# The Analysis of the Economic Inequality of the Coast Regions

## Yulhendri[1⊠], Inaya Sari Melati[2], Jean Elikal Marna[3], Weni Softazia[4]

[1,3,4] Economics Faculty, Universitas Negeri Padang
[2] Economics Faculty, Universitas Negeri Semarang

| Article Information | Abstract |
|---|---|
| | West and East coast of Sumatra are two different geographical and trade routes. The West Coast is connected with trade direction to India, Arabia and Africa while on the East Coast it is connected with trade in the Malacca Strait, East Asian economy. Based on photos of satellite images at night, the east coast has more light compared to the west coast. This study analyzed the differences in economic inequality between the economy of the population residing in the West Coast Region and the East Coast of Sumatra. This study took data sourced from the Indonesian Central Statistics Agency published in the last 5 years, 2013-2017. The data were processed using SPSS and Excel using the Williamson Index analysis tool. There are 23 Regencies / Cities in the West Coast and 23 Regencies / Cities in the East Coast analyzed where the West Coast average growth rate in the last 5 years is 5.17% and East Coast 5.48% with the Inequality index using the Williamson Index formula in West Coast 0.37 and East Coast 0.28. It was found that economic activity on the East Coast tends to be more lively and higher economic growth with a low level of inequality compared to the West coast of Sumatra |

⊠Corresponding author :
Jalan Prof. Dr. Hamka AirTawar, Padang,
West Sumatera
E-mail: yulhendriunp@gmail.com

**INTRODUCTION**

Sumatera is one of Indonesia's largest islands consisting of 10 provinces, namely Aceh, North Sumatera, West Riau, Jambi, Riau islands, Bengkulu, Bengkulu, Bangka Belitung islands, and Lampung. Each province and region has different characteristics of natural resources, population, and geography that influence its own economic region development. These differences will also result in the differences in economic characteristics, and growth of achievements in each region. That is why it is normal that regional development can be unequal. This inequality affects the level of a region economic growth. That is why economic inequality exists in every region.

Regional income of known as Gross Regional Domestic Product (GRDP) is one of instruments to measure population welfare in a region by which whenever the GRDB of a region is high, the population welfare will be high as well, and vice versa. The following table 1 contains the average of the GRDB per capita growth rate of current prices based on islands in Indonesia within 2013-2017.

**Table 1. PDRB Growth Rate Based on Constant Prices by Islands in Indonesia in 2013-2017**

| No | Islands | PDRB Growth Rate (%) | | | | |
|----|---------|------|------|------|------|------|
| | | 2013 | 2014 | 2015 | 2016 | 2017 |
| 1 | Sumatera | 4.95 | 4.60 | 3.53 | 4.29 | 4.30 |
| 2 | Java | 6.01 | 5.57 | 5.48 | 5.60 | 5.61 |
| 3 | Bali, Nusa Tenggara | 5.95 | 3.90 | 10.42 | 5.92 | 3.73 |
| 4 | Kalimantan | 3.95 | 3.37 | 1.38 | 2.02 | 4.33 |
| 5 | Sulawesi | 7.69 | 6.87 | 8.19 | 7.43 | 6.99 |
| 6 | Maluku dan Papua | 7.71 | 4.54 | 6.28 | 7.40 | 4.89 |

(Source: Indonesia Central Statistics Agency (BPS), 2018)

Sumatera island area covers 443,0065.8 $km^2$ areas. It is one of Indonesia largest islands whose economic growth and contribution rank is in the top 2 after Java island. This island has various economic potential and is supported by strategic geographical location that is in synergy with Southeast Asian Economy, namely Malacca Strait and the Andaman sea in India border its north, while Indian Ocean which is the gate to western Indonesia borders. Various and abundant natural resources make Sumatera island suitable for the development of plantation, agriculture, mining, industry, and trade sectors.

Indonesia Presidential Regulation (perpres) number 29/ 2011 on the Government Work Plan in 2012 involves Sumatera island as corridor 1 with the theme as production centers, processing of agricultural products and national energy barns. Sumatera is also set as the economic gateway to the markets of Europe, South Asia, East Asia, Africa and Australia. To do so, the commodities developed in Sumatera are the plantations of palm oil, rubber, and coal (Perpres, 2012). Based on geographical and economic aspects, the West and East coast regions of Sumatera have a greater opportunity to develop than those in Northern and Southern of Sumatera. It is because the Western part of Sumatera is bordered by Indian ocean. Indian ocean is a pretty large trade route in Indonesia, so it will facilitate and expand the trade route of the West coast regions of Sumatera Island. Moreover, Malacca Strait is a strait that is directly connected to the East coast of Sumatera in which this Eastern part of Sumatera is the leading area of economic growth, namely Peninsular Malaysia. Also, since Sumatera island is close to Singapore and Malacca Strait where many economic activities take place, the East coast regions of Sumatera will get advantages to develop its economy.

The PDRB growth rate of regencies and cities in the West coast of Sumatera in 2013-2017 was 5.17 %. The same fluctuation also happened

to the East coast regions, namely 5.48 %. By referring to these data, do the difference in PDRB growth rates of West coast and East coast of Sumatera Island influence the inequality in both regions.

**RESEARCH METHODS**

This article was written based on an empirical study from quantitative data taken from Central Statistics Agency documentation. The data covered 46 regencies/ cities consisting of 23 regencies/ cities in the West coast and 23 regencies/ cities in the East coast Sumatera island within 2013-2017. These data were processed using Williamson index analysis. In addition, the data development from the beginning until the end of study were analyzed using Paired Sample Test statistical method. It was done using SPSS Version 20 and Microsoft Excel software.

The formulation of Williamson index covers number 0-1. Index number 0 (zero) means there is no economic inequality in regencies / cities in the West coast and East coast of Sumatera island, while the index number more than zero indicates inequality between regencies/ cities. The greater the index number means the greater the economic inequality between regencies/ cities.

These indexes help to determine and explain the income inequality condition between regencies/ cities in the West coast and East coast of Sumatera island using Williamson Index analysis.

**RESULTS AND DISCUSSION**

The observation done by Nasa Earth Observatory in 2017 showed human activities seen through the light rays at night. By using National Aeronautics and Space Administration (NASA) satelite image we can see the condition of Sumatera island at night. In this case, the economic activities are determined by the bright light rays in particular areas. However, if the areas are dark or reflect no light it can be said that their economic activities are little, or none.

Whenever there is a little economic activity in particular areas, it can be assumed that the areas have high economic inequality. Oppositely, if there is a lot of economic activity in particular areas, it can be said that the areas have low economic inequality. These are in line with a study by (Ebener, S., Murray, C., Tandon, A., & Elvidge, CC 2005) who confirmed national welfare and output based on data provided by NOAA's National Geophysical Data Center (NGDC) in the form of aerial photographs at night.

These data grid compilation was the result of a resolution composite of 1 km in 6 months based on images collected during October 1994 and March 1995 by the Defense Meteorological Satellite Program (DMSP) and Operational Linescan System (OLS). Another study was conducted by (Sutton, Elvidge, & Ghosh, 2007) about GDP (Gross Domestic Product) of countries such as China, India, Turkey and United States in 2000. Then, (Roychowdhury, Jones, Arrowsmith, & Reinke, 2011) also conducted a study by utilizing the quality of night images in 2001. The following figure 1 is the result of a photograph of Sumatera island at night taken by Nasa Earth Observatory 2017 satellite.

It can be seen that based on figure 1, there is sufficiently bright light in the East coast region of Sumatra Island, while there is no light in the West coast region of Sumatra Island. According to google's study (2017) we can determine the number of economic activity in a region by seeing light in a particular region. If there is bright light, there is a lot of economic activity in the region. Bright light at night may indicate the high of low intensity of community economic activities. In relation to this, the above figure 1 shows that Malaysia and Singapore countries have bright light, meaning that the economic activities in those countries are higher than the other regions that look dim. Similarly, bright light is also seen in the Eastern Sumatera, while the Western looks dim.

Observatory data in 2017 revealed that the difference in the light between the East coast and West coast of Sumatera indicated that there

was economic inequality. In details, this article discusses inequality happened in regencies/ cities in the West coast and East coast regions of Sumatera island. The differences in the economic activities of those regions were somehow caused the economic inequality between the West coast and East coast of Sumatera island. Differences in economic activities of each region made the

growth and development rate of each region different. It was because each region has different potential and advantages, such as skilled labor, technology utilization, soil topography, soil and rocks contents, including differences in supporting infrastructure and also the managerial ability of the regional government to convince investors to invest their shares.
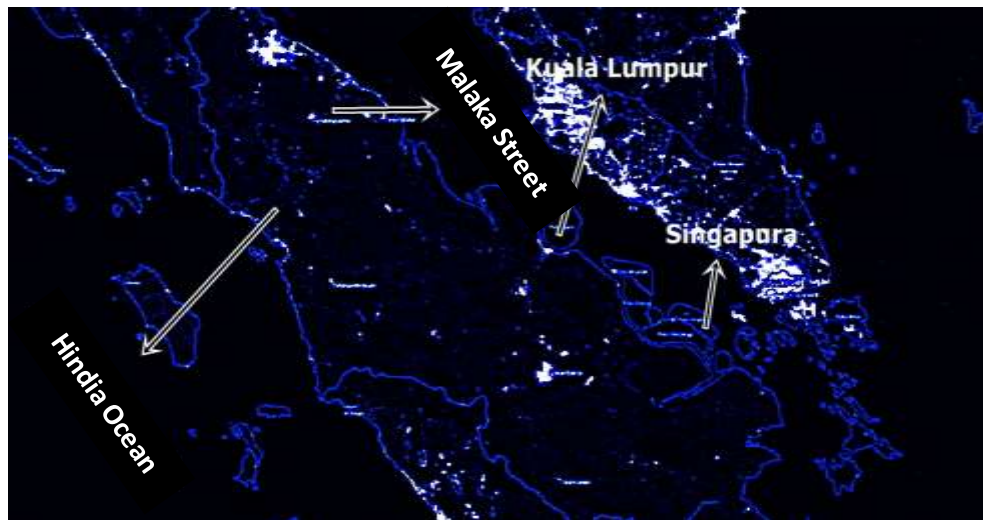


**Figure 1.** Photo of Sumatra Island at Night by Nasa Satellite Imagery
(source: Nasa Earth Observatory data in 2017)

The results of study from Nasa Earth The route owned by the East coast region of Sumatera island is good for increasing economic activities. Since it is located close to Malacca strait, Malaysia and Singapore, the East coast regions gain more advantages than other regions in the West coast of Sumatera because it borders the Indian Ocean. These facts rise an assumption that the economic inequality in the West coast of Sumatera Island would be higher than that of the East coast of Sumatera Island. The high rate of average regional output explains that the economy of this region is high. Accordingly, if the growth of Gross Dpmestic Regional Product (GDRP) of a region is high, its economic growth is also good. However, if the of a Gross Dpmestic Regional Product (GDRP) particular region is low, its economic growth is assumed low. The following table 2 describes the average rate of Gross Dpmestic Regional Product (GDRP) growth on constant price according to regencies/

cities in the West coast and East coast regions of Sumatera Island in 2013-2017. In the last five years, namely 2013-2017 of 23 regencies and cities in Western Sumatera, 13 regencies/ cities economic growth was above the average. Meanwhile, the economic growth of the other 10 regencies and cities were below the average.

The highest economic growth was owned by Padang City, and followed by Mandailing Natal Regency abd Gunung Sitoli. Further, regions which experienced the lowest economic growth were West Aceh Regency, followed by Aceh Jaya Regency, and Aceh Singkil. In addition, Pidie Jaya Regency, Aceh Jaya, and South Tapanuli belonged to regions that gained positive trend changes in the last five years.

Furthermore, the economic growth in the East coast regions was higher than those in West coast regions of Sumatera because the average of economic growth in the West coast regions was 5.48 % in the 2013-2017 period.

**Table 2.** The Regional Output Growth (Constant Prices in 2010) of Regencies / Cities in the West Coast and East Coast Regions of Sumatra Island in 2013-2017 (%)

| No | Provincies | Year | | | | | Average |
|---|---|---|---|---|---|---|---|
| | | 2013 | 2014 | 2015 | 2016 | 2017 | |
| Regions in West and East Coast of Sumatera | | | | | | | |
| 1 | Aceh Jaya | 3.20 | 3.69 | 3.71 | 3.97 | 4.27 | 3.76 |
| 2 | Aceh Barat | 3.90 | 3.36 | 4.58 | 2.92 | 3.15 | 3.58 |
| 3 | South Aceh | 5.32 | 4.51 | 4.23 | 4.64 | 3.93 | 4.52 |
| 4 | Aceh Singkil | 4.49 | 3.72 | 3.72 | 4.16 | 3.98 | 4.01 |
| 5 | Pidie | 4.24 | 4.03 | 4.82 | 3.91 | 4.39 | 4.27 |
| 6 | Pidie Jaya | 4.55 | 3.63 | 4.84 | 3.70 | 5.80 | 4.50 |
| 7 | Nias | 6.35 | 5.77 | 5.52 | 5.03 | 5.01 | 5.53 |
| 8 | South Nias | 4.65 | 4.32 | 4.43 | 4.48 | 4.60 | 4.49 |
| 9 | Central Tapanuli | 5.18 | 5.04 | 5.08 | 5.12 | 5.24 | 5.13 |
| 10 | South Tapanuli | 4.43 | 4.44 | 4.86 | 5.12 | 5.21 | 4.81 |
| 11 | North Tapanuli | 5.27 | 5.04 | 4.89 | 4.12 | 4.15 | 4.69 |
| 12 | Gunung Sitoli | 6.22 | 6.07 | 5.79 | 6.03 | 6.01 | 6.02 |
| 13 | Mandailiang Natal | 6.37 | 6.49 | 6.21 | 6.18 | 6.09 | 6.26 |
| 14 | Sibolga City | 5.96 | 5.84 | 5.65 | 5.15 | 5.27 | 5.57 |
| 15 | West Lampung | 6.87 | 5.56 | 532 | 5.01 | 5.03 | 5.55 |
| 16 | South Bengkulu | 6.17 | 5.68 | 5.14 | 5.32 | 5.01 | 5.46 |
| 17 | Bengkulu City | 609 | 6.12 | 6.02 | 6.17 | 5.64 | 6.00 |
| 18 | Mentawai Islands | 5.77 | 5.57 | 5.20 | 5.02 | 5.13 | 5.33 |
| 19 | Pesisir selatan | 5.90 | 5.80 | 5.73 | 5.33 | 5.42 | 5.63 |
| 20 | Padang Pariaman | 6.20 | 6.05 | 6.14 | 5.52 | 5.59 | 5.90 |
| 21 | Padang City | 6.66 | 6.46 | 6.41 | 6.22 | 6.23 | 6.39 |
| 22 | Pariaman City | 6.06 | 5.99 | 5.79 | 5.59 | 5.62 | 5.81 |
| 23 | West Pasaman | 6.40 | 6.04 | 5.70 | 5.33 | 5.35 | 5.74 |
| | TOTAL | 132.03 | 124.52 | 124.93 | 119.31 | 121.13 | 5.17 |

(Source: Central Statistics Agency of Provinces in Sumatra 2018 and processed)

The growth in the East coast regions was 0.35 percent higher than the West coast regions. The highest growth was gained by East Lampung Regency, namely 7.45 %, followed by Batam City, Karimun, and Tanjung Pinang City. Meanwhile, the bottom three economic growth consisted of Beriuen Regency, South Bangka and Langsa.Lingga Regency and Tanjung Pinang City as well as East Lampung were regions which gained positive prospect changes of economic growth in the period of 2013-2017. On the other hand, the regions whose stagnancy were too high were Bintan Regency, Bangka Belitung, and Karimun. In details, the results are presented in the following table 3.

**Table 3.** The Regional Output Growth (Constant Price, 2010) by Regencies / Cities in the West and East Coast Regions of Sumatra Island in 2013-2017 (%)

| GDRP Growth Rate of the East Coast Regions of Sumatera Island in 2013/2017 | | | | | | | Average |
|---|---|---|---|---|---|---|---|
| 1 | Langsa | 4.57 | 4.24 | 4.40 | 4.52 | 4.47 | 4.44 |
| 2 | Sigli City | 5.35 | 5.56 | 5.89 | 5.78 | 5.98 | 5.72 |
| 3 | Beriuen | 4.03 | 4.02 | 4.80 | 4.08 | 4.09 | 4.20 |
| 4 | Rokan Hilir | 4.50 | 4.81 | 4.85 | 4.85 | 4.98 | 4.79 |
| 5 | Karimun | 7.09 | 6.87 | 6.54 | 6.17 | 5.42 | 6.41 |
| 6 | Tanjung Balai | 5.94 | 5.78 | 5.57 | 5.76 | 5.51 | 5.71 |
| 7 | Tebing Tinggi | 6.01 | 5.45 | 5.90 | 5.11 | 5.14 | 5.52 |
| 8 | Bengkalis | 5.25 | 5.85 | 4.74 | 4.44 | 4.77 | 5.01 |
| 9 | Medan City | 5.36 | 6.07 | 5.74 | 6.27 | 5.81 | 5.85 |
| 10 | Lhoksmawe | 5.78 | 5.27 | 5.24 | 5.17 | 5.19 | 5.33 |
| 11 | Bintan | 6.08 | 6.35 | 5.16 | 5.94 | 5.01 | 5.70 |
| 12 | Lingga | 6.88 | 5.16 | 4.38 | 4.09 | 6.41 | 5.38 |
| 13 | Batam City | 7.18 | 7.16 | 6.87 | 5.43 | 6.19 | 6.56 |
| 14 | Tanjung Pinang | 7.78 | 5.28 | 5.70 | 5.05 | 6.64 | 6.09 |
| 15 | Dumai | 5.13 | 5.53 | 6.41 | 6.32 | 6.01 | 5.88 |
| 16 | Bangka | 5.30 | 4.81 | 4.54 | 4.63 | 5.04 | 4.86 |
| 17 | Bangka Belitung | 5.96 | 5.72 | 5.53 | 5.97 | 5.29 | 5.69 |
| 18 | West Bangka | 5.09 | 4.72 | 4.53 | 4.97 | 5.29 | 4.92 |
| 19 | Central Bangka | 4.56 | 4.75 | 4.89 | 4.90 | 4.91 | 4.80 |
| 20 | South Bangka | 4.45 | 4.44 | 4.27 | 4.30 | 4.57 | 4.40 |
| 21 | East Belitung | 5.70 | 5.17 | 5.40 | 5.24 | 5.17 | 5.33 |
| 22 | East Lampung | 8.96 | 6.87 | 6.58 | 7.23 | 7.64 | 7.45 |
| TOTAL | | 133.04 | 126.00 | 123,99 | 122,39 | 125.17 | 5.48% |

(Source: Central Sumatra Province Statistics Agency 2018 and processed)

The following table 4 explains average differences based on Williamson Index calculation of Regencies/ Cities in the West coast regions of Sumatera and the East coast regions of Sumatera in the period of 2013-2017. The average level of inequality of the West coast regions was 0.37 higer than the East coast regions, namely 0.28. By referring to the calculation of William index in table 3, we can see that the West coast and the East coast regions gained different disparity level, so did regency/ city economic equality. In the West coast of Sumatera Island, there were several regencies/ cities categorized in high level of income inequality, such as South Nias City of 0.55, while the lowest economic inequality happened in Padang Pariaman Regency of 0.21. According to standards set by Williamson index if the index of a region is close to one, meaning that it experiences pretty great inequality, while if the index is close to zero, meaning that the inequality in that region is low. The average results of William index calculation showed that the economic inequality of regions in the West coast regions has not been too severe.

**Table 4.** The Calculation Results of the Williamson Index by Regencies / Cities Located in the West Coast and the East Coast Regions of Sumatra Island

| No. | West Coast Regencies/ Cities | Williamson Index | East coast Regencies/ Cities | Williamson index |
|---|---|---|---|---|
| 1 | Aceh Jaya regency | 0.34 | Langsa | 0.42 |
| 2 | West Aceh Regency | 0.36 | Sigli City | 0.48 |
| 3 | South Aceh Regency | 0.47 | Beriuen Regency | 0.29 |
| 4 | Aceh Singkil regency | 0.41 | Rokan Hilir | 0.22 |
| 5 | Pidie | 0.43 | Karimun | 0.28 |
| 6 | Pidie Jaya | 0.44 | Tanjung Balai | 0.36 |
| 7 | Nias | 0.43 | Tebing Tinggi | 0.40 |
| 8 | South Nias | 0.55 | Bengkalis | 0.25 |
| 9 | Central Tapanuli | 0.44 | Pangkal Pinang | 0.24 |
| 10 | South Tapanuli | 0.28 | Medan City | 0.16 |
| 11 | North Tapanuli | 0.46 | Lhoksmawe | 0.14 |
| 12 | Gunung Sitoli | 0.40 | Bintan City | 0.14 |
| 13 | Mandailiang Natal | 0.39 | Lingga Regency | 0.33 |
| 14 | Sibolga City | 0.32 | Batam City | 0.15 |
| 15 | West Lampung | 0.46 | Tanjung Pinang | 0.17 |
| 16 | South Bengkulu | 0.41 | Dumai | 0.19 |
| 17 | Bengkulu City | 0.23 | Bangka Regency | 0.26 |
| 18 | Mentawai Islands | 0.32 | Bangka Belitung | 0.33 |
| 19 | Pesisir selatan Regency | 0.37 | West Bangka | 0.19 |
| 20 | Padang Pariaman | 0.20 | Central Bangka | 0.32 |
| 21 | Padang City | 0.30 | South Bangka | 0.35 |
| 22 | Pariaman City | 0.31 | East Belitung Regency | 0.30 |
| 23 | West Pasaman | 0.25 | East Lampung | 0.43 |
| MEAN | | 0.37 | MEAN | 0.28 |

Source: Williamson index calculation of Regencies / Cities in the West coast regions and the East coast regions, Central Statistics Agency in Provicies throughout Sumatera in 2018, and processed data in 2019)

One of regencies/ cities in the East coast region of Sumatera that gained high index was Sigli City with 0.48 inequality index. Meanwhile, the region that gained low inequality was Bintan Regency of 0.14. These results were interpreted based on the rules of William index calculation that if the average is close to 0, the level of economic inequality of a region is low. In this way, we can see that there were differences in the economic inequality between the West coast regions and the East coast regions of Sumatera Island in 2013-2017

These findings were supported by the facts that the East coast regions are leading in geographical aspect, such as having fertile soil, abundant mining and petroleum products, and strategic location that is near Malacca Strait which is the center for world's trade route, developed countries such as Malaysia, and Singapore. In terms of economy, since the location of East coast regions are near world trade route and developed countries, the regions in the East coast are easy to do economic activities, such as export and import activities to neighboring countries. With many economic activities, communities and economic growth will increase and economic inequality will not occur in a large way. Beside economic activities, natural resources can also reduce economic inequaity of a particular region if they are managed well by good quality human resources. Unfortunately, the West coast regions are dominated by agricultural sector so that there is little economic activities performed there. As a result, the economic inequality of this region was pretty high since agricultural sector has not been able to give significant contribution to optimize community economy in that regions.

**Table 5.** Kolmogorov Smirnov Test Results on the Inequality Index by Regencies / Cities in the West Coast and East Coast Regions of Sumatra Island

| | | Indeks Williamson East Cost Area | Indeks Williamson West Cost Area |
|---|---|---|---|
| N | | 23 | 23 |
| Normal Parameters[a,b] | Average | 0.377 | 0.281 |
| | SD | 0.086 | 0.102 |
| | Absolute | 0.108 | 0.099 |
| Most Extreme Differences | Positife | 0.094 | 0.099 |
| | Negativ | -0.108 | -0.066 |
| Kolmogorov-Smirnov Z | | 0.516 | 0.475 |
| Asymp. Sig. (2-tailed) | | 0.953 | 0.978 |

(Source: Kolmogorov-Smirnov Test Results in spss 20 (data processed in 2019)

The results of Kolmogrov-Smirnov in table 5 shows that the West coast region in 2013-2017 gained Williamson index average probability value of 0.953>0.05, meaning that the data probability was distributed normally. This fact can be seen from the significant value of 0.05. Meanwhile, the East coast regions obtained 0.978>0.05 normality test value in which their probability value was also greater than 0.05, meaning that the data were normally distributed. Therefore, since both data were normally distributed, the researchers performed paired sample T-test.

**Table 6.** Paired Sample T-Test Results on Inequality Index by Regencies / Cities in the West Coast and East Coast Regions of Sumatra Island Paired Samples Test

| | | Paired Differences | | | | | | T | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Standard Deviation | Average Std. Error | 95% Confidence Interval of the Difference | | | | | |
| | | | | | Lower | Upper | | | | |
| Pair 1 | Indeks Williamson The East regions - Indeks Williamson the West coast regions | 0.096 | 0.147 | 0.030 | 0.032 | 0.160 | | 3.120 | 22 | 0.05 |

(Source: Processed Paired Sample T-test Data Results, 2019)

In table 5 we can see that paired sample T-test was performed to data of Williamson index average of the West coast and East coast regions of Sumatera Island. The results showed that there found differences in economic inequaly between the West coast and the East coast regions of Sumatera island. It can be seen from the rules that if ρ value is less than 0.05 then there is a significant difference. Based on the table, the test resulted the significance value of 0.005 < 0.05 meaning that there was a significant difference between the levels of economic inequality in the West Coast regions and the East Coast regions of Sumatra Island in 2013 - 2017.

From 2002 until 2013, if compared to industrial sector, agricultural sector gave the least contribution to the income inequality of Sumatera economic corridor apart from the

contribution of oil and gas. This study is in line with a study by (Etharina, 2004) which concludes that a sector that causes income inequality is industrial sector. Of 5 economic corridors, Sumatera is the economic corridor whose inequality is high compared to the other five corridors. However, the economic growth of Sumatera corridor is better than the economic corridor of Kalimantan and Bali-Nusa Tenggara (Andhiani, Erfit, & Bhakti, 2018).

Based on the collected data, there were differences in the inequality average between the East coast regions and the West coast regions of Sumatera Island. The data of Williamson Index calculation showed that the West coast regions economic inequality was greater than the East coast regions.

The West coast regions of Sumatera gained an average index of 0.38 in the period of 2013-2017, while the East coast of Sumatera gained 0.28. These averages showed that the West coast of Sumatera experienced greater inequality than the East coast of Sumatera.

The differences took place in the economic capacity of the West and the East coast of Sumatera. It is in line with results of a survey done in North Sumatera in 2001 that the West coast of North Sumatera can only contribute 14.89 % to Gross Domestic Regional Product (GDRP), while East coast of North Sumatera can contribute 67.08 % to Gross Domestic Regional Product (GDRP). In this way, the low volume and economic scale in West coast are the cause of the West coast of Sumatera high level of economic inequality. (Tampubolon, 2007)

In 2013 the agricultural sector of the West coast of Sumatera, namely Aceh Darussalam Province contributed 25.93 % to Aceh Gross Domestic Regional Product (GDRP). This number increased to 26.16 % in 2014, and 2015 of 27.63 % or in other words, this sector consistently increased for three years. In addition, processing industry contributed 7,91 % to Aceh Gross Domestic Regional Product (GDRP) in 2013. The number decresed to 7.19 % in 2014, and 2015 of 5.70 % or in other words, this sector continued to decrease for three years. Next, wholesale trade, retail, car and motorcycle

repair sector in 2013 contributed to Aceh's Gross Domestic Regional Product (GDRP) by 14.68 %, in 2014 and 2015 it increased to 15.04 % ,and 15.74 % respectively. This sector gained an increase for three years.

Bangka Belitung Province of East coast of Sumatera Gross Domestic Regional Product (GDRP) contribution to constant prices based on business fields continued to increase from 2010 to 2014 with the average number of 5.57 %. However, its mining sector was fluctuative. On the other hand, Bangka Belitung processing industry tended to increase by 2.89 % in every year. Thus, Bangka Belitung has processing industry sector as the largest Gross Domestic Regional Product (GDRP) contributor by the presence of the tin processing industry and the Bangka industrial area.

Economic inequality differences that happened to the West coast and East coast of Sumatera Island was influenced by differences in geographical structure of each region. The West coast is dominated by agricultural sector, while the East coast is dominated by industrial sector. That is why the community welfare of the East coast of Sumatera Island is better. Additionally, the East coast regions are located near countries whose industrial areas are rapidly developing compared to the West coast of Sumatera. To the West, the West coast only has high seas. Oppositely, the East coast location that is near Malacca Strait as one of the world's dense trade routes gives a lot of advantages because most of business doers locate their industrial business in Riau islands, Bangka Belitung, and East coast of Sumatera. Even though the West coast regions are near Indian Ocean as one of world's trade route, these areas only have few visitors due to the lack of infrastructure. As a result, their geographical location does not really provide benefit for the regencies/ cities.

There were some regions in the West coast whose economic growth was low, but had better gini ratio than others, such as Aceh Jaya Regency, Aceh Besar and South Tapanuli. Meanwhile, the regencies whose economic growth was above the average and gini ratio relatively better than other Western Sumatera

regencies were Sibolga City, Bengkulu City, Mentawai Regency, Pesisir Selatan Regency, Pariaman City, Padang City, and West Pasaman.

**Table 7.** The Categorization of Regencies / Cities in the West Sumatra Region based on Klassen's typology, 2013-2017

| Economic Growth Rate Gini Ratio Index | Above average growth | Below average growth |
|---|---|---|
| Gini Ratio below the average (better) | Sibolga City Bengkulu City Mentawai Islands Pesisir Selatan Pariaman City Padang City West Pasaman | Aceh Jaya Regency Aceh Besar regency South Tapanuli |
| Gini Ratio above the average (worse) | Gunung Sitoli Mandiling Natal West Lampung South Bengkulu | South Aceh Regency Aceh Singkil Regency Pidie Pidie Jaya South Nias Central Tapanuli North Tapanuli |

Source: The Analyzed Data were taken from Tables 2,3 and 4 Data

Regencies. Cities that had growth above the average, but high level of inequality were Gunung Sitoli, Mandiailing Natal, West Lampung, and South Bengkulu. The inequality level of regions in the Eastern Sumatera were relatively better than the West. This is proved by the following Klassen Typology.

The relationship between growth and income distribution can be seen in quadrant 4. The first quadrant consisted of seven regions whose growth was above the average and had better income inequality. Further, there were 5 regencies/ cities categorized as developed regions whose income distribution was not good. Then, the regions whose growth was below the average, but gained good income distribution amounted to 5 regencies and cities. The last, the regions which were lagging and had poor income distributions amounted to 6 regencies/ cities.

**Table 8.** The Categorization of Regencies / Cities in the Western Sumatra Region based on Klassen's typology, 2013-2017

| Economic Growth Rate Gini Ratio Index | Above average growth | Below average growth |
|---|---|---|
| Gini Ratio below the average (better) | Karimun Pangkal Pinang Medan City Bintan Regency Batam City Tanjung Pinang Dumai | Rokan Hilir Bengkalis Lhoksmawe Bangka Regency West Bangka |
| Gini Ratio above the average (worse) | Sigli City Tanjung Balai Tebing Tinggi Bangka Belitung East Lampung | Langsa Beriuen regency Lingga Regency Central Bangka South Bangka East Belitung Regency |

Source: The Analyzed Data were taken from Tables 2,3 and 4 Data

Differences in economic inequality in the West coast and East coast regions of Sumatera Island was influeced by the geographical structure of each region. The West coast regions are dominated by agricultural sector, while the East coast regions are dominated by industrial sector. That is why the community lives in the East coast of Sumatera Island were more prosperous given that these

regions are located near countries that have industrial areas which are relatively developing compared to those in the West coast of Sumatera since to the West, the West coast only has high seas. Conversely, the East coast regions are near Malacca strait as one of the world's dense trade routes gives a lot of advantages because most of business doers locate their industrial business in Riau islands, Bangka Belitung, and East coast of Sumatera. Even though the West coast regions are near Indian Ocean as one of world's trade route, these areas only have few visitors due to the lack of infrastructure. As a result, their geographical location does not really provide benefit for the regencies/ cities. By referring to (Wei Zhang, 2001) the decrease in regional disparity in the coast of China is caused by the emergence of international trade and foreign investment in China's exclusive economic regions. Similarly, a study in China in the past period, namely in the period 1984-1995 found that rural-urban inequality is higher than inland-coastal inequality towards total inequality (Ravi Kanbur and Xio-Bo Zhang, 1998).

Similar to the previous description, the economic inequality happened in India in some regions were caused by low level of investment, growing population that was not accompanied by economic structure changes to industrial sector, slow government management to attract new investments to the designated regions that caused output increase low while the population continued to grow. (BB Bhattacharya and S. Sakthivel, 2012)

High speed rail in China is able to increase greater economic growth, including capital investment, globalization, marketting, educationa and fiscal desentralization which are able to surpress regional inequality (Chen & Haynes, 2017).

The main factor of economic inequality cause is geographical location, high level of investment, and various economic activities. A geographical location difference makes different number of industrial sector which further causes economic inequality between regions (Kuncoro, 2010). Besides, the level of a region economic inequality can also be determined by the ability

of a region in increasing production, export, and import (Schulz, et. al, 2012). According to geographical location, the West coast regions borders the Indian Ocean. Even though this Ocean is a large trade route, the trade activity is still small and not so wide so that it is not too much traversed and not too crowded.

The above factor made the West coast regions difficult to attract foreign investors to invest, and have not yet gained the increase in economic growth of the West coast regions so that the economic inequality remained high. This condition is in contrast to the East coast regions that border Malacca Strait as one of the world's busiest trade route of Singapore and Malaysia. This situation made the regencies/ cities near these countries easily do economic activities, and attract investors to invest their capital in the East coast regions due to their geographical location. This benefit enabled the community of the East coast regions to increase their trade sector to support the regional economy better. Thus, the community will be prosperous, and reduce the economic development inequality.

Fischer's study (2003) found similar results to this study's that the economic inequality in the western sea area of China is greater than the economic inequality in the Eastern sea area of China. This is caused by the geographical location of the regions, lack of physical and foreign investment as well as regional infrastructure.

It can be concluded that economic inequality in a particular region is due to geographical, natural resources, investment sector, trade sector, and infrastructure. This is in line with a theory by (Kunle, Adeleke, 2014) that economic inequality is strongly influenced by foreign investment, good infrastructure, good human resources, and abundant natural resources. When economic growth in a region is good it will encourage investors to invest their capital in the area. This will also have a positive impact on increasing economic development in the area. Therefore, foreign investment, human resources, natural resources and good infrastructure will be a supporting factor for improving the regional economy.

The findings of this study are in accordance with a study by Nasa Observatory in 2017 on (Google, 2017) about economic inequality that was observed through taking photographs of the island of Sumatra using Nasa satellite imagery at night. The results show that the west coast of Sumatra island has little visible light. This proves that there is little economic activity occurring at night due to the domination of agricultural sector, so there is not too much economic activities occur at night indicated by dark photos. With a little economic activity, the economic inequality in this region can be said to be quite high and when compared with the east coast region on the results of the 2017 Nasa Observatory Satellite Imagery, the photos are so bright and so do the neighboring countries. This means a lot of economic activity is carried out in this area because the East coast has an industrial sector that greatly affects the level of economic inequality. Accordingly, the economic development in this area will be quite good compared to the west coast of Sumatra Island.

By referring to the above explanation, it is known that the West coast regions are dominated by agricultural sector altough they border the Indian Ocean. Indian Ocean is a fairly large trade route but the trade routes are still few and not so busy that it has not yet had an effect on increasing economic growth in the West Coast regions. Alternatively, the West Coast region also has a good soil structure to do farming activities. In contrast, the East Coast regions are directly bordered by the Malacca Strait, Singapore, and Malaysia which are large industrial route areas on the Sumatra Island.

According to the results of hypothesis testing and analysis of Williamson index, it was known that the regencies/ cities in the West coast of Sumatera obtained greater economic inequality by 0.37 than the regencies/ cities in the East coast by 0.28. It was influenced by several factors, such as the regions geographical location, infrastructure, developed industrial and trade sectors, well-managed natural resources, and good quality human resources as well as a lot of foreign capital investment in the regions and the level of population growth. These differences were also proved by the results of paired sample T-test that gained probability value of 0.45 or less than 0.05. It meant that there was a significant difference in the equality of the West coast regions and the East coast regions of Sumatera Island. The level of regencies/ cities inequality in the East coast was assumed low due to the level of excellence of the East Coast Region that was better than regencies / cities in the West Coast region in terms of geographical condition.

There were several factors that increased the economic inequality in the West coast regions of Sumatera. First, the level of economic growth. (Todaro, 2003) states that economic growth will increase income inequality and vice versa. Thus, good economic growth will reduce the level of economic inequality of a region, and the poor economic growth will trigger the high level of region inequality. Second is human resources. Becker (1992) mentions that human as a capital developer is believed to not only increase productivity, but also central role of economy. Third is investment. Jhingan (2004) based on Harrod-Domar's theory argues that investment plays a key role in economic growth by increasing capital modal. When there is a lot of investment in a region, its economic growth will be good, and the economic inequality is reduced.

(Etik & Umiyati 2014) say that income inequality that happens to provices, regencies, and cities in Indonesia is caused by economic structure gap in which a primary sector tends to be more dominant than secondary and tertiary sectors si that the economic value added is lower. Besides, limited resources which cause low absorption of labor and low purchasing power by people affect the quality of labor productivity. (Taryono, 2014) found that economic inequality between regencies / cities in Riau Province during the period 2004-2012 continues to show a decline with fair category. Economic inequality is a complex problem because of many factors, including human resources, and natural resources covering geographical charcteristics, natural characteristics, soil content potential, and rock content (Ravallion & Huppi, 2016).

The decade of economic openness in China after 2004 in the form of government

spending, infrastructure levels, urbanization and education had a significant effect on increasing regional economic growth and increasing regional inequality (Wang, 2016)

Inequality between regions in the development process is common. It is triggered by differences in natural resources, regional characterisctis, and infreastructure owned by the regions themselves. These distribution differences cause the differences in the development between one region to another. (Fajri, 2016).

The East coast of Sumatera is a region that has fertile soil, and abundant mining and petroleum products. It is seen from the contirbution of its Provincial Regional Revenues to National PDB of Riau Province by 5.10 %, and South Sumatera by 2.78 %. Also, the Eastern Sumatera is located close to Malacce Strait which is world's trade route center, and countries that have repid economic development such as Malaysia, Thailand, and Singapore. By having these advantages, regencies/ cities in the East coast regions of Sumatera Island is facilitated to do various economic activities, such as export and import to the neighboring countries. Actually there are abundant natural resources in Western Sumatera provinces, but its not yet managed well so that yet it has not been able to increase the economic growth in that regions. For more, the West coast regions are dominated by agricultural sector that most of the communities work as farmers. On the other hand, the East coast communities work in industrial sector so that their economic growth progress is faster than the west coast area. This has resulted in uneven economic activity throughout Sumatra and triggered economic inequality.

In association with the above findings, it can be concluded that economic inequality is a common problem in various regions. It happenes due to several factors ,such as geographical location, natural resources, human resources, different infrastructure, education, the government spending and investment. These are in line with a study by (Fatih Çelebioğlu, 2010) which recommends investment in education and training for unemployed people in underdeveloped regions because these efforts can affect the level of inequality among regions. Moreover, the government assistance is also needed to solve this issue. It can be done by developing infrastructure, more equitable education and investment between Western and Eastern Sumatera.

## CONCLUSION

There is a difference in regional economic inequality between Eastern and Western Sumatera in which the West part level is higher than the East part. It is caused by the total gross regional revenue in the western region is lower compared to the eastern region, while the population in the west and east is the same.

The contribution of Gross Domestic Regional Product (GDRP) in the western region to the total national Gross Domestic Regional Product (GDRP) is also lower compared to the eastern region. This is because the western region rests on the primary sector with agricultural commodities, plantations and fisheries, while the eastern region's economic structure has begun to change to the secondary sector. and enter the world trade zone.

## REFERENCES

Andhiani, K. D., Erfit, & Bhakti, A. 2018. Analysis of Economic Growth and Development Inequality in Sumatra Region. *E-Journal of Regional Economic and Development Perspective,* 7 (1), 26-34.

B. B. Bhattacharya and S. Sakthivel. 2012. Regional Growth Disparity in India. *Economic and Political Weekly*, 39 (10), 1071–1077.

Becker, G. S. T. A. S. A. 1992. Education, Labor Force Quality, and the Economy. B*usiness Economic*s, 1, 7. Retrieved from Abi / Inform Research

Central Statstics Agency. 2017. Gross Regional Domestic Product. Central Statistics Agency

Chen, Z., & Haynes, K. E. 2017. Impact of high-speed rails on regional economic disparity in China. *Journal of Transport Geography*, 65 (August), 80–91. http://doi.org/10.1016 /j.jtrangeo.2017.08.003

Etharina. 2004. R*egional Inequality in Indonesia: Spatial and Sectoral Dimensions.* MPKP-UI.

Ethics Umiyati. 2014. Analysis of Economic Growth and Development Inequality between Regions in Sumatra Island. *Pradigma Ekonomika*, 9 No 2 Oct.

Fajri. 2016. *Factors Influencing Regency / City Economic Inequality in Aceh Province. Challenge and Strategy Faculty of Economics and Business in Digital Era*.

Fatih Çelebioğlu. 2010. Regional Disparity and Clusters in Turkey: A Lisa (Local Indicators of Spatial Association) Analysis. *Dumlupınar Üniversitesi Sosyal Bilimler Dergisi*, (28), 9 (1), 76–99. http://doi.org/10.1558/jsrnc.v4il.24

Fischer, S. 2003. Globalization and its challenges. *Presented at the Conference in Memory of Rudiger Dornbush*.

Google. 2017. Earth at Nigt Google Earth. Retrieved from https://earth.google.com/web/ @ 27.44405656, -84.76931014,5.6502 4792a, 8916357d, 35y, 0h, 0t, 0r / data = Cjismbigmgy3ztjkyzdlogexmtflnj5mgqbzzgwc zzcwlxwqgq2w

Jhingan, M. 2004. Development Economics and Planning. Jakarta: PT. Raja Grafindo Persada.

Kuncoro. 2010. P*roblems, Policies and Politics of Development Economics*. Jakarta: Erlangga.

Kunle, Adeleke, O. and O. 2014. Impact of Foreign Direct Investment on Nigerian Economic Growth. *Internation Journal of Academic Research*, 4 (8), 234–242.

Perpres. 2012. Ministry of National Development Planning / National Development Planning Agency. Bappenas, III (1), 1–5.

Ravallion, M., & Huppi, M. (016. Measuring Changes in Poverty: A Methodological Case Study of Indonesia during an Adjustment Period Author (s): Martin Ravallion and Monika Huppi Source: *The World Bank Economic Review*, Vol. 5, No. 1 (Jan., 1991), pp. 57-82 Published by: Oxfor, 5 (1), 57–82.

Ravi Kanbur and Xio-Bo Zhang. 1998. Working Paper 세무 대리인 의사 결정. *Department of Agricultural, Resources and Managerial Economics*, WP 98-10 (087), 1–3. http://doi.org/10. 2139/ssrn.701181

Roychowdhury, K., Jones, S. D., Arrowsmith, C., & Reinke, K. 2011. A Comparison of High and Low Gain DMSP / OLS Satellite Images for the Study of Socio-Economic Metrics. *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 4 (1), 35–42. http://doi.org/10.1109/JSTARS.2010.20530 22

Schulz, A. J., Mentz, G., Lachance, L., Johnson, J., Gaines, C., & Israel, B. A. (2012). Associations Between Socioeconomic Status and Allostatic Load: Effects of Neighborhood Poverty and Tests of Mediating Pathways, 102 (9), 1706-1715. http://doi.org/10.2105 /AJPH.2011. 300412

Sutton, P., Elvidge, C., & Ghosh, T. 2007. Estimation of gross domestic product at sub-national scales using nighttime satellite imagery. International *Journal of Ecological Economics & Statistics*, 8 (S07), 5–21. Retrieved from http://urizen-geography.nsm.du.edu/ ~ psutton / AAA_Sutton_WebPage / Sutton / Publications / Sut_Pub_13.pdf

Tampubolon, D. 2007. Development and inequality of the west coast and east coast of North Sumatra. *USU Postgraduate Medan,* 1 (1).

Taryono. 2014. Analysis of Human Development Disparities. *Journal of Socio Economic Development*, IV (11), 194-214.

Todaro. 2003. *Third World Economic Development.* Jakarta: Erlangga.

Wang, F. (2016). Analysis on the Regional Disparity in China and the Influential Factors. American *International Journal of Humanities and Social Science,* 2 (4), 94–104. Retrieved from www.cgrd.org

Wei Zhang. (2001). Rethinking Regional Disparity in China. . *Economics of Planning* 34, (34), 113–138. http://doi.org/https://doi.org/10. 1023 / A: 1017552500252