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Economic Growth Disparity among the Regions in Aceh, Indonesia

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Abstract - This study aims at investigating the extent of cumulative causation effect on economic growth disparity across the regions: Basajan-Pijay, Northeast, South-West, and Central-Inland in the Aceh Province, Indonesia. It also includes some others factors in determining economic growth disparity such as Gross Domestic Product (GDP) per capita, the concentration of economic activity areas, Human Development Index (HDI), the labour productivity of the region, the allocation of public investment as well as the accessibility among regions in the Aceh Province. To capture the goals of this study, it uses panel data during the period 2000 to 2010 consisting of 23 districts/cities of Aceh Province. The results show that the potential conditions for convergence because the dominant factor affecting the disparity without entering variable cumulative effect, the concentration of economic activity among regions have positive and negatively affected HDI. By entering variable cumulative effects, it turns HDI to have a negative effect, while the cumulative effect of the growth of inter-regional and the GDP per capita were positive. Thus, it can be said that the economic disparity among regions has the potential for convergence if and only if there is a policy intervention by the government in improving the quality of education, health, and consumer purchasing power to reduce the disparity. It is recommended that the Government of Aceh and District/City Government should encourage the growth of GDP per year, equal to or above the average growth of the national economy in order to increase labour productivity so that economic prosperity has also increased *(spread effect* is greater than *backwash effect)* because workings of the cumulative effect of growth within the region and among regions.

Keywords : Disparity, Backwash effect, Spread Effect, Economic Growth, Aceh
Paper Type : Research Paper

Introduction

Economic growth disparity between regions is a crucial issue of national economic development. The magnitude of the disparity depends on the factors that influence it, such as differences in economic structure and spatial distribution of endowment factors. Thus, the economic growth disparity between the regions to increase in developing countries, such as Indonesia.

Economic development disparity between regions always arises and increasingly widespread, known as *Centre-Periphery*. This means that the more advanced areas of progress, while the underdeveloped areas. The cause is the result of the cumulative causation effect, the *spread effect* and *backwash effects*. According to Myrdal (1976), *backwash effect* was greater than the *spread effect*.

According to Myrdal, there are three stages of the balance of regional economic growth. Firstly, lack of inter-regional disparities before industrialization. Secondly, the increasing disparity between the regions due to the cumulative effect *(backwash effect* greater than the *spread effect).*Thirdly, *Spread effect* greater than the *backwash effect* to reduce the disparity (Knowles and Wareing, 1994).

An area with a high rate of economic growth does not necessarily correlate with high levels of equity as well. Level area of high economic growth can occur due to high employment growth in the region concerned. However, the rate of economic growth of a region that is lower than other regions do not necessarily reflect the lower level of equilibrium.

GDP contribution of the district/city of the Province can be used as an indicator to see the progress of economic activity and population of an area. Contribution of GDP between regions can also be used to analyze the concentration of economic activity between regions or better known as agglomeration. Concentration of economic activity is also one of the causes of economic growth gap.

This can be seen in the district/town where the highest contributor to the Provincial and district/city where the lowest.

In terms of the regional contribution to the Aceh's economy, the North-East region contributed the highest by 42.41%, followed Basajan-Pijay 25.97%, then the South-West region of 21.08%, meanwhile the lowest contributor is the Middle-Inland area by only 10.54%. Districts/cities in the region Basajan-Pijay and Northeast contributed to more than two-thirds of the GDP of Aceh province. While the South-West and Central-Inland accounted for less than one-third of the provincial GDP. Economic concentration occurs in the region Basajan-Pijay and the Northeast, which consists of 11 districts/cities. While the South-West and Central-Inland covers 12 districts/cities contribute little to the provincial GDP.

The trend of GDP per capita growth in Aceh is still dominated by the Northeast region, followed Basajan-Pijay as the second, then the Middle-Inland region ranked the third, followed by the Southwestern region in the next ranking. Middle-Inland and Southwestern rural under the Provincial average. The average GDP per capita was dominated by the North-East region, which is Rp. 5,929,786, next Basajan-Pijay region of Rp. 5,828,734, followed by the Central-Inland region of Rp. 4,634,749 ranked the third, and the South-Western region with a number of Rp. 4,425,794 in the last ranking. Still it is clear that the region of Central-Inland and South-West outback shows GDP per capita below the Province, namely Rp. 5,204,765, while the North-Eastern region and Basajan-Pijay was above the Provincial average.

To assess the level of social welfare of district/city regions in the Province of Aceh, the most appropriate indicator used is the HDI. This seems that the most accurate index used to analyze the economic development disparity between regions as variables to consider social and economic development as a means of measuring the success of human resources in the area.

The highest HDI in the area of Basajan-Pijay with a range of 66.39 points in 2000 to 74.21 in 2010, with an increasing trend, followed by the North-East region with a range of 61.52 index in 2000 to 72.80 in 2010 in the second ranking. Furthermore, the Middle-Inland region with index numbers ranges 60.76 in 2000 to 71.03 in 2010 as the third. While the South-West region as the last ranking has a magnitude index of 66.67 in 2000 and 69.62 in 2010. The two last areas still under the Provincial index level ranging from 60.60 in 2000 to 71.03 in 2010.

Several researches have been conducted investigating the economic growth disparity. Ramakrishnan and Cerisola (2004) conducted a research on "Regional Economic Inequality in Australia" by using the theory of the labour market and the multiple regression model of the unemployment rate as the dependent variable, differences in productivity and wages, transfers per labour force participation, and the unemployment rate average of the previous year as the independent variable. They found that the average growth of income per capita of the population of South Australia (1.4%), Tasmania (1.2%), and Northern Territory (1.4%) was below Australia's national income per capita, which was 1.9%. Similarly, the unemployment rate of South Australia (7.97%), Western Australia (7.17%), and Tasmania (9%), was above the Australian average, by 7%, was based on the data collected during 1990 - 2001. This showed that severe economic inequality occurred in the area of Tasmania, because the per capita income of the region is under the national per capita income and the unemployment rate is above the national unemployment rate. It means that the increase in real wages, productivity, and increased transfer spending will reduce the unemployment rate, so it will slowly reduce inter-regions economic disparities.

Meliciani (2006) investigated the difference (disparity) income and employment in the European region and produced two main conclusions. Firstly, the disparity has decreased since the last 1990s. Secondly, the disparity decreases when observed by entering the labour productivity of the income per capita.

Ezcurra (2007) examined the relationship between income inequality and economic growth in some regions of European Union countries in 1993-2002 periods, using household panel data of the European Economic Community. Taking into account the effects of spatial and spatial econometric model estimation, the study showed that variation of income was negative when compared with the level of regional economic growth. This finding can be the fact for alternative specifications explanatory variables, such as income per capita, sector composition of economic activity, human capital, population density, and market potential. The result of this study showed that there is a negative correlation between the imbalance of income (inequality) and economic progress in the region.

Ciriaci (2008) conducted an empirical study on "Regional economic disparities and migration labour force with higher education (Brain Drain)" in Italy using the growth theory of Harrod and Leon. The model used was the rate of growth of labour supply (the multiple regression equation includes labour mobility experts or *brain drain* as the independent variable). The results showed that skilled labour migration (brain drain) of the south to the north of Italy has increased very sharply from 23.5% in 1998 to 39.5% in 2004. Displacement of labour has encouraged economic disparity in the South (backwash effect) and the concentration of economic activity (spread effect) in Northern Italy because of the cumulative causation effects as proposed Myrdal.

Based on the above research background, it appears that the district/city in the region and Basajan-Pijay and Northeast make greater contribution to provincial GDP when compared to districts/cities in the South-West and Central -Inland. It also raises some questions in this study as follows:

1. What is the cumulative effect caused by economic growth of Basajan-Pijay region, Northeast, South-West, and Central-Inland in the Aceh Province?
2. Do GDP per capita, the concentration of economic activity areas, Human Development Index, the labour productivity of the region, the allocation of public investment, and the accessibility of the area without entering the cumulative effect of the growth variable region affect the economic growth disparity among the regions in the Province of Aceh?
3. Do GDP per capita, the concentration of economic activity areas, Human Development Index, the labour productivity of the region, the allocation of public investment, and the accessibility of the area by including the cumulative effect of the growth variable region affect the economic growth disparity among the regions in the Province of Aceh?

Review of the Literature

Neoclassical Theory of Regional Economic Growth

The neoclassical model draws regional economic experts' attention because it contains the theory of mobility factor. Implications of perfect competition for capital and labour will move, if there is remuneration of different factors. Will have current capital of the region that have a high cost level to regions with lower cost levels because it provides higher income (return). Labour force that lost jobs will move to other areas that have a new job as a stimulus for growth in the area (Adisasmita, 2005).

Theoretically, North (1990) initially raised the problem of growing disparities between the regions in his analysis of the neoclassical growth theory. The theory discussed a prediction about the relationship between the level of a country's national economic growth and neoclassical inter-regional development gaps. Other theory known as the Kuznets inverted U hypothesis (Reserve or Inverted U-shape Curve), said that the growth disparities between regions is likely increase to the disparities reached a peak. If the development process continues, the regional disparities gradually decreased (Sjafrizal, 2008).

In the developing countries, the disparities generally tend to increase between regions, whereas in developed countries the disparities tend to lower. This is due at the time of new construction starts, opportunities and development opportunities exploited by the developed regions, while the underdeveloped areas are less able to carry out this opportunity due to limited human resources, facilities/infrastructure, and social factors other cultures, so that not much significant progress. The result is likely to widen the disparities between regions (Sjafrizal, 2008).

In short, neoclassical regional growth model explains the real reasons why some areas have a strong competitive advantage and some other areas have failed. Neoclassical found in the long-term economic growth will always appear countervailing forces that can cope with imbalances and irregularities to restore a stable equilibrium and thus no need for active government policy interventions.

Cumulative Causation Theory

Based on the principle of cumulative causation, it can be explained that the cumulative causation effect occurs based on the power of the "spread effect" and "backwash effect". Spread effect is any force towards convergence between rich areas and poor areas, while the "backwash effect" is the flow of resources from poor areas to rich areas because of low-income elasticity, capital, and skilled labour migration to the rich. Myrdal believes that the spread effect is certainly smaller than the backwash effect due to increasing economic imbalances between developed regions and backward regions (Fujita, 2004).

Capital can be transferred by individuals or companies through inter-regional financial institutions very quickly. Capital flow is part of the balance to optimize growth between regions. Physical

capital can move individually as long as it has economic value. The transfer of physical capital was moved or sold with it first and then transferred in the form of money as if physically moved (Nugroho and Dahuri, 2004).

Flows of interregional capital theoretically affect the amount of investment risk. Capital will flow to areas that have a low level of investment risk, infrastructure, economic conduciveness, and favourable investment experience. In contrast, investment flows can be inhibited even in areas with high growth rates. This is due to non-economic factors, such as political instability, institutional weakness, the behaviour of economic actors who put personal gain, and high transaction costs due to differences in distance (Nugroho and Dahuri, 2004). This contributes to a cumulative effect on regional economic growth. Myrdal theory of cumulative causation stated that the backwash effects (divergent process) larger than the spread effects (convergence). To reduce the disparities (backwash effect) is not necessarily to be determined by the market mechanism, but through local government economic policy in minimizing the disparity.

Factors Affecting the Regional Economic Inequality

There are several key factors that led to the economic disparities between the regions of which can be classified as follows: 1) differences in the quantity and quality of production factors such as land owned, infrastructure, labour, capital, and enterprise organizations; 2) accumulation of various factors vicious circle of poverty (cumulative causation of poverty propensity); 3) influence spread and backwash effect; and 4) market distortions such as immobility, pricing policy, specialization constraints, limited manpower skills, and so on.

There have been several factors that cause the development disparity among regions, such as the concentration of economic activity, mobility of goods (trade), the factors of production between regions, and the allocation of investment (public and private) among regions. In addition, the policy pursued by an area can also affect regional economic development disparities (Sjafrizal, 2008).

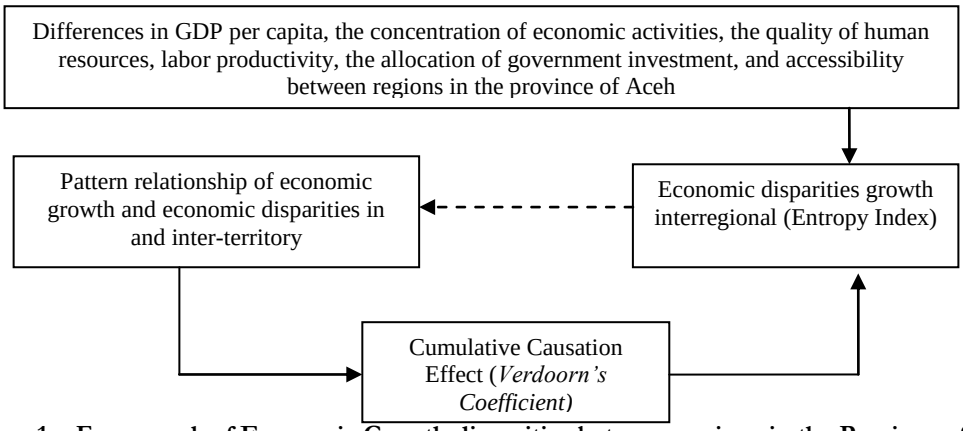

Figure 1. Framework of Economic Growth disparities between regions in the Province of Aceh

What can affect labour productivity disparity due to increased productivity, economic growth and an increased in prosperity led to decrease. Level of education as human capital variables included in the model can explain the phenomena of economic growth per capita income disparities contributing to economic growth and the reduction of inequalities. That is, the level of education can spur local economic growth accelerated to speed up the convergence.

Areas with higher levels of education tend to have better labour productivity as well as encourage the improvement of employment and economic growth in the developing region. Conversely, if a particular area of education levels is low, resulting in low labour productivity making it less attractive for investment causes economic growth in the region will be lower.

Methodology and Data

This study used panel data (time series and cross section) for 11 years, spanning from 2000 to 2010 of the districts/cities of Basajan-Pijay region, North-Eastern, Central-Inland, and South-West of the 23 (twenty three) districts/town in Aceh. Thus, this study has 44 observations (11-year period multiplied by 4 regions of Basajan-pijay, Northeast, South-West, and Central-Inland.

The data used in this study is a secondary data which was collected from various agencies/institutions related to the problems studied, among others; Indonesian Statistics Agency (Badan Pusat Statistik), National Development Planning Agency (Badan Perencanaan Pembangunan Nasional), Aceh Development Board, Revenue Management Agency and the Governor Office, and Bank Indonesia, the central bank of Indonesia.

To measure the economic disparities among regions, this study used Theil Entropy Index with the following formula:

$$I(y) = \sum_{i=1}^{N} y_i \log \frac{y_i}{N} \quad \text{.....(1)}$$

where I (y) is the entropy of the overall index on regional disparities in the province of Aceh, y_i is the GDP per capita region i to the total GDP per capita in the province of Aceh, and N is the total number of districts/cities in Aceh province. To measure the economic development gap between regions (Basajan-Pijay, Northeast, South-West, and Central-Inland) in Aceh Province, the study adopt the formula introduced by Kuncoro (2007) as below:

$$I(y) = \sum_{r=1}^{R} y_i \, \mathrm{Ln} \frac{Yr}{(Nr/N)} + \sum_{r=1}^{R} Yr \left(\sum_{iEr} y_i \, \frac{y_i}{Yr} \, \ln \frac{y_i / Yr}{Nr} \right) \quad \text{.....(2)}$$

where Y_r is the GDP per capita across districts/cities in region r, N_r is the number of districts/cities in region r, and R is the total number of regions in the Province of Aceh.

While to analyze the cumulative effects caused by economic growth between regions, the study used the cumulative effects model following (Soukiazis and Madaleno, 2007):

$$r_{it} = \alpha + \lambda(g)_{it,} \quad \text{.....(3)}$$

where: r_{it} is the rate of growth of labour productivity, g_{it} is the GDP growth rate in region i in year t, α is a constant or the autonomous growth of productivity, while λ is the verdoorn coefficient or the elasticity of labour productivity growth with respect to output growth (Verdoorn's coefficient).

The cumulative effects model can then be expressed in a simple form by using the linear equation (McDonald, 1997). Mathematically it can be formulated as follows:

$$r = a + bY \quad \text{.....(4)}$$

Where: r is the growth rate of labour productivity, a is a constant, b is the Verdoorn coefficient, while Y is the level of regional economic growth. This is due to the agglomeration and increasing returns to scale are greater if there is an increase in economic growth between regions. While the level of efficiency wage formula is used:

$$w = c - dr \quad \text{.....(5)}$$

Where: w is the wage rate of growth efficiency, c is a constant, while d is the estimated coefficient.

Furthermore, to evaluate the relationship between regional economic growths with the level of real wages, the study uses the following equation:

$$Y = e - fw \quad \text{.....(6)}$$

Substituting equation (4) and (5) to equation (6), the following formula can be rewritten:

$$Y_{t+1} = e + f(ad - c) + bdfY_t \quad \text{.....(7)}$$

Equation (7) can then be simplified:

$Y_{t+1} = gY_t + h$.....(8)

Where: g = bdf and h = e + f (ad - c). Because positive numbers b, d and f is negative then g> 0. Equilibrium growth rate (Y_e) can be obtained on condition that: $Y_e = Y_t = Y_{t+1}$ in equation (3.8) to obtain:

$$Ye = \frac{h}{1-g} = \frac{e + f(ad - c)}{1 - bdf} \quad \text{.....(9)}$$

From equation (9), the following formula was derived:

$Y_t = (Y_0 - Y_e)gt + Y_e$.....(10)

Where Y_0 is the region's economic growth rate in the early stages. A condition for the growth effect is cumulative: g>1 and $Y_0 > Y_e$, so $Y_e > 0$, then g>1, h<0 or g<1, h>0. If $Y_0 > Y_e$ and g<1, h<0, which means no cumulative effects occur, but moves towards equilibrium. This indicates that before reaching the point of equilibrium, g>1 and h<0, there is no cumulative effect (spread effects) on regional economic growth so that the gap tends to shrink (converge). Conversely, if g<1 and h>0, there will be a cumulative effect (backwash effects) in the area so that the gap tends to widen or diverge.

As for the relationship between regional inequality and economic growth is not linear; the regression equation can also be done in the form of nonlinear functions. Thus, the equation can be used to analyze the dominant factor of development disparity between regions (Sjafrizal, 2008), as follows:

$I(y) = \theta Y_c^{\beta} (LQ)^{\gamma M \delta} I^{\pi}$.....(11)

Equation (3.11) can be analysed by the regression with logarithmic transformation, as follows:

$I(y) = \text{Log}\theta + \beta \text{Ln} Y_c + \gamma \text{Ln} LQ + \delta \text{Ln} M + \pi \text{Ln} I + \varepsilon$ .....(12)

where I(y) is the entropy index, Y_c is GDP per capita, LQ is the concentration of economic activities of the area, M is the migration of labour (in percent), I is the allocation of investment (in percent), and θ, β, γ, δ, π, is the regression coefficient. While ε is the error terms.
Panel data model used in this study are:

$Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it}$ i = 1, 2, ...n; t = 1, 2, ...(13)

To estimate the parameters with panel data model, several techniques are used such as: multiple regression model of panel data (Pooled Least Square), *Fixed* Effects Model and Random Effects Model. To test hypotheses of the factors that affect regional economic disparities among regions, excluding and including variable of the cumulative causation of the growth of the region, the model equation (3.13) is modified and developed into a multiple regression model of the panel data, as follows:

$\text{LnI}(y)_{it} = \text{Ln}\alpha_0 + \alpha_1 \text{LnPc}_{it} + \alpha_2 \text{LnEC}_{it} + \alpha_3 \text{LnHDI}_{it} + \alpha_4 \text{LnPL}_{it} + \alpha_5 \text{LnGAF} + \alpha_{6\text{Ln}} \text{SAF}_{it} + \alpha_7 \text{LnAcc}_{it} + \alpha_8 \text{LnY}_e + \varepsilon_i$ .....(14)

Where: $I(y)_{it}$ is the economic growth gap of region i in year t, Pc_{it} is the GDP per capita of region i in year t; EC_{it} is the concentration of economic activities of the region i in year t; HDI_{it} is the Human Development Index of region i in year t; PL_{it} is labour productivity region i in year t; GAF_{it} is the general allocation fund region i in year t; SAF_{it} is the special allocation fund of region i in year t; Acc_{it} is the accessibility of region i in year t which is measured by the path length per unit area; Y_e is the rate of growth of cumulative effects area; α_0 is a constant, and α_1 - α_8 is the estimated coefficients; and ε_{it} is the error term.

The assumptions used in the fixed effect model is that the study of functionally identical analysis. The purpose to use this model is to identify and generalize other populations. Fixed effect model can be written as follows:

$$Y_{it} = \alpha_i + x^j_{it}\beta j + \sum_{r=1}^{n} \alpha_i D_i + \varepsilon_{it} \quad \text{.....(15)}$$

where Y_{it} is the dependent variable, α_i is the intercept, x^j_{it} is the independent variable, βj are parameters, and ε_{it} is the error term.

Meanwhile the adoption of random effect model is to infer interval of scenario/ simulation. In this model, narrowly defined population, not to predict other populations and limited the usefulness of the analysis. This model can be written as follows:

$$Y_{it} = \alpha + x^j_{it}\beta j + \varepsilon_{it} \quad \text{.....(16)}$$
$$\varepsilon_{it} = \mu_i + \nu_t + \omega_{it} \quad \text{.....(17)}$$

Where: $\mu_i \sim N(\Theta, \delta\mu^{2})$ is the *cross section* error component, $\nu_t \sim N(\Theta, \delta\mu^{2})$ is the component of *time series,* and $\omega_{it} \sim N(\Theta, \delta\mu^{2})$ is the *error term* component combinations both.

Results and Discussion

Growth Cumulative effect Inter-region

The relationship between labour productivity and economic growth among the regions is reported in Table 1 based on the findings from the Pooled Least Square (PLS), Fixed Effects Model, and Random Effect Models.

Table 1. Results of relationship between labour productivity and economic growth among the regions: Model comparison

Variables	PLS	Fixed Effect Model	Random Effect Model
Constants	-3.69***	-3.47***	-3.60***
	(-3.88)	(-3.54)	(-3.23)
Economic Growth	0.95***	0.90***	0.93***
	(7.07)	(6.43)	(6.90)
R^2	0. 54	0.57	0.51
R^2Adjusted	0.53	0.52	0.50
DW	2.39	2.41	2.35

Note: *** indicates significant at 1% level. The figures in parentheses show the t-value.

From Table 1 and based on the results of diagnostic Chow Test and Hausman Test, we conclude that the estimation using the fixed effects model is better than the Pooled Least Square (PLS) and Random Effect Model. Results of regression relationships between GDP growths and labour productivity among regions can be rewritten as follows:

$$r_{it} = -3.47 + 0.90Y_{it}$$

Using the Fixed Effect Model, the coefficient of verdoorn, a was found to be 0.90. This means that for every increase in 1% of economic growth in a region causes labour productivity to grow by 0.90%. This indicates that the elasticity of labour productivity growth with respect to output growth is inelastic (less than one), while the growth of autonomous productivity (constant) was -3.47%.

The relationship between wages and labour productivity area was also investigated using Pooled Least Square (PLS), Fixed Effects Model and Random Effect Model, where the results of these relationships was reported in Table 2.

Table 2. Results of the relationship between wages and labour productivity among regions: Model comparison

Variables	PLS	Fixed Effect Model	Random Effect Model
Constant	920,747***	926,420	923,331**
	(17.4)	(17.30) ***	(13.03)
Productivity Growth	38,102.4**	31,536.3*	35,112**

	(2.32)	(1.83)	(2.13)
R^2	0. 51	0.61	0,48
R^2Adjusted	0.49	0.48	0,47
DW	1.48	1.95	2.04

Note: ***, **, and * indicate significant at 1%, 5 % and 10% levels, respectively.
The figures in parentheses show the t-value.

From Table 2 and based on the results of the diagnostic Chow Test and Hausman Test, the study found that the Pooled Least Square (PLS) provided better estimation than the fixed effect model and Random Effects Model. Results of regression relationships between labour productivity growths and wages of labour among regions can be shown by the following estimated equation.

$$w = 920{,}747 + 381{,}02r_{it}$$

Furthermore, results of the relationship between economic growth and the rate of wage growth rates between regions based on the Model Pooled Least Square (PLS), Fixed Effects Model, and Random Effect Model can be seen in Table 3.

Table 3. Results of relationship between economic growth and wage growth among regions: Model comparison

Variables	PLS	Fixed Effect Model	Random Effect Model
Constant	-22.43***	-22.43***	-22.43***
	(-200.41)	(-188.38)	(-198.75)
Wage Rates	0.000028***	2.83***	2.83***
	(243.36)	(228.64)	(241.90)
R^2	0.99	0.99	0.95
R^2Adjusted	0.99	0.99	0,94
DW	2.39	2.44	2.24

Note: *** indicates significant at 1% level. The figures in parentheses show the t-value.

From Table 3 and based on the results of diagnostic Chow Test and Hausman Test, the study found that the Pooled Least Square (PLS) provided better estimation than the fixed effect model and Random Effects Model. Results of regression relationships between the growth rates of wages and the GDP growth among regions showed significant results.

$$Y_{it} = -22.43 + 0.000028W_{it}$$

Finally, to analyze the equilibrium rate of economic growth between regions, the study also used *Pooled Least Square (PLS), Fixed Effects Model,* and *Random Effect Models* where the results are shown Table 4.4. Based on Table 4.4 and the diagnosis of Chow Test and Hausman Test, the study found that the fixed effect model provided better estimation than the Pooled Least Square (PLS) and Random Effects Model. The cumulative effect of the balance of growth among regions can be shown by the following estimated regression:

$$Y_{te} = 0.30g + 3.65$$

Table 4. Results of the balance economic growth rates inter-region: Model comparison

Variables	PLS	Fixed Effect Model	Random Effect Model
Constant	3.46***	3.65***	3.69***
	(4.16)	(4.17)	(3.44)
Economic Growth Rate	0.34**	0.30*	0.89*
	(2.31)	(1.65)	(1.96)
R^2	0.12	0.15	0.08
R2Adjusted	0.10	0.14	0,06
DW	2.17	2.15	2.07

Note: ***, **, and * indicate significant at 1%, 5 % and 10% levels, respectively.
The figures in parentheses show the t-value.

From the fixed effects model, the study found that the balance of the growth coefficient was 0.30. This indicates that for every 1% increase in growth of the previous year led economy to grow the current year by 0.30%, while the magnitude of the constant of 3.65. Since the value was g<1 and h>0 this implies that there is a cumulative effect between regions in the Province of Aceh, but it moves towards equilibrium.

Factors of Affecting the Interregional Economic Growth Disparities (Excluding and Including Variable Cumulative Effects Area)

Table 5 showed that based on results of the Hausman Test and Chow test, the estimated results based on fixed effects model is found to be better than the results from the Pooled Least Square (PLS) and Random Effect. Results of multiple regression using the program Gretl-Panel Data for the influence of the Human Development Index (HDI) and the concentration of economic activities (LQ) region on economic growth disparities between regions, without including the cumulative effects of growth, are as follows:

$$LnI(y) = 0.44LnEC_{it} - 3.50\ LnHDI_{it}$$

Table 5. Results of variables affecting economic growth disparities inter-region (Excluding and Including Cumulative Effects)

Variables	PLS		Fixed Effect Model		Random Effect Model	
Constants	-55.48	-5 2.63	0.92	-7.67	-55.48	-52.63
	(-9.52)***	(-9.06)***	(0.09)	(-2.26)**	(-13.79)***	(-12.53)***
Ln Yc	4.81	4.86	0.60	1.28	4.81	4.86
	(10.10)***	(10.57)***	(0.86)	(2.93)***	(14.63)***	(13.02)***
Ln EC (LQ)	-0.12	-0.21	0.44	0.31	-0.12	-0.21
	(-0.84)	(-1.46)	(2.92)***	(1.96)*	(-1.21)	(-2.13)**
Ln HDI	-1.22	-2.04	-3.50	-3.36	-1.22	-2.04
	(-0.88)	(-1.46)	(-2.87)***	(-3.23)***	(-1.28)	(-1.69)
Ln PL	-1.42	-1.43	0.59	0. 32	-1.42	-1.43
	(-3.93)***	(-4.10)***	(1.24)	(0.55)	(-5.69)***	(-4.40)***
Ln GAF	-2.29	-2.30	0.08	-0.19	-2.29	-2.30
	(-8.88)***	(-9.24)***	(0.19)	(-1.10)	(-12.86)***	(-12.45)***
Ln SAF	0.57	-0.53	-0.04	-0.02	0.57	-0.53
	(3.85)***	(-3.70)***	(-0.26)	(-0.32)	(5.57)***	(-7.48)***
LnAcc	-0.05	-0.08	-0.02	- 0.06	-0.05	-0.08
	(-0.43)	(-0.72)	(-0.29)	(-0.83)	(-0.62)	(-0.66)
Ln Y_e	-	0.16	-	0.090	-	0. 16
		(1.91)*		(2.79)***		(2.11)**
R^2	0.94	0.95	0.98	0.98	0.57	0.23
R^2 Adjusted	0.93	0.93	0.97	0.98	0.54	0.17
DW	1.75	1.64	1.83	1.99	1.23	1.32

Note: ***, **, and * indicate significant at 1%, 5 %, and 10% levels.

From Table 5, the results of Chow Test and Hausman Test showed that the estimates using fixed effect model is found to be better than the Pooled Least Square (PLS) and Random Effect Model as obtained by the significance of Hausman test at the 1% level, indicating the rejection of H_0, Fixed effects model. Results of multiple regression using the program Gretl Using Panel Data showed that the effects of GDP per capita, the concentration of economic activities, Human Development Index (HDI), and growth cumulative effect on economic growth disparities among regions by including the cumulative effect of the regional growth could be represented by the following estimation:

$$LnI(y)_{it} = -7.67 + 1.28Yc_{it} + 0.31\ LnEC_{it} - 3.37LnHDI + 0.09\ LnYe$$

Based on the Fixed effects model, the GDP per capita, regional economic concentration, Human Development Index, and the cumulative effect of the growth areas were found to affect significantly the economic growth disparity among regions in the Province of Aceh. While the productivity of the region, the General Allocation Fund (DAU), Special Allocation Fund (DAK), and the accessibility of the area were insignificant in affecting the economic growth disparity. Interestingly, one of the causes of the

development disparities among regions was the cumulative effects of their growths, where these variables can increase the gap by 0.09% if the cumulative effect of the regional growths increased by 1%.

Outcome disparities between regions in the Province, from the results of the regression coefficient of verdoorn (0.90) showed to be inelastic mean (divergence), as well as the cumulative effect of the area showed constant (h) of 3.65 and a coefficient (g) of 0.30 to qualify for divergence. The dominant factors affecting the disparities without the cumulative effect of the variable were the concentration of economic activity among regions and HDI that affected the disparity positively and negatively, respectively. By entering the cumulative effect of the variable into the model, HDI turned to be negative, while the growth of inter-regional cumulative effects alone and GDP per capita become positive. Thus, this implied that the economic disparities among regions have the potential for convergence if and only if there is intervention through government policies in reducing disparity.

Our finding to some extent were in harmony with the following previous studies. Ramakrishan and Cerisola (2004) found that the regional economic disparities among regions in Australia have declined due to the increase of real wages, labour productivity, and transfer spending. Meanwhile, Meliciani (2006) documented that the economic disparities in the region of Europe has decreased when the labour productivity of the income per capita was considered in the estimation. In addition, Ezcurra (2007) found that the income inequality in some areas of the European countries during the 1993-2002 period was caused by the differences of sector composition of economic activities, human capital, and population density. Finally, Ciriarici (2008) proved that regional economic inequality has increased sharply in the Southern Italy due to the displacement/mobility of skilled labour (brain drain) in the region. Labour movement has caused the "backwash effect" in the Southern Italy and the concentration of economic activity (spread effect) in the Northern Italy.

Unlike the above previous highlighted studies, this study attempted to enrich the model of economic growth disparities among regions by considering the Human Development Index (HDI) and the region cumulative causation growth. We found that the HDI could significantly reduce the economic disparities among regions. Similarly, the cumulative effect of the growth has also caused the existence of disparity among regions in Aceh.

Conclusions and Recommendations

This study investigated the extent of cumulative causation effect on economic growth disparity across the regions: Basajan-Pijay, Northeast, South-West, and Central-Inland in the Aceh Province, Indonesia. It also includes some others factors in determining economic growth disparity such as Gross Domestic Product (GDP) per capita, the concentration of economic activity areas, Human Development Index (HDI), the labour productivity of the region, the allocation of public investment as well as the accessibility among regions in the Aceh Province. To capture the goals of this study, it uses panel data during the period 2000 to 2010 consisting of 23 districts/cities of Aceh Province.

The study found that the cumulative effect of inter-regional growth in the Province of Aceh has been in the process of convergence, but it has not reached the point of convergence fully. Without including a cumulative effect of the growth in the model, the study documented that the regional economic concentration, which was measured by LQ and the Human Development Index (HDI) has significantly affected the economic disparities among the regions in the Province of Aceh. While GDP per capita, regional productivity, the General Allocation Fund (DAU), Special Allocation Fund (DAK), and the accessibility of the area were found to be insignificant. Thus, the only significant variable that could reduce economic disparities among regions was the cumulative effect of the Human Development Index (HDI).

On the other hand, when the cumulative effect of the growth variables was included in the model, the GDP per capita, regional economic concentration, Human Development Index (HDI), and the cumulative effects of growth among regions were found to significantly affect the regional economic disparities in the province of Aceh. Meanwhile, the productivity of the region, the General Allocation Fund (DAU), Special Allocation Fund (DAK) and the accessibility of the area was found to be insignificant. The only variables that can reduce economic disparities among the regions in the Province was the HDI variable and cumulative effects of growth among regions.

References

Adisasmita, H.R. (2005). *"Region Economic Basics"*. Graha Science Publishers. Yogyakarta.

Ciriaci, D. (2008). "Regional Economic Disparities and Brain Drain: the case of Italy". *Journal of Rivista Economica del Mezzogiorno*. No. 3, pp. 1-4.

Ezcurra, R. (2007). "Is Income Inequality Harmful for Regional Growth? Evidence from the European Union". Limited Urban Studies, Published by Sage.

Fujita, N. (2004). "Gunnar Myrdal's Theory of Cumulative causation Revisited". *Economic Research Center Discussion Paper*. No. 137.

Knowles, R. And J. Wareing. (1994). "Economic and Social Geography". Mad Simple Books. London.

McDonald, J.F. (1997). "Fundamentals of Urban Economics". Prentice-Hall Inc. New Jersey.

Meliciani, V. (2006). "Income Disparities and employment in the EU: The role of national and spatial factors". *Regional Studies*. Vol. 40, No. 1, pp. 75-91.

Myrdal, G. (1976). "Rich Nations and Poorer Nations". Translation by Paul Sitohang: Gramedia. Jakarta.

North, D. C. (1990). "*Institutions, Institutional Change and Economic Performance"*. Cambridge University Press. Cambridge.

Nugroho, I. and Rochmin Dahuri. (2004). "Development Region: Perspectives on Economic, Social and Environmental". Publisher LP3ES Library. Jakarta.

Ramakrishnan, Uma and Martin Cerisola (2004). Regional Economic Disparities in Australia, International Monetary Fund Working Paper, August 2004.

Sjafrizal. (2008). Regional Economic: Application and Theory. Penerbit: Baduose Media. Padang – Sumatera Barat.