



The Composition of Human Capital and Economic Growth: Evidence from Aceh and West Papua Provinces, Indonesia

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ABSTRACT

This paper investigates the importance of human capital and each educational level on economic growth in Aceh and West Papua from 2010 to 2017. Examining the dynamic panel data using difference generalized method of moments shows there is insignificant impact of tertiary education on economic growth. Both provinces have U-shape effect of human capital composition, which indicates primary and secondary education seems to contribute more on the economy. Hence, the government should solve these educational levels first. Since the data showed the indication of low quality of educators, teachers' skills improvement on teaching and their wellbeing should be prioritized.

Keywords: Economic Growth, Education, Human Capital

JEL Classifications: I25, J24, O15

1. INTRODUCTION

Human capital is one of the essential factors which can boost economic growth. The role of human capital on the economy is explained by several neoclassical theories such as the endogenous growth theory, the augmented solow model, and the real business cycle (RBC) model. In the RBC model, there are two types of shocks in the economy: Education and government expenditure, in which education has a larger impact on economic growth (Romer, 2012). Education encourages human capital to perform better in terms of achieving tasks and improving productivity. Previous studies found there is a positive relationship between education and positive macroeconomics indicators (Stefan, human capital as a determinant of the economic growth – panel data approach, 2016). In fact, different levels of education have different impacts on gross domestic product (GDP) growth. Of these, tertiary education level has the largest impact on GDP growth, which agrees with (Arabi and Abdalla, 2013).

Providing an equitable access of education for everyone is one of the government's main tasks. By having higher education, the society are expected to reach more prosper life because they also have more capacity to earn. Different capacity on earning creates inequality. Consequently, inequality in education could lead to income gap between societies. Glomm and Ravikumar (1992) examine the implication of human capital investment on growth and income distribution among different skills level. The result shows if education is not equally distributed among the population, a large part of the revenue will be earned by a minority person with higher education, which led to large inequalities in the income distribution and increasing poverty. As such, human capital has the important role on economic growth across countries (Engelbrecht, 2003) and across regions within countries (Zhang and Zhuang, 2011).

Although majority of the countries have been considered education has significant effect on economic and social

development processes, many countries are far from achieving public education (Ibourk and Amaghous, 2013). Based on International NGO Forum on Indonesian Development (INFID) survey 2014, the community stated that inequality in educational attainment is the main cause of social and economic inequality in the community. As the GDP growth rate of Indonesia has been increasing from 2006 to 2015 even compare to several countries (Kementrian Keuangan, 2017), the need of educated labor with high education level has been arise in Indonesia (World Bank, 2016). Based on data from Kemenkeu (2017), the percentage of educational budget remained constant in 20% from the total national budget.

Based on these facts, this paper aims to analyse the effect of the composition of human capital in terms of education level (primary, secondary, tertiary) on economic growth in Aceh and West Papua Provinces, Indonesia. The data gathered from Bureau statistic (BPS) of each province from 2010 to 2017. There are 36 regions and these panel data are analyzed using the difference generalized method of moments (GMM) model. Since previous studies only evaluate the role of human capital without investigating the contribution of human capital from different educational level, this thesis contributes to enrich the literature regarding this area of focus. Furthermore, the thesis provides an evaluation and proposal for the government to implement proper policies for different needs. The rest of the paper is organized as follow; Section 2 provides additional information about specific issue regarding of each province and theory-related explanation. Data collecting and processing are discussed in Section 3 of methodology. After finishing data analysis, there will be results and discussion in Section 4. All those parts will be summed in Section 5.

2. LITERATURE REVIEW

This research lean on grounded theory of augmented solow model and endogenous growth theory below:

2.1. Augmented Solow Model

To be able to capture the role of human capital in the clear economic growth, Mankiw et al. (1992) added the Solow model with incorporating human capital as it incorporates physical capital. In this case, the Cobb-Douglas production function becomes:

$$Y_t = K_t^\alpha H_t^\beta (A_t L_t)^{1-\alpha-\beta} \quad 0 < \alpha + \beta < 1 \quad (1)$$

where Y is output, K is capital, H is human capital stock, L is labor, A is technology, β is share human capital in output. L and A are assumed to grow by n and g . Schutt (2003) Mankiw et al. make three other important assumptions; namely.

- Capital investment is divided into not only in form of physical capital with the fraction of s_k , but also in form of human capital with the fraction of s_h from their total income
- Human capital and physical capital have the same constant depreciation rate at δ

- The output (the homogeneous good produced in the economy) can be used for either consumption or investment in (physical or human) capital.

2.2. Endogenous Growth Theory

Solow, Ramsey-Cass-Koopman which considered infinite time horizon, and the diamond growth theory, focusing on capital accumulation and saving as the determinant of economic growth. None of those models consider effective labor aspect as an essential factor. Then, Robert Lucas and David Romer introduced endogenous growth theory, highlighted effectiveness of labor which as represented by knowledge or technology. Technological progress enhances production of output to be more efficient. Therefore, this theory is modeling the accumulation of knowledge.

To model the accumulation of knowledge, there must be a separate sector in economy where new ideas are developed. Resources are divided between the sector where conventional output is produced and new research and development (R&D) sector, and how inputs into R&D produce new ideas. The idea that knowledge stock is the main source of improvement economic productivity. Thought that emphasizes the importance of learning by doing and human capital with the introduction of new things (external) inside the economy becomes the driving factor for increased productivity economy. These though emphasize the importance of human capital power in the economy.

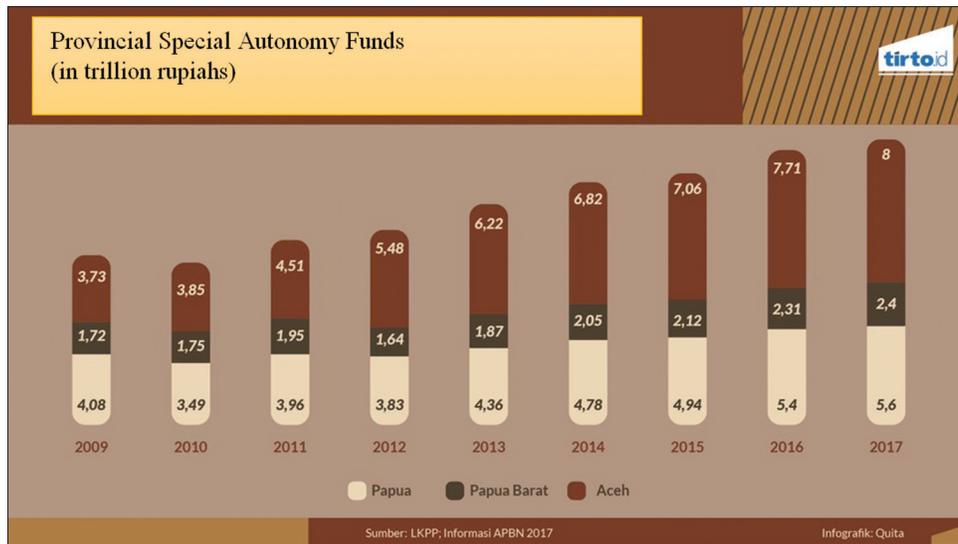
2.3. Research Problems

There are three provinces receiving Special Autonomy Fund (Dana Otsus). This fund will have been allocating for 20 years from 2008. Among those three, it can be seen in Figure 1 that Aceh receives the greatest total amount of money. The Table 1 is based on (Laporan Keuangan Pemerintah Pusat/Government's Financial Report) report. Each province has its own priority sector. Papua and West Papua (Papua Barat) focus more on education and health sectors, while Aceh has wider aspect of funding which also covers infrastructure, economy, poverty, and social. Hence, Aceh received greater amount of money due to their larger need of development process. Nevertheless, Papua and West Papua can receive infrastructure fund by proposing to the legislative.

Since, these provinces have the same priority sector which are education and health, this research wants to investigate whether this effort on improving education already boosts the economic growth. However, because of the limited access on Papua's data, this province is excluded from the analysis.

In Aceh itself, its budget allocation for education from Central Government to Province Government increases every year from 2011 to 2017 (Kemenkeu, 2017). In case of evaluating the human resources quality, it can be shown by human development index (HDI) in which education is one of the components in HDI computation. Education component is determined by analyzing literacy ratio and average years of schooling. Based on Figure 2, data in 2015 noted that Aceh's HDI reached 69.45, which increased compared to previous years. However, this number is still below

Figure 1: Special Autonomy Fund (Dana Otonomi Khusus) 2009-2017



Source: Kementerian Keuangan (Kemenkeu/Ministry of Finance) 2018

Table 1: Human development index in Aceh and Indonesia 2010-2017

Wilayah	IPM							
	2010	2011	2012	2013	2014	2015	2016	2017
Simeulue	60.6	61.03	61.25	61.68	62.18	63.16	63.82	64.41
Aceh Singkil	62.36	63.13	64.23	64.87	65.27	66.05	66.96	67.37
Aceh Selatan	61.22	61.52	61.69	62.27	62.35	63.28	64.13	65.03
Aceh Tenggara	63.82	64.27	64.99	65.55	65.9	66.77	67.48	68.09
Aceh Timur	61.75	62.35	62.93	63.27	63.57	64.55	65.42	66.32
Aceh Tengah	69.17	70	70.18	70.51	70.96	71.51	72.04	72.19
Aceh Barat	66.05	66.47	66.66	66.86	67.31	68.41	69.26	70.2
Aceh Besar	69.76	69.94	70.1	70.61	71.06	71.7	71.75	72
Pidie	66.75	66.95	67.3	67.59	67.87	68.68	69.06	69.52
Bireuen	66.42	67.03	67.57	68.23	68.71	69.77	70.21	71.11
Aceh Utara	63.56	64.22	64.82	65.36	65.93	66.85	67.19	67.67
Aceh Barat Daya	60.91	61.75	62.15	62.62	63.08	63.77	64.57	65.09
Gayo Lues	60.93	61.91	62.85	63.22	63.34	63.67	64.26	65.01
Aceh Tamiang	64.67	64.89	65.21	65.56	66.09	67.03	67.41	67.99
Nagan Raya	63.57	64.24	64.91	65.23	65.58	66.73	67.32	67.78
Aceh Jaya	64.75	65.17	66.42	66.92	67.3	67.53	67.7	68.07
Bener Meriah	67.29	68.24	69.14	69.74	70	70.62	71.42	71.89
Pidie Jaya	68.38	68.69	68.9	69.26	69.89	70.49	71.13	71.73
Banda Aceh	80.36	80.87	81.3	81.84	82.22	83.25	83.73	83.95
Sabang	69.7	70.15	70.84	71.07	71.5	72.51	73.36	74.1
Langsa	71.79	72.15	72.75	73.4	73.81	74.74	75.41	75.89
Lhokseumawe	71.55	72.35	73.55	74.13	74.44	75.11	75.78	76.34
Subulussalam	58.97	59.34	59.76	60.11	60.39	61.32	62.18	62.88
Aceh	67.09	67.45	67.81	68.30	68.81	69.45	70	70.6
Indonesia	66.53	67.09	67.7	68.31	68.90	69.55	70.18	70.81

Source: BPS Aceh 2017

the national HDI, 69.55. The steadily increasing HDI outlook from year to year shows a positive indication that human quality in Aceh is getting better.

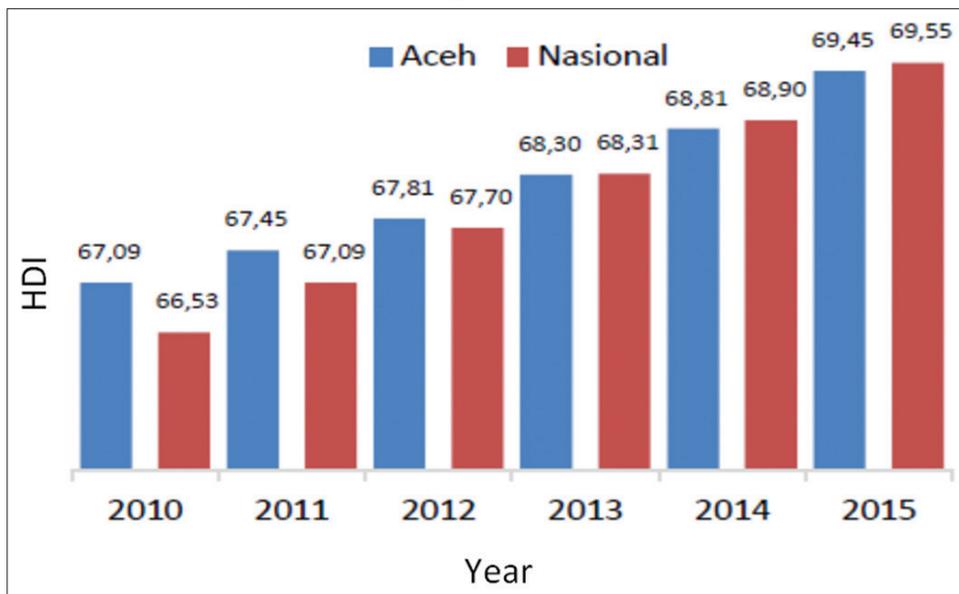
Not only in term of HDI, in term of economic performance, Aceh reaches 4.78% which is above Sumatra’s economic growth rate in 4.43%. However, those achievement is still below national economic level in 5.06%.

HDI in Aceh is mostly ranged in 60-75. From 23 regencies in Aceh, only Banda Aceh has relatively high HDI around 80. On

average, HDI in Aceh from 2010 to 2017 is only slightly lower than national level. However, it cannot be ignored that the disparity among regions are there (Figure 3).

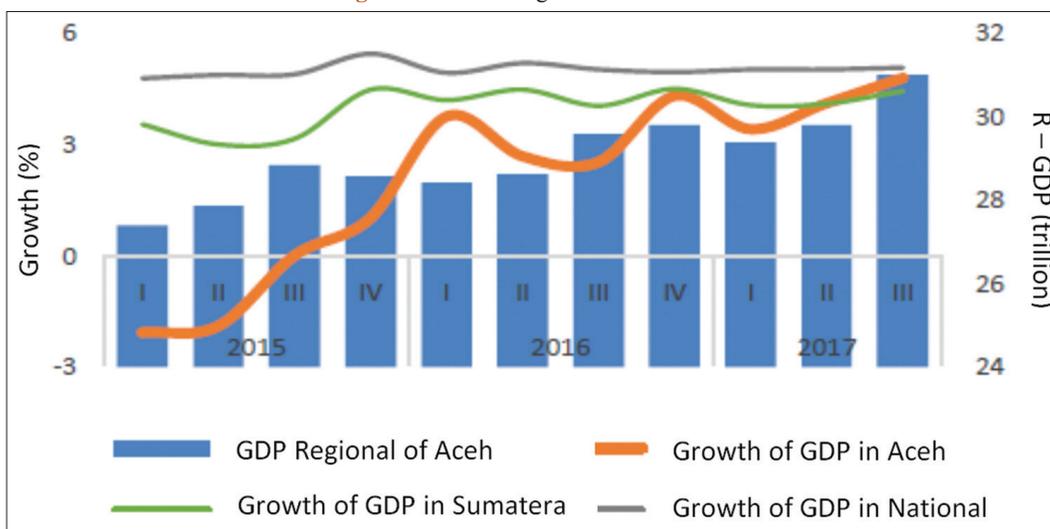
Large income gap among districts could be caused by inequality in job opportunities. Those opportunities depend on the fieldwork capacity in each district. Moreover, the economic level of each region determines the need of labor from certain education level. Bank Indonesia (2017) released the data that most of the workforce in Aceh Province was still dominated by labors with low education level in average years of schooling is 6 years (elementary school

Figure 2: Human development index in Aceh 2010-2015



Source: Bank Indonesia, 2017

Figure 3: Economic growth in Aceh 2017



Source: Bank Indonesia, 2017

and below). The population of working people in Aceh Province in August 2017 was still dominated by workers with elementary school level which reach 655 thousand people (30.64%). The amount was increases to 638 thousand people (30.57%) on February 2016.

Meanwhile, the development of human capital in West Papua did not improve as fast as Aceh. For instance, in Teluk Wondama, Tambrauw, Maybrat, Manokwari Selatan, and Pegunungan Arfak, in 2017, HDI is only at the range below 60 (Tables 2 and 3).

HDI represents the human development which education is part of the indicators. Noorbakhsh (1998) categorized the value into three terms;

1. The area is considered as less likely to put enough attention on human development if the HDI ranges from 0 to 50

Table 2: Educational level of employees in Aceh 2016-2017 (%)

Education level	2016	2017
Elementary school and below	30.57	30.64
Junior high school	20.20	20.75
Senior high school	26.89	27.24
Vocational high school	4.28	4.39
Diploma I/II/III	5.72	4.65
University	12.34	12.34

Source: Bank Indonesia (2017), Data until August

2. The area is considered as having some attention on human development if the HDI ranges between 51 and 79
3. The area is considered as having much attention on human development if the HDI value ranges from 80 to 100.

Table 3: Gini ratio and human development index in West Papua’s districts 2010-2018

Regions	Human development index							
	2010	2011	2012	2013	2014	2015	2016	2017
Fakfak	60.95	61.94	62.56	64.29	64.73	64.92	65.55	66.09
Kaimana	57.25	57.87	58.99	60.36	61.07	61.33	62.15	62.74
Teluk Wondama	52.97	53.74	54.69	55.65	56.27	56.64	57.16	58.1
Teluk Bintuni	56.99	57.87	58.84	59.73	60.4	61.09	61.81	62.39
Manokwari	66.29	67.28	67.86	68.81	69.35	69.91	70.34	70.67
Sorong Selatan	54.24	56.01	56.87	57.73	58.24	58.6	59.2	60.19
Sorong	57.56	58.56	59.18	60.86	61.23	61.86	62.42	63.42
Raja Ampat	57.36	58.37	59.06	60.36	60.86	61.23	61.95	62.35
Tambrau	-	45.97	47.18	48.69	49.4	49.77	50.35	51.01
Maybrat	-	53.29	54.13	54.93	55.36	55.78	56.35	57.23
Manokwari Selatan	-	-	-	54.95	55.32	56.59	57.12	58.08
Pegunungan Arfak	-	-	-	53.36	53.69	53.73	53.89	54.39
Kota Sorong	71.96	72.8	73.89	74.96	75.78	75.91	76.33	76.73
West Papua	59.6	59.9	60.3	60.91	61.28	61.73	62.21	62.99
Indonesia	66.53	67.09	67.7	68.31	68.90	69.55	70.18	70.81

Source: (BPS, 2018)

It is obvious that Aceh and West Papua are categorized as the areas which start putting their attention on human development. Only Banda Aceh in Aceh Province put much attention based on its high value in HDI. Nevertheless, investigating the educational aspect cannot be concluded based on HDI value only.

2.4. Previous Research

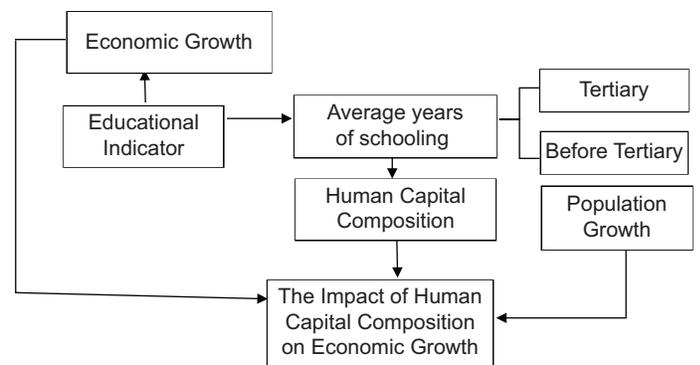
Human capital indicator can be measured by a lot of proxies. Based on Pelinescu (2015), education expenditure in GDP is used as the human capital indicator. The result revealed a negative relationship between GDP and education expenditure. This result is different with Nonneman and Vanhoudt (1996), which can be due to individual heterogeneity across countries.

Most of previous studies analyzed the significance and relevance of different educational levels to economic growth (Stefan, 2016; Pereira and St. Aubyn, 2009; Petrakis and Stamatakis, 2002). However, they cannot find the best percentage of each educational level in one country. Then, Zhang and Zhuang (2011) include human capital structure variable as an additional human capital indicator in percentage.

Previous studies in Indonesia analyze the role of human capital on economic growth across districts of the province by measuring Gini index of education inequality on GDP growth rate. Larger amount of education inequality will result negative significant effect on economic growth. It means, human capital and economic growth are correlated (Bustomi, 2012). However, those studies did not analyze the impact of each educational level on economic growth. Therefore, this study will add an empirical result which highlighted these issues especially in Aceh Province.

2.5. Analytical Framework

Sudarwati (2015) Aceh Province has managed Rp. 27.3 trillion since 2008 until 2013. However, despite the large amount of funding, the education system in Aceh is still in a low level. In fact, some districts in Aceh prioritize in physical development without balanced quality improvement of educators and quality of infrastructure.



3. METHODOLOGY

3.1. Data Selection

Since 2008, Indonesia government allocate several amounts of money called Special Autonomy Funds (Dana Otonomi Khusus/ Dana Otsus) for several province such as Aceh, Papua, and West Papua. These regions were given an authority to manage their own district. Hence, they can cope with the other province to be in a prosperous life. Due to this special condition, this research aims to analyse whether receiving the special fund improving their economic growth. As the main development of the province is human capital, it is needed to be analysed whether human capital in those provinces has significant impact on economic growth. Due to the limitation of the data, the observation in this thesis will only be Aceh Province and West Papua. Type of data will be used in this research is the secondary data. The data are attained from published document of Bureau Statistic (Badan Pusat Statistik/BPS) of each province. There will be 23 regencies or municipalities in Aceh and 13 regencies or municipalities in West Papua. Therefore, there will be 36 regions in total. The research period covers in 2010 to 2017. The process of data analysis follows Zhang and Zhuang (2011) (Table 4).

3.2. Variables Calculation

3.2.1. Human capital

Examining the significance of human capital will be the main concern of this research. Human capital variable – which is

be measured by the educational attainment – was treated as an independent variable and divided into four categories; H, H₁, H₂, HS, and HS₂. Human capital structure and its square is based on Zhang and Zhuang (2011).

- H = proportion of human capital stock with all level of education
- H₁ = number of human capital with tertiary educational level (having/or more 15 years of schooling)
- H₂ = number of human capital below tertiary educational level (primary school and secondary school, <15 years of schooling)
- HS = proportion of human capital with tertiary educational level on human capital stock (H₁/H)
- HS₂ = square of HS.

There is a plausible case where in Aceh and West Papua, primary and secondary levels have more demanded position as reported in Petrakis and Stamatakis (2002) study. Hence, the notion of those categories is to investigate mostly on the impact of tertiary education for economic growth. Is there any obvious distinction of having highly-educated-workforce?

3.2.2. GDP per capita

The GDP per capita will be used as the measurement of economic growth. By using Hodrick-Prescott filter, real GDP data for each region are decomposed into potential (trend) GDP and actual (cyclical) GDP. Then, the output gap variable is measured by calculating the difference between the potential (trend) GDP and actual (cyclical) GDP. Next, all those GDP variables will be transformed into logarithm form. The output gap will be treated as an independent variable. Dependent variable of economic growth will be in the form the change in log GDP per capita. Change in log GDP per capita is computed as: $\frac{y_t}{y_{t-1}} - 1$.

Table 4: The list of regency/municipality Aceh and West Papua 2019

No.	Aceh Province	No.	West Papua Province
1.	Simeulue	1.	Fakfak
2.	Aceh Singkil	2.	Kaimana
3.	Aceh Selatan	3.	Teluk Wondama
4.	Aceh Tenggara	4.	Teluk Bintuni
5.	Aceh Timur	5.	Manokwari
6.	Aceh Tengah	6.	Sorong Selatan
7.	Aceh Barat	7.	Sorong
8.	Aceh Besar	8.	Raja Ampat
9.	Pidie	9.	Tambrau
10.	Bireuen	10.	Maybrat
11.	Aceh Utara	11.	Manokwari Selatan
12.	Aceh Barat Daya	12.	Pegunungan Arfak
13.	Gayo Lues	13.	Kota Sorong
14.	Aceh Tamiang		
15.	Nagan Raya		
16.	Aceh Jaya		
17.	Bener Meriah		
18.	Pidie Jaya		
19.	Banda Aceh		
20.	Sabang		
21.	Langsa		
22.	Lhokseumawe		
23.	Subulussalam		

3.2.3. Control variable

Zhang and Zhuang (2011) uses two control variables (fertility rate and state-owned enterprises proportion in GDP). Because of the research’s scope which is narrowing on each regency/municipality, data needed as the control variables should be substitute to other variables which have close definition. However, there is population growth variable which could be used as a substitute for fertility rate variable. Investment data might be a good variable for state-owned enterprises. Hence, capital formation from GDP expenditure is the investment variable used in this research.

3.2.3.1. Descriptive statistics

Based on the whole sample analysis in Table 5, human capital has relatively large different between its minimum and maximum value. Then, the log of GDP and log of output gap has relatively similar value while the log of GDP per capita is approximately 10% lower than those two. In terms of population growth, there is a significant fall, it was dramatically fall around 39.09%. Hence, it caused more than 50% distance from the maximum value.

Furthermore, the analysis will be specifically looking on each region. Tables 6-10 indicated the summary of data statistic from Aceh (Western Part) and Papua Barat (Eastern Part) separately. Table 6 relates to Aceh, while Table 7 is the variables statistic of

Table 5: Whole sample descriptive statistic

Variables	Obs	Mean	SD	Min	Max
Lrgdp	284	28.58	1.20	25.22	30.78
Lrgdppc	284	16.96	0.72	15.09	19.76
Logap	284	28.58	1.20	25.20	30.80
H	288	123413.6	103942	9301	470762
H ₁	278	10897.54	10500.11	235.45	57351.59
H ₂	278	116297.2	96396.48	8735.02	445152.5
HS	278	0.09	0.04	0.01	0.27
PopG	284	1.88	3.92	-39.09	12.36
Lcap	284	27.58	1.86	22.48	35.63

Table 6: Aceh summary descriptive statistic

Variables	Obs	Mean	SD	Min	Max
Lrgdp	184	28.90	0.80	27.33	30.53
Lrgdppc	184	16.84	0.36	16.28	17.80
Logap	184	28.90	0.80	27.32	30.54
H	184	164593.4	105348.4	23366	470762
H ₁	184	13789.77	11212.95	1700.356	57351.59
H ₂	184	150803.6	98500.64	19961.57	445152.5
HS	184	0.09	0.04	0.01	0.27
PopG	184	2.09	2.01	-7.38	12.36
Lcap	184	27.92	0.60	26.63	29.21

Table 7: Papua barat summary descriptive statistic

Variables	Obs	Mean	SD	Min	Max
Lrgdp	100	28.00	1.55	25.22	30.78
Lrgdppc	100	17.18	1.07	15.08	19.76
Logap	100	28.00	1.55	25.20	30.80
H	104	50556.93	44686.77	9301	192308
H ₁	94	5236.13	5659.93	235.45	22263.18
H ₂	94	48752.76	40226.21	8735.02	170096.4
HS	94	0.08	0.03	0.02	0.19
PopG	100	1.49	6.02	-39.09	12.12
Lcap	100	26.95	2.93	22.48	35.63

Table 8: Difference GMM total samples

Dependent variable: Change in log GDP per capita 2010-2017				
Variables	Model 1		Model 2	
	One-step	Two-step	One-step	Two-step
L. lrgdppc	-0.058*** [0.0009]	-0.058*** [0.0011]	-0.058*** [0.0009]	-0.057*** [0.0010]
Lrgdppc	0.057*** [0.0006]	0.057*** [0.0010]	0.057*** [0.0006]	0.057*** [0.0009]
Logap	0.000 [0.0003]	0.000 [0.0002]	0.000 [0.0003]	0.000 [0.0003]
H ₁	-0.000 [0.0000]	0.000 [0.0000]		
H ₂	0.000 [0.0000]	0.000 [0.0000]		
PopG	-0.000 [0.0000]	-0.000 [0.0000]	-0.000 [0.0000]	-0.000 [0.0000]
Lcap	-0.000 [0.0000]	-0.000 [0.0000]	-0.000 [0.0000]	-0.000 [0.0000]
H			0.000 [0.0000]	0.000 [0.0000]
HS			-0.001 [0.0006]	-0.001 [0.0005]
HS ₂			0.003 [0.0019]	0.003 [0.0022]
Hansen test	0.075	0.075	0.106	0.106
Serial correlation				
AR (1)	0.126	0.136	0.156	0.159
AR (2)	0.918	0.934	0.975	0.987
n	208	208	208	208

Table 9: Difference GMM provincial sample statistic one-step difference GMM

Dependent variable: Change in log GDP per capita 2010-2017				
Variables	Aceh		West Papua	
	Model 1	Model 2	Model 1	Model 2
L. lrgdppc	-0.057*** [0.0004]	-0.057*** [0.0004]	-0.058*** [0.0006]	-0.058*** [0.0007]
Lrgdppc	0.057*** [0.0004]	0.057*** [0.0004]	0.058*** [0.0008]	0.057*** [0.0007]
Logap	-0.000*** [0.0001]	-0.000*** [0.0001]	0.000 [0.0005]	0.000 [0.0005]
H ₁	-0.000 [0.0001]		-0.000 [0.0000]	
H ₂	0.000** [0.0000]		0.061 [0.0840]	
PopG	-0.000 [0.0000]	-0.000 [0.0000]	-0.000 [0.0000]	0.000 [0.0000]
Lcap	0.000 [0.0001]	0.000 [0.0001]	-0.000* [0.0000]	-0.000 [0.0000]
H		0.000** [0.0000]		-0.000 [0.0000]
HS		-0.001** [0.0002]		-0.001 [0.0014]
HS ₂		0.001* [0.0017]		0.004 [0.0065]
Hansen test	0.205	0.162	0.970	0.941
Serial correlations				
AR (1)	0.273	0.381	0.177	0.186
AR (2)	0.052	0.055	0.458	0.492
n	138	138	70	70

Table 10: Difference GMM provincial sample statistic two-step difference GMM

Dependent variable: Change in log GDP per capita 2010-2017				
Variables	Aceh		West Papua	
	Model 1	Model 2	Model 1	Model 2
L. lrgdppc	-0.057*** [0.0007]	-0.057*** [0.0008]	-0.058*** [0.0007]	-0.058*** [0.0004]
Lrgdppc	0.057*** [0.0007]	0.057*** [0.0008]	0.058*** [0.0009]	0.058*** [0.0007]
Logap	-0.000*** [0.0000]	-0.000** [0.0000]	0.000 [0.0012]	0.000 [0.0008]
H ₁	-0.000 [0.0000]		-0.000 [0.0000]	
H ₂	0.000* [0.0000]		-0.000 [0.0000]	
PopG	-0.000 [0.0000]	-0.000 [0.0000]	0.000 [0.0000]	0.000 [0.0000]
Lcap	0.000 [0.0001]	0.000 [0.0001]	-0.000** [0.0000]	-0.000 [0.0000]
H		0.000 [0.0000]		-0.000 [0.0000]
HS		-0.001 [0.0006]		-0.001 [0.0017]
HS ₂		0.001 [0.0028]		0.004 [0.0076]
Hansen test	0.205	0.162	0.970	0.941
Serial correlation				
AR (1)	0.265	0.458	0.195	0.185
AR (2)	0.064	0.061	0.454	0.463
n	138	138	70	70

West Papua. The result shows Aceh has bigger number of human capital than West Papua. However, the structure is nearly the same for both. It indicates the same educational attainment during the period of 2010-2017.

Nevertheless, there is a significant different scale of population growth from both provinces. In Table 6, the lowest point is at -7.38%, while in Table 7, which represents Papua Barat, the value is at an extremely low point of -39%. However, both provinces have approximately the same highest scale at 12%. Investment in West Papua is bigger than in Aceh.

3.3. Modeling

Dynamic panel data analysis with GMM proposed by Arellano and Bond (1991) is used to investigate both of research objectives. Following Bond et al. (2001), the analysis will consist of the following dynamic panel data econometric model:

$$\Delta y = y_{it} - y_{it-1} = \beta_1 y_{it-1} + \beta_2 (y_{it-1} - y_{it-1}^T) + \beta_3 H_{it} + Z_{it} \beta_z + \eta_i + u_{it} \tag{2}$$

The model above can be simplified as:

$$y_{it} = (\beta_1 + 1)y_{it-1} + \beta_2 (y_{it-1} - y_{it-1}^T) + \beta_3 H_{it} + PopG_{it} \beta_{pg} + lcap_{it} \beta_{lcap} + \eta_i + u_{it} \tag{3}$$

Where

y_{it} = change in log of constant GDP per capita

y_{it}^T = the trend component of per capita output (rupiahs)

$(y_{it-1} - y_{it-1}^T)$ = the output gap at the start of the period (ogap) (rupiahs)

H = a set of indicators of human capital (H, H₁, H₂, HS and HS₂) (person)

PopG_{it} = population growth (as control variable) (%)

Lcap = capital formation (rupiahs)

η = the effects of omitted regional time-invariant which control province fixed effect

μ = the error term

i = regency/municipality

t = time period.

There is a plausible endogeneity problem of variable y_{it-1} to the error terms through u_{it} . Hence, the GMM method is the solution for the analysis method (Arellano and Bond, 1991). Afterwards, it will be processed by taking the first differences of the equation and treating the independent variables as the instruments one-step GMM provides consistent estimators by using the suboptimal weighting matrix. However, the estimators are inefficient. Then, in order to provide efficient estimators, there is two-step GMM, which uses optimal weighting matrix.

The analysis is done with two models; model 1 and model 2. Model 1 excluded human capital composition variable of H, HS, HS₂. Meanwhile, variable of H₁ and H₂, are excluded from model 2.

Model 1

The first model is constructed to see the contribution of each educational level separately (tertiary and before tertiary) to the economic growth. Hence, it can be written as;

$$y_{it} = (\beta_1 + 1)y_{it-1} + \beta_2(y_{it-1} - y_{it-1}^T) + \beta_3H_{1it} + \beta_4H_{2it} + PopG_{it}\beta_{pg} + lcap_{it}\beta_{lcap} + \eta_i + u_{it} \quad (4)$$

Model 2

The second model uses the variable of human capital structure as proposed by Zhang and Zhuang (2011). This model is constructed in order to see whether the educational levels matters more on economic growth or not. Hence, this model focusing more on the human capital stock and structure.

$$y_{it} = (\beta_1 + 1)y_{it-1} + \beta_2(y_{it-1} - y_{it-1}^T) + \beta_3H_{it} + \beta_4HS_{it} + \beta_5HS_{2it} + PopG_{it}\beta_{pg} + lcap_{it}\beta_{lcap} + \eta_i + u_{it} \quad (5)$$

4. RESULTS

4.1. Whole Sample Statistics

The Table 8 provides statistical analysis for the whole samples. For model 1, all variables - except variable H, HS, and HS₂ - are

regressed using one-step and two step GMM. Then, in model 2, H₁ and H₂ will be excluded from the regression in model 2. The results are shown below:

Neither tertiary nor before tertiary education have a significant impact on change in GDP. Even the change in GDP per capita shows negative contribution of tertiary education. Human capital structure has negative coefficient, while its square is positive. It indicates the U-shape effect on economic growth. By dividing the human capital structure coefficient with the double coefficient of its square, the turning point is 0.25. This value is far higher than the mean of human capital structure which is only 0.09. It means the increase in educational investment on higher education will lead to the fall in the economic growth. Hence, at this point, primary and secondary education has more important role to boost the economic growth. Furthermore, the need of education which financed by the GDP brings negative effect on growth. It brings a lot of burden because the productivity of human capital is relatively low.

Based on Table 8, whole sample statistic shows that there is a positive significant impact of initial GDP per capita on economic growth while the lag form shows a contra relationship. Meanwhile, output gap does not seem to have significant impact on GDP per capita. In terms of diagnostic analysis, there is no evidence of proving no serial correlation or valid instruments (Hansen test).

4.2. Provincial Sample Statistics

4.2.1. One-step difference GMM

Breaking down the samples into specific provinces, Aceh, as the western province, and West Papua, as the eastern province, gives different results. Based on Table 9, output gap in Aceh has significant negative impact on change in GDP at 1% significance level. As the gap is getting larger, it is less likely for the regions in Aceh to grow. However, the output gap in West Papua is not significant for the change in GDP.

Previous whole sample statistics shows no evidence of essential contribution of each educational level. Although there is also no significant contribution of each educational level in West Papua, but it has a positive relationship with bigger coefficient. However, it is not the case for Aceh, where H₂ is significant for GDP. At significance level of 5%, primary and secondary level plays an important role in Aceh's economic growth. Meanwhile, tertiary education in Aceh has negative relationship. Negative value of tertiary educational level means as population with high education arises, the plausibility of GDP to change is lower. Hence, Aceh needs more productive human capital. Furthermore, both regions have U-shape human capital structure, which similar with the whole sample results. However, the impact is larger in Aceh.

4.2.2. Two-step difference GMM

Regarding the serial correlation and instrument validity test, both provinces in all models showed the same results. It can be concluded that there is no strong evidence neglecting the fact of serial correlation and invalid instrument. The significant negative sign in West Papua means capital formation is larger in low-income regions. Proposing two-step GMM shows fairly similar

results. In terms of human capital, although both provinces are in different geographical area, they face similar U-shape human capital structure.

In Zhang and Zhuang (2011), there are several reasons why a region has U-shape human capital structure. It can be found in low-economic regions. It is due to the region does not have a conducive economic growth in which contribution of human capital is not positive. Therefore, it seems that investing in primary and secondary educational investment is preferable, since human capital structure as the representative of tertiary education contribution for economic growth. However, there are two main causes that tertiary education doesn't show any positive contribution; lack of educational investment on tertiary education or lack of strong foundation in primary and secondary level.

West Papua was formed in 1962 (former Irian Jaya) and central government has an authority on promoting growth in this province. However, education sector did not seem to be the priority, which leads to the low quality of education. Due to its geographical isolation, West Papua also suffers from unequal distribution of human resources in this sector. As one of the rich provinces with its abundant natural resources does not guarantee they will have better quality of life. Establishment of giant company - Grasberg mine – contributes the largest amount of tax for Indonesia, yet very little benefits to the West Papuans (Mollet, 2007). It is also the case in Aceh where it becomes the poorest province in Sumatra Island and the 6th poor province in Indonesia.

The next issue is whether the low productivity due to the bad educational performance. Teachers are crucial foundation to maintain the quality. In Figure 4, Aceh and West Papua are far from national level, even they are positioned in the 5 lowest score from all provinces. Low level of teachers' competency score indicates weak foundation of early education. Teachers don't have qualified skills on managing students in the class. Hence, enormous amount of investment on education doesn't seem to bring distinct change on economic growth.

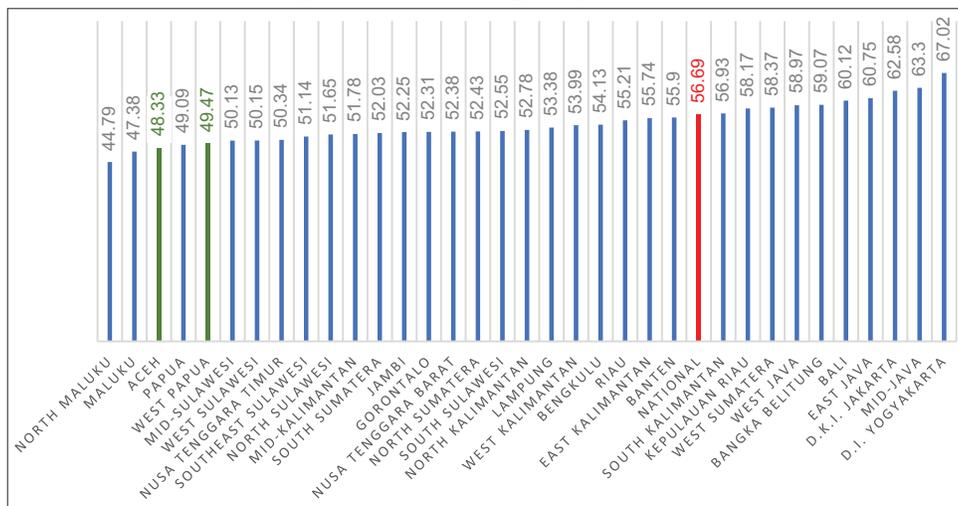
However, concluding government expense on education as a waste because the insignificant role of highly-educated-human-capital is not the whole truth. Education is a long-term investment, which should not be measured for short-term evaluation. The biggest proportion of educational expenses is on infrastructure development. Hence, after completing a standard requirement of schools' facility, the quality will be improved afterwards. In Aceh itself, the college graduates contribute the largest amount of unemployment. It caused the negative relationship on economic growth.

There are several reasons why tertiary education is still important. Kadir et al. (2018) found education, health, labor and agriculture sector capital spending has significant positive effect on economic growth as measured by the agriculture sector GDP of South Sumatera. If the number of educated labor force increased by 1 thousand, then the agricultural sector GDP also increased by 50, 13 billion. It is important to note that agricultural field is highly affected by labors' educational background due to their capacity on using more effective tools. It is also in line with Islam et al. (2016), who conducted research in Malaysia. The authors used qualitative research using questionnaire. Based on 100 respondents, it can be concluded that higher education gave positive significant impact on economic growth due to its role on providing better knowledge and training skills of human capital.

Hanif and Arshed (2016) also found the same result which shows tertiary education is more significant in South Asian Association for Regional Cooperation (SAARC) countries compared to primary and secondary education. All the SAARC countries are developing countries, which are Pakistan, India, Bangladesh, Bhutan, Nepal, Sri Lanka, Maldives, and Afghanistan. As developing countries, they have large population and also facing high poverty rate. This research took long-term analysis for 53 years from 1960 to 2013.

Furthermore, Bokhari (2017) evaluates government expenditure in terms of investment on education, health, and fixed capital

Figure 4: Teachers' competency score 2015



Source: Ditjen GTK 2015

formation (physical capital) with error correction model analysis method from 1971 to 2014. The author found investment on physical capital and education is not significant for the economic growth, while health expenditure was found to be significant in short-term and long term growth with bidirectional causal relationship. However, there is still a unidirectional relationship between capital formation and economic growth. The author also highlighted, that human capital investment on education and health jointly affect the economic growth much bigger than physical capital investment (capital formation). To sum up, health expenditure and fixed capital formation have much more effective effect than massive amounts of education expenditure.

5. CONCLUSIONS

This paper investigated the contribution of human capital at different level of education. All regions in the eastern (West Papua) and the western province (Aceh) are analyzed from 2010 to 2017. Difference GMM analysis used to examine the dynamic panel data of the study. GMM analysis was chose due to the endogeneity problem occurs in the model.

The empirical results showed that tertiary education does not contribute much on GDP growth. However, it could be caused by the educational failure of creating generations with strong competency. Human capital structure in both regions has U-shape effect, which means the return on economic growth seems to be negative. It is an indication of those regions rely more on primary and secondary education. Human capital become insignificant can be due to the proportion of GDP mostly in form of the exploitation of abundance natural resources rather than the productivity of human capital itself.

Investigating the fact that early education needs more attention to be improved, government could strengthen the policy on primary and secondary education. Teachers' competencies are main area to be improved. As they are prepared to be more critical and competitive, tertiary education will bring more positive sign on economic growth. Here are some recommendations that could be done:

1. Government should focusing more on early education because primary and secondary education is the foundation of high quality tertiary education graduates
2. As the college graduates increase especially in teaching field, program SM3T should be maintained. Furthermore, it will be better to finance the students from rural area to study in University, therefore, they will go back to become more eligible teachers
3. As the early education students are more stimulated of how good are the teachers on transferring the information, pedagogical aspect may be the essential aspect to be improved
4. To deter their willingness to go back to the city, provide fairly similar wages with the teachers in the city
5. As in the paper only focusing on educational aspect of human capital, it is better to put health as another variable and working opportunity for high-educated human capital to show more obvious effect on economic growth.

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