Jurnal Ekonomi Malaysia 54(3) 2020 59 - 76
http://dx.doi.org/10.17576/JEM-2020-5403-5

Measuring the Inequality in Education: Educational Kuznets Curve

(Mengukur Ketaksetaraan dalam Pendidikan: Keluk Kuznet Pendidikan)

Khusaini Khusaini
Islamic University of Syekh-Yusuf

Sutyastie Soemitro Remi
University of Padjadjaran

Mohamad Fahmi
University of Padjadjaran

Rd. Muhamad Purnagunawan
University of Padjadjaran

ABSTRACT

This study aims to measure the inequality of education. The study examines the pattern in the educational Lorenz curve as a way to investigate the impact of education experience, per capita income, and poverty on educational inequality. Using Banten Province secondary data series over 1996 –2016, the unbalanced panel unit root were tested for the educational Kuznets curve. The regression results shows that the educational Kuznets curve does not exist. While we found that the educational experience reduce the educational inequality, the per capita income and poverty were not significant.

Keywords: Educational inequality; educational Kuznets curve; education experience; per capita income; Indonesia

ABSTRAK

Kajian ini mengukur ketaksetaraan dalam pendidikan. Kajian ini cuba memeriksa corak lengkung Lorenz pendidikan sebagai satu cara untuk menyiasat kesan pengalaman pendidikan, pendapatan per kapita, dan kemiskinan terhadap ketaksetaraan pendidikan. Dengan menggunakan data siri sekunder Banten bagi 1996 – 2016, unit root panel yang tidak seimbang telah diuji untuk menguji keluk pendidikan Kuznets. Keputusan regresi menunjukkan bahawa keluk Kuznets pendidikan tidak wujud. Sementara kami mendapati bahawa pengalaman pendidikan mengurangkan ketaksetaraan pendidikan, pendapatan per kapita dan kemiskinan tidak memberi sebarang kesan.

Kata kunci: Ketidaksamaan pendidikan; keluk Kuznet pendidikan; pengalaman pendidikan; pendapatan per kapita; Indonesia

INTRODUCTION

In developing countries, the has been an alarming concern on the issue of educational inequality recently. To overcome this problem, the researcher and policymaker have become more attentive towards the issue, both focus at the national level and at the regional levels, including those in the inter regions, provinces, and regencies/municipalities. The average years of schooling represented the education levels of the people age over 15 years old. Hong et al. (2018) stated that higher education levels offered workers a greater opportunity to adopt technology to boost their productivity. It is essential to generate the qualified human capital for each of the populations. Hence, education should be made accessible to every population to improve awareness, skills, and attitudes in adapting to the growth of science and technology, as well as employment. One of the indicators in education development is the the accomplishments of nations and regions in increase in the average years of schooling. An increase in the average years of schooling can be used to measure that education has been evenly distributed and the number of school years also illustrates the educational achievements for each population.

The means years of schooling in Banten Province in 2016 were 8.79 years. This rate was comprised of the average of schooling for males and females, each which 9.16 and 8.40 years, respectively (BPS 2016a). The huge difference in the schooling rate between males and females showed the gap in education between males and females. However, there was also a gap in the attainment of education levels between the rural-urban areas. In urban areas, educational attainment

levels are better than those in rural areas. The average years of schooling of the population over the age of 15 years were 9.67 years in urban and 6.75 years in rural areas (BPS 2016a), wihich indicated a gap at 2.92 years. That means the expansion of education in urban areas is greater than in rural areas. To suppress the inequality between these groups, it is necessary to develop education in all areas with the special attention paid to the education development in the rural areas. The education gap between rural and urban areas also affects declining economic development and welfare in the rural areas.

In Indonesia, there was only few studies of educational inequality that used the average years of schooling data as part of the inequality measurement since the issue has not been a high concern. However, many economists had conducted the study of such an issue in several countries (Lei & Shen 2015; Shukla & Mishra 2019; Thomas et al. 2001). The expansion of education and the share of the population completing the level of education can be used to evaluate educational inequality and the results on the issue enable the contributon to education policy. Using the education Gini index for education policy is good to calculate the populations' distribution from various grades (Hu 2015). This measurement has a sensitivity of the population transitions, like enhancement or reduction of the educational attainment level, especially in regions. However, when students are still at the first year of college, the education Gini index method finds it hard to capture the response of inequality in education, which becomes the weakness of this method.

There are linear and non-linear relationships between educational expansion and educational inequality. Following the Kuznets model, the pattern of non-linear relationships Kuznet (1955) examined the impact of the growth of the economy on the disparity of income generated by the inverted U-shaped curve of Kuznets. The model also was developed the Kuznets curve with a distinct framework-like (Balaguer & Cantavella 2018; Ketenci 2018; Ridzuan 2019; Usman et al. 2019) which examined the environmental Kuznets curve pattern relationship. This method was also used by (Bazillier & Sirven 2008) to evaluate the social Kuznets curve pattern relationship. Some other researchers also used this curve to study several issues. The political Kuznets curve was assessed by (Alpalhão 2019), tax evasion Kuznets curve (Hanousek & Palda 2008), the heatlh Kuznets curve (Costa-Font et al. 2018; Grecu & Rotthoff 2015), the human capital Kuznets curve was studied by (Castelló & Doménech 2002; Hanif et al. 2019; Lim & Tang 2008), household welfare Kuznets curve was investigated (Shukla et al. 2018), openness Kuznets curve by (Jalil 2012), and financial Kuznets curve was examined by (Özdemir 2019).

In education, (Ram 1990; Shukla & Mishra, 2019; Thomas et al. 2001) examined the correlation pattern inverted U-shaped between education expansion and schooling of standard deviation. The education Gini index as a measure of education inequality was evaluated by (Fidalgo et al. 2010; Hojo 2009; Shukla & Mishra 2019; Thomas et al. 2001), and student attainment was examined (Guarini et al. 2018). These results of these studies were able to demonstrate that the pattern of correlation between education and the standard deviation of schooling could develop the inverted U-shaped relationship pattern. On the contrary, a negative association between average years of schooling and inequality in education was found by (Castelló & Doménech 2002; Ibourk & Amaghouss 2012; Thomas et al. 2001). The previous research finding was inconsistent that it was caused by the measure of educational inequality.

Education disparity is a gap in a country or region of education grads of the populations (Sholikhah et al. 2014). Several methods will help the measure of education inequality, namely the educational Kuznets curve, average years of schooling, and education Gini index (Fidalgo et al. 2010; Hojo 2009; Thomas et al. 2001; Wail et al. 2011) and the standard deviation of schooling (Gregorio & Lee 2002; Ram 1990; Thomas et al. 2001). Other researchers such as Sahn and Younger (2007)and de Barros et. al. (2009) used the generalized Entropy index to measure education inequaliy. Similarly, the education expenditure Theil index was also used by (Wang 2014). In this study, we focus on the educational Lorenz curve and education Gini index are measure education inequality and will be described in the form of a curve.

The increasing or decreasing educational inequality is not determined only by the mean years of schooling, but also educational inequality affected by the economy. One of the significant concepts in the economy of a country is the aspect of income. According to Todaro and Smith (2015), the term mostly used as a measure for the level economic well-being of the country's population is the gross national product per capita. In discussing income inequality, Kuznets uses the definition of per capita income. In discussing income inequality, Kuznets uses the definition of per capita income. The distribution of income in the country contributed to reducing educational inequality. The finding of previous research concluded that there was a positive association between the degree of income inequality and education inequality (Abdelbaki 2012; Coady & Dizioli 2018). Hamzah et al. (2017) and Mesa (2007) also concluded that GDRP per capita was negatively correlated to education inequality. The education level in the high-income district was likely higher than that of low-income district, the educational inequalities were more likely to be greater than those in high-income districts (Naveed et al. 2018). Even Peng et al. (2020) expressively stated that to reduce educational inequality, we need to encourage economic equality, especially in less developed areas. However, there are

a few number of studies finding, otherwise, conluded that the income distribution did not significantly lower educational inequality (Bustomi 2012). On the contrary, higher per capita income caused the more unequal distribution of income as well as education (Lee & Lee 2018). In the current study, the authors used per capita income as a proxy of the distribution of income aspect (Wilkinson & Pickett 2010), instead of as economic growth, thus reflecting economic distribution.

Another important factor in reducing education inequality is poverty reduction. The study of World Bank (2018) indicated that the proportion of poorer schools tends to be in smaller regencies/municipalities. This illustrates the inequality of education in the region in providing educational services for poor students. This situation was well captured by Ahmad and Triani (2018) also stated that there was a significant correlation between poverty and education levels. Todaro and Smith (2015) also stated that poor output would be difficult to continue to pursue higher education. Educational inequality was positively related to the causes of poverty (Mesa 2007). Other the studies also concluded that higher level of poverty led to lower level of human development (Syofya 2018) and increased children enrollment at school (Chowdhury & Hossain, 2018). Other empirical evidence showed that there were several factors to affect the higher educational completion These factors include the condition of household structure and economic limitations (poor), thus inhibiting the decrease in educational inequality (Arshed 2020). Antoninis et al. (2016) illustrated that the completion rate of secondary education in sub-Saharan Africa was lower based on its wealth, since the poorest 40% of young people account for fewer than 20% of high school graduations. The previous researchs provide a direction for the authors to test the effect of poverty on educational inequality.

This study, which addressed educational inequality, was conducted in Banten, since such problems were prevalent in social groups and regencies/municipalities. We investigated the educational Lorenz curve, the educational Kuznets curve pattern, and the decomposing of the Gini education index to address this issue. The educational Kuznets curve is the inverted U-shaped correlation pattern between years of schooling of the population over 15 years and educational inequality. We also tried to suggest the policy input to improve the average years of schooling and to reduce inequality in education. We propossed three contibrutions to study of inequalities in education. First, the accuracy of the curve of the educational Kuznets is explained. Second, by integrating other variables, such as per capita income and poverty, the authors analyze the model to identify the effect of these variables on increasing or decreasing educational inequality. In the review unit of the current report, there are many districts in which per capita and poverty are connected to serious issues. Third, according to North-South Banten areas and regencies/municipalities, we also break down disparity, since, there were few studies to address this issue in Indonesia

LITERATURE REVIEW

Testing of the theory of educational inequality has been done extensively before, including its measurement as a means of the scope of the evaluation. Test results vary slightly in the evaluation of the educational attainment where the mean level of education was calculated along with the distribution. The first researchers tested this issue (Psacharopoulos & Arriagada 1986) who used the rate of labor education attainment by the standard deviation of schooling. Other researcher used different methods, namely education Gini index in the country (Asadullah & Yalonetzky 2012; Digdowiseiso 2012; Mesa 2007) between countries (Thomas et al. 2001; J. Zhang & Li 2002), between provinces, regions, and groups (Shukla & Mishra 2019). Testing is conducted to analyze the development, contribution, and determining factors of educational inequality. The results reveal the trends, sources of the problems, both between and within, and so on.

Over the past, there has been a dwindling interest to study educational inequalities in many countries, but several countries had seen an increasing trend on this issue (Lim & Tang 2008). Similar results found in Latin American countries (Sahn & Younger 2007), but India there a decreasing trend on the issue (Asadullah & Yalonetzky 2012). It was also revealed that there was the adequate educational gap in China between urban and rural populations (Lei & Shen 2015)and the educational gap between coast-inland provinces (Qian & Smyth 2008). In addition, there was declining in all states in India according to the age of the cohort (Shukla & Mishra 2019), and a decrease based on areas, education levels, and gender in Mongolian (Banzragch, Mizunoya, & Bayarjargal 2019).

The study of education inequality in Indonesia using the Gini education index had been conducted by (Digdowaseso 2010) who found that educational inequality had decreased at a national level. There was also a decrease at the urban level in 1999 to 2005, but an increase of educational inequality in urban areas. Furthermore, there were only few recent studies on educational inequality at the provincial level in Indonesia (Adiningtyas & Budyanra, 2019; Ahmad & Triani, 2018; Bustomi, 2012; Sholikhah et al. 2014) which revealed a decreasing trend in educational inequalityeducational inequality.

An inverted U-shaped was observed by Lin (2007) and Meschi and Scervini (2014) using the nonlinear relationship between the average years of schooling and inequality in education. They measured the inequality in education by the Gini coefficient index. Some researchers used the mean years of schooling to

measure the dispersion of schooling (Ram 1990; Shukla & Mishra 2019; Thomas et al. 2001) that confirmed the existence of the educational Kuznets curve. In contrast, Castelló and Doménech (2002) and Thomas et al. (2001) found that the relationship between the average years of schooling and inequality in education were negatively significant, while education inequality was measured with the education Gini index. The contradictory finding is caused by the different proxy of educational inequality.

The recent study had reassessed the significant role played of the dynamics of income inequality within the group (Chuliang et al. 2018). The decomposition of the educational inequality group provinces, areas, and gender was conducted by (Saccone 2008), at the costal and the widening in China (Qian & Smyth 2008) and the education inequality at the national and the provincial level was performed by (Yang et al. 2014). They found that there had been a declining educational inequality not only at the national level, but also at the provincial level, regional level, and group of gender educational inequality.

The educational Lorenz curve is one of the indicators identified in education inequality. It is defined in the form of a curve for the education distribution and means years of schooling. The educational Lorenz curve was used by (Hojo 2009), who demonstrated that the horizontal axis of the curve represented an accumulated share of populations (Q) that achieve a certain education level and an accumulated number of school years is the vertical axis. We can measure the cumulative share of populations (Q) as following formula:

$$Q_k = \sum_{i=1}^{k} p_i \tag{1}$$

where p_i = the cumulative share of population older than 25 who have achieved a certain degree of education, group *i*. Also, to calculate the cumulative share of schooling (S), we can use the following formula:

$$S_k = \left(1/\mu \right) \sum_{i=1}^{t} p_i y_i, \qquad k = 1,2,\ldots,8 \tag{2}$$

where y_i = the cumuative share of schooling (S) in each group *i*, μ = average years of schooling.

Education Gini index was used to construct the educational curve (Thomas et al. 2001). It is measured as the ratio of two areas, with the nominator being the area of the egalitarian triangle and the numerator being the area between the educational Lorenz curve and the egalitarian line. This research uses 6 categories to construct the educational Lorenz curve. Figure 1 describes the educational Lorenz curve.

The equity line is shown in the educational Lorenz curve by the A, with B representing the area below the curve of Lorenz. The (A + B) = ½, is the area of the triangle as a whole. Education equity is perfect educational preciseness is representing the diagonal line. The point shown in the Lorenz curve shows that education inequality is greater as the Lorenz curve moves further to the diagonal axis.

To calculate education inequality, we can also use the first Kuznets curve was also used, since (Kuznet 1955) was the first to analyze the effects of economic growth. Kuznets found that there was a rise in the inequality of income at the early step of the development of the economy, and the inequality of income decreased along with the progress of economic development. A nonlinear pattern (convex) is created by the correlation between education expansion and disparity in education, which is called the Kuznets curve in the economy. A few researchers proved the association between average years of schooling and standard deviation of schooling by the inverted U-shaped pattern. We by (Gregorio & Lee 2002; Ram 1990; Shukla & Mishra 2019; Thomas et al. 2001) found that higher the populations' education levels, the higher inequality in education, before reaching the threshold. Hence, improving the population's education attainment would substantially reduce the inequality in education of the populations. The inverted U-shaped relationship form or educational Kuznets curve represents this relationship.

The inverted-U pattern was also found to occur in Portugal as revealed (Fidalgo et al. 2010). He found that the process of accumulation of human capital (through formal education) would lead, in the initial and intermediate stages, an increase in education disparity, and would only begin to decline after a crucial threshold. For the increase of the peak-end of the distribution, the rise in inequality was necessary for the initial stages, while the subsequent expansion across higher education levels would cause inequality to decrease. However, the outcome did not extend to the country, as many regions (provinces) were still weak, so there was a rise in education inequality.

The per capita income reflects the well-being of a country or region. The higher the per capita income, the higher the development level, and prosperity of the community. Todaro and Smith (2015) stated that the populations with low incomes tend to find it difficult to access higher education. This situation is because people with lower middle incomes are willing to pay lower tuition fees compared to communities with higher education groups. The calculated level of income is statistically positive significant. Therefore, a changing of per capita income appeared to improve educational inequality over time (Lee & Lee 2018).

Poverty is generally the inability of a person to fulfill the normal requirements of every aspect of life. Poverty is more linked to the failure to reach the standard of living (Sen 1999). Theoretically, people with higher education levels will be more likely to be working in structured jobs that have better wages, helping people to move out of poverty (Taufiq & Dartantoa 2020).

Several empirical studies about the effects of poverty on education had shown that the poor families expected their children to help the family economy. As a result, the children dropped out of school, thus increasing the educational inequality (Grimm 2011), even they found it difficult to go ahead to the higher education level (Ahmad & Triani 2018). It is also supported by other research showing that poverty has a significant effect on increasing educational inequality (Senadza 2012).

METHODOLOGY

The current study aimed to establish a few ways of measuring the inequality of education and to examine the educational curve of Kuznets in Banten. The authors quantified disparity in education, namely the education Gini index, the Lorenz curve of education, the decomposition of the Gini education index by regencies/municipalities, and regions. In addition, the authors re-tested the nature of the Lorenz educational curve and examined the determinant of inequality in education. The education Gini coefficient and the educational Lorenz curve were calculated by previous research to explain educational inequality among the population, regions, and countries. It contributed not only entirely to the literature, but also to identify the origins of the issue of educational expansion and the consequences of the policy. While calculating the threshold number of average years of schooling, the educational Kuznets curve was retested. The study design was being used to get an analysis linked to the objective of the research and validate the existing hypothesis through quantitative correlation. The study of the educational curve of Kuznets was in Banten Province, with unbalanced panel unit root results. The model was carried out by following the curve of the Kuznets model.

The impotence of the findings of data analysis is achieved by way of interpretations that lead to attempts to respond to research questions. This paper stated that the theory was approved or denied. The interpretation is carried out by emphasizing the relationship between this observation and the results. A generalization of the interpretation's results leads to the inference. The conclusions, implications, and suggestions of the findings are produced as the result of the study. The Gini education index is adapted to measure education inequality (Kane et al. 2006; Mesa 2007). The Lorenz curve for education was conducted (Hojo 2009; Shukla & Mishra 2019), the Gini education coefficient decomposed by (Ihle & Siebert-Mayerhoff 2017), and the educational Kuznets curve was studied by (Fidalgo et al. 2010; Meschi & Scervini 2014; Shukla & Mishra 2019).

RESEARCH DATA

We use data of 6 cross-sections, namely the Municipality of Tangerang, the Municipality of Cilegon, the Regency of Tangerang, the Regency of Serang, the Regency of Pandeglang, and the Regency of Lebak, and in Banten from 1996 to 2016. The Municipality of Serang and South Tangerang had not yet been created, as they were only extended in 2010. The data source from the Central Bureau of Statistics, the World Bank of Indodapoer, the population data of census in 2000, and other website sources are collected. The census results were especially added to enrich details about the accuracy rate of the populations' completed schooling. In comparison, the development of the Lorez education curve was based on the data from the Central Statistics Bureau of Banten Province in 1996 and 2016, also from the National Socioeconomic Survey (Indonesia, Survey Sosial Ekonomi Nasional/SUSENAS).

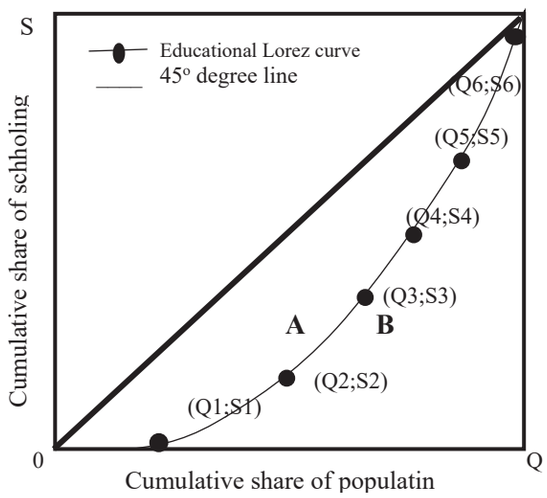

FIGURE 1. The educational lorenz curve

MEASURING EDUCATION INEQUALITY

The measurement of the education Gini index in this study obtains methods that had been developed by the previous researchers (Mesa 2007; Shukla & Mishra 2019; Thomas et al. 2001). Each method used certainly has its advantages and disadvantages. The disadvantage this measurement was, among other the discrete attainment of the population (students), resulting in a kinked educational Lorenz curve on the horizontal axis, unlike the educational Lorenz curve of opinion that uses continuous data resulting in a smooth curve (Thomas et al. 2001). To solve the weaknesses of the method, it was necessary to require a specific formulation by providing a category on the determination of the average length of school to calculate the index of education as done by 8 categories (Hojo 2009), 7 categories (Ibourk & Amaghouss 2013; Thomas et al. 2001), and 6 categories (Psacharopoulos & Arriagada 1986).

In this study, the authors used 6 categories and made adjustments to the condition of the research area. The six categories were not attending school or elementary school, finishing junior high school, finishing high school/vocational school, graduating diploma 1 - 3, graduating from university. The author also adapted the average calculation of school length by including equality education graduates (in Indonesia package A, B, and C). This calculation is different from the calculation of the Central Bureau of Indonesia Statistics which uses 9 categories (BPS 2011).

Thomas et al. (2001) calculated education inequality using the formulation of the education Gini index by adapting (Thomas et al. 2001), as follow:

$$EG = \left(\frac{1}{\mu}\right)\sum_{i=2}^{n}\sum_{j=1}^{i-1} z_i \left(y_i - y_j\right) z_j \qquad (3)$$

Where μ, is the average of schooling for a certain population

z_i and z_j, is representative of the proportions of the population with certain levels of education.

y_i and y_j, is the years of schooling at different levels of educational attainment.

n, is the category of schooling attainment, 6 in the current study

Thomas et al. (2001) determined the criterion for measuring the education inequality were low [0.0 – 0.3], moderate [0.3 – 0.6], and high [0.6 – 1].

EDUCATIONAL LORENZ CURVE

To develope the equation (3), we obtained the detailed description method of the education Gini index with adapting (Hojo 2009; Thomas et al. 2001). They constructed a curve where the horizontal axis includes the accumulated share of populations, the educational Lorenze curve is created. The vertical axis represents the accumulated share of schooling. To determine the educational Lorenz curve, 6 categories are suggested in this study. The cumulative share of the population at each education levels that have been completed can be shown in the equation follow:

Not completing primary school/no schooling	$Q_1 = z_1$
Primary school completed	$Q_2 = z_1+z_2$
Junior high school completed	$Q_3 = z_1+z_2+z_3$
Senior/vocationional high school completed	$Q_4 = z_1+z_2+z_3+z_4$
Diploma 1 – 3 completed	$Q_5 = z_1+z_2+z_3+z_4+z_5$
University gradueted	$Q_6 = z_1+z_2+z_3+z_4+z_5+z_6$

(4)

The cumulative share of schooling on each education levels could be determined by adapting Thomas' formulation as shown in the llowing equation:

Not completing primary school/no schooling incompleted

$S_1=(z_1y_1)/\mu$

Primary school completed

$S_2=(z_1y_1+z_2y_2)/\mu$

Junior high school completed

$S_3=(z_1y_1+z_2y_2+p_3y_3)/\mu$

Senor/vocational high school completed

$S_4=(z_1y_1+z_2y_2+z_3y_3+z_4y_4)/\mu$

Diploma 1 – 3 completed

$S_5=(z_1y_1+z_2y_3+z_3y_3+z_4y_4+z_5y_5)/\mu$

University graduated

$S_6=(z_1y_1+z_2y_2+z_3y_3+z_4y_4+z_5y_5+z_6y_6)/\mu$

(5)

DECOMPOPOSING EDUCATION GINI INDEX

Initially, the Gini education index of the decomposition was conducted to evaluate income inequality. It is developed to learn inequality in education. We provided the decomposition of the Gini education coefficient by within and between area North – South Banten in 1996 and 2016 and regencies/municipalities. It was analyzed the contribution to the regional education inequality. We adapted the model developed by (Ihle & Siebert-Mayerhoff 2017; Qian & Smyth 2008) could be shown follow:

$$G_{EG} = P_1^2\left(\frac{\mu_1}{\mu}\right)G_1 + P_2^2\left(\frac{\mu_2}{\mu}\right)G_2 + G_B \qquad (6)$$

where (i=1,2). P_i is the population share of subgroups i. μ_i, is the number of average years of schooling i, G_i is the education Gini index of the two subgroups of

the population. G_B is an inter-groups contribution to total education inequality. Instead, G_B is the regency or municipal as a contributor to the Banten province. It also is the contribution of area difference to the North-South Banten.

VARIABLES

In this research, we used education inequality as a dependent variable. The variable was the education Gini index (EG). It was used to measure education inequality. It has values between 0 - 1 [see equation "(3)"]. We also used three independent variables, namely mean/average years of schooling (MYS), GDRP per capita (GDRP-CAP), and poverty (POV). The MYS was proxied by the total of average years of schooling in units of years in regencies/municipalities. The gross domestic regional bruto (GDRP) per capita income was proxied by dividing the amount of Banten Province/regencies/municipalities GDRP with the total population following the constant price of 2000. In the form of logarithms (ratio), the variable was then modified. The Head Count Index (HCI) measured the poverty (POV) measurement. It is the proportion of the population in units of a percent below the Banten Province poverty line. The value of the poverty line was based on consumption standards with 2,100 per capita calories.

The (MYS) were derived from the level of educational attainment that was achieved and the proportion of populations completing the highest education ever achieved by populations over the age of 15 years. We also weighted the share of the population in each category the levels of education. The weighting of these categories were no completed primary school/no schooling = 3, primary school completed = 6, junior high school completed = 9, senior/vocational school completed = 12, diploma 1st – 3rd degree completed = 14, and university/college graduated = 16.

ECONOMETRIC MODEL SPESIFICATION

We analyzed an inverted U-shaped correlation pattern between education expansion (it was proxied from MYS) and education inequality. In the first step before estimating the unbalanced regression panel model, the authors test the stationarity of the data with the unit root test (Baltagi 2005). The unit root testing method uses Levin, Lin, and Chu (LLC). By taking into account the basic specifications of Augmented Dickey-Fuller (ADF), it can be written:

$$DY_{it} = \alpha Y_{it-1} + \sum_{i=1}^{pi} \beta_{it} DY_{it-j} + X^*_{it}\delta + \varepsilon_{it} \quad (7)$$

where DY_{it} = difference form of Y_{it}, Y_{it} = data panel, $\alpha = \rho - 1$, p_i = the number of inaction adjusted for the different shape, X^*_{it} = the exogenous variable in the fixed effect model of the individual time trend area, and ε_{it} = error term. As for the criteria of determining the unit root test results, we use the probability value of LLC < 0, the data panel does not have a unit root or data stationer.

The quadratic function is a general and simplest formulation to test an inverted-U relationship. To generate an equation, we must assume that $\beta_0 > 0$ (positive relationship) and $\beta_1 < 0$ (negative relationship). In this research, we use education inequality as a dependent variable and the mean years of schooling (MYS) as an independent variable. For an inverted-U relationship, a pattern is formed, so we make the MYS square. Education inequality is measure by the Gini education index, it is a relative measurement and low the variability than the other (like standard deviation of schooling, enrollment, etc). Then, the authors estimate the regression of the data panel with the empirical model analysis adapted by (Fidalgo et al. 2010; Meschi & Scervini 2014; Shukla & Mishra 2019; Thomas et al. 2001) about the educational Kuznets curve (EG), so it can be written:

$$EG_{it} = \beta_0 + \beta_1 MYS_{it} + \beta_2 \left(MYS\right)^2_{it} + \beta_3 GDRP\_CAP_{it} + \beta_4 POV_{it} + \varepsilon_{it} \quad (8)$$

where, the MYS_{it}, is an average year of schooling year t in region i. The MYS^2_{it}, is an average year of schooling square at year t in region i, The GDRP_CAP, is an income-per-capita at year t in region i. The POV it, is the share of the pooer population to total population in percent at year t in region i. The ε_{it}, is the term of error at year t in region i. After we test unit root all of the variables, we use the new variables like DMYS, DGDRP_CAP, of DPOV, which depends on the test results.

One of the assumptions fulfilled in assessing the OLS method was the formulation $E[\varepsilon T\ \varepsilon] = \sigma 2I$, which was not heteroscedastic. If the assumption is a form of an interaction, it has different variances, so the Generalized Least Square (GLS) methods were considered as the appropriate method to estimate the coefficient. With this approach, the coefficients were calculated by first modifying the linear regression model to satisfy the assumptions in the OLS model. In addition, the panel data test was firstly used, and the Chow statistical test was used to distinguish between the model of pooled least square (PLS) or common effect (CE) and the model of fixed effect (FE). Secondly, the Hausman test was used to select between the fixed effect model and the random effect (RE) model. Third, the Lagrange Multiplier (LM) was used to select between the common effect (CE) and the random effect (RE) model.

RESULTS AND DISCUSSION

In the descriptive analysis, we compared the educational inequality in the North-South Banten and regencies/ municipalities inequalityat the regional level. The values of the educational Gini coefficient were decomposed to know the source of each region's contribution to the education inequalityinequality in Banten. The empirical outcome of the estimatiomodel from average years of schooling (education expansion) on the existence of the educational Kuznets curve, and critical threshold (peak point). The findings could be used as an input for policy making as a way to reduce educational inequality in Banten.

TRENDS AND COMPARISON OF EDUCATION INEQUALITY IN BANTEN

The education inequality between the North and South Banten was one form of development difference. The calculation of the average years of schooling for the Gini eduction index is used to assess the degree of disparity in education. The low level of education disparity showed a tendency to decline over time or, in other words, the educational level of the population was more fairly distributed. The estimation of the Gini education coefficient in the South Banten area from 1996 to 2016 showed the highest level of inequality in 1998 and 1999, reaching 0.29 and 0.27, respectively. In 2001 and 2002, the lowest education Gini index was 0.23. A substantial decrease in the education Gini in South Banten occurred in 2001, a decrease from 0.29 in 1998. During economic crisis of 1998-1999, the response of the community in South Banten was better than Noth Banten. The reduction of inequality in education was only 0.01 (see Figure 3).

In the North Banten and South Banten regions, the application of Constitution Number 20/2003 to the National Education System may affect reducing inequalities. The effect of education deregulation, however, was brief, since it only existed in the period 2004-2007 and subsequently increased education

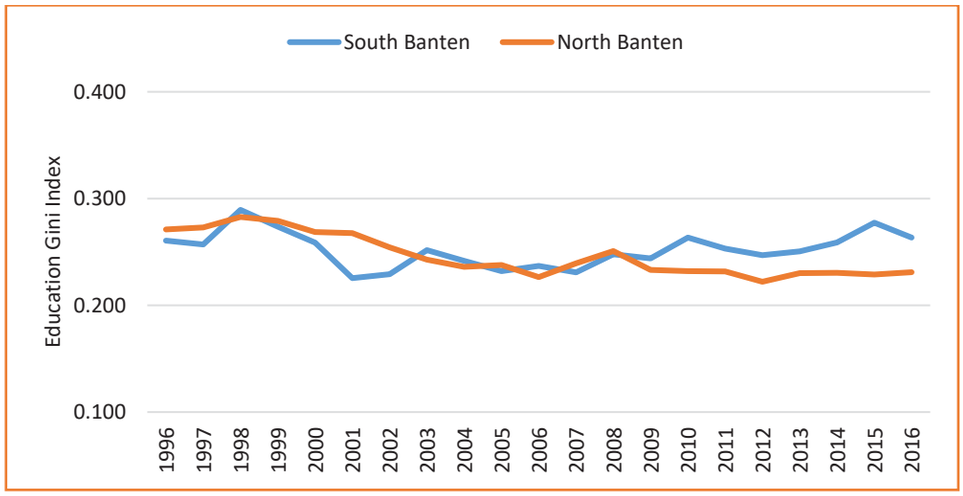

FIGURE 3. The comparison of education inequality between North-South Banten, 1996 - 2016

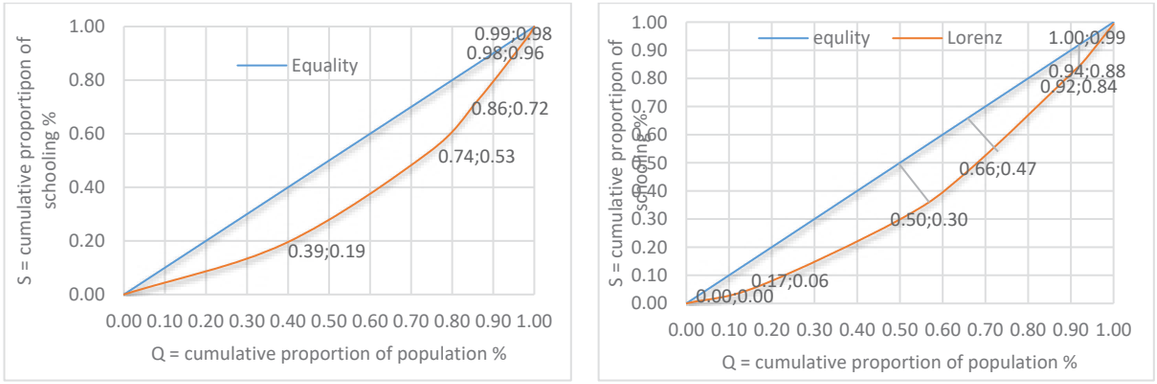

FIGURE 4. Comparison of inter-regencies/municipalities of education inequality, 1996 and 2016

inequality until 2016. The decrease in education inequality in South Banten was slower than in North Banten because the average years of schooling in North Banten was high. BPS (2016b) noted an increase in the value of average years of schooling from 6.90 in 1996 to 8.79 in 2016 in North Banten. Meanwhile, in South Banten, there was an increase from 5.10 in 1996 to 6.41 in 2016. It showed the gap in the average years of schooling between South and North Banten. In other words, there has been a considerable educational inequality between regions in Banten.

Banten Province is comprised of 8 regencies/ municipalities. However, this research did not include the South Tangerang and Serang Municipality in the calculation of the education Gini index. It was caused that the two regions as new autonomous (Indonesia, daerah otonom baru/DOB). Since 2010, the data had been accessible for the two new autonomous regions, so that data has been added (combined) with the main region. It was South Tangerang and Serang Municipality. The result of the educational inequality calculation as shown below:

Based on FIGURE 4, the trend of educational inequality among regencies/municipalities tended to decrease in all regions. Meanwhile, in 1996 [0.234; 0.196] and 2016 [0.238; 0.211], Tangerang Municipality and Cilegon Municipality had a low level of education disparity, which is below the median amount of 1996 [0.258] and 2016 [0.246]. This situation has shown that inequality in education is declining and low. These findings confirmed a study conducted by (Qian & Smyth, 2008), which concluded that education disparity decreased by 20.54%, while education expansion increased by 29.54% in all provinces. A similar finding was conducted by (Mesa 2007) that the educational disparity decreased from 1960 to 2000 at the regional and provincial levels in the Philippines. The other similar study was found by (Digdowaseso 2010; Shukla & Mishra 2019) who concluded that education inequality decreased.

EDUCATIONAL LORENZ CURVE

Besides that use of quantitative methods in the measurement of inequality of education, the approach defined in the curve termed the educational Lorenz curve was also be used. In Figures 5 and 6, the results of the analysis can be seen. This curve showed that the empirical relationship between the cumulative population share achieving a certain education level with cumulative average years of schooling. It was shown that the population age over 15 years who completed from school was low, so the education disparity was higher. This fact is presented in Figure 6 below:

In 1996 and 2016, the values of average years of schooling were 6.18 and 8.37 (increase by 2.19), respectively. The education Gini coefficient decreased to 0.252 in 2016 from 0.274 in 1996. It means that there was a decrease in educational inequality in Banten. The comparison showed a decrease on educational inequalityin the study period in Banten. The comparison of declining educational inequality with education Lorenz curve models for populations aged over 15 years in 1996 and 2016 is shown in figures 5 and 6. The findings revealed that there was a substantial decrease in the populations that completed primary school/equivalent in 2016 relative to 1996. It has shown that the education gap in this category is more uniformly distributed. The Lorenz curve also changed in 2016 as compared to that in 1996 due to a relative rise in higher education, in particular university graduates. This situation indicates that in this population, the difference in education is more uniformly distributed. This fact exists since, relative to the classes of individuals who completed education at the elementary school/equivalent level, there was rising in population for all grades, especially those graduated from the university level. The research conducted by (Hojo 2009; Thomas et al. 2001) supported the findings of these findings. Lei and Shen (2015) had shown not supporting these findings. He found the inequality in education had risen in several decades in the past. The disparity of education among urban-rural was increasing in universities in China. Educational attainment and hopes for the future were also influenced by deprivation. Related to education inequality between regions, other researchers also found educational inequality occurring between urban-rural areas using data comparative of five birth years in China (Chunling 2015).

DECOMPOSING EDUCATION GINI INDEX

The formulation (6) of the overall Gini education index in Banten was used to evaluate the within and between regions' contribution to the total education inequality of South-North Banten. The results of regions decomposition were shown below:

In 2000, the North and South Banten contributed to educational inequality in Banten by 58.14% and 4.47% respectively, thus leading to a greater level of educational inequality in Banten in 2000 (see table 1). Meanwhile, in 2016, North Banten's contribution to total educational inequality increased to 67.00% (an increase was 8.96%) and South Banten dropped to 4.26% (a decrease of 0.21%). This result leads to a conclusion that the educational inequality contribution in South Banten tends to decrease while the contribution of North Banten in educational inequality in Banten decreases.

The contribution of regencies/municipalities to the sum of the Gini education index in Banten Province was also discussed in this paper. The results of calculating the Gini coefficient in 2000 at the Tangerang Regency was 0.289. The value was highest than other regencies/ municipalities. However, in 2016, Serang Regency obtained the highest value of 0.305. The highest

contribution to total educational inequality in Banten is Tangerang Regency which is 2000 (12.30%) and 2016 (15.85%). The contribution between districts/cities in Banten in 2016 was smaller than in 2000, which was 78.91% to 63.69% respectively. It could be seen in Table 2.

In Banten, the reduction of the Gini education coefficient was supported by the reduction of contributors in the regencies/municipalities group and inter regencies/ municipalities group. Although the contribution of education disparity between the internal and inter-municipal sectors to the province has decreased, the provincial government need to take some measurements to minimize the accelerated educational inequality. The government was becaming more attention to the rise in educational expenditure allocations for the Tangerang Regency, Lebak Regency, and Pandeglang Regency. The current research was also inconsistent with the research conducted by (Zhang & Li 2002) on inter-state education inequality, which claimed that contribution from male and female groups in both developing and developed countries. It was crucial to reduce education disparity between countries. The situation, however, also revealed that women's communities in different countries did not receive the same educational services as men, so the efforts of women's groups were considered less critical in reducing the inequalities in education. This finding also confirmes the previous research which concluded that the contributor to reducing disparity in education was between inland and coastal provinces in China (Qian & Smyth 2008).

RESULTS OF EMPIRICAL MODEL

The summary of the aggregate data in 1996-2016, which included the mean (M) and standard deviation (SD), was explained in this result. It represented the disparities in the educational level achieved by each population over 15 years of age who had a low level of education relative to populations who were highly educated in Banten. It was seen in table 3 that the education Gini index (EG) value was [M=0.247, SD=0.034]. It implied that disparity was a small category. The average years of schooling (MYS) value are [M=7.67, SD=1.721]. This implied that the population's average years of education are high. The per-capita income (GDRP_CAP) value was [M=6.8005, SD=0.415]. This implied that the per capita average income was IDR 6.317.133. At last, [M=10.34, SD=6.109] is the value of poverty (POV) during the period. This means that the overall poverty rate in Banten was 10.35%.

TABLE 1. Decomposition of Education Gini Index in South_north Banten, 2000 and 2016

Year	Education Gini Index			Within		Between
	All	North Banten	South Banten	North Banten	South Banten	
2000	0.287	0.269	0.259	0.167 (58.14%)	0.013 (4.47%)	0.107 (37.39%)
2016	0.252	0.248	0.263	0.169 (67.00%)	0.011 (4.26%)	0.072 (28.73%)
Δ(2000 – 2016)	-0.035	-0.035	0.004	0.002 (8.86%)	-0.002 (-0.21%)	-0.035 (-8.66%)

TABLE 2. Decomposition of Education Gini Index by Regions, 2000 and 2016

Region	Coefficient Gini Index		Δ (2000 – 2016)	2000		2016		Δ (2000 – 2016)	
	2000	2016		Within	Between	Within	Between		
Pandeglang Regency	0.274	0.265	-0.009	0.004 (1.22%)	0.277 (78.91%)	0.003 (0.94%)	0.183 (63.69%)	-0.001 (-0.27%)	-0.004 (-5.22%)
Lebak Regency	0.241	0.261	0.019	0.003 (1.01%)		0.003 (0.92%)		0.000 (-0.10%)	
Tangerang Regency	0.289	0.268	-0.021	0.035 (12.30%)		0.046 (15.85%)		0.010 (3.56%)	
Serang Regency	0.282	0.305	0.024	0.009 (3.30%)		0.012 (4.04%)		0.002 (0.75%)	
Tangerang Municipality	0.234	0.196	-0.037	0.009 (3.13%)		0.006 (2.10%)		-0.003 (-1.04%)	
Cilegon Municipality	0.238	0.221	-0.017	0.0004 (0.14%)		0.0004 (0.14%)		0.000 (0.00%)	
Banten	0.287	0.252	-0.035	(100%)		(100%)			

TABLE 3. Statistical description

Variable	Obs	Mean	Stand. Dev	Max	Min
EG	122	0.2470	0.0339	0.3987	0.1599
MYS	122	0.6779	1.7206	10.28	4.55
GDRP_ CAP	122	6.8005	0.4147	7.7666	5.8392
POV	122	10.3486	6.1094	32.46	3.57

The stationer's data are the data that means, variance, and auto variannce (at lag variations) remain the same at any time the data is formed. The stationarity data test by the unit root test. The result of the unit root test is shown as below:

The test results of the unit root data unit with Levin, Lin & Chu show that the education inequality (EG), mean years of schooling (MYS), and per capita income (GDRP-CAP) variables are stationers at levels of significance of 1% and 5% (see table 4). While the poverty variable (POV) is not stationer at the level, the next step tests at the first degree. The result of variable poverty testing is stationer at the first degree with a significant rate of 1%.

The model of educational Kuznets curve without any variables used an RE model, with the asumption of all invidual (regencies/municipalities in Banten) and inter-times (1996 – 2016) were varied. The random effect model (RE model 1) without entering any variables to test the educational Kuznets curve assumed that between inter-individual and inter-time varid. We tested with Hausman test and generated the probability value of 0.671 > 0.05, so could be stated that RE model was feasible. Instead, the result of model 2 evaluate by the Chow test and Hausman test obtained the probability value of 0.000 < 0.05 and 0.024 < 0.05, respectively. Hence, it is concluded that the FE model is feasible. The results of the Chow and Hausman test in model 3 obtained the probability value of 0.000 < 0.05 and 0.0008 < 0.05, respectively. Thus, it is concluded that the FE model is feasible. After testing the unit root, the authors perform an estimate of the unbalanced unit root panel, because there are variables that are not stationer. The results of Chow and Hausman in model 4 show that the probability value is 0.000 < 0.05 and 0.0069 < 0.05, respectively. Hence, it is concluded that the FE model is feasible. Finally, the Chow and Hausman test shows the probability value is 0.000 < 0.05 and 0.0056, 0.05, respectively. Hence, it is stated that the FE model is feasible.

To detect violations of traditional assumptions, we first executed a multicollinearity and heteroscedasticity test. The results of the multicollinearity test showed a relationship between MYS, GDRP_CAP, and POV variables had a correlation coefficient of < 0.85 for the relationship between the variables. It can be concluded that the model was no problems with multicollinearity. Although the heteroscedasticity test was not executed, we used the unbalanced panel unit root of the generalized least square (GLS). The problem of heteroscedasticity and autocorrelation could be solved by this model.

We added any other variables in the model before and after testing the unit root. The RE model 1, FE model 2, and FE model 4 failed to prove that the educational Kuznets curve exists in Banten. Even though the pattern of the inverted U-shaped is formed in this research, the models are not significant. The shape of the curve and results depend on the study area, using the period (sample), the measurement of education inequality (Morrisson & Murtin 2013), and the relationship between the variable was temporary (Meschi & Scervini 2014).

Using a common effect model will lead to the formation the educational Kuznets curve in Banten (see table 5). The existing of (CE Model) would be the educational Kuznets curve, which implied that all cross-section and inter time intercepts are the same. Initially, for all regencies/municipalities in Banten at level 5%, the mean years of schooling (MYS) had a positively significant impact on education inequality. In other words, with every increase of 1 year of the school population age 15 and above, the average education inequality rises by 4.7% across the regencies/ municipalities, which reaches the threshold of 6.98 years. This indicates that mean years of schooling square (MYS^2) are negatively significant. In other words, every increase of 1 year in school, it will decrease the level of education inequality by an average of 0.4% for all the regencies/municipalities in BantenThe MYS and MYS^2 variables should explain the 55.99% factor of education inequality, while other variables explain the remainings. On this basis, the analysis will be an ineffective and biased if we use the traditional impact model. Apart from the importance of calculating the inequalities in education and the model, we also investigated the determining factor of educational inequality in this study. The outputs of the regression is presented in Table 5 below:

The RE model 1, FE model 2, and FE model 4 were excluded from our analysis because the regression results were not significant to test the educational Kuznets curve and education expansion. In FE model 3, the MYS coefficient is negative and statistically insignificant at 1%. It means that every increase in the years of schooling (educational expansion) 1 year will decrease the average of the educational inequality by 2.3% for the regencies/municipalities, by assuming that other variables remain constant. The coefficient of per capita income (GDRP_CAP) is positively significant at 5%. It means that every increase in per capita income at 1% will increase the average educational inequality by 3.4%, by assuming that other variables are constant. On the contrary, the value of the poverty coefficient (POV) is -0.0008 and statistically insignificant at 1%, 5%, or

TABLE 4. Panel unit root method with Levin, Lin, & Chu

Variable	Level		First difference	
	t-statistic	Conclussion	t-statistic	Conclusion
EG	-2.68157***	stationer	-	-
MYS	-5.28994***	stationer	-	-
GDRP_CAP	-2.18498**	stationer	-	-
POV	-0.89475	non Stationer	-7.50994***	stationer

Notes: *** sig 1%, **sig 5%, * sig 10%

TABLE 5. The regression result

Vraible	CE Model (GLS)	RE Model 1	FE Model 2	FE Model 3 (GLS)	FE Model 4 (GLS)	FE Model 5 (GLS)
MYS	0.047** (0.061)	0.011 (0.018)	-0.021 (0.019)	-0.023*** (0.003)	0.004 (0.017)	-0.019*** (0.003)
MYS^2	-0.004*** (0.001)	-0.002 (0.001)	-0.0001 (0.001)	-	-0.001 (0.001)	-
GDRP_CAP	-	-	0,043** (0,010)	0.034** (0.016).	0.039** (0.015)	0.039** (0.016)
POV	-	-	-0,001** (0,001)	-0.0008 (0.0006)	-	-
DPOV	-	-	-	-	0.0008 (0.0006)	0.0007 (0.0006)
Intecept	0.118*	0.255***	0.135	0.200**	0.041	0.135
_Pandeglang		-0.008	-0.012	-0.014	-0.010	-0.011
_Lebak		-0.012	-0.015	-0.019	-0.013	-0.016
_Tangerang		0.026	0.043	0.042	0.039	0.040
_Serang		0.007	0.013	0.011	0.014	0.016
_M_Cilegon		-0.008	-0.029	-0.021	-0.028	-0.027
_M_Tangerang		-0.005	-0.006	-0.003	-0.008	-0.008
Obs	122	122	122	122	116	116
R^2	0.5599	0.2035	0.5675	0.7168	0.7225	0.7158
F-stat	75.726	15.201	16.326	35.763	30.663	33.697
Prob-stat	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Notes:)*** sig = 1%,)** sig = 5%,)* sig = 10%

10%. It means that every decrease in poverty at 1% will lead to an increase in educational inequality of 0.06%, but statistically it is insignificant. The mean years of schooling (MYS), per capita income (GDRP_CAP), and poverty (POV) variables explain the Gini education index of 71.65%, while the remaining is explained by other variables.

In FE model 5 shows that the value of the variable coefficient of the mean years of schooling (MYS) is -0.019 and statistically significant at 1%. It means that every increase in the 1 year in the school of the population over the age of 15, will decrease the average of the education inequality by 1.9% for all regencies/ municipalities. Meanwhile, the per capita income (GDRP_CAP) gets a positive coefficient value of 0.039 and significant at a rate of 5%. It means that every increase in the per capita income of 1%, will increase the average of the education inequality by 3.9% for all regencies/municipalities, assuming other variables are constant or vice versa. While the value of the poverty coefficient (DPOV) is 0.0007, it is statistically insignificant either 1%, 5%, or 10%. This result can be interpreted as a 1% reduction in poverty, decreasing the education inequality by 0.07%, but statistically insignificant. The MYS, GDRP_CAP, and DPOV variables explain inequality in education was 71.58%, the reaming was explained by other variables.

In checking the Kuznets curve of education, the presumption is that all the features of the education system do not explicitly reflect the degree of inequality,

but it only affects the overall level of education, and this in turn directly reduces the distribution, as the number of average years of school rises at a certain level. However, after testing back the consistency of the educational Kuznets curve without including any control variable, we revealed that there was no evidence of the existence of the Kuznets curve of education in Banten. The current study does not confirm previous research that significantly formed the inverted U-shaped pattern (Castelló & Doménech 2002; Fidalgo et al. 2010; Hojo 2009). Many other researchers have proven that the relationship of mean years of schooling with educational distribution when measured by the standard deviation (Meschi & Scervini 2014; Ram 1990; Shukla & Mishra 2019; Thomas et al. 2001) an inverted U-shaped correlation. In other words, when the mean years of schooling increases, educational inequality will initially increase, and, once it reaches the peak, then it begins to decline in the last phase of education expansion. However, we confirmed the previous researchers who also found no evidence that the educational Kuznets curve exists in 5 Latin American countries (Teng 2019).

We suggest that the average years of schooling had a negatively significant impact on educational inequality. The longer the population's average school year in Banten, the sharper the decrease in education disparity. The expansion of education is one of the important instruments to improve an equal of access to education for the community, especially areas having no secondary and higher education institutions. This research consolidates the results of previous studies that found that increasing years of schooling would reduce educational inequality (Fidalgo et al. 2010; Shukla & Mishra 2019; Thomas et al. 2001).

The result of the current study that the coefficient of per capita income is significantly positive to affect educational inequality. As a result, the increasing well-being of the community has not been able to encourage the expansion of education. This is due to the per capita income level in the respective regions, such as Cilegon Municipality and Tangerang Municipality in 2016, which were IDR 196,843.52 and IDR 64,997,395.98, while in Pandegalang and Lebak Regencies are to IDR 18,466,009.98 and IDR 17,607,970.81 (BPS, 2018) respectively. The education level of the 10-year-old of the population who have completed primary or not attending school and university graduates in 2016 in Pandeglang Regency is 73.2% and 4.56%, those in Lebak Regency were 72.21% and 3.12% respectively, while those in Tangerang Municipality was 30.18% and 13.63%, all of which indicating the unequal condition. These results confirm the previous research that per capita income raises appear to increase educational disparity over time (Lee & Lee 2018; Naveed et al. 2018; Teng 2019), but do not correspond to research (Mesa 2007 and Hamzah 2017) who found otherwise. There are several reasons for school-age children to complete school at higher levels, one of the reasons for economic reasons is to work and have an income (BPS 2014; Nurmaidah & Gautama 2020).

Poverty is an important variable in the decline of inequality of education because poor families cannot afford to finance educational tuition. Although the results of the study obtained a positive coefficient that describes the decrease in the number of poor people, it will be followed by equalization of education, which is statistically insignificant (Model FE 4 and FE 5). These results do not confirm the previous research that poverty contributed to the reduction in educational inequality (Adiningtyas & Budyanra 2019; Ahmad & Triani 2018; Mesa 2007; Todaro & Smith 2015), but they are in line with (Latuconsina et al. 2020) which indicated time

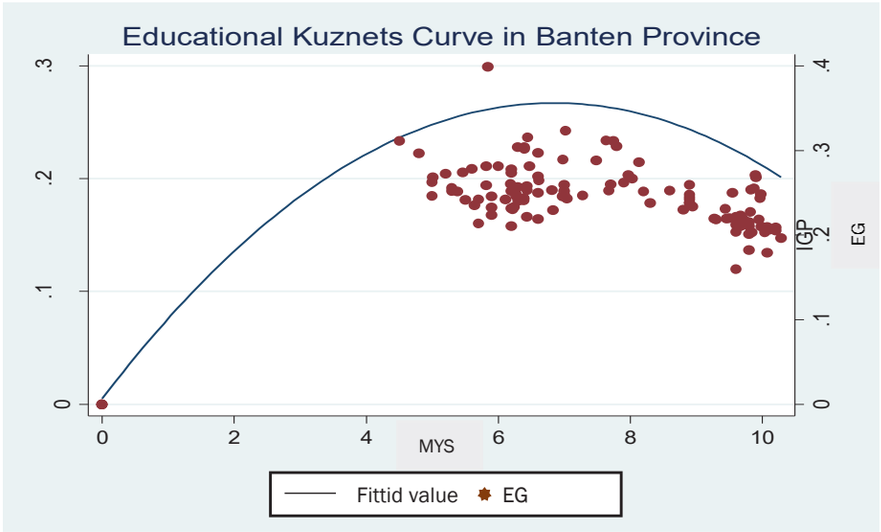

FIGURE 7. Educational Kuznets Curve in Banten, 1996 - 2016

series analysis. Meanwhile, Zhang, (2014) explained the effect of poverty on educational inequality from the economic aspect. The poor have fewer resources so they have less access to a good education. The inequality between the poor and non-poor in access to education would further broaden the inequality in education.

Although the author failed to prove that the Kuznets curve of education existed in Banten, but by using information from the CE model (see table 5), we wanted to inform the pattern of the relationship (wether the statistical requirements were sufficient or not). The result of estimation could be described as a graphic in Figure 7.

A graphical presentation of the inverted U-shape relationship pattern between the average school year and educational inequality with the educational Kuznets curve model is depicted in figure 7. The pattern of the Kuznets curve is a nonlinear inverted U-shape. This figure indicates that the value of average years of schooling and educational inequality increase until 6.98 years. After reaching the point, the mean years of schooling (MYS) always increases while the educational inequality (EG) decreases. It can be stated that education was getting evenly distributed in all regencies/municipalities. The results of the study in Japan MYS threshold score of 11.72 years (Hojo 2009), the same study scored 5.13 years in Portugal (Fidalgo et al., 2010), and standard deviation of schooling (Shukla & Mishra 2019) found that the threshold was around 7 years in India.

The results, when compared to the state of means years of schooling (MYS) regencies/municipalities in Banten in 2016 that were still below the threshold recorded by BPS (2018), were Lebak Regency (MYS=6.62) and Lebak Regency (MYS=6.19). While the mean years of schooling were greater than the threshold were Tangerang City (MYS=10.28), Cilegon City (MYS=9.68), Tangerang Regency (MYS=8.23), and Serang Regency (6.98). The average years of schooling were increasing successfully awareness, education level, and skill. It also supported the growth of human capital accumulation. Economically, the population with higher education will get high incomes as well. The income received is allocated to family expenditure and invetsment in education for their children in the future. As a consequence, more children will go to higher education grades. It will be able to encourage a reduction in education disparity.

Educational improvement of the population, which is characterized by a rise in the total level of education, will still affect the structure of jobs. This condition arises if the distribution of education in Banten is quicker than the improvement of the industrial employment so that the side effects of structural unemployment can arise. The absorption rate of employment opportunities for unemployed workers who graduated from different levels of education was 49.95 The rest were unemployed because they could not meet the requirements of such vacancies. A large number of the populations that were unable to continue to a higher level of education can be viewed, on the one hand, as the factors to contribute to the increasing education inequality, but on the other hand, some populations were able to pursue a higher level of education at the university level. The accumulation of qualified human resources in terms of both skills and level of education will influence this situation. The higher the population education levels, the better the quality of human resources. As a result, human resource productivity will also increase.. Hence, the study findings by (Hong et al. 2018) concluded that human resource inequality is negative to the growth of total local productivity factors.

This fact is also in line with what is stated by Baloch et al. (2017) that education would prepare the labor force and as a medium of job training for prospective workers. The more investment in education, the more knowledge, and skills, so the student would get a better job in the future. The government has responded to the need for employment by continuously promoting the development of Banten's schools and colleges. The expansion of education allows children of low-income families to access education through the available government scholarships (Indonesia, Bidikmisi) to complete higher education. The level of educational attainment has increased among high-income children than among their low-income children (Bloome et al. 2018).

CONCLUSION

The study aims to reassess the educational Kuznets curve and evaluate the changes in educational inequality in Banten as recognition of distributional features. The results indicate that the advancement of education inequality in Banten has been distributed more fairly during 1996 - 2016. This fact can be seen from the declining value of the education Gini index and the increasing average years of schooling across the regencies/municipalities, North-South Banten areas, and Banten Province. Meanwhile, the testing results of the inverted U-shaped patterns of the educational Kuznets curve, which existed with or without other variables, proved insignificant.

North Banten contributed significantly to educational inequality in Banten by decomposing the Gini education index. The decomposition results of regencies/municipalities, meanwhile, showed that Tangerang Regency contributed more than other regions that inhibited the reduction of educational inequality. Other findings of the research showed that the average years of schooling contributed to decreasing education inequality. In other words, if the level of populations' education is higher, then education will be more evenly

distributed for all regencies/municipalities. We also found that per capita income impacted to contribute to the education inequality. This fact indicates that an increase in income will lead to the higher degree of education inequality. The condition was attributed to the fact that children over the age of 15 prefer working to pursuing to a higher level of education. Finally, we found that poverty had less contribution in reducing educational inequality.

On the basis of the research findings, we suggested that it could enrich the theoretical literature on this issue. This research is addressed to the science development and confirmation theory about educational inequality. Thus, it is advised that future research reexamine the educational Kuznets model to obtain consistent results. It is also advised to add other variables as a way to determine the educational inequality, such as the government spending in education, household expenditure in education, and other variables. The dynamic panel dan expansion of unit analysis is very recommended for the future research. We also proposed other measurements of education inequality, like the standard deviation of schooling or vise versa.

A noteworthy point from this research for policymakers in Banten Province is that in 2017, the division of authority significantly affected the soaring allocation of government budget to support around 11,893 students in secondary schools and around 1,018 for teachers and education employees, which probably cause high operating costs for secondary school. This was given to the very low allocation of the education budget in Banten until 2015 and 2016, which was about 4.4% and 5.7% respectively (without transfers). Hence, the government needs to focus more on the education of populations aged 16-18 and 19-24 who have never attended school by enabling them easy access to secondary and higher education, especially in the South Banten area. The provincial education office of Banten should collaborate with other SKPDs/Local Government Agencies (*Satuan Kerja Perangkat Daerah*) in charge of synergizing policies aimed at expanding education opportunities, and on increasing the process quality, teacher equality, and infrastructure equality, and vise versa.

In managing secondary school, the provincial Government needs to take simple, quality-oriented, and effective measurements. In particular, the Education Office program is also required to focus on the achievement of 12-year compulsory education program by increasing the budget allocated for poor students through Student Assistance Program/BSM and scholarships for students' achievement.

ACKNOWLEDGEMENT

For their comments and suggestions, the author sincerely thanks to two anonymous reviewers and Hazmi Shahin. The sole responsibility of the authors remains for any remaining mistakes. This research is no conflict of interest and no receive a specific grant from the governments' fund or other agencies.

REFERENCES

Abdelbaki, H.H. 2012. An Analysis of Income Inequality and Education Inequality in Bahrain. *Modern Economy* 03(05): 675–685.

Adiningtyas, A.P. & Budyanra. 2019. Determinan ketimpangan capaian pendidikan kabupaten/kota di provinsi jawa timur pada tahun 2014-2016. *Jurnal Dinamika Ekonomi Pembangunan* 2(3): 1–18.

Ahmad, D. & Triani, M. 2018. Analisi Kausalitas Antara Kemiskinan, Ketimpangan Pendapatan, dan Tingkat Pendidikan di Provinsi Sumatera Barat. *Jurnal EcoGen*, *1*(September): 604–615.

Alpalhão, H. 2019. Democracy as a Curve : The Dynamic Effects of Democratization on Economic Growth. *SSRN Electronic Journal*, (May,10): 1–28.

Antoninis, M., Delprato, M. & Benavot, A. 2016. Inequality in education: the challenge of measurement. In *Title: World Social Science Report, 2016: Challenging Inequalities; Pathways To A Just World*, 359. Retrieved from www.education-inequalities.org/indicators

Asadullah, M.N., & Yalonetzky, G. 2012. Inequality of Educational Opportunity in India: Changes Over Time and Across States. *World Development* 40(6): 1151–1163.

Balaguer, J. & Cantavella, M. 2018. The role of education in the Environmental Kuznets Curve. Evidence from Australian data. *Energy Economics*, *70*: 289–296.

Baloch, A., Noor, Z. M., Habibullah, M. S., & Bani, Y. 2017. The impact of gender equality on education inequality: A global analysis based on GMM dynamic panel estimation. *International Journal of Economics and Management*, *11*(3 Special Issue).

Baltagi, B. H. 2005. *Econometric Analysis of Panel Data* (Third). West Sussex: John Wiley & Sons, Ltd.

Banzragch, O., Mizunoya, S., & Bayarjargal, M. 2019. Education inequality in Mongolia: Measurement and causes. *International Journal of Educational Development*, *68*: 68–79.

Bazillier, R., & Sirven, N. 2008. Is there a social Kuznets curve? The influence of labour standards on inequality. *Journal of Development Studies*, *44*(7): 913–934.

Bhattacharya, N., & Mahalanobis, B. 1967. Regional Disparities in Household Consumption in India. *Journal of the American Statistical Association*, *62*(317): 143–161.

Bloome, D., Dyer, S., & Zhou, X. 2018. Educational Inequality, Educational Expansion, and Intergenerational Income Persistence in the United States. *American Sociological Review*, *83*(6): 1215–1253.

BPS. 2011. Ensiklopedia Indikator Ekonomi dan Sosial. In *Badan Pusat Statistik* (pp. 1–241). Badan Pusat Statistik.

BPS. 2014. *Situasi Pendidikan Provinsi Banten 2014*. Banten: BPS Banten.

BPS. 2016a. *Potret Pendidikan Indonesia: Statistik Pendidikan 2016*. (D. Susilo, S. Yasmuarto, & I. E. Harahap, Eds.). Jakarta: Badan Pusat Statistik.

BPS. 2016b. Statistik Kesejahteraan di Banten 2016.

BPS. 2018. *Provinsi Banten Dalam Angka 2018*. Banten: Badan Pusat Statistik.

Bustomi, M. J. 2012. Ketimpangan Pendidikan Antar Kabupaten/Kota dan Implikasinya di Provinsi Jawa Tengah. *Economics Development Analysis Journal*, *1*(2): 1–10.

Castelló, A., & Doménech, R. 2002. Human capital inequality and economic growth: Some new evidence. *Economic Journal*, *112*(478): C187–C200.

Chowdhury, N. M., & Hossain, M. 2018. *Poverty, Income Inequality and Growth in Bangladesh: Revisited Karl-Marx*. https://doi.org/1812.09385v1

Chuliang, L., Shi, L. & Sicular, T. 2018. *The long-term evolution of income inequality and poverty in China* (WIDER Working Paper No. 2018 / 153). Helsinki. Retrieved from https://www.wider.unu.edu/sites/default/files/ Publications/Working-paper/PDF/wp2018-153.pdf

Chunling, L. 2015. Trends in Educational Inequality in Different Eras (1940-2010) - A Re-Examination of Opportunity Inequalities in Urban-Rural Education. *Chinese Education and Society*, *48*(3): 163–182.

Coady, D. & Dizioli, A. 2018. Income inequality and education revisited: persistence, endogeneity and heterogeneity. *Applied Economics*, *50*(25): 2747–2761.

Costa-Font, J., Hernandez-Quevedo, C., & Sato, A. 2018. A Health 'Kuznets' Curve'? Cross-Sectional and Longitudinal Evidence on Concentration Indices'. *Social Indicators Research*, *136*(2): 439–452.

de Barros, R.P., Ferreira, F.H.G., Vega, J.R.M., & Chanduvi, S.J. 2009. Measuring Inequality of Opportunities in Latin America and the Caribbean. In *Latin American Development Forum Series* (pp. 1–169). Washinton, DC: The World Bank. Retrieved from http://siteresources.worldbank.org/LACEXT/Resources/258553-1222276310889/Book_HOI.pdf

Digdowaseso, K. 2010. *Measuring gini coefficient of education: the Indonesian cases* (MPRA Paper No. 19865). *MPRA Paper, No. 19865*. Munich. Retrieved from http://mpra.ub.uni-muenchen.de/19865/

Digdowiseiso, K. 2012. Education Inequality, Economic Growth, and Income Inequality: Evidence from Indonesia, 1996-2005. *SSRN Electronic Journal*, (17792), 1996–2005. https://doi.org/10.2139/ssrn.1602642

Fidalgo, J. G., Simões, M. & Duarte, A. 2010. Mind the Gap: Education Inequality at the Regional Level in Portugal, 1986-2005. *Notas Económicas*, *10*: 22–43.

Grecu, A. M., & Rotthoff, K. W. 2015. Economic growth and obesity: findings of an Obesity Kuznets curve. *Applied Economics Letters*, *22*(7): 539–543.

Gregorio, J. D., & Lee, J.-W. 2002. Education and income distribution: new evidence from cross-country data. *Review of Income and Wealth*, *48*(3): 395–416.

Grimm, M. 2011. Does household income matter for children's schooling? Evidence for rural Sub-Saharan Africa. *Economics of Education Review*, *30*(4): 740–754.

Guarini, G., Laureti, T., & Garofalo, G. 2018. Territorial and individual educational inequality: A Capability Approach analysis for Italy. *Economic Modelling*, *71*(December 2017): 247–262.

Hamzah, F., Rosyadi, R., & Kartika, M. 2017. Pengaruh Pengeluaran Pemerintah Bidang Pendidikan, Gender Gap dan Pendapatan Per Kapita Terhadap Ketimpangan Pendidikan dan Ketimpangan Pendapatan Kabupaten/Kota di Provinsi Kalimantan Barat. *Jurnal Ekonomi Bisnis Dan Kewirausahaan*, *6*(2): 77–96.

Hanif, N., Arshed, N. & Aziz, O. 2019. On interaction of the energy: Human capital Kuznets curve? A case for technology innovation. *Environment, Development and Sustainability*, (0123456789). https://doi.org/10.1007/s10668-019-00536-9

Hanousek, J., & Palda, F. 2008. *Tax Evasion Dynamics in the Czech Republic: First Evidence of an Evasional Kuznets Curve*. *Working Paper Series, 360*.

Hojo, M. 2009. Inequality in Japanese Education. *Japanese Economy*, *36*(3): 3–27.

Hong, D.Y., Nor, A.H.S.M. & Sarmidi, T. 2018. The Dynamic Relationship between TFP and Human Capital Inequality : Evidence from ASEAN Countries. *Jurnal Ekonomi Malaysia*, *52*(2): 175–188.

Hu, A. 2015). Evaluating Educational Inequality Within Educational Expansion: A Formal Comparison Between Odds Ratio and the Educational Gini Coefficient. *Journal of Mathematical Sociology*, *39*(4): 280–303.

Ibourk, A. & Amaghouss, J. 2012. Measuring Education Inequalities: Concentration and Dispersion-Based Approach-Lessons from Kuznets Curve in MENA Region-. *World Journal of Education*, *2*(6): 51–65.

Ibourk, A. & Amaghouss, J. 2013. Inequality in Education and Economic Growth: Empirical Investigation and Foundations - Evidence from MENA Region. *International Journal of Economics and Finance*, *5*(2): 111–124.

Ihle, D., & Siebert-Mayerhoff, A. 2017. *The older, the richer? A decomposition of wealth inequality by age subgroups* (No. 97). *CAWM Discusiion Paper*. Munster. Retrieved from http://hdl.handle.net/10419/170712%0A

Jalil, A. 2012. Modeling income inequality and openness in the framework of Kuznets curve: New evidence from China. *Economic Modelling*, *29*(2): 309–315.

Kane, T.J., Riegg, S.K., & Staiger, D.O. 2006. School quality, neighborhoods, and housing prices. *American Law and Economics Review*, *8*(2): 183–212.

Ketenci, N. 2018. The environmental Kuznets curve in the case of Russia. *Russian Journal of Economics*, *4*(3): 249–265.

Kuznet, S. 1955. Economic Growth and Income Inequality Simon Kuznets. *The American Economic Review*, *45*(1): 1–28.

Latuconsina, H., Khusaini, & Sabur, A. 2020. Income and education inequality in banten. *Jurnal Ilmiah Ekonomi Dan Bisnis*, *17*(2): 131–140.

Lee, J. W., & Lee, H. 2018. Human capital and income inequality*. *Journal of the Asia Pacific Economy*, *23*(4): 554–583.

Lei, X., & Shen, Y. 2015. Inequality in educational attainment and expectation: evidence from the China Family Panel Studies. *China Economic Journal*, *8*(3): 252–263.

Lim, A. S. K., & Tang, K. K. 2008. Human capital inequality and the kuznets curve. *Developing Economies*, *46*(1): 26–51.

Lin, C. H. A. 2007. Education expansion, educational inequality, and income inequality: Evidence from Taiwan, 1976-2003. *Social Indicators Research*, *80*(3): 601–615.

Mesa, E. P. 2007. Measuring Education Inequality in the Philippines. *The Philippine Review of Economics XLIV*(No.2): 33–70.

Meschi, E., & Scervini, F. 2014. Expansion of schooling and educational inequality in Europe: The educational kuznets curve revisited. *Oxford Economic Papers*, *66*(3): 660–680.

Morrisson, C., & Murtin, F. 2013. The Kuznets curve of human capital inequality: 1870-2010. *Journal of Economic Inequality*, *11*(3): 283–301.

Naveed, T. A., Gordon, D., & Ullah, S. 2018. Measurement of Educational Disparities in Punjab (Pakistan): An Analysis from MICS ' s Micro-data. *The Pakistan Journal of Social Issues*, *IX*(January): 26–49.

Nurmaidah, & Gautama, M. I. 2020. Faktor Penyebab Tamatan SMA Tidak Melanjutkan Pendidikan Tinggi pada Keluarga Mampu (Petani Pemilik Sawah di Nagari Supayang Kecamatan Payung Sekaki Kabupaten Solok). *Jurnal Perpektif: Jurnal Kajian Sosiologi Dan Pendidikan*, *3*(4): 590–598.

Özdemir, O. 2019. Rethinking the financial kuznets curve in the framework of income inequality: Empirical evidence on advanced and developing economies. *Economics and Business Letters*, *8*(4): 176–190.

Peng, H., Qi, L., Wan, G., Li, B., & Hu, B. 2020. Child population, economic development and regional inequality of education resources in China. *Children and Youth Services Review*, *110*(February).

Psacharopoulos, G., & Arriagada, A. M. 1986. *The Educational Attainment of the Labor Force An International Comparison* (Discussion Paper No. 38). *Education and Training Series*. Washington, D.C.

Qian, X., & Smyth, R. 2008. Measuring Reginal inequality of education in China: widening coast-inland gap or widening rural-urban gap? *Journal of International Development*, *20*: 132–144.

Ram, R. 1990. Educational Expansion and Schooling Inequality:International Evidence and Some Implications. *Review of Economics & Statistics*, *72*(2): 266–274.

Ridzuan, S. 2019. Inequality and the environmental Kuznets curve. *Journal of Cleaner Production*, *228*: 1472–1481.

Saccone, D. 2008. *Education inequality and educational poverty: The Chinese case in the period 1975-2004* (Working Paper Series No. 08/2008). Torino. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1310254

Sahn, D. E., & Younger, S. D. 2007. *Decomposing World Education Inequality*. *SAGA Working Paper*. Washinton, DC. https://doi.org/10.2139/ssrn.779404

Sen, A. 1999. *Development as freedom*. Oxford: Oxford University Press.

Senadza, B. 2012. Education inequality in Ghana: gender and spatial dimensions. *Journal of Economic Studies*, *39*(6): 724–739.

Sholikhah, N., Suratman, B., Soesatyo, Y., & Soejoto, A. 2014. Analisis Faktor Yang Memengaruhi Ketimpangan Pendidikan. *Jurnal Ilmu Pendidikan*, *Jilid 20*(2): 176–182.

Shukla, V., & Mishra, U. S. 2019. Educational Expansion and Schooling Inequality: Testing Educational Kuznets Curve for India. *Social Indicators Research*, *141*(3): 1265–1283.

Shukla, V., Mishra, U. S., Akita, T., Krafft, C., & Alawode, H. 2018. Educational Expansion and the Role of Education in Expenditure Inequality in Indonesia Since the 1997 Financial Crisis. *Social Indicators Research*, *62*(3): 234–244.

Suryadarma, D., Suryahadi, A., & Sumarto, S. 2006. *Causes of Low Secondary School Enrollment*.

Syofya, H. (2018). Pengaruh tingkat kemiskinan dan pertumbuhan ekonomi terhadap indeks pembangunan manusia Indonesia. *Jurnal Ilmiah Ekonomi Dan Bisnis*, *15*(2): 177–185.

Tam, H. 2008. An economic or political Kuznets curve? *Public Choice*, *134*(3–4): 367–389.

Taufiq, N. & Dartantoa, T. 2020. Education, informal turnover and poverty dynamics in Indonesia. *International Journal of Economics and Management*, *14*(1): 157–172.

Teng, Y. 2019. Educational inequality and its determinants: Evidence for women in nine Latin American countries, 1950s-1990s. *Revista de Historia Economica - Journal of Iberian and Latin American Economic History*, *37*(3): 409–441.

Thomas, V., Wang, Y., & Fan, X. 2001. *Measuring Education Inequality: Gini Coefficients of Education*. *Policy Research Working Paper, No. 2525*. Washington, D.C.

Todaro, M. P., & Smith, S. C. 2015. *Economic Development*. (D. Battista & D. Alexander, Eds.) (Twelfth Ed). New Jersey: Person.

Usman, O., Iorember, P. T., & Olanipekun, I. O. 2019. Revisiting the environmental Kuznets curve (EKC) hypothesis in India: The effects of energy consumption and democracy. *Environmental Science and Pollution Research*, *26*(13): 13390–13400.

Wail, B., Hanchane, S., & Kamal, A. 2011. A New Data Set of Educational Inequality in the World, 1950-2010: Gini Index of Education by Age Group. In *W, Benaabdelaali., S, Hanchane., A ...* (pp. 1–33). Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1895496

Wang, W. 2014. Spatial Decomposition of Funding Inequality in China ' S Basic Education : a Four-Level Theil Index Analysis. *Public Finance and Management*, *14*(4): 416–436.

Wilkinson, R., & Pickett, K. 2010. *The Spirit Level: Why Greater Equality Makes Societies Stronger* (2nd ed.). New York: Bloomsbury Press.

World Bank. 2018. *Pendidikan untuk Pertumbuhan*. Washinton, DC. Retrieved from http://documents.worldbank.org/curated/en/379011531893611851/pdf/126891-BAHASA-PUBLIC-IEQ-June-2018-IDN-For-web.pdf

Yang, J., Huang, X., & Liu, X. 2014. An analysis of education inequality in China. *International Journal of Educational Development*, *37*: 2–10.

Zhang, H. 2014. The poverty trap of education: Education-poverty connections in Western China. *International Journal of Educational Development*, *38*: 47–58.

Zhang, J., & Li, T. 2002. International inequality and convergence in educational attainment, 1960-1990. *Review of Development Economics*, *6*(3): 383–392.

Khusaini*
Faculty of Training and Teaching
Islamic University of Syekh-Yusuf
Jl. Maulana Yusuf Babakan
Kota Tangerang Banten 15118
INDONESIA
E-mail: khusaini@unis.ac.id

Sutyastie Soemitro Remi
Faculty of Economics and Business
University of Padjadjaran
Kampus Jatinangor
Jln. Raya Bandung-Sumedang Km. 21 Jatinangor
Sumedang Jawa Barat 45363
IINDONESIA
E-mail: sutyastie@fe.unpad.ac.id

Mohamad Fahmi
Faculty of Economics and Business
University of Padjadjaran
Kampus Jatinangor
Jln. Raya Bandung-Sumedang Km. 21 Jatinangor
Sumedang Jawa Barat 45363
INDONESIA
E-mail: mfahmi@fe.unpad.ac.id

R. Muhamad Purnagunawan
Faculty of Economics and Business
University of Padjadjaran
Kampus Jatinangor
Jln. Raya Bandung-Sumedang Km. 21 Jatinangor
Sumedang Jawa Barat 45363,
INDONESIA
E-mail: muhamad.purnagunawan@fe.unpad.ac.id

*Corresponding author