic growth. The increase of road length with good condition ratio against area width by 1 unit, *ceteris paribus*, will decelerate economic growth by 1.7%. The negative relationship between road length ratio variable shows specific cases in Riau Province during the period of 2005-2011. This is because the biggest contribution

to GDP is mining sector, but based on road infrastructure, mining location usually has damaged road condition due to soil surface or gravels.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

1. Education inequality during the period of 2005-2011 in Riau Province decreased until 2010, but then experiences a slight increase in 2011. Education inequality in Riau Province is considered low throughout the year. In 2011, the province with the most equal education inequality is Pekanbaru and the least unequal is Pelalawan District.
2. Based on static data panel method, it is obtained that education inequality has significant negative impact on growth. Higher education inequality can decelerate the economic growth of Riau Province.

Recommendations

1. The conclusions of the study illustrate that education inequality is a more important factor in promoting economic growth compared to educational attainment (years of schooling). Therefore, government policy should also be oriented towards the effort of education equality and not only on the increase of educational attainment.
2. The inequality measure used in this study is Gini coefficient. For the next study, other inequality measures such as Theil index as well as Atkinson index can be used.

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