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Exploring Education Gini on a Smaller Scale: How Education Inequality Differs among Districts

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Abstract

Decentralization creates a need to discuss education inequality on a smaller scale to formulate a better development policy. This study aims to give insights on how education inequality can vary across districts depending on the characteristics attributed to the said region. By calculating education Gini indices, we found that regencies and agricultural districts tend to experience worse education inequality than municipalities and non-agricultural districts. Adding to that, using panel data regressions, we also found that the data shows the opposite of education Kuznets curves, contradicting some of the previous studies. This study contributes to the literature by highlighting the importance of measuring education inequality in a smaller scale to improve the accuracy of development policies.

Keywords: *Education Inequality; Kuznets Curve; Development Policy; Education Gini*
JEL Classification: I24; I25; I28

INTRODUCTION

Equal education for all has always been one of the main goals of development. Providing equal education does not only contribute to the fulfilment of basic human rights, it is also a crucial requirement for ensuring a sustainable development in a region. It is universally understood that education has a huge role in the accumulation of human capital (Galor & Moav, 2004) and it is especially important to unsure the access to education is available for all. In order to tackle the persisting imbalanced distribution of education and create equal schooling, many previous studies have explored the nature of education inequality in various locations around the globe as well as analyzing the determinants of the said inequality.

Using data from 85 countries for 30 years, Thomas, Wang, and Fan (2001) measured inequality in educational attainment by generating the education Gini index for the over-15 population. Along with the conclusion that education inequality declined over time, the study also found interesting evidence that education inequality is negatively related to income (GDP per capita) and positively related to gender gaps. In another empirical study, Checchi (2001) found that

education inequality, as measured by average years of education, has a strong impact on income inequality. Another study by Zhang, Li, and Xue (2015) pointed out that education inequality is so much higher for people living in rural areas, especially the migrants.

These findings are important as they shed light on the characteristics of education inequality; most importantly how this inequality differs across different groups of people. The severity of inequality is often associated with the gender of the observed samples, their level of income, and the area they live in. Understanding this characteristic can be very beneficial in forming policy on education as it shows the different needs from many groups of people; thus, helping policy-makers choose the most efficient set of policy and programs. However, the conclusions from studie using a country-level data can be too broad of a statement to be used for creating a specific policy recommendation. Rather than using country-aggregate data, utilizing the available data on region/district level can provide clear insights. For example, the study on gender and spatial inequalities in educational attainment in Ghana led to a specific set of policy implications for the region (Senadza, 2012).

Another instance arose from the empirical research conducted by Yang, Huang, and Liu (2014) which found that the social concern persists in disadvantaged areas despite the general decline of education inequality across China, especially for women. The importance of specific targeting was highlighted in the findings from Varughese and Bairagya (2020), which discussed the persistent group-based education inequality in India despite the long-term policy implemented to address it. The evidence showed that the policy did little to minimize the education disparities. It is implied that the incorrect policy may lead to a lasting inequality, had the focus of the said policy not been shifted.

Based on that ground, we attempt to measure the education inequality using data suitable for a specific targeting policy. In this case, data from Indonesia will be used to estimate the education Gini index on districts level. Indonesia is chosen as it is one of developing countries, which are known for the diverse and extensive dimensions of education inequality (Buchmann & Hannum, 2001). Furthermore, the data used in this study will be on districts level instead of countries or provinces. This level of data is chosen to better reflect the community needs and interest (Devas, 1997) as well as determining the characteristics of the districts that may contribute to the education inequality. It becomes even more relevant for the case of Indonesia as this country has long promoted the decentralization reform on education access and quality of primary and secondary education following the Asian crisis in 1998 (Kristiansen & Pratikno, 2006).

To evaluate the disparities in education among regions, we focus on the 27 districts in West Java, Indonesia. There are several considerations to examine the condition in West Java instead of other provinces, as expressed by Hendajany and Rizal (2019). First, with West Java having the largest portion of population in Indonesia relative to other provinces, the condition in West Java can considerably affect the national situation. Second, as West Java is located next to the country's capital, this province is expected to act as a buffer for the capital. Lastly, there is an interesting fact that despite the strategic location and the continuing development programs, the HDI score for West Java is relatively small, compared to the average value of other provinces in Indonesia (Hendajany & Rizal, 2019; Saifuddin, 2014).

A question arises whether this low HDI is due to the big imbalances in human development factors, including education.

Other than presenting the existing inequality in education among districts in West Java, this paper also wants to explore the relationship between education attainment and education inequality in this province. The evidence for this relationship forming an inverted U shape, or more widely known as education Kuznets curve, has been repeatedly found (Digdowiseiso, 2010; Lin, 2007; Thomas et al., 2001). The education Kuznets curve implies that, before it improves equality in education, the increase in education attainment (often measured by average of schooling) leads to a worsening of inequality first (Ram, 1990). We use an empirical data to prove whether the same pattern emerges in districts-level data from West Java.

There are two main objectives for this study. First, we want to compare the education inequality among districts in West Java and explore the characteristics that can be attributed to the difference in the said inequality. Second, we want to explore the relationship between average schooling and education inequality to see whether the education Kuznets curve exists in West Java. This study attempts to contribute to literature by providing an empirical evidence of education inequality using districts-level data. With this insight, we hope it can be beneficial for the purpose of forming specific policy and development program for improving education equality, especially with the decentralization system in Indonesia and many other developing countries.

Several studies have investigated the existence of education inequality using education Gini index, and there are a lot of ways to explore the information obtained from this index. Looking at cross-countries data, the trend of education inequality as measured by education Gini is observed to be declining over time (Thomas et al., 2001). While some studies took interest in examining the how this inequality in education correlates with income inequality (Checchi, 2001; Lin, 2007), relationship between education inequality and education attainment is one of the most researched issues on this topic.

Theoretically, education inequality and education attainment are known to possess a non-linear relationship, specifically a quadratic correlation that creates the education Kuznets curve. This quadratic relationship has been found in several studies, both using education Gini as the measure of inequality (Lin, 2007) as well as the standard deviation of schooling (Digdowiseiso, 2010; Thomas et al., 2001). But, despite the established theoretical concept, other empirical research found a negative relationship between the two variables instead (Checchi, 2001).

Investigating how the inequality in education varies across different groups of people or regions has also been of interest. Varughese and Bairagya (Varughese & Bairagya, 2020) explained how people in India experienced differing severity in educational inequality depending on the group they are in. Other studies also found that spatial gaps appear in discussion on education inequality (Senadza, 2012; Yang et al., 2014). This finding highlights the importance of analyzing the issue of educational imbalance on regional level.

This specific discussion of regional disparities in education can be even more relevant within the scope of Indonesia. After the 1998 monetary crisis that disturbed the attempt of development in most Southeast Asian countries, Indonesian government decided to undergo a huge reform in many development aspects,

including education (Yeom et al., 2002). From this reform, a decentralization policy for education was implemented, giving local government the responsibility for policy implementations and daily operations in education sector (Kristiansen & Pratikno, 2006). With this decentralization reform, the urgency to conduct research on districts-level becomes a lot more pertinent.

Since this study focuses on the situation in West Java, further context about the region is needed. As mentioned before, West Java is the most populated province in Indonesia. Moreover, this province is observed to be the fastest-growing region, especially the mostly urbanized area of Northern West Java (Firman, 1997). The northern region of West Java has many industrial areas which also encourage urbanization to the area, so that population growth in that area is faster than other parts. The development of the Northern West Java region has also become faster. This difference causes educational inequality.

In Indonesia, the districts are classified into two categories: kabupaten (regency) and kotamadya (municipality). West Java has 27 districts which consist of 18 regencies and 9 municipalities. Furthermore, West Java also has both agricultural and non-agricultural districts. As explored by Hendajany and Rizal (2019), 14 out of 27 districts in West Java is classified as agricultural, while the remaining 13 districts are non-agricultural. These classifications that separate regencies and municipalities as well as agricultural and non-agricultural districts will be one of the highlights of this study. The majority of agricultural areas in the southern part of West Java have limited income. The allocation of consumption from income is 55% for agricultural areas while for urban areas only 45% is used for consumption (Hendajany & Rizal, 2019). This has a consequence, in the agricultural area, further education is less of a priority because of the low income constraint and dominantly allocated for consumption. The characteristics of a district will be appropriately specified in the upcoming tables for an easier comparison.

METHOD

The data used in this study is obtained from Badan Pusat Statistik (Central Statistics Bureau) or BPS of West Java, Indonesia. The access to all data is currently available on its official website. The main data that is used in this study is the proportion of population above 15 in every particular education level for calculating the education Gini coefficient, standard deviation of education, and average years of schooling. The data is presented for every district and ranged from 2013 to 2019. That range of observed period is chosen as 2013 was the first time West Java was divided into 27 districts; the formation which remains to the present time. Data collection until 2019, because the data is considered stable, there has been no impact of the pandemic in early 2020.

The education attainment in this paper is divided into six levels: (1) no schooling for people without education or who did not finish primary school, (2) primary school which translates into six years of education, (3) junior high school which means 9 years of education, (4) senior high school or 12 years of education, (5) vocational school or 14 years of education, and lastly (6) college/university which translates into 16 years of education. This division of education level is decided for two reasons. First, there was a change in grouping of education levels from the original data provided by BPS during the observed period, making it

impossible to separate the proportion of population with master and doctoral degrees. Second, the proportion of population with post-graduate education (master degree and above) is very small relative to other education levels. For the whole West Java in 2013, the proportion of population with education higher than undergraduate program in a university is only 0.31 percent. With those considerations, the population with education longer than 16 years is grouped together in the last category, which is also how the latest data from BPS is presented. The overview of the data used in this study is presented in Table 1 as the mean value of the observed period.

Table 1. Data Overview (Mean of 2013-2019)

No	Regency/City	Proportion of Population with Level of Education						Average Years of Schooling
		No Schooling	Primary	Junior High	Senior High	Vocation	Tertiary	
1	Bogor	19.82	31.58	20.96	21.05	2.23	3.82	7.96
2	*Sukabumi*	19.33	39.29	23.51	14.16	1.01	2.28	7.64
3	*Cianjur*	17.97	48.32	19.24	11.09	0.99	2.08	6.64
4	Bandung	10.51	34.83	23.90	23.02	1.78	4.78	6.97
5	*Garut*	17.39	42.87	20.05	15.15	1.24	2.43	8.29
6	*Tasikmalaya*	10.60	56.44	18.59	10.51	0.97	2.45	7.04
7	*Ciamis*	10.22	44.56	23.57	15.32	1.59	3.70	7.04
8	*Kuningan*	17.36	39.66	16.43	18.95	2.10	4.76	7.46
9	*Cirebon*	26.73	32.36	19.35	17.12	1.80	2.88	7.14
10	*Majalengka*	17.91	42.87	21.14	12.94	1.48	3.15	6.49
11	*Sumedang*	9.54	42.30	21.80	19.27	2.01	3.89	7.03
12	*Indramayu*	33.17	30.03	20.18	14.51	1.29	2.40	7.53
13	*Subang*	26.60	31.25	20.39	17.31	1.32	3.51	5.79
14	Purwakarta	18.61	31.35	21.49	21.63	2.36	4.06	6.77
15	Karawang	20.34	31.43	21.10	22.07	2.41	2.76	7.46
16	Bekasi	15.01	21.22	21.15	33.32	3.43	5.42	7.26
17	*Bandung Barat*	9.60	43.80	22.94	18.24	1.34	3.23	8.58
18	*Pangandaran*	9.38	49.81	21.29	15.13	1.09	2.34	7.63
19	Bogor*	10.52	23.74	18.46	32.06	2.87	10.39	7.64
20	Sukabumi*	9.87	24.82	22.40	31.13	2.37	7.39	10.09
21	Bandung*	6.25	20.57	20.16	34.13	3.27	12.14	9.34
22	Cirebon*	11.55	20.19	18.45	36.44	2.36	8.85	10.44
23	Bekasi*	7.14	14.57	17.37	39.60	3.23	14.41	9.91
24	Depok*	7.98	13.98	18.39	37.58	4.14	14.57	10.79
25	Cimahi*	5.36	16.78	19.11	36.97	3.98	15.38	10.73
26	Tasikmalaya*	7.60	34.59	21.73	25.76	1.85	6.94	10.59
27	*Banjar**	12.16	34.25	24.00	21.09	2.39	4.95	8.69

Source: Authors' calculation from Badan Pusat Statistik of West Java

Note: the * sign indicates that the district is classified as a municipality and the italic indicates the districts is considered agricultural.

To calculate the education Gini index, this study will refer to the formula used by Thomas et al. (2001), which was developed from Deaton (1997). The formula can be written as:

$$GINI_E = \left(\frac{1}{\mu}\right) \sum_{i=2}^{6} \sum_{j=1}^{i-1} p_i \left| E_i - E_j \right| p_j, \quad (1)$$

where p_i is the proportion of population aged 15 and older with education level-i; p_j is the proportion of population aged 15 and older with education level-j; E_i is the years of schooling for the group of people with education level-i; E_j is the years of schooling for the group of people with education level-j; and μ is the average years of schooling, which can be calculated using the equation:

$$\mu = \sum_{i=1}^{6} p_i E_i. \quad (2)$$

Further, the first equation can be expanded as:

$$GINI_E = \left(\frac{1}{\mu}\right) [p_2(E_2 - E_1)p_1 + p_3(E_3 - E_1)p_1 + p_3(E_3 - E_2)p_2 + \cdots + \cdots + p_6(E_6 - E_1)p_1 + p_6(E_6 - E_2)p_2 + p_6(E_6 - E_3)p_3 + p_6(E_6 - E_4)p_4 + p_6(E_6 - E_5)p_5]. \quad (3)$$

Other than the education Gini coefficient, the standard deviation of schooling is one of the commonly used alternative to measure the disparities in education (Birdsall & Londoño, 1997; Lam & Levison, 1991; O'Neill, 1995; Ram, 1990). According to Thomas et al. (2001), standard deviation of schooling simply measures the dispersion of education attainment in absolute terms; whereas education Gini measures the dispersion in relative terms. Although education Gini is seen as a better measure to evaluate the improvement of equality in education (Lin, 2007), this study also calculates the standard deviation of schooling in West Java's districts for a comparison purpose. Also, it was previously found that the educational Kuznets curve in Indonesia can be found while using the standard deviation of schooling instead of education Gini (Digdowiseiso, 2010). The formula for calculating the standard deviation of schooling, as used by Thomas et al. (2001), can be written as:

$$\sigma = \sqrt{\sum_{i=1}^{6} p_i (E_i - \mu)^2} \quad (4)$$

To examine the relationship between average years of schooling and education inequality, we estimate panel data regression using the following equation:

$$EI = \alpha + \beta_1 \mu + \beta_2 \mu^2 + \varepsilon \quad (5)$$

where EI is the measure of education inequality, in this case education Gini coefficient and standard deviation of schooling; μ is the average years of schooling; and ε is the error term. Since we are dealing with panel data, we will control both fixed effect (for years) and random effect (for years and districts), the way Thomas et al. (2001) did it in their study using the cross-countries panel data. If the relationship between education inequality and education attainment forms an

inverted U shape, as proposed by Ram (1990), we expect β1 to have a positive value while β2 shows negative value.

RESULTS AND DISCUSSION

Table 2 shows the calculated education Gini index for all districts in West Java from 2013 to 2019. At a glance, it can be observed that most districts experienced a declining inequality in education, which is shown from the decreasing value of education Gini over time in the observed period. In 2013, Indramayu had the highest level of inequality of education with education Gini coefficient of 53.52 while the best district in term of education equality was Cimahi with education Gini of 23.05.

Table 2. Education Gini Index for All Regencies and Cities in West Java, 2013-2019

No	Regency/City	2013	2014	2015	2016	2017	2018	2019
1	Bogor	**42.54**	**37.55**	**34.94**	**31.57**	**30.69**	**31.91**	**28.6**
2	*Sukabumi*	**36.81**	**41.06**	**29.96**	**27.21**	**29.44**	**30.27**	**28.31**
3	*Cianjur*	**38.26**	**40.61**	**29.67**	25.08	**25.73**	**30.09**	**28.1**
4	Bandung	30.2	28.22	25.43	25.94	**26.26**	24.42	23
5	*Garut*	**39.4**	**38.67**	**32.44**	26.32	**27.71**	**27.43**	**27.5**
6	*Tasikmalaya*	29.11	24.47	25.33	21.65	23.7	22.83	25
7	*Ciamis*	29.16	27.24	25.44	20.46	21.31	23.52	24.6
8	*Kuningan*	32.78	**43.39**	**28.6**	25.39	25.29	**29.7**	**31**
9	*Cirebon*	**47.39**	**41.48**	**42.71**	**37.75**	**31.72**	**39.26**	**37.67**
10	*Majalengka*	**34.83**	**34.53**	**31.45**	**31.12**	**29.74**	**30.64**	**30.78**
11	*Sumedang*	29.58	26.86	26.46	24.04	**25.6**	23.85	21.75
12	*Indramayu*	**53.52**	**47.87**	**46.83**	**44.82**	**30.44**	**46.79**	**43.66**
13	*Subang*	**44.8**	**53.25**	**38.16**	**36.08**	**28.76**	**34.84**	**36.8**
14	Purwakarta	**40.21**	**37.21**	**32.11**	**32.07**	**26.14**	**30.61**	**31.92**
15	Karawang	**39.99**	**34.94**	**36.89**	**34.34**	**28.49**	**34.03**	**30.41**
16	Bekasi	**34.11**	27.24	27.44	26.51	**26.29**	26.04	**31.87**
17	*Bandung Barat*	27.13	24	23.92	24.37	24.98	25.29	25.57
18	*Pangandaran*	24.64	23.23	25.49	24.28	24.51	22.91	25.07
19	Bogor*	31.43	28.27	23	25.88	23.83	24.52	22.9
20	Sukabumi*	29.48	22.99	25.44	**27.28**	23.22	21.63	21.8
21	Bandung*	24.98	23.26	20.76	18.55	22.96	20.31	18.9
22	Cirebon*	29.01	21.67	25.12	**27.44**	21.59	24.22	26.97
23	Bekasi*	24.96	19.56	18.69	17.01	23.18	18.7	21.24
24	Depok*	25.29	16.78	20.5	19.73	22.6	20.91	22.44
25	Cimahi*	23.05	14.01	18.54	19.8	19.61	18.38	21.07
26	Tasikmalaya*	30.25	23.83	23.84	23.98	22.01	20.82	20.27
27	*Banjar**	33.03	29.96	27.21	**28.37**	22.96	26.4	25.22
Average for West Java		33.55	30.82	28.38	26.93	25.51	27.05	27.13

Note: the * sign indicates that the district is classified as a municipality and the italic indicates the districts is considered agricultural. The bolded value indicates that it is above the province's average. The value of education Gini index is multiplied by 100 for easier read.

After six year, Indramayu still held the highest education Gini coefficient, with 43.66 in 2019. On the other hand, the more equal district in term of education attainment changed to Bandung (municipality) in the last year of the observed period with education Gini index of 18.9. Further analysis on the education Gini index is presented in Table 3.

Table 3. Comparison for Education Gini Index among Districts (Cities and Regencies)

Indicators	2013	2014	2015	2016	2017	2018	2019
Average for all districts (province)	33.55	30.82	28.38	26.93	25.51	27.05	27.13
Average for all regencies	36.36	35.10	31.29	28.83	27.05	29.69	29.53
Average for all cities	27.94	22.26	22.57	23.12	22.44	21.76	22.31
Average for all agricultural districts	35.75	35.47	30.98	28.35	26.56	29.56	29.36
Average for all non-agricultural districts	31.19	25.81	25.59	25.39	24.37	24.34	24.72
Percentage of districts with EG above province's average	0.41	0.41	0.41	0.37	0.48		0.44
Percentage of cities with EG above province's average	0.00	0.00	0.00	0.22	0.00	0.00	0.00
Percentage of regencies with EG above province's average	0.61	0.61	0.61	0.44	0.72	0.61	0.67
Percentage of non-agricultural districts with EG above province's average	0.31	0.23	0.23	0.38	0.38	0.23	0.31
Percentage of agricultural districts with EG above province's average	0.50	0.57	0.57	0.43	0.57	0.57	0.57

From Table 3, we can see that the average education Gini for all districts went through a steady decline from 2013 to 2017 before experiencing a spike again in 2018. This increase in education inequality may be caused by the considerably higher proportion of population with tertiary education since 2018. In 2019, many education Gini for many districts declined again, but there are also some districts that had another increase of education inequality, making the overall average for the province slightly higher than 2018.

Comparing the averages, municipalities tend to have better education inequality than regencies, as indicated by the lower education Gini (22.31 to 29.53 in 2019). There are also noticeably more regencies with education Gini higher than the province's average. Out of 18 regencies, 12 of them had worse score of education inequality relative to the province's average in 2019 (67 percent); while all 9 municipalities in West Java had lower education Gini index than the province's average.

In addition, we also compare the difference in education inequality among agricultural and non-agricultural districts. Agricultural districts observably have higher education inequality than the non-agricultural ones based on the average scores of education Gini. In 2019, the average education Gini for agricultural districts was 29.36 while the score for non-agricultural districts was 24.27. Accordingly, the percentage of non-agricultural districts with education Gini higher than the province's average is lower than the percentage of agricultural districts

with that specification. In 2019, 31 percent of non-agricultural districts (4 out of 13) had education Gini index higher than the province's average, while it was 57 percent (9 out of 14) for agricultural districts. This aligns with Hendajany and Rizal's finding that non-agricultural districts tend to have higher education than agricultural ones (Hendajany & Rizal, 2019). With this evidence, it shows that the disparities between agricultural and non-agricultural districts do not stop in just education attainment, but also in the equal distribution of education.

Furthermore, we investigate whether the increasing average years of schooling worsens education inequality before improving it; or, in other words, whether the education Kuznets curve emerges from the data of West Java. The relationship between education attainment, as proxied by average years of schooling, and education inequality (measured by education Gini) is shown in Figure 1. Interestingly, instead of an inverted U-shaped curve or Kuznets curve, the opposite is found. It appears that the increase in education attainment improves to a certain point before starting to worsen it. This contradicts Thomas et al. (2001) finding that shows a clear pattern of education Kuznets curve, using cross-country data.

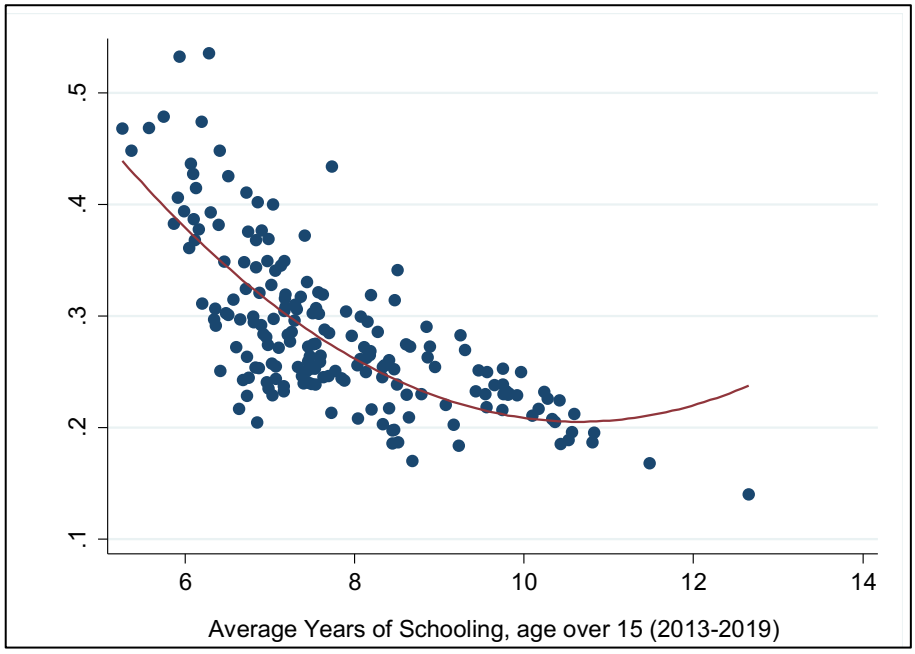

Figure 1. Average Years of Schooling and Education Gini, 2013-2019

The unexpected finding is further explored through a panel data regression. The results are presented in Table 4. All models (fixed effect for years and districts and random effect for districts) come up with significant results at the confidence level of 99 percent. The positive coefficients for average years of schooling and negative for the squared average years of schooling indicate that the relationship between education attainment and education inequality (as measured by education Gini) forms a U-shaped curve. The turning points are 11.34, 10.67, and 10.74 years for year fixed effect, district fixed effect, and district random effect respectively. Averaging the three models, we find that education attainment worsens education

inequality after 10.92 years. This maximum value is considerably higher than the peak of education attainment when the education Kuznets curve emerges from the data, which is around 6-7 years (Lin, 2007; Ram, 1990; Thomas et al., 2001). This abnormal pattern might arise due to the characteristics of the sample.

Table 4. Panel Data Regression (Dependent Variable: Education Gini)

Variables	Variables Stacked by Date	Variables Stacked by Districts	
	Fixed Effect	Fixed Effect	Random Effect
Average Years of Schooling	-0.154***	-0.118***	-0.139***
	(-0.0231)	(-0.0276)	(-0.0254)
(Average Years of Schooling) ^{2}	0.00679***	0.00553***	0.00647***
	(-0.00138)	(-0.00158)	(-0.00148)
Intercept	Fixed Effect	Fixed Effect	Random Effect 0.964*** (-0.107)
Observations	189	189	189
Number of groups	7	27	27
R-squared	0.632	0.197	0.1964

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

As a developing country, many of the programs on education from Indonesian government focuses on providing an equal access to primary school, and later secondary (Duflo, 2004; Yeom et al., 2002). This implies that the increase of education attainment may simply means that more people get access to primary and secondary schools (basic education), which in turn improving the overall education inequality.

While more people obtain the basic education, the dropout rate is still high for higher education, especially for tertiary education (Jones & Hagul, 2001). This imbalance may be the one reflected in the U-shaped curve that illustrates the relationship of education attainment and education inequality in West Java. As a comparison, we also evaluate the education inequality through an alternative measure, which is the standard deviation of schooling. The relationship between average years of schooling and standard deviation of schooling is shown in Figure 2. Compared to education Gini, the relationship between education attainment and education inequality is much less noticeable if the inequality is measured by standard deviation of schooling.

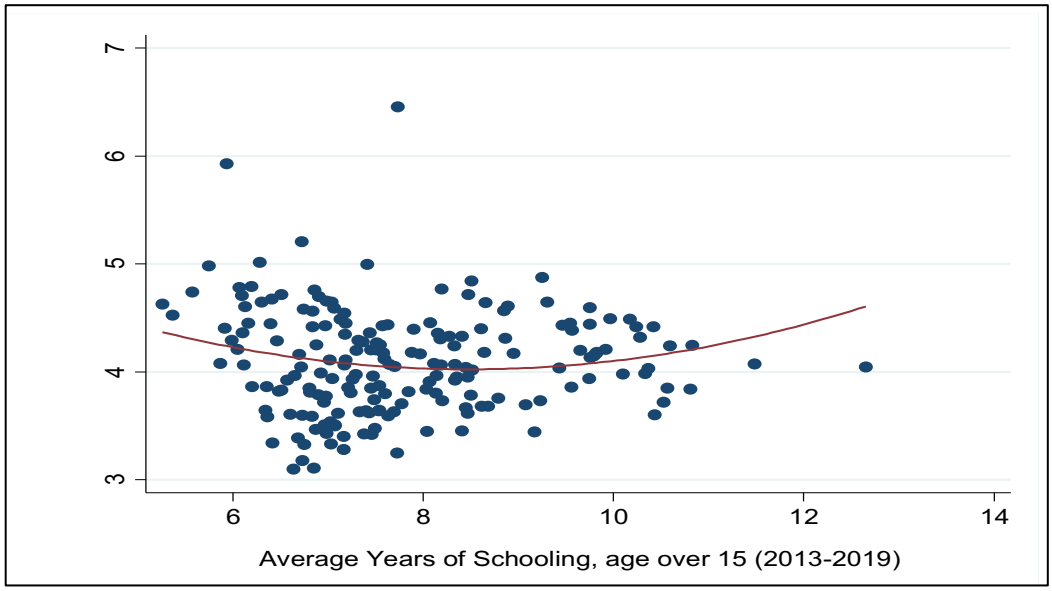

Figure 2. Average Years of Schooling and Standard Deviation of Schooling, 2013-2019

The graph shows a slight U-shaped curve, but that correlation is denied by the results of the panel regression presented in Table 5. No coefficient of average years of schooling nor the squared value of it is statistically significant. That finding persists through all models of estimation. These results may be explained by the fact that standard deviation is considered not as efficient as education Gini in showing the improvement of equality in education over time (Lin, 2007). Though, this finding contradicts the one found by Digdowiseiso (2010) which states that an education Kuznets curve emerges from Indonesian data using the standard deviation of schooling. The contradiction may arise due to the different type of data, since Digdowiseiso (2010) utilized micro-level data instead of an aggregate for regions or districts.

Table 5. Panel Data Regression, Standard Deviation of Schooling (Dependent Variable: Standard Deviation of Schooling)

Variables	Variables Stacked by Date	Variables Stacked by Districts	
	Fixed Effect	Fixed Effect	Random Effect
Average Years of Schooling	-0.297	-0.319	-0.388
	(-0.242)	(-0.268)	(-0.246)
(Average Years of Schooling) ^{2}	0.0162	0.0196	0.0232
	(-0.0145)	(-0.0153)	(-0.0143)
Intercept	Fixed Effect	Fixed Effect	Random Effect 5.669*** (-1.039)
Observations	189	189	189
Number of groups	7	27	27
R-squared	0.013	0.012	0.0113

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

CONCLUSION

Education inequality is an important issue to address, but investigating the problem on national level may not be the best option when it comes to specific targeting in creating development policy. This paper utilizes districts-level data to examine how education inequality differs among regions and what characteristics can be attributed to the said difference. By calculating education Gini index for 27 districts in West Java, Indonesia, we found that education inequality is lower for districts that classified as municipalities relative to the ones classified as regencies. In addition, we also found that agricultural districts seem to experience worse education inequality than those considered to be non-agricultural. Combining this result with the finding from Hendajany and Rizal (2019), it can be said that agricultural districts not only have lower education attainment, but also more inequal distribution of education.

Regarding the relationship between education attainment and education inequality, the opposite of education Kuznets curves is found from the data. When education inequality is measured by education Gini, average years of schooling is observed to lead to a decline in it before worsening the inequality after it passes 10.92 years. This illustrates the limitations of the people of West Java, especially in the agricultural district, to access higher education because of limited income. Therefore, it is necessary to take policy alignments to prioritize educational assistance–such as KIP–in agricultural districts. This finding is confirmed by a panel data regression. On the other hand, this pattern does not show up when standard deviation of schooling is used as the measure for education inequality.

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