IRJEMS International Research Journal of Economics and Management Studies
Published by Eternal Scientific Publications
ISSN: 2583 – 5238 / Volume 3 Issue 3 March 2024 / Pg. No: 183-189
Paper Id: IRJEMS-V3I3P125, Doi: 10.56472/25835238/IRJEMS-V3I3P125

Original Article

The Impact of Disparities in Economic Development: Among Cities in North Sumatra Province after COVID-19

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Received Date: 19 February 2024 Revised Date: 29 February 2024 Accepted Date: 07 March 2024 Published Date: 27 March 2024

Abstract: *Economic development aims to change for the better through planned and consistent efforts and development to achieve the best goal of obtaining prosperity. The COVID-19 virus hit the Indonesian population and impacted the decreasing gross regional domestic product at constant prices in 2020–2022. This research uses secondary data from 2017–2022, with a base year of 2010. The analytical tools used are the Williamson Index, Klassen Typology, and the regression model, which is panel data. The software used is eviews. The results of the Williamson index analysis explain that the highest inequality occurred in Medan at 0.45, while the lowest occurred in Simalungun Regency. Class Typology Analysis explains that: 1) fast-developing and fast-growing areas are Medan, South Labuhan Batu, North Labuhan Batu, South Tapanuli, Tanjung Balai, Asahan, and Padang Lawa, 2) advanced but depressed areas are Pematang Siantar, Karo, Sibolga Batu Bara, and Deli Serdang; 3) fast-growing areas are Padang Lawas, Mandailing Natal, West Pakpak, Gunung Sitoli, Simalungun, Samosir, and Padang Sidempuan; 4) relatively underdeveloped areas are North Tapanuli, Tebing Tinggi, Binjai, Langkat, Humbang Haunjungan, Toba Samosir, Dairi, West Nias, North Nias, and South Nias. Regression analysis explains that development disparities have a negative and significant influence on the gross regional domestic product of North Sumatra Province. Estimated parameters do not match expectations, where the variables have a real and significant effect with a real level of 1% and development disparities have a positive and significant effect on the poor population. The estimated parameters align with expectations, where all variables have a real and significant effect at a real level of 1%. Development disparities positively affect COVID-19, both before and after COVID-19. Estimated parameters align with expectations, where all variables have no significant effect.*

.***Keywords:*** *Williamson Index, Klassen Typology, and Regression*.

I. BACKGROUND OF THE STUDY

Economic growth carried out by the government without being followed by equitable economic development will widen the gap between one community group and another, while economic equality without economic growth is the same as increasing poverty in an area (Jonadi 2012). Regional autonomy law number 22 of 1999 concerning regional government gives broad, real, and responsible authority to regions in a proportional manner, which is realized by regulating, distributing, and utilizing national resources, as well as balancing central and regional finances following the principles of democracy, community participation, equality, and justice, as well as regional potential and diversity, implemented within the framework of the Unitary State of the Republic of Indonesia. According to BPS (2023), the factors causing regional economic inequality include the concentration of regional economic activities, investment allocation, level of mobility, low production factors between regions, differences in natural resources between regions, differences in demographic conditions between regions, and a lack of smooth regional trade (Santosa 2015).

Entering the beginning of 2020, the government and global society must face new challenges in the form of the COVID-19 pandemic, which has spread to the country and all corners of the region. The fast and widespread spread of COVID-19 has caused most regions to implement large/micro-scale social restrictions.(Hidayadi and Niam 2022) The impact of the COVID-19 pandemic not only endangers health but also has the potential to endanger the social conditions of society, the national and regional economies, and the financial system's stability. According to BPS North Sumatra Province (2023), the economy of North Sumatra in 2020 compared to 2019 experienced a contraction of 1.07 percent. The open unemployment and poverty rates decreased to 6.91 percent and 10.19 percent, respectively, due to the impact of the economic contraction (Ratnoo 2024).

North Sumatra Province is one of the largest provinces, 72.981,23 km^2, with 33 regencies/cities. The vastness of North Sumatra Province and the large number of regencies/cities in North Sumatra Province have resulted in disparities in economic development between regencies/cities, and this is a unique phenomenon in North Sumatra Province. Differences in area and population in each regency/city cause migration in each regency/city, which results in disparities in each regency/city in the

province of North Sumatra. The existence of regencies/cities experiencing fast and slow growth. Unequal development in each region has implications for regional income. Areas with increased land productivity levels dominate each regency's gross regional domestic product. The Gross Regional Domestic Product increase is dominated by regencies/cities with plantations or land uses (Malau et al. 2022).

According to(Jonadi 2012), the new economic view considers that the main goals of economic development are GDP growth and poverty alleviation, overcoming income inequality, and providing employment opportunities in a continuously developing economy. Increasing GRDP does not merely reduce the level of poverty in the area. The success of an economy is no longer only measured by increasing GDP but also by a country's ability to overcome the problem of poverty (Oktanata 2022).

Based on the background above, problems arise, namely (1) What are the disparities in economic development among regencies/cities in North Sumatra Province in 2017-2022 (2) What are the disparities in economic development after COVID-19 in 2017-2022? It is hoped that this research can be used as consideration in formulating development policies to increase economic growth in North Sumatra Province and as a reference for future researchers.

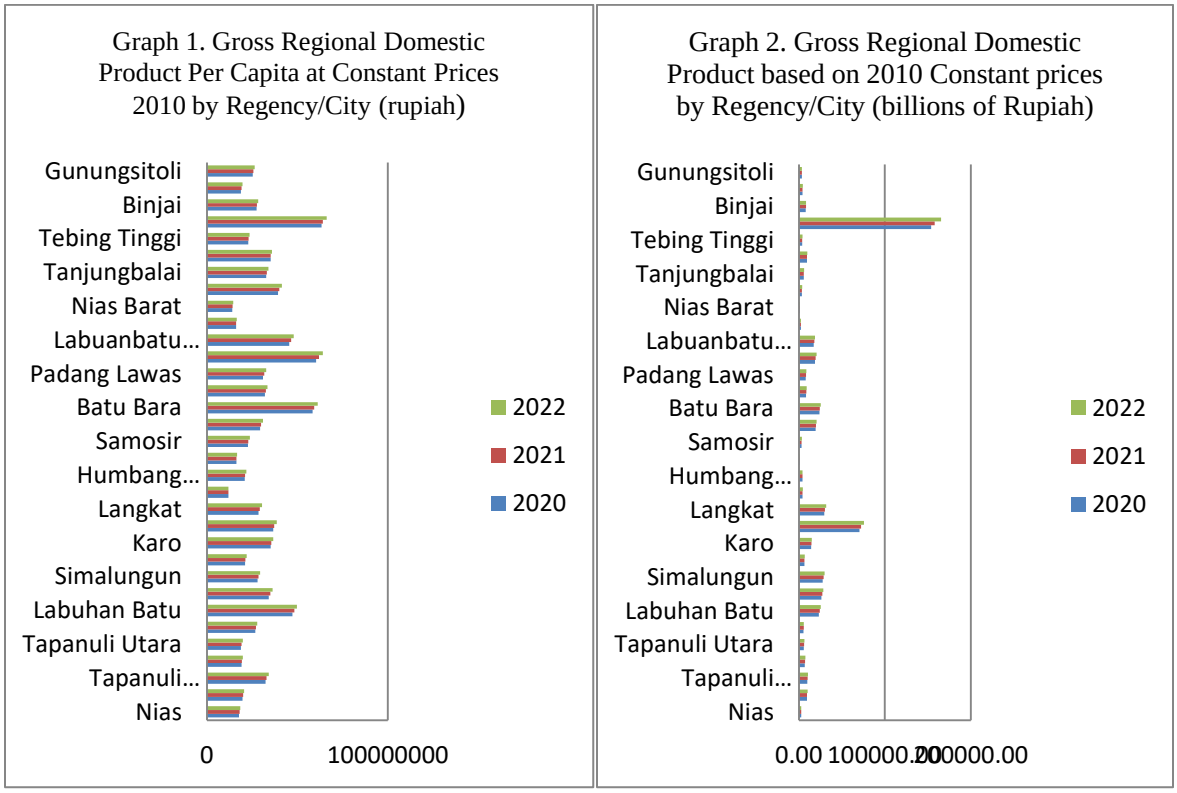

Figure 1: Graph of Gross Regional Domestic Product at Constant Prices and Number of Poor People According to Regency/City of North Sumatra Province, 2020-2022

II. LITERATURE REVIEW

A) Economic Development

Suryana (2000) states that economic development is a process that causes the per capita income of the population in society to increase in the long term. In contrast, economic development as a process means continuous change and takes place in the long term. According to Todaro (2006), economic development is a multi-dimensional process that includes changes in structure, attitudes, and institutions. Apart from that, economic development also includes increasing economic growth, reducing unequal income distribution, and eradicating poverty to produce a series of economic progress that is truly beneficial and through an efficient process.

B) Gross Regional Domestic Product

According to Gross Regional Domestic Product, GRDP (Gross Regional Domestic Product) is the total amount of added value of goods and services produced from all economic activities throughout the region in a certain year, generally within one year. Calculating GRDP can use two prices, namely GRDP at current prices and GRDP at constant prices, where GRDP at

current prices is the value of goods and services calculated using the prices prevailing in that year, and GRDP at constant prices is the value of goods and services calculated using prices in a certain year which is used as a reference year or base year. To calculate economic growth in nominal terms, GDP can be used. GRDP is used for various purposes, but the most important is to measure overall economic performance. This amount will equal the sum of the nominal consumption values, investment, government spending on goods and services, and net exports.

C) Inequality

Inequality or disparities among regions is a common thing that occurs in the economic activities of a region. This occurs because of differences in natural resource content and demographic conditions in each region. This difference makes the ability of a region to encourage the development process also different. According to Sjafrizal (2018), the concentration of economic activity in a particular location tends to increase, and this is also in line with Hirschman's (1958) statement, which states that the transmission of economic growth among regions generally does not run in a balanced manner (unbalanced).

D) Williamson Index

The Williamson Index is an instrument for measuring regional development in an area by comparing it with higher areas (Berlianantiya 2017). In other words, the Williamson Index broadly measures how much inequality there is in development in a region. The Williamson Index has a value between 0 - 1; the closer it is to zero, the more evenly distributed the region's development is. Meanwhile, if it approaches one, the region becomes unequal. The Williamson index formula is as follows:

$$IW = \frac{\sqrt{(y_i - Y)^2 \; f_i / n}}{Y} \qquad (1)$$

where IW = Williamson Index
y_t = GRDP per regency/city of North Sumatra Province in the t-th year
Y = Average GDP per capita of North Sumatra Province
f_t = Population per regency/city in the t-th year of North Sumatra Province
n = Population of North Sumatra Province

E) Klassen Typological Analysis

According to(Darius, Jamal, and Syathi 2021), Klassen Typology analysis is used to determine the structure of economic growth in a region based on regional groupings divided into predetermined criteria. Klassen typology is also a regional economic analysis tool, namely an analytical tool used to obtain an overview of the pattern and structure of economic growth in a region (Table 1).

Table 1: Regional Classification based on Klassen Typology

GRDP Per Capita (Y) / **Growth Rate (R)**	$y_i < y_n$	$y_i \geq y_n$
$r_i \geq r_n$	Quadrant III (fast-developing areas)	Quadrant I (fast-developing and fast-growing areas)
$r_i < r_n$	Quadrant IV (fast-developing areas)	Quadrant II (developed but depressed areas)

Source: *Sjafrizal (2019)*

Where

y_i : GRDP per capita of regencies/cities of North Sumatra Province in the t-th year
r_i : Economic growth rate of regencies/cities of North Sumatra Province in the t-th year
y_n : GDRP per capita of North Sumatra Province in the t-th year
r_n : Economic growth rate of North Sumatra Province in the t-th year

The quantitative analysis method used in this research is to answer the second research objective: What are the disparities in economic development before COVID-19 and after COVID-19 in regencies/cities in North Sumatra Province?

The analysis used is panel data regression from the following equation:

$$IW_{it} = \beta_0 + \beta_1 PDRB_t + \beta_2 KM_t + \beta_3 DV_t + \beta_4 IPM_t + \varepsilon \qquad (2)$$

Where

PM = Number of Poor People in North Sumatra Province in 2017-2022
DV_t = Dummy Variable
IPM_t = Human Development Index for the t-th year

III. RESEARCH METHODOLOGY

Following the research objectives, this research was quantitative descriptive, and the research location was North Sumatra province. The data used in this research was secondary data obtained from the North Sumatra Province Central Statistics Agency (No Title n.d.) and related agencies. The data used were as follows: (1) GRDP of North Sumatra Province per regency/city in 2017-2022, (2) average GDP of North Sumatra Province per capita, (3) population of North Sumatra Province per regency/city in 2017 -2022, (4) population of North Sumatra Province in 2017-2022, (5) the economic growth rate of the regencies/cities of North Sumatra Province in 2017-2022. The location of this research was in North Sumatra Province.

IV. RESULTS AND DISCUSSION

A) Results of Klassen Typology Analysis of North Sumatra Province

The results of the Klassen typology analysis of North Sumatra Province obtained a classification of regional economic growth in the regencies/cities of North Sumatra Province in 2017-2022 (Graph 2).

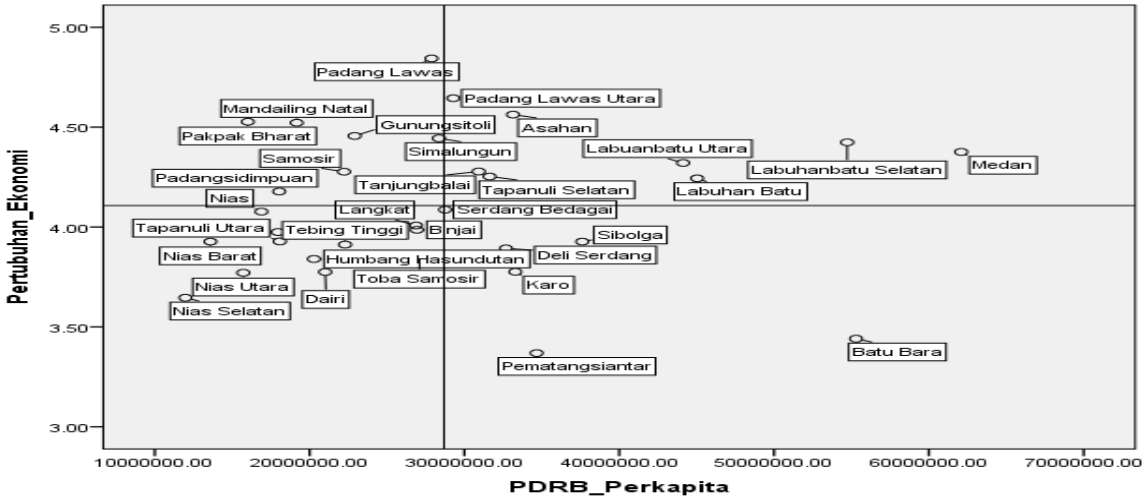

Figure 2: Classification of Typology Analysis of Regency/City in North Sumatra Province in 2014-2022
Source: *Processed Data (2023)*

The results of Klassen Typology Analysis: The regencies/cities of North Sumatra province can be divided into four quadrants. (Science 2019) **Quadrant 1** is a fast-developing and fast-growing area, a region with a higher rate of economic growth and per capita income than the per capita income of North Sumatra province. **Quadrant 1** areas include Medan, South Labuhan Batu, North Labuhan Batu, Labuhan Batu, South Tapanuli, Tanjung Balai, Asahan, and North Padang Lawas. **Quadrant 2** is a developed but depressed area, an area whose economic growth rate is lower than the provincial per capita income. **Quadrant 3** is a fast-developing area that has a high growth rate, but the per capita income level is lower than the per capita income of North Sumatra Province. These areas are Padang Lawas, Mandailing Natal, West Pakpak, Gunung Sitoli, Simalungun, Samosir, and Padang Sidempuan. **Quadrant 4** is a relatively underdeveloped area with a lower level of economic growth and per capita income than provincial per capita income. These areas are North Tapanuli, Tebing Tinggi, Binjai, Langkat, Humbang Haunjungan, Toba Samosir, Dairi, West Nias, North Nias, and South Nias.

B) Results of Williamson Index Analysis

Inequality in the economic development of a region, whether large or small, can provide an overview of the conditions and development of economic development in that region. Inequality of economic development among regencies/cities in North Sumatra province. (Wuryandani 2020) Table 2 explains that there is inequality in economic development among regencies/cities in North Sumatra Province, which is relatively varied. The highest inequality occurred in Medan City at 0.45, while the lowest occurred in Simalungun Regency. Development inequality in each Regency/City of North Sumatra province due to differences in growth and per capita income of each region.

Table 2: Williamson Index for Regencies/Cities in North Sumatra Province in 2027-2022

Regencies/Cities	Williamson Index								
	2014	2015	2016	2017	2018	2019	2020	2021	2022
Nias	0.0414	0.0407	0.0404	0.0419	0.0417	0.0411	0.0401	0.0405	0.0410
Mandailing Natal	0.0602	0.0588	0.0576	0.0564	0.0555	0.0551	0.0600	0.0611	0.0614

Tapanuli Selatan	0.0143	0.0145	0.0150	0.0158	0.0164	0.0176	0.0112	0.0122	0.0129
Tapanuli Tengah	0.0576	0.0588	0.0600	0.0609	0.0619	0.0636	0.0583	0.0573	0.0577
Tapanuli Utara	0.0528	0.0527	0.0532	0.0537	0.0540	0.0539	0.0538	0.0536	0.0534
Toba Samosir	0.0031	0.0032	0.0030	0.0028	0.0025	0.0018	0.0122	0.0132	0.0137
Labuhan Batu	0.1084	0.1064	0.1043	0.1023	0.1005	0.0970	0.1065	0.1072	0.1077
Asahan	0.0317	0.0332	0.0346	0.0359	0.0375	0.0396	0.0319	0.0347	0.0354
Simalungun	0.0004	0.0019	0.0035	0.0048	0.0060	0.0082	0.0159	0.0162	0.0167
Dairi	0.0368	0.0362	0.0356	0.0351	0.0346	0.0337	0.0411	0.0434	0.0434
Karo	0.0299	0.0285	0.0271	0.0261	0.0239	0.0209	0.0302	0.0282	0.0279
Deli Serdang	0.0461	0.0421	0.0384	0.0344	0.0305	0.0236	0.0861	0.0796	0.0836
Langkat	0.0221	0.0213	0.0210	0.0203	0.0199	0.0183	0.0131	0.0105	0.0077
Nias Selatan	0.0835	0.0838	0.0841	0.0844	0.0844	0.0843	0.0896	0.0957	0.0973
Humbang Hasundutan	0.0324	0.0327	0.0328	0.0328	0.0329	0.0329	0.0343	0.0354	0.0356
Pakpak Bharat	0.0243	0.0245	0.0246	0.0247	0.0249	0.0253	0.0264	0.0276	0.0282
Samosir	0.0220	0.0211	0.0206	0.0200	0.0193	0.0180	0.0227	0.0236	0.0235
Serdang Bedagai	0.0017	0.0003	0.0011	0.0027	0.0041	0.0071	0.0038	0.0031	0.0021
Batu Bara	0.1625	0.1594	0.1571	0.1539	0.1515	0.1493	0.1600	0.1574	0.1578
Padang Lawas Utara	0.0006	0.0003	0.0000	0.0007	0.0013	0.0030	0.0094	0.0094	0.0089
Padang Lawas	0.0068	0.0077	0.0082	0.0091	0.0096	0.0116	0.0045	0.0055	0.0057
Labuhanbatu Selatan	0.1328	0.1305	0.1283	0.1262	0.1245	0.1209	0.1550	0.1506	0.1521
Labuanbatu Utara	0.0858	0.0860	0.0862	0.0865	0.0867	0.0871	0.0815	0.0851	0.0856
Nias Utara	0.0435	0.0431	0.0432	0.0434	0.0435	0.0434	0.0449	0.0466	0.0473
Nias Barat	0.0411	0.0408	0.0405	0.0384	0.0383	0.0379	0.0399	0.0416	0.0418
Sibolga	0.0219	0.0230	0.0236	0.0244	0.0251	0.0264	0.0242	0.0243	0.0248
Tanjungbalai	0.0070	0.0072	0.0076	0.0078	0.0082	0.0086	0.0104	0.0099	0.0095
Pematangsiantar	0.0315	0.0319	0.0317	0.0309	0.0306	0.0308	0.0233	0.0213	0.0200
Tebing Tinggi	0.0218	0.0221	0.0224	0.0224	0.0226	0.0228	0.0254	0.0265	0.0271
Medan	0.4547	0.4609	0.4708	0.4778	0.4854	0.4948	0.4392	0.4482	0.4508
Binjai	0.0067	0.0065	0.0063	0.0060	0.0058	0.0056	0.0116	0.0130	0.0136
Padangsidimpuan	0.0447	0.0452	0.0455	0.0457	0.0458	0.0463	0.0458	0.0461	0.0460
Gunungsitoli	0.0235	0.0232	0.0227	0.0221	0.0217	0.0212	0.0153	0.0148	0.0152

Source: *Processed Data (2023)*

C) Panel Data Regression Analysis

To carry out the analysis, panel data regression was used to estimate disparities in Regency/City Economic Development in North Sumatra Province. The dependent variable and the independent variable are as follows: 1. Gross Regional Domestic Product (GRDP), 2. Poor Population (PP),3.Dummy Variable before and after COVID-19, and 4. Community Development Index (CDI). So, the regression model is panel data, which consists of three approaches, namely (1) Pooled Least Squares model, (2) fixed effect model, and (3) random effect model.

D) Estimation

The estimation results using the FEM method model on the impact of disparities in economic development among regencies/cities in North Sumatra Province post-covid-19 in 2017-2022 are as follows (Table 3).

Table 3: Estimation Results using the FEM Model Method

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.04981	0.018297	2.722326	0.0105
PDRB	-2.23E-09	2.28E-10	-9.804245	0
PM	0.000936	0.000107	8.729397	0
DV	0.002817	0.002143	1.314446	0.1983
IPM	0.000138	0.000272	0.507082	0.6157
R-squared	0.921994	Mean dependent var		0.039172
Adjusted R-squared	0.911929	S.D. dependent var		0.021375
S.E. of regression	0.006343	Akaike info criterion		-7.154595
Sum squared residual	0.001247	Schwarz criterion		-6.934662
F-statistic	91.60179	Durbin-Watson stat		0.582696
Prob(F-statistic)	0			

Source: *Processed Data (2023)*

So, the estimated equation is as follows:

$$IW_t = 0{,}049 - 2{,}23E-09\,PDRB_t + 0{,}001\,PM_t + 0{,}003\,DV_t + 0{,}0001\,IPM_t + e \quad (3)$$

Prob	(0.010)	(0.000)	(0,0000)	(0,1983)	(0.6157)
t-statics	(2.722)	(-9.804)	(8.729)	(1.3144)	(0.507)

E) Coefficient of Determination Results

The results of the coefficient of determination of R-square value of 0.92199 can explain that GRDP, poor people, dummy variables (pre-Covid and post-Covid period), and community development index can influence development inequality in North Sumatra Province in 2017-2022, amounting to 92.2 percent, while 7.8 percent was influenced by other variables not included in this study.

F) F Test

The results of the F statistical test generally show whether the independent variables referred to in the model have a simultaneous influence on the dependent variable. The F statistical test basically shows whether the independent variables referred to in the model have a simultaneous influence on the dependent variable. With a Prob (F Statistics) value of 0.000 < 0.05 means Ho is rejected and H is accepted, which means that the test shows that GRDP, poor population, dummy variables (before and after Covid), and the community development index significantly affect economic development disparities (Williamson index).

G) The Effect of Development Disparities on Income (GRDP)

The estimated results from the equation above explain that development disparities have a negative and significant effect on the Gross Regional Domestic Product of North Sumatra Province.(Hodijah and Bhakti 2015) Estimated parameters do not match expectations (hypothesis), where the variable has a real and significant effect with a real level of 1%. Increasing inequality will reduce income (GRDP). This follows the findings of (Masselus and Fiala 2024) in developed countries that find that income inequality actually reduces economic growth.

H) The Effect of Development Disparities on the Poor

The results of the estimated equation above explain that development disparities have a positive and significant effect on people with low incomes. The estimated parameters align with expectations (hypothesis), where all variables have a real and significant effect with a real level of 1%. If the poor population decreases by 10%, it will reduce development disparities by 87%. This follows (Hermanto 2020) research explaining that the inequality development on people with low incomes has a positive effect.

I) The Influence of Development Disparities on Dummy Variables (before and after Covid)

The estimated result of the equation above is that development disparities have a positive effect on COVID-19, both before and after COVID-19.(Aditia et al., 2020) The estimated parameters align with expectations (hypothesis), where all variables have no significant effect with a significance level of 1% and 5%. An increase in COVID cases by 10% means that disparities in economic development will increase by 13%. This follows the research results of (Rahmawati et al. 2021), explaining that during the COVID-19 pandemic, economic disparity conditions will occur, and the events can be significant, moderate, or small. In the COVID-19 pandemic in the Jabodetabek area, almost all regencies and cities experienced a significant decline in GRDP. The estimated parameters align with expectations (hypothesis), where all variables have a real and significant effect with a real level of 1% and 5% (Wiliandri 2010).

J) The Influence of Development Disparities on the Human Development Index

The estimated results of Equation 3 above explain that economic development disparities have a positive effect on the Community Development Index. The estimated parameters align with expectations (hypothesis), where all variables have a real and significant effect with a real level of 20%. An increase in the community development index by 10% will increase economic development disparities by 5.1% (Oktanata, 2022).

V. CONCLUSION AND SUGGESTION

A) Conclusion

Based on the results and discussion above, several conclusions can be drawn following the research objectives. **Class Typology Analysis** shows that **Quadrant 1** is a fast-developing and fast-growing area. The areas include Medan, South Labuhan Batu, North Labuhan Batu, Labuhan Batu, South Tapanuli, Tanjung Balai, Asahan, and North Padang Lawas. **Quadrant 2** is a developed but depressed area. These areas include Pematang Siantar, Batu Bara, Karo, Deli Serdang, Sibolga, and Serdang Bedagai. **Quadrant 3** is a fast-developing area. These areas include Padang Lawas, Mandailing Natal, West Pakpak, Gunung Sitoli, Simalungun, Samosir, and Padang Sidempuan. **Quadrant 4** is a relatively underdeveloped area. These areas include North Tapanuli, Tebing Tinggi, Binjai, Langkat, Humbang Haunjungan, Toba Samosir, Dairi, West Nias, North

Nias, and South Nias. Based on **the Williamson index analysis**, it is found that the highest inequality occurred in the city of Medan at 0.45, while the lowest occurred in Simalungun regency. Development inequality in each regency/city in North Sumatra Province due to differences in growth and per capita income in each region. Based on panel data analysis, the following results are obtained: (1) development disparities have a negative and significant effect on the Gross Regional Domestic Product of North Sumatra Province. Estimated parameters do not match expectations (hypothesis), where the variables have a real and significant effect with a real level of 1%; (2) Development disparities have a positive and significant effect on the poor population. The estimated parameters align with expectations (hypothesis), where all variables have a real and significant effect with a real level of 1%; (3) Development disparities have a positive effect on COVID-19, both before and after COVID-19. The estimated parameters align with expectations (hypothesis), where all variables have no significant effect with a significance level of 20%.

B) Suggestion

Regency/City Governments should carry out development following the Term Development Plan (RPJP) by increasing Regency/City economic growth and optimizing Regency/City potential management. The North Sumatra Provincial Government should further encourage regency/city governments to increase the economic growth of each region.

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