

**MEASURING REGIONAL INEQUALITY AMONG  
DISTRICTS IN NORTH SUMATRA PROVINCE****Meilin Regina Cahyani<sup>1\*</sup>, Zulkifli Siregar<sup>2</sup>, Azhar Apriandi<sup>3</sup>**<sup>1,2,3</sup>Universitas Islam Sumatera Utara

Jl. Sisingamangaraja, Medan

**\*Email:** [meilinregina10@gmail.com](mailto:meilinregina10@gmail.com)**ABSTRACT**

This study aims to determine whether there is regional inequality, income distribution and development among regencies in North Sumatra. The analytical tools used are the Williamson Index and Theil Entropy Index. This research uses data from the Central Bureau of Statistics, which is available in the form of secondary data from 2018-2022. The results showed that the Williamson Index and Theil Entropy Index figures for regencies in North Sumatra Province during the study period were in the moderate inequality category with an average Williamson Index figure of 0.40 and an average Theil Entropy Index figure of 0.44, indicating that development inequality is decreasing or development equity is getting greater.

**Keywords:** District, Inequality, Theil Entropy Index, Williamson Index.**INTRODUCTION**

Indonesia is a developing country, therefore a common problem often faced by developing countries including Indonesia is the economic gap or inequality in income distribution between high-income groups and low-income groups and the poverty rate or the number of people below the poverty line (Tambunan, 2001). According to Hajiji (2010), income inequality can be determined by a country's level of development, ethnic heterogeneity, and the presence of dictatorships and failed governments in a country. Income inequality will occur in the early stages of economic growth. During this time, income distribution will worsen, but in the later stages, income distribution will improve and inequality will be eroded, creating a more equal society. Inequality has both positive and negative impacts. The positive impact of inequality is that it can encourage other less developed regions to compete and increase their growth to improve welfare. The negative impacts of extreme inequality include economic inefficiency, weakening social stability and solidarity, and high inequality is generally seen as unfair (Todaro, 2006). Inequality has been taking place in various forms, aspects and dimensions. Such as inequality in development results, for example in terms of per capita income or regional income, and inequality in activities or the development process itself. Differences in natural, social, economic, and natural resource characteristics that are distributed differently in each region. This difference is an obstacle to equitable economic development due to the concentration of an economic activity that has an impact on increasing the economy in

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several regions that have abundant natural resources. Natural wealth should be able to make added value in improving economic development. These advantages are expected to have a trickle down effect. However, this natural wealth is not owned by all provinces in Indonesia equally. This is one of the causes of inequality or disparity between regions (Kuncoro, 2003).

North Sumatra Province is inseparable from the problem of regional inequality. This is due to differences in characteristics between districts/cities in North Sumatra province that have a strong influence on the creation of economic development patterns in North Sumatra province, so it is natural that the pattern of economic development between districts/cities in North Sumatra province is uneven. This unevenness affects the ability to develop which results in some districts / cities being able to develop quickly while other districts / cities develop slowly. This ability to develop then causes inequality in both development and income between districts / cities in North Sumatra. North Sumatra Province is the fourth largest province in Indonesia after West Java, East Java, and Central Java. North Sumatra Province consists of 25 regencies, 8 cities, 450 sub-districts, 693 villages, and 5,417 villages and the population of North Sumatra in 2022 according to the central statistics agency reached 15,115,206 people. GRDP at current prices represents the value added of goods and services calculated using current year prices. If the greater the GRDP per capita, the better the welfare of the community. The amount of Gross Regional Domestic Product (GRDP) based on current prices in 2022 in North Sumatra reached Rp955.19 trillion and GRDP per capita. reached Rp63.19 million. Table 1 below shows the amount of GRDP per capita at current prices by district in the North Sumatra region in 2018-2022. Total GRDP Per Capita at Current Prices by Regency in the North Sumatra Region in 2018-2022

**Table 1. Gross Regional Domestic Product**

District	Gross Regional Domestic Product Per Capita at Current Prices by Regency in North Sumatra Region (Billion Rupiah)					
	2018	2019	2020	2021	2022	Average
Nias	24636473	26611574	27619440	28565862	30393638,19	4,28%
Mandailing Natal	28451718	30169003	29379369	31126553	33830497,56	3,52%
South Tapanuli	45961324	49397036	48806866	50945707	55487218,95	3,83%
Central Tapanuli	24934361	26119495	27867949	28753713	31049490,02	4,48%
North Tapanuli	24332249	26071315	26524531	27917074	30291797,92	4,47%
Toba Samosir	39204402	41812686	38204189	39597467	42161712,84	1,46%
Labuhan Batu	64345055	67295287	70449184	75216464	82297309,45	5.04%
Asahan	47854663	51146769	50416672	54003135	59129668,11	4,32%
Simalungun	41038393	43832797	40010292	42418784	46285430,28	2,43%
Dairi	30228407	32272154	30271338	31157809	33972435,3	2,36%
Karo	46917382	49028529	51961249	53349721	57852049,99	4,27%
Deli Serdang	46882094	49166871	57121603	59394175	65275058,35	6,84%
Langkat	38504178	40770602	41997095	44756262	49438868,74	5,13%

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South Nias	19694732	21362077	19975206	20265918	21447849,7	1,72%
Humbang Hasundutan	29325411	31169378	31066971	31828353	34204247,53	3,12%
Pakpak Bharat	22589017	23767278	23282247	23834097	25519226,85	2,47%
Samosir	32469661	35152678	33395960	34534288	37077364,13	2,69%
Serdang Berdagai	42294269	45450612	43601239	45944656	50176775,18	3,48%
Coal	77415555	81396934	85362158	90029827	98150709,02	4,86%
North Padang Lawas	40154176	42096054	46921625	49849624	53784663,76	6,02%
Padang Lawas	38458403	39891069	46121233	49822507	54575865,34	7,25%
Labuhan Selatan	Batu 75465242	79036333	90032146	97078029	106625839,3	7,16%
Labuhan Batu Utara	63032129	66758160	66167204	71009862	77457956,83	4,20%
North Nias	23724681	25449555	25276857	26043861	27675665,99	3,13%
West Nias	20490439	22185630	21408363	22298150	23780110	3,02%

**Source: Data processed (BPS SUMUT)**

Table 1 shows that the level of per capita GRDP acquisition from 25 districts in North Sumatra Province has increased every year. However, the value of GRDP per capita between districts has not been evenly distributed, when viewed in the table there are only two districts that have an average GRDP per capita very far from other districts in 2022, namely South Labuhan Batu Regency Rp. 106,625,839.28 billion rupiah with an average economic growth of 7.16% and Batu Bara Regency Rp. 98,150,709.02 billion rupiah with an average economic growth of 4.86% in the range of 2018 to 2022. The high GRDP per capita in Labuhan Batu Selatan Regency is due to income from the industrial sector reaching 43.95% and Batu Bara Regency due to income from the agricultural sector, namely the red chili commodity reaching 1,500 hectares with production reaching 63,800 tons in 2022. In addition, there are two districts. which has a very low average GRDP per capita from other districts, namely South Nias Regency Rp. 21,447,849.70 billion rupiah with an average economic growth of 1.72% and West Nias Regency Rp. 23,780,110 billion rupiah with an average economic growth of 3.02% in the range of 2018 to 2022. Based on data from the Central Bureau of Statistics regarding the population of North Sumatra Province in 2018 the population in North Sumatra Province amounted to 14,415,391 people, in 2019 the population of North Sumatra Province amounted to 14,562,549 people, the percentage increase in population in North Sumatra Province from 2018 to 2019 was 0.5%. in 2020 the population in North Sumatra Province amounted to 14,703,532 people, the percentage increase in population from 2019 to 2020 is 0.48%. in 2021 the total population in North Sumatra Province amounted to 14,936,148 people, the percentage increase in population in North Sumatra Province in 2020 to 2021 was 0.78%. in 2022 the population in North Sumatra Province amounted to 15,115,206 people, the percentage increase in population in North Sumatra Province in 2021 to 2022 was 0.59%. Based on the percentage increase in population in North Sumatra Province from 2018 to 2022, it can be concluded that the population in North Sumatra Province has increased every year.

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GRDP data shows that there are several districts that experienced a decrease in GRDP based on current prices, including Toba Samosir Regency, Asahan Regency, Simalungun Regency, Dairi Regency, South Nias Regency, Humbang Hasundutan Regency, Pakpak Bharat Regency, Samosir Regency, Serdang Berdagai Regency, North Nias Regency, this is due to the impact of Covid-19. Based on the background that has been described, the author is interested in conducting research on "Measuring Regional Inequality Between Districts in North Sumatra Province".

### METHOD

The population in this study were all districts in North Sumatra Province with a total of 25 districts, The data used in this study is secondary data where the data obtained by researchers indirectly through intermediary media, namely through the bps.go.id website. The data analysis technique used in measuring inequality between districts in North Sumatra Province used the Williamson Index, namely:

$$IW = Y$$

The analysis of regional inequality between regions in Kabupaten/kota can also be calculated using the Theil Entropy Index (Kuncoro: 2004) with the following formula:

$$I(y) = \sum(y_j / Y) \times \log [(y_i / Y) / (x_j / X)]$$

### RESULTS

The Williamson Index is a weighted variation created by Williamson in 1965. The Williamson Index is very sensitive to measuring regional differences and observing trends in inequality. The method describes what the researcher has done to answer the research question. The basic principle to explain the method is to "follow my recipe; you will get

**Table 2. Williamson Index of Regency in North Sumatra Province 2018-2022**

District	Williamson Index					Average
	2018	2019	2020	2021	2022	
Nias	0.23	0.23	0.25	0.26	0.26	0.25
Mandailing Natal	0.41	0.41	0.44	0.46	0.47	0.44
South Tapanuli	0.33	0.29	0.35	0.37	0.38	0.34
Central Tapanuli	0.38	0.38	0.41	0.41	0.42	0.40
North Tapanuli	0.34	0.34	0.36	0.38	0.38	0.36
Toba Samosir	0.26	0.26	0.28	0.31	0.31	0.29
Labuhan Batu	0.43	0.43	0.46	0.48	0.48	0.46
Asahan	0.53	0.53	0.56	0.59	0.60	0.56
Simalungun	0.57	0.57	0.61	0.67	0.69	0.62
Dairi	0.33	0.33	0.35	0.38	0.38	0.35
Karo	0.39	0.40	0.43	0.43	0.44	0.42
Deli Serdang	0.91	0.91	0.98	0.94	0.95	0.94
Langkat	0.63	0.63	0.67	0.68	0.69	0.66
South Nias	0.35	0.35	0.37	0.41	0.42	0.38

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<b>Humbang Hasundutan</b>	<b>0.27</b>	<b>0.27</b>	<b>0.29</b>	<b>0.30</b>	<b>0.31</b>	<b>0.29</b>
<b>Pakpak Bharat</b>	<b>0.14</b>	<b>0.14</b>	<b>0.15</b>	<b>0.16</b>	<b>0.16</b>	<b>0.15</b>
<b>Samosir</b>	<b>0.22</b>	<b>0.22</b>	<b>0.23</b>	<b>0.25</b>	<b>0.25</b>	<b>0.23</b>
<b>Serdang Berdagai</b>	<b>0.48</b>	<b>0.48</b>	<b>0.51</b>	<b>0.55</b>	<b>0.55</b>	<b>0.52</b>
<b>Coal</b>	<b>0.40</b>	<b>0.13</b>	<b>0.42</b>	<b>0.43</b>	<b>0.44</b>	<b>0.36</b>
<b>North Padang Lawas</b>	<b>0.32</b>	<b>0.32</b>	<b>0.34</b>	<b>0.34</b>	<b>0.35</b>	<b>0.34</b>
<b>Padang Lawas</b>	<b>0.32</b>	<b>0.33</b>	<b>0.35</b>	<b>0.35</b>	<b>0.35</b>	<b>0.34</b>
<b>Labuhan Batu Selatan</b>	<b>0.36</b>	<b>0.36</b>	<b>0.38</b>	<b>0.38</b>	<b>0.38</b>	<b>0.37</b>
<b>Labuhan Batu Utara</b>	<b>0.37</b>	<b>0.37</b>	<b>0.40</b>	<b>0.42</b>	<b>0.42</b>	<b>0.40</b>
<b>North Nias</b>	<b>0.23</b>	<b>0.23</b>	<b>0.24</b>	<b>0.26</b>	<b>0.26</b>	<b>0.24</b>
<b>West Nias</b>	<b>0.18</b>	<b>0.18</b>	<b>0.19</b>	<b>0.20</b>	<b>0.21</b>	<b>0.19</b>

Source: Excel output, data processed 2022

Table 2 shows the results of the calculation of the Williamson Index of Regencies in North Sumatra Province from 2018 to 2022 which were calculated using excel software. In this table, it can be seen that from 2018 to 2022 the Regency that has the highest Williamson Index every year is Deli Serdang Regency The Regency that has the lowest Williamson Index from 2018 to 2022 is Pakpak Bharat Regency.

**Table 3. Category of District Inequality in North Sumatra Province in 2018-2022**

District	IW	Category	District	IW	Category
Pakpak Bharat	0,15	Low Inequality	Labuhan Batu0,37 Selatan		Moderate Inequality
West Nias	0,19		South Nias	0,38	
Samosir	0,23		Central Tapanuli	0,4	
North Nias	0,24		Labuhan Batu Utara	0,4	
Nias	0,25		Karo	0,42	
Toba Samosir	0,29		Mandailing Natal	0,44	
Humbang Hasundutan	0,29		Labuhan Batu	0,46	
North Padang Lawas	0,34		Serdang Berdagai	0,52	
Padang Lawas	0,34		Asahan	0,56	
South Tapanuli	0,34		Simalungun	0,62	
Dairi	0,35	Moderate	Langkat	0,66	High Inequality
North Tapanuli	0,36	Inequality	Deli Serdang	0,94	
Coal	0,36				

Source: Excel output, data processed 2022

Based on table 3 above, when viewed from the overall average Williamson Index between districts in 2018 to 2022. The districts that have the lowest Williamson Index are Pakpak Bharat Regency with a Williamson Index figure of 0.15. West Nias Regency with a Williamson Index figure of 0.19. Samosir Regency with a Williamson Index figure of 0.23.

North Nias Regency with a Williamson Index figure of 0.24. Nias Regency with a Williamson Index figure of 0.25. Toba Samosir Regency with a Williamson Index figure of 0.29. Humbang Hasundutan Regency with a Williamson Index figure of 0.29. North Padang Lawas Regency with a Williamson Index figure of 0.34. Padang Lawas. Padang Lawas Regency with a Williamson Index figure of 0.34. South Tapanuli Regency with a Williamson Index figure of 0.34. Regencies that have a medium Williamson Index are Dairi Regency with a Williamson Index figure of 0.35. North Tapanuli Regency with a Williamson Index figure of 0.36. Batu Bara Regency with a Williamson Index figure of 0.36. South Labuhan Batu Regency with a Williamson Index figure of 0.37. South Nias Regency with a Williamson Index figure of 0.38. Central Tapanuli Regency with a Williamson Index figure of 0.40. North Labuhan Batu Regency with a Williamson Index figure of 0.40. Karo Regency with a Williamson Index figure of 0.42. Mandailing Natal Regency with a Williamson Index figure of 0.44. Labuhan Batu Regency with a Williamson Index figure of 0.46. The regencies that have the highest Williamson Index are Serdang Berdagai Regency with a Williamson Index figure of 0.52. Asahan Regency with a Williamson Index figure of 0.56. Simalungun Regency with a Williamson Index figure of 0.62. Langkat Regency with a Williamson Index figure of 0.66. Deli Serdang Regency with a Williamson Index figure of 0.94. This research is in accordance with research conducted by Ryansyah, M et al who examined the Williamson Index and Klassen Typology approaches in an effort to realize SDGs in North Sumatra, this study states that the most moderate inequality is found (Ryansyah, M et al, 2023).

### **Theil Entropy Index**

The analysis of regional inequality between regions in Kabupaten/kota can also be calculated using the Theil Entropy Index (Kuncoro: 2004) with the following formula:

$$I(y) = \sum (y_j / Y) \times \log [(y_i / Y) / (x_j / X)]$$

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**Table 4. Theil Entropy Index of Districts in North Sumatra Province**

District	Theil Entropy Index					Average
	2018	2019	2020	2021	2022	
Nias	0.28	0.27	0.30	0.28	0.27	0.28
Mandailing Natal	0.34	0.33	0.32	0.32	0.32	0.33
South Tapanuli	0.55	0.54	0.54	0.53	0.53	0.54
Central Tapanuli	0.28	0.26	0.30	0.28	0.28	0.28
North Tapanuli	0.27	0.26	0.28	0.27	0.27	0.27
Toba Samosir	0.48	0.47	0.44	0.42	0.41	0.44
Labuhan Batu	0.69	0.67	0.70	0.70	0.70	0.69
Asahan	0.57	0.55	0.56	0.56	0.56	0.56
Simalungun	0.50	0.49	0.46	0.45	0.45	0.47
Dairi	0.37	0.35	0.34	0.32	0.32	0.34
Karo	0.56	0.54	0.57	0.55	0.55	0.55
Deli Serdang	0.56	0.54	0.61	0.60	0.60	0.58
Langkat	0.47	0.46	0.48	0.47	0.48	0.47
South Nias	0.18	0.18	0.16	0.13	0.12	0.15
Humbang Hasundutan	0.35	0.34	0.35	0.33	0.32	0.34
Pakpak Bharat	0.24	0.22	0.22	0.20	0.19	0.21
Samosir	0.40	0.39	0.38	0.36	0.36	0.38
Serdang Berdagai	0.51	0.50	0.49	0.49	0.49	0.50
Coal	0.77	0.76	0.79	0.78	0.78	0.78
North Padang Lawas	0.49	0.47	0.53	0.52	0.52	0.51
Padang Lawas	0.47	0.45	0.52	0.52	0.52	0.50
Labuhan Batu Selatan	0.76	0.74	0.81	0.81	0.82	0.79

**Source: Excel output, data processed 2022**

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Table 4 shows the results of the calculation of the Theil Entropy Index of the Regency in North Sumatra Province from 2018 to 2022 calculated using excel software. Seen in table 4 Regencies that have Theil Entropy Index values The highest is Labuhan Batu Selatan Regency with a Theil Entropy Index figure of 0.79 from 2018 to 2022. Batu Bara Regency with a Theil Entropy Index figure of 0.78 from 2018 to 2022. The regency that has the lowest Theil Entropy Index value is South Nias Regency with a Theil Entropy Index figure of 0.15 in 2018 to 2022. West Nias Regency with a Theil Entropy Index figure of 0.18 from 2018 to 2022. Based on table 4 above, when viewed from the overall average Theil Entropy Index between districts in 2018 to 2022. The regencies that have the lowest Theil Entropy Index to the highest Theil Entropy Index are South Nias Regency with a Theil Entropy Index figure of 0.15. West Nias Regency with a Theil Entropy Index figure of 0.18. Pakpak Bharat Regency with a Theil Entropy Index figure of 0.21. North Nias Regency with a Theil Entropy Index figure of 0.25. North Tapanuli Regency with a Theil Entropy Index figure of 0.27. Kabupaten Tapanuli Tengah with a Theil Entropy Index figure of 0.28. Nias Regency with a Theil Entropy Index figure of 0.28. Mandailing Natal Regency with a Theil Entropy Index figure of 0.33. Dairi Regency with a Theil Entropy Index figure of 0.34. Humbang Hasundutan Regency with a Theil Entropy Index figure of 0.34. Samosir Regency with a Theil Entropy Index figure of 0.38. Toba Samosir Regency with a Theil Entropy Index figure of 0.44. Simalungun Regency with a Theil Entropy Index figure of 0.47. Langkat Regency with a Theil Entropy Index figure of 0.47. Serdang Berdagai Regency with a Theil Entropy Index figure of 0.50. Padang Lawas Regency with a Theil Entropy Index figure of 0.50. North Padang Lawas Regency with a Theil Entropy Index figure of 0.51. South Tapanuli Regency with a Theil Entropy Index figure of 0.54. Kabupaten Karo with a Theil Entropy Index figure of 0.55. Asahan Regency with a Theil Entropy Index figure of 0.56. Deli Serdang Regency with a Theil Entropy Index figure of 0.58. North Labuhan Batu Regency with a Theil Entropy Index figure of 0.68. Labuhan Batu Regency with a Theil Entropy Index figure of 0.69. Batu Bara Regency with a Theil Entropy Index figure of 0.78. Labuhan Batu Selatan Regency with a Theil Entropy Index figure of 0.79.

### CONCLUSION

Based on the results of the research that has been done, it can be concluded as follows: The kabupaten that have low inequality based on the Williamson Index calculation with an  $IW < 0.35$  are Pakpak Regency, West Nias Regency, Samosir Regency, North Nias Regency, Nias Regency, Toba Samosir Regency, Humbang Hasundutan Regency, North Padang Lawas Regency, Padang Lawas Regency, South Tapanuli Regency. Kabupaten that have moderate inequality based on the Williamson Index calculation with an inequality score of  $0.35 \leq IW \leq 0.5$  are Kabupaten Dairi, Kabupaten Tapanuli Utara, Kabupaten Batu Bara, Kabupaten Labuhan Batu Selatan, Kabupaten Nias Selatan, Kabupaten Tapanuli Tengah, Kabupaten Labuhan Batu Utara, Kabupaten Karo, Kabupaten Mandailing Natal, Kabupaten Labuhan Batu. The districts that have high inequality based on the Williamson Index calculation with  $IW > 0.5$  are Kabupaten

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Serdang Berdagai, Kabupaten Asahan, Kabupaten Langkat, Kabupaten Deli Serdang. The districts that have low inequality based on the Theil Entropy Index calculation are South Nias, West Nias, Pakpak Bharat, North Nias, North Tapanuli, Central Tapanuli, Nias, Mandailing Natal, Dairi, Humbang Hasundutan. The districts that have moderate inequality based on the Theil Entropy Index calculation are Samosir Regency, Toba Samosir Regency, Simalungun Regency, Langkat Regency, Serdang Berdagai Regency, Padang Lawas Regency, North Padang Lawas Regency, South Tapanuli Regency, Karo Regency, Asahan Regency, Deli Serdang Regency. The districts that have high inequality based on the Theil Entropy Index calculation are Labuhan Batu Utara, Labuhan Batu, Batu Bara, Labuhan Batu Selatan. Factors that cause inequality include differences in natural resources, differences in demographic conditions, lack of smooth mobility of goods and services, concentration of regional economic activities, and different allocation of development funds between regions (Silviana, 2020).

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